Handbook of Research on

Global Aspects of Sustainable Finance in Times of Crises

Ibrahim Yasar Gok

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Handbook of Research on Global Aspects of Sustainable Finance in Times of Crises

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In the last years, sustainable finance emerged as one of the most popular research topics all over the world. Inspired by the need to reconsider the role and contribution of finance for a more sustainable development and capitalism, sustainable finance encompasses a very broad set of terms and investment approaches that lead to a blurring of its boundaries and core elements. This chapter explores research on the field of sustainable finance by using a bibliometric approach and mapping its conceptual landscape and the related sub-themes. The chapter provides a better understanding of sustainable finance to researchers, organizations, and the society by clarifying the origin, concept, and boundaries of sustainable finance, and delineating comprehensive knowledge of the tools, approaches, and instruments useful for sustainable development in the financial world.

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Anastassios Gentzoglanis, University of Sherbrooke, Canada

More often than not, responsible investing (RI) is associated with "patient" capital and sustainable development. Venture capital (VC), by its objectives to invest in projects with very high returns and exit quickly the market, is rightly considered as "impatient" capital, and as such, it is a less likely candidate to contribute to sustainability. This chapter advances the argument that VC can indeed contribute to sustainability, should it adopt the ESG factors into its investment criteria. This is illustrated using the case study of a Canadian VC firm, the Cycle Capital Management (CCM). The latter uses strict ESG criteria and rigorous decision-making mechanisms in the screening, evaluation, and the choice of highly lucrative and innovative projects with the aim to contribute to the Canadian economy's sustainability through its efforts to reduce the environmental footprint of its investments. Policy makers and regulators should develop policies that promote the growth and development of venture capital, should they care

about sustainability and value creation.

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The emergence of impact investing over the past decade has been accompanied by an increased interest of practitioners and scholars in the impact evaluation topic, one of the twofold pillars of the such an innovative financial approach. To contribute to the international debate, this study adopts a qualitative approach by obtaining results from a systematic literature review of extant research. This is useful to 1) identify the current existing impact evaluation approaches adopted in the field and 2) derive an empirical analysis in the impact investing sector with a focus on impact measurement in social impact bonds. The study opens interesting insights into recognizing the potential for the whole impact investing field, deriving both from theory and evidence of impact evaluation practices.

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Transitioning towards sustainability requires fundamental changes in policies, institutions. Green Finance is a novel concept which is discussed to address current environmental issues. This chapter illustrates obstacles and solutions to the greening of financial systems to provide an overview on the scaling up of Green Finance in a post COVID-19. The frameworks of Strategic Niche Management and Multi-Level Perspective are used to walk the reader in analyzing relevant steps for sustainability, also in light of the COVID-19 pandemic. Implications are derived focusing on the concepts of mission-oriented policies and nudges applied to financial markets.

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Beata Zofia Filipiak, University of Szczecin, Poland

An effective response to climate change that assures a sustainable development pathway will require a fundamental transformation towards a low carbon, climate-resilient societies. Each change need for solid financial support, financial solutions, and dedicated instruments, taking into account ESG factors and taking into account the impact of financial crises. This chapter aims to bring together theories, trends, dilemmas, and directional concepts to answer the question about changes in the existing paradigm of climate finance. On the other hand, the analysis of trends and presenting future prospects regarding sustainable finance will be aimed at enhancing the substantive and practical knowledge of the target audience. In addition, in this chapter, the following issues will be presented in particular: changes in the sustainable finance paradigm and the emergence of the climate finance paradigm, macro-and micro-financial aspects of climate change taking into account the influence of risk (including ESG risk), and a new landscape of climate finance.

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Sonia Marcos, University of Burgos, Spain
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The European Union has a clear strategy on how sustainable development should be financed. However, there is still no regulation that defines which activities can be considered sustainable and which cannot. Private initiative has taken the lead in recent years with the publication of different taxonomies and principles applicable on a voluntary basis to green financial products and social projects. The EU taxonomy, issued in 2020, establishes criteria to determine whether an economic activity is environmentally sustainable, and the green bond standard is in the consultation period in 2021. The EU taxonomy will increase investor confidence in green financial products, prevent greenwashing, and reduce information costs. This chapter reviews the evolution and future application of the EU taxonomy, the EU green bond standard, and the need to adopt a taxonomy for socially sustainable activities.

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Chak Sham Wong, City University of Hong Kong, Hong Kong
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This chapter discusses green certification and credit rating on Mainland Chinese green bonds in Hong Kong. These green bonds are mostly denominated in USD, distributed to global investors, and issued with international practices of green certification and credit rating. Using qualitative analysis and case study method, the chapter finds four external reviewers sharply different in their assessment framework although they attempt to assess degree of compliance of a bond issuance or a bond issuer with some international green standards. All the three global credit rating agencies claim their incorporation of green assessment into their credit rating process. However, the chapter finds no clear evidence on such claim from their credit rating comments on selected bond issuers.

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This study provides an empirical analysis on the existence of a green bond premium on the secondary market. The green bond premium is defined as the yield differential between a green and a comparable brown bond, while controlling for liquidity. The EUR-denominated green bonds are studied to determine if they diverge from comparable conventional bonds in terms of yields, during the period from January 2018 to December 2020. Through a matching method, a sample composed of 35 bond couples is obtained. On average, this study reports a negative greenium of -3.20 bps within the sample. The greenium differs across the sub-samples, being negative for green bonds issued by financial institutions, in domestic currency, by AA- and A-rated issuers, and for those issued by issuers with low or medium ESG risk levels. Finally, the ESG risk level has been found to be the driver of the negative green bond premium.

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Neslihan Turguttopbaş, Atılım University, Turkey

The purpose of this chapter is testing the existence of the green bond premium in the secondary market by using a most update data set involving the market developments in the pandemia times. The variables such as rating, sector, amount of the issue, maturity, and external review are balanced by using a matching procedure of a green bond with conventional bond issued by the same issuer. The ask-bid spread differential is regressed by using a panel regression method under fixed and random effects. The results of the analysis revealed that there exists negative premium of 39 basis points, and the green bond premium is more profound for USD denominated twins than for Euro ones as there exist a negative premium of 59 basis points for USD-denominated green bonds whereas it is -26 basis points for Euro-denominated bonds.

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This chapter analyzes the academic debate regarding the need to adopt a long-term vision of CSR strategies. It's based on the premise that short run is the dominant approach in financial markets, and this situation could be negatively conditioning the long-term sustainability value creation. New social values may be requesting different management decisions from companies, prioritizing long-term over short term results. A thorough literature review has been done across specialized journals, international reports, and key legislation, trying to determine and model the elements facilitating this sustainable value creation. It shows the alignment needed between CEO and their shareholders within the framework of corporate governance to create long-term value within CSR. There are signs of a possible financial over-performance of companies that strategically create a shared value with stakeholders based on environmental, social, and governance objectives, selected due to their materiality. A model is proposed to consider a long-term approach creating sustainable value in organizations.

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Matthew D. Worthington-Smith, FarSightFirms, South Africa
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Sustainable finance proponents argue that integrating environmental, social, and governance (ESG) factors into investment decisions should have a positive long-term material impact on financial performance and ultimately benefit wider society as a whole. This chapter is based on interviews and an ESG materiality survey that was run among 20 prominent South African asset managers. The results demonstrate that if there is a growing awareness of ESG factors among the respondents, there are some perceived tensions around how to practically embed ESG factors within investment processes. In addition, the results show that the integration of ESG factors into financial valuation are not yet mainstream and that more needs to be done to demonstrate how the integration of ESG factors within investment processes materially impacts financial performance and meanwhile contributes to the sustainable development of economies.

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This chapter examines the impact of ESG scores on bank stock returns as a response to the COVID-19 pandemic. The authors use a sample of 73 publicly listed banks from 15 developed European countries. They perform the analysis using two different periods that cover the pandemic: the first major wave period of COVID-19 (February-April 2020) and an extended period (February 2020-April 2021). The findings reveal the negative influence of the COVID-19 pandemic on bank stock returns during the first wave of the pandemic. They further find that, during the first wave, stock returns of banks with higher ESG scores were more resilient to the pandemic. However, when they use the extended time period (from February 2020-April 2021), the influence of both COVID-19 and ESG scores becomes insignificant. The chapter's findings have important policy implications during unprecedented crisis times such as COVID-19.

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Isil Erem Ceylan, Usak University, Turkey

This chapter intends to measure environmental, social, and economic sustainability efficiency levels of the manufacturing companies listed in Borsa Istanbul Sustainability Index by using data envelopment analysis (DEA) based on the target year of 2019. In this context, considering the relationship between inputs and outputs determined as a result of the comprehensive review of the related literature, efficiency assessment is made by considering environmental, social, and economic indicators, which are the main dimensions of corporate sustainability. The input-oriented Charnes, Cooper, and Rhodes (CCR) and Banker, Charnes, and Cooper (BCC) models have been used in the efficiency measurement. According to the obtained efficiency scores for the relatively inefficient companies in terms of environmental, economic, and social dimensions, several suggestions are offered depending on the potential improvement rates for them.

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Berthold Matthias Kuhn, Freie Universität Berlin, Germany
Claudia Tober, Klima-Kollekte, Germany

This chapter discusses the current trend of mainstreaming sustainable finance in Germany. It provides an overview of contributions of different stakeholders to this trend and sheds light on the evolution of the sustainable finance landscape in Germany, including banks, the insurance sector, rating agencies, nonprofits, and academia. EU regulations are currently driving change and promoting sustainable finance in Germany. New policy initiatives and regulations are closely monitored and discussed by diverse stakeholders, including organisations with a long-standing expertise in promoting responsible and ethical investments. Advocacy-oriented nonprofits critically address greenwashing and engage in debates on qualitative aspects. The sustainable finance trend is expected to gain further traction in Germany.

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Morufu Oladimeji Shokunbi, Yaba College of Technology, Nigeria
Rabiu Olowo, Lagos State Ministry of Finance, Lagos, Nigeria

The chapter explicates the need to rethink the prospects of sustainable finance (SF) for agribusiness transformation in spite of the challenges facing the sector in Nigeria. It extends to highlighting the implications of the nexus on entrepreneurship development. After a triangular data analysis using the world development indicators (2000-2016) and scholarly articles, the authors found that the prospects of SF are enormous: (1) Nigeria has a modest agricultural growth performance in the crop, food, livestock, and cereal production that could support SF; and (2) SF options such as green loans, green bonds, green credit, green investment funds, green mortgage scheme, and other green financial support instruments could be suitable for agribusiness transformation in the country. Also, the content analysis revealed there are 13 challenges facing agribusiness transformation in the country, and these have harmed the vegetation, farmland, and ocean leading to low productivity. The authors contribute to the literature by identifying SF options as a game-changer for agribusiness transformation.

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Sanela Arsić, Technical Faculty in Bor, University of Belgrade, Bor, Serbia
Aleksandra Fedajev, Technical Faculty in Bor, University of Belgrade, Bor, Serbia

The European Union (EU) consists of 27 economies characterized by different economic structures, living standards, demographic dynamics, technology development, and other factors shaping their sustainable development patterns. This chapter aims to examine the impact of total investments and R&D investments on the sustainable development of EU economies and determine how these financial investments impact sustainable competitiveness in the global market. The assessment of the sustainable development performances was performed for the period from 2008 to 2019 using the linear regression model. The key findings pointed out that total investments and R&D investments had different impacts on sustainable competitiveness aspects in old member states (OMS) and new member states (NMS). The results could help policymakers understand, adjust, and optimize sustainable competitiveness to secure economic growth in all regions and reduce the differences between OMS and NMS.

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Paradigm changes also change the sources of corporate finance. The goal of this chapter is to demonstrate how the sociological changes that will be created by technological developments transform the sources of finance within the framework of "sustainability" and "financial inclusion." At this point, the basic elements of the financial system in the transition from traditional financing to alternative financing and to platform-based financing, albeit a new one, are examined. For this purpose, first of all, traditional financing sources and alternative financing sources are briefly mentioned, and then platform-ecosystem-based financing sources, which are the main subject of the study, are shed light on. The sources of financing provided through FinTechs are examined within the framework of digital finance-digital inclusion and online finance models (especially crowdfunding). The changes that the COVID-19 process may create in financial resources and the digital technologies it may bring are also assessed.

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Foreword

Sustainable finance is increasingly becoming one of the most researched academic subjects in the area of economics and finance. Environmental, Social and Governance (ESG) practices are also becoming decisive in today's business environment. ESG practices play a key role in a company's financial performance and "good-citizen" performance. As expected, sustainable finance, as a new research subject, raises a lot of questions and generates many debates. On the one hand, academics design models to explain the causes for this interest in sustainable finance and analyze its implications for long-term growth and prosperity. On the other hand, businesses discover the virtues of sustainable finance and adopt the ESG principles either to make a real contribution to corporate and social sustainability or to improve how they are perceived by environmentally conscious consumers and other interested parties, thereby distinguishing themselves from competition. Arguably, corporations respond to society's demands for more transparency, better management practices and accountability with respect to the environment and other ESG aspects. Few academics doubt that sustainable finance could be a real motive for business practices. To put it differently, they believe that sustainable finance strategies simply cannot be profitable. They argue that to satisfy the new trends in sustainable finance, corporations would rather adopt less costly strategies, like "greenwashing", i.e. strategy aiming at trumping up a company's green credentials, which do not actually contribute to economic growth and sustainability.

This book is based upon selected and edited academic papers and it is an attempt to give a straightforward account of the recent developments in the field of sustainable finance and to blend them into the traditional theory of corporate finance. The editor, Dr Ibrahim Gok, has carefully selected a wide range of chapters reflecting the rich and international aspects of academic research in this growing field. This book provides a thorough examination of the current debate with respect to the business and policy issues that arise from the study of sustainable finance, with particular emphasis on modelling, methodologies and data sources and applications to real world cases. The empirical evidence and case studies demonstrate that the adoption of sustainable finance practice has the potential for increasing firms' profitability and society's well-being. This may be the case especially in periods of shocks and financial crises like the Covid-19 pandemic as highlighted in some chapters of the book. Lest readers who think of sustainable finance issues as esoteric or unimportant, can refer to a recent report published by the Ministry of Environment and Climate Change, Canada (2019) that stresses the importance of sustainable finance as a tool for "accelerating the transition to a smarter, more resilient and more prosperous economy" (p. 3).

This book captures both the convergent and divergent issues of sustainable finance from a number of perspectives and achieves state-of-the-art results. The book succeeds in providing a multifaceted and rich view of both the changing approaches in the study of sustainable finance and the new developments in the application of the theoretical models in business practices. The editor and the book's contributors

are to be congratulated for this timely publication. All in all, the contributions of this volume reflect the highly diverse environment of researchers and provide a crucial window into key contemporary debates in sustainable finance. I am confident that this book will inform and shape future debates, steer more academic research, stimulate strategic thinking and business planning.

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REFERENCES

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Preface

Sustainable finance has been one of the emerging areas of finance in the last decade. With its emphasis on any form of financial services that take environmental, social and governance (ESG) considerations into account in decision-making processes, it can help to improve social well-being, preserve the ecosystems and promote sustainable economic development. Furthermore, it can contribute to economic and financial resilience, along with enabling sustainable recovery against crises arising from physical or financial shocks.

This book titled *Handbook of Research on Global Aspects of Sustainable Finance in Times of Crises* discusses theory and concepts, focuses on practices and strategies, addresses the recent challenges and trends, and presents future prospects regarding sustainable finance. The book provides a global look at sustainable finance in a variety of contexts, along with highlighting contemporary issues in light of crises such as the climate emergency and the COVID-19 pandemic.

The book consists of 17 chapters. A brief description of each of the chapters is as follows:

Chapter 1, contributed by Rabia Fatima, Iustina Alina Boitan and Rosella Carè, highlights the ambiguity of boundaries and core elements regarding sustainable finance, and by applying a bibliometric approach, it depicts the conceptual landscape, which provides a better understanding of the theme and sub-themes.

Anastassios Gentzoglanis, in Chapter 2, proposes a link between venture capital (VC) and responsible investing (RI), though at first it seems that the objective of VP is quite opposite to the nature of RI. By conducting a business case study, the chapter proves that under certain circumstances, VC can indeed contribute to sustainability.

Chapter 3, authored by Eugenia Strano, Alessandro Rizzello and Annarita Trotta, presents an evaluation for impact investing, and delves into the existing impact evaluation approaches, alongside providing an empirical analysis focusing on social impact bonds' impact measurement.

Patrizio Giganti and Pasquale Marcello Falcone, in Chapter 4, consider the need for scaling up of green finance in the post-Covid-19 era. They present an overview of environmental awareness and green finance, provide obstacles and solutions for the greening of the financial system, and apply strategic niche management and the multi-level perspective to analyze the green finance scenario in light of Covid-19 crisis. They also discuss the concepts of mission-oriented policies and the "nudge", and explain these concepts' applications to the financial markets.

Beata Zofia Filipiak, in Chapter 5, focuses on climate finance, and brings together the theories and trends, as well as addressing the current challenges. Chapter depicts the new climate finance landscape, along with providing future perspectives and recommending actions for climate finance.

In Chapter 6, Sonia Marcos and Maria-Jesús Castrillo identify the EU Taxanomy, which establishes criteria to assess an economic activity is whether environmentally sustainable, along with introducing the EU Green Bond Standard, which may be brought to the legislative agenda of European Commission soon. They also discuss future directions for the EU legal framework in order to adopt a taxonomy for socially sustainable activities, which have become more pronounced during the Covid-19 crisis.

Chapter 7, contributed by Chak Sham Wong and Stan H M Ho, focuses on Mainland China green bond issuance in Hong Kong, reviews green certification approaches and explores the effect of ESG factors on credit rating.

Chapter 8 and Chapter 9 both investigate the existence of the green bond premium in the secondary market. In Chapter 8, Sonia Stati and Paolo Ceccherini study EUR-denominated green bonds' divergence from matched conventional bonds. In Chapter 9, Neslihan Turguttopbaş studies both EUR and USD denominated green bonds. Both chapters report a negative premium. While Chapter 8 reveals the ESG risk level as being the driver of the negative premium, Chapter 9 points out that the greenium of USD denominated green bonds are more profound than EUR denominated ones.

Manuel Moreno, Elena Mañas-Alcón, Oscar Montes and Beatriz Fernández-Olit, in Chapter 10, rise the problem of short-termism in financial markets, and its negative effect on long-term vision of CSR strategies. They review the academic literature, legislation and international standards on non-financial information in order to identify and model the elements that facilitate long term sustainable value creation in organizations.

Chapter 11, authored by Matthew D. Worthington-Smith and Stephanie Giamporcaro, raises the crucial topic of ESG materiality, and shines a spotlight on awareness and implementation of ESG solutions within the South African asset managers' investment processes.

In Chapter 12, by considering 73 publicly listed banks from developed EU countries, Gamze Ozturk Danisman examines the effect of their ESG scores on stock returns during two different periods of Covid-19 crisis. A more resilient stock return associated with a higher ESG score is demonstrated especially during the first wave of pandemic.

Isil Erem Ceylan, in Chapter 13, investigates the sustainability efficiency in Turkish manufacturing companies listed in XUSRD, by considering environmental, social and economic indicators and applying data envelopment analysis. Some suggestions are made for the companies that get relatively lower scores in order to improve their efficiency.

In Chapter 14, by clarifying the contributions of government and regulatory authorities, banks and asset managers, institutional investors, rating agencies and consulting firms, lobbies and advocacy-oriented nonprofits, and academia to sustainable finance trend in Germany, Berthold Matthias Kuhn and Claudia Tober provide an overview of stakeholders, and depict the sustainable finance landscape in Germany.

Chapter 15, authored by Lukman Raimi, Morufu Oladimeji Shokunbi and Rabiu Olowo, addresses the challenges of agribusiness in Nigeria, sheds light on the sustainable finance prospects for agribusiness transformation, and finally discusses the implications of nexus on entrepreneurship development.

In Chapter 16, by using World Bank's Enterprise Surveys data for the period 2008 and 2019, Sanela Arsić and Aleksandra Fedajev explore the impact of total and R&D investments on social, ecological and economic aspects of sustainable competitiveness in the old and new EU member states. It is concluded that especially the ecological and economic aspects of sustainable competitiveness are quite different between old and new member states. Also, the effect of investments differs across the social, ecological and economic indicators.

Chapter 17, contributed by Çiğdem Kurt-Cihangir and Burcu Zengin, highlights the paradigm change in the financial system, and focuses on ensuring financial sustainability in light of the transition from traditional finance to platform-based finance.

Covering a wide range of topics such as climate finance, green finance, social finance, ESG investing and responsible banking, the book is ideal for corporate managers, portfolio managers, investors, financial analysts, researchers, academicians, students, and policymakers.

I hope this book on Sustainable Finance, with its strong international flavor and valuable insights and perspectives, will make a significant contribution to this emerging and exciting field.

Ibrahim Yasar Gok
Süleyman Demirel University, Turkey & Freie Universität Berlin, Germany

Acknowledgment

I would like to extend my sincere gratitude to all the chapter authors, whose time, energy and ideas made this book possible.

Many thanks to reviewers who spared their time in hot summer months of July and August, and I know that some of them indeed invested their holiday time. Their expertise, insights and recommendations were essential to provide the readers a high-quality reference.

I am indebted to the editorial advisory board members for their assistance, cooperation and invaluable comments to ensure the quality of this book.

Great appreciation is extended to Prof. Anastassios Gentzoglanis, Professor of Economics and Finance at the University of Sherbrooke, Canada, who agreed to write a foreword for this book. Also, he has contributed a valuable chapter and collaborated to the achievement of this book.

I'm additionally grateful to the IGI Global team and especially Gianna Walker, development editor of this project, who guided me right from the beginning.

A special mention goes to Prof. Dr. Andreas Löffler, who invited me as a visiting professor to the Department of Finance, Accounting and Taxation of Freie Universität Berlin. His hospitality and ongoing support facilitated completing this project.

The biggest acknowledgement goes to Zeynep, my dear wife and friend, and to Bilge, my lovely daughter. Your love, support and understanding helped develop this book.

Chapter 1
How Many Shades Are There in Sustainable Finance?
A Bibliometric Review

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ABSTRACT

In the last years, sustainable finance emerged as one of the most popular research topics all over the world. Inspired by the need to reconsider the role and contribution of finance for a more sustainable development and capitalism, sustainable finance encompasses a very broad set of terms and investment approaches that lead to a blurring of its boundaries and core elements. This chapter explores research on the field of sustainable finance by using a bibliometric approach and mapping its conceptual landscape and the related sub-themes. The chapter provides a better understanding of sustainable finance to researchers, organizations, and the society by clarifying the origin, concept, and boundaries of sustainable finance, and delineating comprehensive knowledge of the tools, approaches, and instruments useful for sustainable development in the financial world.

INTRODUCTION

Many studies have suggested that the subprime crisis highlighted a crisis of ethics and values that raised the demand for long-term approaches to creating sustainable development in the finance world. In this perspective, several works emphasized that traditional finance has not been able to fulfill its social purpose (Sandberg, 2018).

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The concept of sustainable finance emerged from sustainability or sustainable development defined as "the provision of financial capital and risk management products and services in ways that promote or do not harm economic prosperity, the ecology and community well-being" (Strandberg, 2005, p. 6). According to academic literature, sustainable development has considered economic, environment, and social constraints on the same level rather than preference for just monetary goals (Lagoarde-Segot & Paranque, 2017). Thus, sustainable development not only reflects all the issues related to the environment, society, and governance (ESG), but also creates sustainability by balancing these three main factors (Vifell & Sonery, 2012).

Salzmann (2013) describes how environment, social justice, and corporate governance can be considered the three main central aspects of concern in assessing the sustainability of an investment. More recently, academic contributions on sustainable finance are increasingly focusing on the role of sustainable finance in achieving Sustainable Development Goals (Ziolo et al., 2021), on the challenges and opportunities emerging after the COVID-19 crisis (Caldecott, 2020; Quatrini, 2021), and on the role of regulatory policy to encourage the development of sustainable finance (Klettner et al., 2019; Ahlström & Monciardini, 2021; Okonjo, 2021). The exploration of the following themes further enriches the current debate around sustainable finance: Environmental, Social, and Governance (ESG) (Ramadhani, 2019; Kew & Krosinsky, 2020; Weston & Nnadi, 2021), Sustainable Responsible Investments and Socially Responsible Financial Markets (Jednak, & Jednak, 2019), Impact Investing (Park, 2018), Green Bonds (Park, 2018; Carè et al., 2018; Maltais & Nykvist, 2020; Birindelli et al., 2020), and Green and Climate Finance (Dörry & Schulz, 2018; Liang & Renneboog, 2020; Migliorelli, 2021).

Although there have been many reviews before, most of them are more inclined to specific sub-themes. These reviews are often unable to summarize the development and knowledge structure of the whole field. Sustainable finance encompasses an extensive set of terms and investment approaches without a clear understanding of its boundaries and core elements. Based on this consideration, this chapter explores the stance of previous studies on sustainable finance by (i) identifying their origins and roots; and (ii) by mapping its conceptual landscape and the related sub-themes.

The structure of a scientific field can be analyzed by its research and publication activity (Ronda-Pupo, 2017). This chapter uses bibliometric tools (Castriotta, Loi, Marku, & Naitana, 2019) that, combined with a co-word analysis approach, can show the structure and central themes of a research area (Tunger & Eulerich, 2018). More in detail, a bibliometric analysis enables the identification of current trends and future research avenues (Fahimnia et al., 2015; Li, Wu, & Wu, 2017; Xu et al., 2018).

Finally, this study provides a better understanding of sustainable finance to researchers, organizations, and society by clarifying the origin, concept, and boundaries, and delineating comprehensive knowledge of the tools, approaches, and instruments useful for sustainable development in the financial world.

SCOPE AND RESEARCH METHODOLOGY

The aim of this chapter is to conduct a systematic and objective bibliometric analysis on sustainable finance to determine the theoretical structure of this emerging field and the future research directions. To accomplish the aim, a bibliometric approach was used to describe the evolution of this research field quantitatively. This methodological approach supports researchers in understanding the knowledge structure of a research field and capturing both research gaps and future research directions. Bibliometric analyses are conducted by using an objective, replicable, and quantitative approach. One of the main

Table 1. Search protocol

Database	Fields	Document types	Keyword	Number of articles	Search key
SCOPUS	All fields	Articles	"sustainable finance"	1909	ALL (("sustainable finance") AND (LIMIT-TO (DOCTYPE, "ar"))
ISI Web of Knowledge	All fields	Articles	"sustainable finance"	348	ALL FIELDS: ("sustainable finance") Refined by: DOCUMENT TYPES: (ARTICLE) Timespan: 1990–2021. Indexes: SSCI, A&HCI, CPCI-S, SCI-EXPANDED, CPCI-SSH, BKCI-SSH, BKCI-S, ESCI, CCR-EXPANDED, IC.

Source: Authors' elaboration

significant results emerging from this methodological approach is the "scientific knowledge map" in which visual graphics depict the structure, development process, core content, and frontier of a research field (Shiffrin & Börner, 2004).

The authors applied a systematic literature review and co-word analysis for this work. According to Gough et al. (2012), a systematic review is based on a set of processes namely, defining the research questions, choosing the inclusion and exclusion criteria, defining the keyword-based search terms, analysis of the literature, and synthesis. Further, an analysis of keywords co-occurrence was used to systematically evaluate the existing sub-themes, determine their evolution over time, and identify the future research pathways.

The analysis of keywords co-occurrence is an effective method for exploring research topics and identifying new research trends because the terms used by authors as keywords can provide a concise overview of the important contents and key points of a body of articles (Li et al., 2016). The VOSviewer 1.6.17 tool calculates the frequency of keywords and creates a keywords co-occurrence matrix used to analyze keywords co-occurrence. Sections below describe the methodological approach adopted for the systematic literature review and then the preliminary standardization procedures adopted for the keyword co-occurrence analysis.

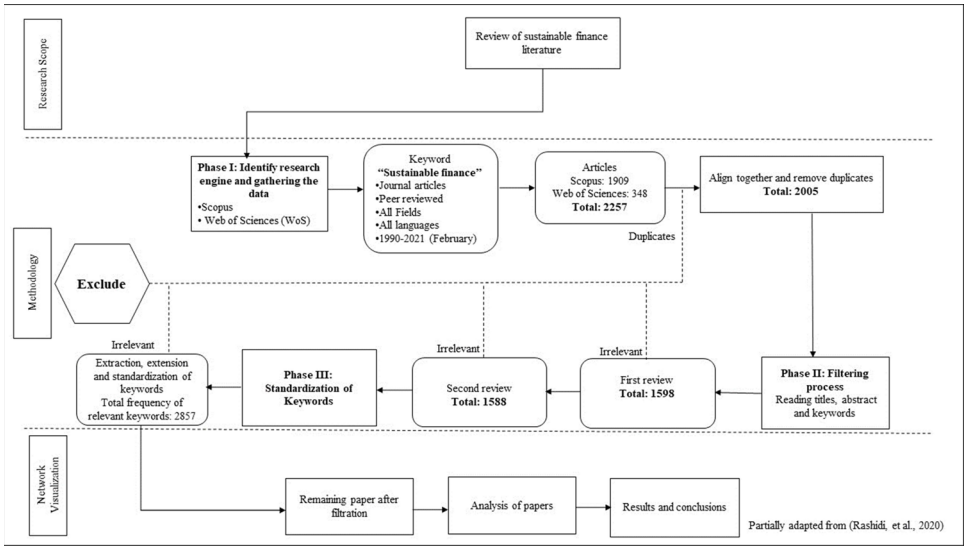
Data Sampling, Collection, and Cleaning

Two primary databases - ISI Web of Science (WoS) and SCOPUS–have been used to search for scientific publications as they are considered the most used platforms in social sciences to collect data for bibliometric analysis (Zupic & Čater, 2015; Röhm, 2018; Fabregat-Aibar et al., 2019; Maia et al., 2019; Rashidi et al., 2020). The only keyword used to collect the data from both search engines was "sustainable finance." The fixed time frame for each database was from 1990 to February 16, 2021. The data collected were limited to scientific articles. As an outcome of the initial search, "348" articles from Web of Sciences and "1909" articles from SCOPUS related to sustainable finance were obtained by following the search protocol summarized in Table 1. Afterward, retrieved data was downloaded in Excel format.

After merging the result and forming the standardized Excel sheet, a total of 2257 articles were found. The researchers then manually corrected minor errors related to the authors' names and article titles within the sample file before excluding the repeated and irrelevant articles (Baker et al., 2020). All duplicate papers were eliminated using the "duplicate value" function in Excel as many items appeared

in both databases (Fabregat-Aibar et al., 2019; Rashidi et al., 2020). At the end of this process, only 2005 papers remained. The data were reviewed twice by two researchers independently, a process that entailed analysis of all article titles, abstracts, author keywords, and index keywords (Fabregat-Aibar et al., 2019; Nájera-Sánchez, 2020; Rashidi et al., 2020). The rationale behind eliminating irrelevant papers during the complete review process was based entirely on failure to address the sustainable finance concept adequately (Röhm, 2018; Rashidi et al., 2020). Therefore, only those papers that are precisely related to sustainable finance were selected. After removing the irrelevant articles, a total of 1588 articles were left for further analysis. Figure 1 provides an overview of the process used for data gathering and filtration in this study.

Figure 1. Methodology workflow
Source: Authors' elaboration



Data Standardization

During this phase, the author's keywords were extracted and standardized within the selected articles. Before the standardization process, the researchers manually selected and added the important keywords to 181 authors' articles without keywords from index keywords or by reading the title and abstract or full text–three keywords maximum were extracted from each research article (Statman, 2000; Ding et al., 2001; Bauer et al., 2005; Barnett et al., 2006; Renneboog et al., 2008; Dehdarirad et al., 2014; Topalli & Ivanaj, 2016). Thus, the sample of 1588 articles yielded 8143 different keywords. As discussed by Choi (2011), it is important to standardize the keywords before network analysis (p. 373). Table 2 summarizes the standardization process applied (Choi et al., 2011; Nájera-Sánchez, 2020; Aracil et al., 2021). This process normalized the data for further analysis and reduced the number of keywords to 2857. Appendix 1 provides an overview of the final standardized terms.

Table 2. Keywords extraction, extension, and standardization

Standardization procedure	Screened keywords
Selected and added important keywords to 181 missing authors' keyword articles (Statman, 2000; Bauer et al., 2005; Barnett et al., 2006; Renneboog et al., 2008).	533
To build uniformity within the data file, the first alphabet of each keyword was turned into uppercase (Ding et al., 2001; Castriotta et al., 2021).	8143
Corrected and unified spelling errors within the data set (Ding et al., 2001; Dehdarirad et al., 2014; Murgado-Armenteros et al., 2015; Castriotta et al., 2021).	8143
Hyphen removed if the meaning was not affected (Choi et al., 2011).	8143
Unified keywords or Abbreviations, for example for mostly used terms, if keyword and its abbreviation were used together, it was converted into complete word and also for other terms, if the somewhere complete term mentioned to explain Acronym they were also consolidated by complete word (Palshikar, 2007; Choi et al., 2011; Castriotta et al., 2021). For instance, "Corporate social responsibility" and "CSR" became "Corporate social responsibility," "Environmental, Social, and Governance", "Environment Social Governance (ESG)," "Environmental social governance," "Environment, social, governance (ESG)," "Environmental Social and Governance," "social and governance (ESG)," "Social and corporate governance (ESG)," and "ESG" became "Environmental, social, and governance," "Microfinance Institutions" and "MFI" became "Microfinance institutions," "Sustainable Development Goals," "Sustainable Development Goals (SDGs)," "SDG" and "SDGs" became "Sustainable development goals."	8113
Standardized singular and plural terms (Choi et al., 2011; Dehdarirad et al., 2014; Castriotta et al., 2021). For instance "Sustainable development goal" and "Sustainable development goals" were merged into "Sustainable development goals," "social impact bond," and "social impact bonds" were merged into "social impact bonds."	8113
Separated multiple terms combined as a single keyword. If two separate terms were used together in the keyword, they were separated and considered as individual keywords (Choi et al., 2011).	8118
Unified synonyms merged closely related terms, or converted them into a more general term (Choi et al., 2011). For instance, "poverty alleviation" and "poverty reduction" were merged into "poverty alleviation," "clustering analysis" and "cluster analysis" were merged into "cluster analysis," "Reputation risk" and "reputational risk" were merged into "reputational risk."	8118
Removed irrelevant terms or keywords that are not related to sustainable finance (words with general meanings) (Ding et al., 2001; Dehdarirad et al., 2014; Murgado-Armenteros et al., 2015; Castriotta et al., 2021). For instance countries names like China, Africa, Malaysia, Indonesia, Bangladesh, European Union, Sub-Saharan Africa, India, Pakistan, Canada, Turkey, Ghana, Latin America, South Africa, Australia, Egypt, France, United Kingdom, United states, Germany, Nigeria, Kenya, Northern Uganda, Asia-Pacific, and many more, target samples like education sector, students, technology, etc., statistical tests and data types like structural equation modeling, fuzzy cognitive map, data envelopment analysis, event study, panel data, content analysis, or JEL Classification Codes e.g., G11, G12, G13, G22, G33, C15, G10, Q430, G20, G110, G130, G150, Q56, G14, Q43, Q56, G01, G32, C5, etc. and some very general terms like glass ceiling, big data, Performance, Developing countries, Investment.	2857

Source: Authors' elaboration

REVIEW RESULTS AND DISCUSSION

In this section, the formal characteristics of the collected papers are analyzed and assessed. Information related to the research articles across the various journals, publication dates, and authors are evaluated. In the first part, a comprehensive view of all papers is provided to understand the development of the research field by considering the research growth trends and elucidate the analysis of keywords co-occurrence. This will not only reveal the influential authors or journals but also depict the visual network of the main clusters (themes) within this emerging field of finance, which ultimately shows the most relevant topics or themes of sustainable finance (Ye et al., 2020). In the second part, bibliometric cluster analysis is applied to understand the relationship within/among these main clusters. Keyword

cluster analysis is the most effective way of learning and understanding the relationships between keywords because it categorizes the data into sensible clusters (Rashidi et al., 2020). Each cluster would help understand the most common features and similarities within well-connected themes (keywords) and compare and/or link them to other themes (keywords) of other clusters (Rashidi et al., 2020). The cluster analysis in this study selects keywords based on highest occurrences and total link strength, by applying the association strength method to normalize the link strength between keywords (Van Eck & Waltman, 2009). The results show 47 keywords (nodes), 291 links (edges), and total link strength of 742 between the keywords related to sustainable finance. These findings indicate that the number of edges between nodes is high because the keywords (nodes) are linked within or/and among the clusters of the selected dataset. Thus, the study reveals the specific trends and patterns of sustainable finance by establishing appropriate clusters and mapping the network within/among the clusters to provide the researchers, organizations, and the society with an in-depth understanding of the conceptual structure of sustainable finance (Olawumi & Chan, 2018).

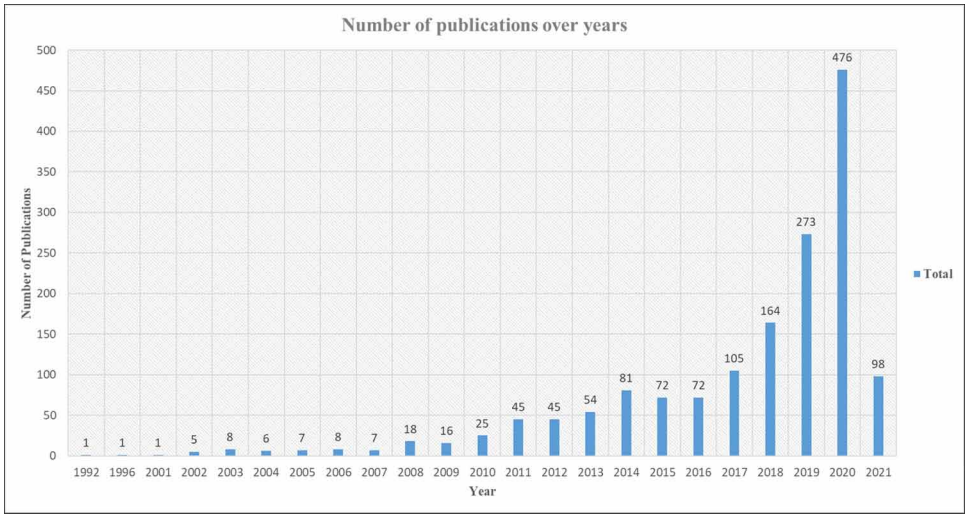
For the purpose of this work, the software VOSviewer 1.6.17 was used to calculate the keywords frequency and to create a keywords co-occurrence matrix. The software allows the representation of a network of items with the total number of links and the link strengths. In the visualization map, the size of each circle is proportionate to the relevance of the term it represents. To obtain a full picture of different clusters, only keywords with a minimum of ten occurrences have been selected.

Number of Published Articles and Publication Output

The publication trend over the years (1990 to 2021) is summarized in Figure 2. The graph represents the number of publications on the y-axis and the year on the x-axis. According to the collected data, the first paper on sustainable finance was published in 1992. After the 2007/2008 crisis, an upward trend is observed from 2009 to 2014 and 2017 to 2020. The highest number of publications (476 articles) was recorded in 2020. The growth in publications seems to be relatively flat in 2015 and 2016; it does not indicate a significant decline. Moreover, the percentage analysis from 2009 to 2021 showed that little more than 96 percent of articles were published after the global financial crisis. Thus, this upward trend indicates that there has been increasing attention on the study of sustainable finance by researchers after the financial crisis.

Table 3 reports the top ten journals with the highest number of publications–both total and per year number of publications–of the collected dataset. The percentage analysis indicates that these top 10 journals published 35.83% of the total articles from the selected dataset. The highest number of publications came from the Journal of Sustainable Finance and Investment (210), followed by Sustainability (171), Journal of Cleaner Production (43), Business Strategy and the Environment (29), and Journal of Business Ethics (24). Table 3 also provides the data of publications per year. For instance, the year with the highest number of publications was 2020 for the Journal of Sustainable Finance and Investment, Sustainability, Business Strategy and the Environment, Corporate Social Responsibility and Environmental Management, World Development, and Journal of Cleaner Production. Whereas, it was 2019 for the Journal of Organization and Environment, Technological Forecasting and Social Change, and Ecological Economics; and 2021 for the Journal of Business Ethics. All publications were related to sustainable finance.

Figure 2. Number of publications over years
Source: Authors' elaboration



Most Contributing Authors

This section shows the researchers with the highest number of publications in this emerging field of research. Table 4 summarizes the author's information–country, affiliation, and focused research area–regarding the maximum number of article publications in this field. In the selected dataset, Weber was the most productive author with 23 publications, followed by Richardson with 12, and Polzin with 10 publications. However, it should be noted that in the selected dataset, Weber worked as the author in 14 articles and as co-author in other nine articles, while Richardson appears as the author in all the 12 published articles. Moreover, Weber's areas of focused research are diversified as his publications are on social (Social finance, socially responsible investing*, CSR, microfinance) or/and environmental factors (Environmental finance, Green finance) of sustainability (Sustainable development, Impact investing*, Sustainable finance, Sustainable banking). Richardson's researches on the other hand, focused on socially responsible investing, Sustainable development, social investing, and ethical investing, and Polzin's research focuses on innovation finance, Crowdfunding, and Entrepreneurial finance. Additionally, Table 4 shows that the University of Waterloo and the University of British Columbia, both of which are in Canada, are the most active institutions with a total of 35 publications. The table also shows that Canada is the main contributing country in this field of research based on the number of publications by the countries' authors. Canada has a total of 35 publications (authors: Weber and Richardson), followed by Greece with a total of 17 publications (authors: Nikolaou and Tsalis), Netherland with total 16 (authors: Polzin and Scholtens) and France with total 12 publications (authors: Paulet and Louche).

Research Hotspots and Emerging Topics: Results from the Keyword Co-Occurrence Analysis

This section presents the findings of a co-occurrence analysis of keywords that was conducted to systematically identify the linkages among different sub-topics. In general terms, the co-word analysis

Table 3. Ranked Journals with highest publications for the year 1990–2021

Journal name	Number of publications per year																					
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Journal of Sustainable Finance and Investment											17	18	16	22	13	13	13	16	18	55	9	210
Sustainability (Switzerland)																5	7	20	51	74	14	171
Journal of Cleaner Production														1		5	4	7	9	9	8	43
Business Strategy and the Environment					1			1	1					1	1		2		6	10	6	29
Journal of Business Ethics				1					1	1				3	3	1	2	2	2	3	5	24
Corporate Social Responsibility and Environmental Management					1										2		1		5	7	4	20
Journal of Banking & Finance									1					11	2	1			4	1		20
World Development		1	1				1					1	1	1	2			1	1	4	1	15
Organization and Environment														1				1	7	4		13
Technological Forecasting and Social Change																1		2	4	3	2	12
Ecological Economics		1									1			1				2	5	1	1	12

Source: Authors' elaboration

Table 4. Ranked authors with highest publications for the year 1990–2021

#	Authors	Total number of articles	Country	Affiliation	Research area
1.	Weber, O.	23	Canada	University of Waterloo	Green finance, Impact investing*, Social banking, Social finance, Green economy, Microfinance, Socially responsible investing*, Sustainable finance, Environmental finance, Sustainable banking, Corporate social responsibility, Sustainable development/ Sustainability
2.	Richardson, B.J.	12	Canada	University of British Columbia	Socially responsible investing*, Sustainable development/ Sustainability, Social investing*, Ethical investing*
3.	Polzin, F.	10	Netherlands	Utrecht University School of Economics (U.S.E.)	Innovation finance, Crowdfunding, Entrepreneurial finance
4.	Nikolaou, I. E.	09	Greece	Democritus University of Thrace	Environmental finance, Sustainable development, Water finance, Climate change finance
5.	Caldecott, B.	08	United Kingdom	University of Oxford	Environmental, social, and governance, sustainable finance, Transition Finance, Public finance, Decarbonization
6.	Tsalis, T. A.	08	Greece	Democritus University of Thrace	Global Reporting Initiative, Corporate sustainability, Climate change finance, Environmental finance, Sustainable development
7.	Hoepner, A.G.F.	07	Ireland	Smurfit Graduate Business School, University College Dublin	Environmental finance, Green venture capital, Socially responsible investing*, Corporate social irresponsibility, Climate finance
8.	Scholtens, B.	06	Netherlands	University of Groningen	Sustainability/Sustainable development, Financial crisis, Environmental, social, and governance, Sovereign bonds, Sustainable finance, Responsible investment*
9.	Paulet, E.	06	France	ICN Business School	Financial crisis, Corporate social responsibility, Ethical banks, Greenwashing
10.	Louche, C.	06	France	Audencia Business School	Impact investing*, Social entrepreneurship, Social finance, Sustainable banking, Microfinance

*investing or investment
Source: Authors' elaboration

Table 5. Keywords clusters with frequency

Cluster no.	No. of Keywords within cluster	Keywords	Keywords frequency	Color
1.	12	Corporate governance Corporate social performance Corporate social responsibility Environmental performance Environmental, social, and governance Environmental, social, and governance criteria Green banking Responsible investment* Social performance Social responsibility Socially responsible investing* Shareholder theory	82 10 143 23 96 28 10 26 14 19 95 10	Red
2.	10	Carbon emissions Climate change Climate finance Energy transition Financial development Green bonds Green finance Paris Agreement Renewable energy Sustainable finance	10 79 22 12 10 52 34 10 28 109	Green
3.	09	Crowdfunding Impact investing* Social banking Social enterprise Social entrepreneurship Social finance Social impact Social impact bonds Social impact investment*	19 49 15 17 16 21 14 14 13	Blue
4.	09	Corporate sustainability Covid-19 Financial crisis Financial institutions Green credit Sustainability reporting Sustainable banking Sustainable development Sustainable Development Goals	31 10 16 14 10 16 21 103 51	Yellow
5.	07	Financial inclusion Microcredit Microfinance Microfinance Intuitions Poverty alleviation Social capital Sustainable investing*	21 37 141 37 60 12 25	Purple

*investing or investment

Source: Authors' elaboration

Figure 3. Network of keywords
Source: Authors' elaboration

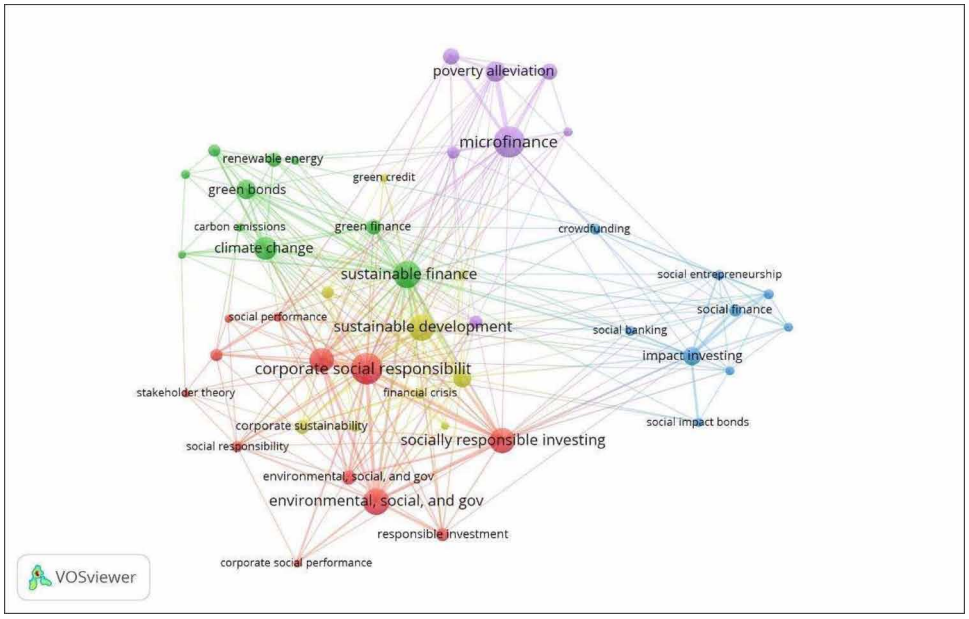
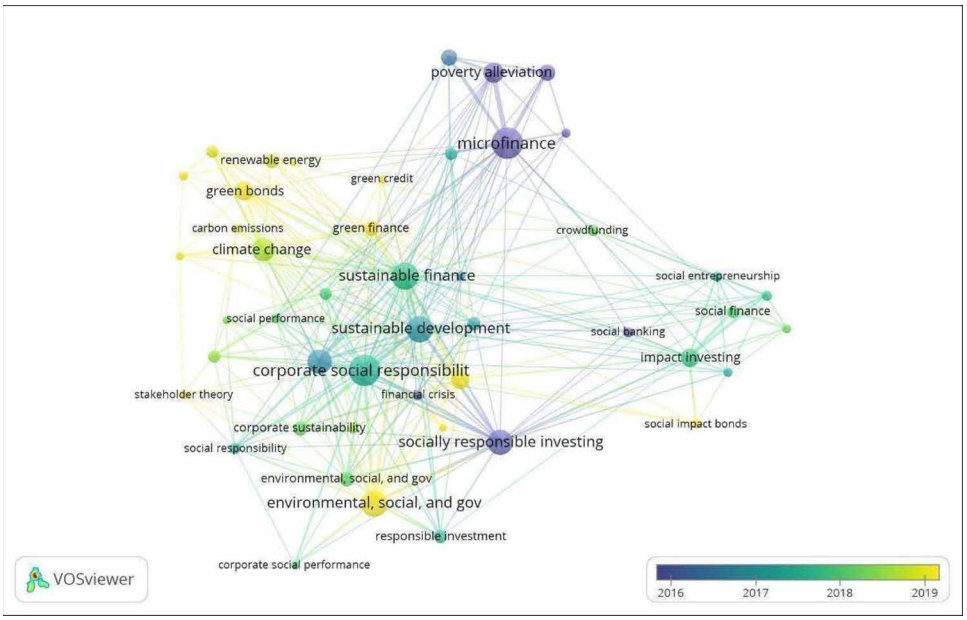


Figure 4. Keyword time map (overlay visualization)
Source: Authors' elaboration



supports identifying research hotspots in a particular field of study (Gao et al., 2020). Keywords with high frequencies indicate the research hotspots (Dai & Zhang, 2020). Before conducting the analysis, the keywords list was cleaned as summarized in Table 2. In the end, 2641 out of 2857 keywords were retained for the analysis. Table 5 shows the frequency of the keywords and how they are allocated to each cluster.

After excluding the keywords with a co-occurrence frequency below ten (for a clearer visualization), the co-occurrence network of keywords is shown in Figure 3.

In Figure 3, the bigger circles represent keywords with higher frequencies. The size of nodes can reflect the frequency of keywords: the higher the frequency of a keyword, the larger the size of the node. The thickness of each line is proportional to the closeness between two keywords.

Finally, in the overlay visualization (Figure 4) different colors correspond to the year in which the keyword appears (average publication year of the articles in which a keyword occurs).

Cluster Analysis

The data clustering revealed five main areas of research described in the sections below.

Cluster 1: Corporate Social Responsibility and the Environmental, Social, and Governance (ESG) Research Landscape

The cluster groups ethical investment practices (*responsible investment, socially responsible investing*), principles (*governance*), and outcomes (*corporate social performance, environmental performance, environmental (ESG), social and governance performance, and social performance*) within the broader *CSR* and *ESG* spectrums–that are used by managers within financial institutions to maximize the value of organizations. Over the last few years, CSR has attracted social sciences researchers' attention (Auld et al., 2008; Jaysawal & Saha, 2015; Nguyen et al., 2020) and has become one of the most significant aspects of the business industry (Amran et al., 2017; Bing & Li, 2019). The concept takes into consideration the interests of all stakeholders (Diez-Cañamero et al., 2020). In this vein, CSR activities benefit not only investing stakeholders but also non-investing stakeholders (Buchanan et al., 2018). Corporate social responsibility also includes corporate governance (Dell'Atti et al., 2017)–such that in the cluster, the governance is much closer to CSR and connected with the highest link strength (16). Corporate governance is defined as "the rules under which firms are operating, with the rules coming from such sources as the legal system, the judicial system, financial markets, and factor (labor) markets" (Claessens, 2006, p.93). The investment practices shown by this cluster are socially responsible investing (SRI) and responsible investment (Bing & Li, 2019). Although in recent researches, the broad relevance of the term "social" was questioned in SRI and had been frequently replaced with "sustainable investing" or "responsible investing," the count of socially responsible investment articles was higher than that of responsible investment (Daugaard, 2020). This cluster even showed that SRI is the most evolved investment practice. The Social Investment Forum (2006) - defines SRI as an investment approach that is mainly based on social screening (i.e., the consideration of social factors to either avoid or seek out specific investments), community investing, and shareholder advocacy. These actions show a positive impact on society and the world (Daugaard, 2020, 1501). Whereas responsible investment is defined as "an investment that considers ESG criteria to generate long-term competitive financial returns and positive societal impact" (US SIF 2017, as cited in, Yamahaki, 2019, p. 162). Within the wider spectrum of sustainable development and sustainable finance, many non-financial factors, especially ESG have

transformed the conventional finance paradigm into a sustainable one. ESG factors are considered as the three main pillars of financial development–that inclusion in the decision-making processes of financial institutions built a more sustainable financial system (Ziolo et al., 2019). Moreover, the relationship between two resilient concepts of this cluster - CSR and ESG is described by Clarke (2007) as, "the same forces that are impressing corporations toward taking a greater regard of CSR issues are guiding investments institutions to address ESG issues in their investment policies and practices" (p.92). Thus, Crifo et al. (2016) further define the relationship between these two concepts by clarifying that "it is becoming conventional wisdom today to define CSR through the lenses of three main dimensions: ESG factors)" (p.6).

Cluster 2: The Green Soul of Sustainable Finance

The cluster groups keywords like *climate change, climate finance, green finance*, and *green bonds* under the wider spectrum of *sustainable finance*. More precisely, this cluster elucidates the main driver (*carbon emission*) and policies (*Paris Agreement*) of climate change by defining tools (*green bonds*) and practices (*energy transition, renewable energy*) that are developed within the sustainable finance spectrum (*green finance, climate finance*). This cluster shows that the link between climate change and financial activities has markedly intensified during the recent years. The United Nations Framework Convention on Climate Change (UNFCCC), defines climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (1992, p.7). On the relationship between climate change and carbon emission, the European Commission (2016) in their climate action plan assert that human activities, especially industrial development, are the primary reason behind greenhouse gases emissions. The Paris Agreement is considered to be one of the most applicable agreements within the United Nations Framework Convention on Climate Change (UNFCCC) that states the issues related to climate change (UNFCCC 2015; Tolliver et al., 2020). Moreover, to reduce carbon emissions and/or enhance climate resilience in line with the Paris Agreement objectives it is important to integrate sustainable practices into the financial business model (Migliorelli, 2021). The green bond is the most important and developed innovation in the field of sustainable finance. According to Ehlers & Packer, "green bonds are fixed income securities which finance investments with environmental or climate-related benefits" and are considered as the "integral component of green finance" (2017, p.89) because they make considerable contribution to the achievement of the Paris Agreement objectives and the Sustainable Developments Goals (Tolliver, Keeley, & Managi 2019; Ferrer et al., 2021). Regarding the relationship between green bonds and climate finance–green bonds are considered "the best vehicle to finance low-carbon infrastructure" (Sartzetakis, 2020, p.1). In the cluster, the keyword sustainable finance is at the center of the map. There is however still no standard or universal definition of sustainable finance. According to Strandberg, "sustainable finance is the provision of financial capital and risk management products and services in ways that promote or do not harm economic prosperity, the ecology and community well-being" (2005, p. 6). Whereas according to the critical realist view by Lagoarde-Segot, "sustainable finance entails deep qualitative changes in the practice of finance that would rather require adopting an open-system view in which human agency is embedded in an organic social context" (2019, p.8). In general, sustainable finance is defined as "finance for sustainability" (Migliorelli, 2021, p.1). The cluster overlapping the visualization map shows that green finance and climate finance are recently evolved fields within the wider spectrum of sustainable finance, so can be considered as the

main components of sustainable finance (Migliorelli, 2021, p.5). Thus, this cluster focuses on the fact that the green dimension is the predominant component of sustainable finance.

Cluster 3: The Social Dimension of Sustainable Finance

The main focus of this cluster is on impact investment and its relationship with social finance and social enterprises. More precisely, this cluster is focused on the socially-oriented business and investment practices (*impact investing, social impact investment, social banking, social entrepreneurship, crowdfunding*) and instruments (*social impact bonds*).

Recent studies summarized that social finance lies between two extremes (Rexhepi, 2016)–profit and philanthropy–and consider it as "an umbrella term for financial products and services that strive to achieve a positive social, environmental or sustainability impact" (Weber, 2012, p.3). Social finance incorporates many socially-oriented financial activities (Rexhepi, 2016; 15), for instance, impact investing, social banking, and crowdfunding. Impact investing is the main theme of this cluster and is strongly linked to social finance–with the highest link strength (11). According to La Torre et al., "Impacting investing and social impact bonds represent an interesting field of research in innovative business models for sustainable finance" (2019, p.1). In general terms, social impact bonds are defined as an "instrument/tool for funding projects where a fixed amount of money is paid if performance results are achieved" (Rexhepi, 2016, p.40). The relationship between social finance and social impact bonds is, according to Carè et al., "social impact bonds have emerged as one of the most innovative instrument of social finance that is designed to support the social service sector in the delivery of innovative social programs" (2020, p.1). In conclusion, this cluster majorly focuses on the social aspects of the newly emerged field of sustainable finance.

Cluster 4: Sustainable Development at the Driving Force of Sustainable Finance

The core focus of this cluster is on *sustainable development*. The 2007/2008 global financial crisis was a crisis of unsustainability (Yip & Bocken, 2018)–that brought dramatic consequences for economies and societies (Herzig & Moon, 2013, p.1870). After the financial crisis "it has become apparent that the expansion of the financial sector, the phenomenal sophistication of financial products, and the unprecedented velocity of financial transactions have together profoundly altered the relationship between finance, the economy, and society" (Lagoarde-Segot, 2017, p.113). "The crises led business industry and research groups around the world to rethink and debate on assumptions of modern finance, the impact of finance on society and the sustainability of financial system" (Sun et al., 2011, p.3) and therefore raised the demand for long-term sustainable approaches for sustainable development in the financial world.

The network visualization map shows the crucial role of sustainable development, as this term is addressed in 103 articles. It is the prominent theme in this cluster and is present almost at the center of the cluster–between sustainable finance and CSR. Sustainable development describes the pathways (processes) to achieve sustainability (Beland Lindahl et al., 2016; UNESCO, 2015).

As the global crises enforced to rethink about the unsustainable business models adopted by banks (Yip & Bocken, 2018)–most financial institutions are modifying their traditional approaches by redesigning their products and services to meet the need for a green economy (Lundgren & Catasús, 2000, as cited in Galletta et al., 2021). According to the Collevecchio Declaration endorsed by civil society organizations, "financial institutions - banks and asset managers–must expand their missions from ones

that prioritize profit maximization to a vision of social and environmental sustainability" (2003, p.3). Sustainable banking is an evolved and dynamic concept that internalizes ESG systems and ethical conduct policies to promote sustainable development (Mendez & Houghton, 2020, p.973).

Cluster 5: Poverty Alleviation at the Core of Sustainable Finance

The main themes of this cluster are *microfinance* and *poverty alleviation*. Furthermore, this cluster shows the relationship between sustainable investment and financial inclusion. According to Beck, "financial inclusion refers to the access by enterprises and households to reasonably priced and appropriate formal financial services that meet the needs of enterprises and households" (Beck, 2015, p.3). Poverty alleviation is one of the most important Millennium Development Goals by the United Nations (United Nations General Assembly, 2000), and also SDGs for the society (United Nations General Assembly, 2015). The basic aim of the goal "no poverty" is to "ensure that everyone around the world - particularly the poor and the vulnerable–have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology, and financial services–microfinance or microcredit" (United Nations General Assembly, 2015, p.15). Many microfinance institutions worldwide contribute to poverty reduction and improve quality of life (Schoenmaker & Schramade, 2018). Microfinance institutions provide banking services to lower-income group individuals and micro-enterprises (Mersland & Øystein Strøm, 2009; Schoenmaker & Schramade, 2018; Tang et al., 2020), but their institutional and operational frameworks are totally different from those of commercial banks (Quayes, 2012). The major goals of microfinance institutions are to provide low-income group individuals with different ways to manage their finances, spending, and savings (van Rooyen et al., 2012). Microfinance is the most prominent theme of this cluster, as it is addressed in 141 documents.

DISCUSSION OF RESULTS, LIMITATIONS OF THIS STUDY, IMPLICATIONS FOR RESEARCH, AND DIRECTIONS FOR FUTURE STUDIES

Through exploring the stance of previous studies on sustainable finance and mapping its conceptual landscape and the related sub-themes, the study conducted in this chapter has manifold and practical implications for researchers, the society, and decision makers.

By providing a comprehensive and relevant snapshot of existing research on sustainable finance, published in prestigious journals indexed in WoS and SCOPUS, researchers benefit from uncovering the scientific knowledge generated so far in the field of sustainable finance and from identifying current research gaps that create opportunities for exploring new research assumptions. Despite the noticeable upward trend in the number of published papers gravitating around the sustainable finance concept, there are still underexplored areas to which researchers should channel their attention–as suggested also by the analysis of the co-occurrence of keywords. Thus, the findings of the bibliometric analysis performed in this chapter complemented with the identification of research hotspots may serve as a starting point for novel and original research topics and approaches that will further advance knowledge in this continuously evolving field.

Although this study reveals interesting results regarding sustainable finance, it has several limitations related to bibliometric analysis. First, data collected are limited to scientific articles only, while excluding

books, news items, editorial material, and proceeding papers. Even through journal articles are the most widely accepted and frequently used for bibliometric analysis, there may be publications related to the subject matter that this study has not contemplated. An interesting direction for future research would be to consider the use of other scientific sources of knowledge (e.g., book chapters, position papers) in order to obtain a more comprehensive perspective of the evolution of the fields. Following the identified limitations of this research, future research may complement this study using different bibliometric methodologies (e.g., co-citation analysis).

From the standpoint of society, in terms of civil society organizations and individuals, the results obtained are primarily meant at raising awareness on the multifaceted acceptations of sustainable finance that could be incorporated into their saving or investment behavior (e.g., sustainable banking products and services; savings placed at ethical banks; investments in social impact bonds, green bonds, and sustainable stock market indices; crowdfunding). A direct consequence of increased social awareness and involvement in applying for sustainable or green financial products and relying on financial institutions that incorporate the principles of ethics and social responsibility will be represented by a shift in the business strategies of conventional financial institutions. The institutions will have to adapt the traditional offer of financial products and services in resonance with the ethical values requested by their customers. Thus, the adaptation will create prospects for generating not only economic added value, but also social and/or environmental added value. Additionally, if society becomes an active promoter of ethics and sustainability in the financial system, it will indirectly contribute to alleviating the needs of local communities and enhancing social and financial inclusion.

Interestingly, the dynamics recorded by public debates at the global level, by the European Commission's communications, policy papers, or regulations in the field of sustainability are mirrored by the temporal dimension of the published papers. As the time map for the keywords shows, there is a continuous evolution of research hotspots from microfinance in 2016, to CSR and sustainable finance in 2018 and ESG and climate change-related issues in 2019, and ongoing. Climate risk management and climate change impacts on economic development and economic fundamentals, public finances (such as government debt, budget deficit), and the financial system (banking system, capital market, insurance market, private pensions, investment funds) is key topic for the agendas of the current day policymakers and international authorities. In this respect, the recent EU Taxonomy of environmentally sustainable activities which entered into force in July 2020 can be mentioned to provide milestones for those economic activities that can be considered environmentally sustainable and help companies to become more climate-friendly. This guideline regulation would be further developed based on regular input and advice provided by an independent body of the European Commission called Platform on Sustainable Finance, whose members include various stakeholders such as the corporate and public sector, financial system, academia, and civil society. Therefore, the joint, pivotal role to be played by representative stakeholders, including researchers and academia, in generating new knowledge on sustainable finance issues, is officially recognized.

We expect emerging research in this area of sustainable finance aimed at substantiating both qualitatively and empirically the strength of climate change impact, countries' vulnerability to climate risks as well as their readiness to mitigate them. Additionally, future studies should design climate risk management frameworks to be used by decision makers as starting points for official policies and strategies. The frameworks may indicate whether a one-size-fits-all regulatory approach at European (international) level is suitable for addressing climate change challenges and risks, or if it is preferable to identify peer

countries and design tailor-made regulations in order to enhance the catching-up process toward climate resilience/neutrality.

CONCLUSION

The chapter is aimed at identifying the various sustainable finance concepts in a comprehensive manner and reveals several co-existing dimensions, such as the following: i) CSR and the ESG practices; ii) the field of green finance that focuses on fulfilling ecological (environmental protection, climate change) goals; iii) the social finance field that aims at stimulating social inclusion, quality of life and employability (through social impact investment, social banking, social entrepreneurship, and crowdfunding); and iv) microfinance, with the stated goal of poverty alleviation and financial inclusion. Further, the density and time map of the keywords show the frequency of occurrence of these concepts in published papers, to enable understanding of which of them have been most studied by researchers and what the trends are.

Research findings published to date, irrespective of their statistical or conceptual nature may be seen as guidelines and triggers of best practice to be used as starting points for practitioners and decision makers in designing policies, frameworks, or management tools. In this regard it can be noticed that in order to facilitate connection of the financial system and corporate sector to the objectives of sustainable development, series of action plans, standards, and principles have been developed at the international level, to which financial institutions and businesses can voluntarily adhere, by implementing them in their current activity.

There has been continuous development of international voluntary frameworks that financial institutions and businesses may adhere to; the most representative (in chronological ordering) being: The United Nations Environment Program Finance Initiative (UNEP-FI) launched in 1991, the London Principles launched in 2002, the Equator Principles launched in 2003, the Principles of Sustainable Banking Activity and the Global Alliance for Banking on Values (both launched in 2009), the UNEP-FI Principles for Sustainable Insurance Initiative launched in June 2012, the RE100 initiative (renewable energy 100%) emerged in 2014, the Paris Climate Agreement and the United Nations 2030 Agenda for sustainable development (both launched in 2015), the Principles for Positive Impact Finance and the Network for Greening the Financial System (both launched in 2017), the Action plan on Sustainable Finance belonging to the EC launched in 2018, and the United Nations Principles for Responsible Banking launched in 2019.

The ongoing evolution and adaptation of complementary and voluntary sustainability frameworks mirrors the intensification of public debates related to the imperative need of the financial industry's robust and transparent commitment into the process for progress toward sustainable development. Against this background, new challenges arise in the context of the COVID-19 global pandemic. Some reports emphasize that the pandemic occurrence acts "as a wake-up call for sustainable finance" (Deutsche Bank, 2020), while the UN Global Compact (2021) perceives it as "an opportunity to refocus on sustainability and responsible investment." A World Bank study (Klein, 2020), argues that the global response to the COVID-19 outbreak should include the joint efforts of investors, businesses, and financial institutions in leading the way to a new, more sustainable and climate-friendly economic model. In a similar fashion, the UNEP report (2020) discusses the potential implications of the pandemic for sustainable finance markets and proposes a framework for strengthening the role of the financial system in supporting transition to a low-carbon economy.

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APPENDIX 1

Table 6. Standardized Keywords

Original terms	Conceptually similar terms	Standardized terms
Corporate governance	Governance	Corporate governance
Corporate social responsibility, CSR, Corporate social responsibility (CSR)		Corporate social responsibility
Environmental, Social, and Governance, Environment Social Governance (ESG), Environmental social governance, Environment, social, governance (ESG), Environmental Social and Governance, social and governance (ESG), Social and corporate governance (ESG), ESG		Environmental, social, and governance
Environmental, Social, and Governance criteria, Social and governance (ESG) criteria, ESG criteria	Environmental, Social, and Governance performance, Social and governance (ESG) performance, ESG performance	Environmental, social, and governance criteria
Responsible investment, Responsible investments, Responsible investing		Responsible investment*
Socially Responsible Investing, Socially Responsible Investment, Socially Responsible Investments, SRI	Social, and governance investments (SRI), Sustainable and responsible investment	Socially responsible investing*
Microfinance Institutions, MFI		Microfinance institutions
Sustainable development goal, Sustainable Development Goals, Sustainable Development Goals (SDGs), SDG, SDGs		Sustainable development goals
Carbon emissions, Carbon emission		Carbon emissions
Green bond, Green bonds		Green bonds
Social impact bond, Social impact bonds		Social impact bonds
Renewable Energy, Renewable Energies		Renewable Energy
Social enterprises, Social enterprise		Social enterprise
Impact investing, Impact investment		Impact investing
Social impact investments, Social impact investment, Social impact investing		Social impact investment*
Microcredits, Microcredit		Microcredit
Micro-finance, Microfinance		Microfinance
Poverty alleviation	Poverty reduction	Poverty alleviation
Sustainable investments, Sustainable investment, Sustainable investing		Sustainable investing*

*investing and investment
Source: Author's elaboration

Chapter 2
Responsible Investing With Venture Capital: A Business Case Study for Sustainable Finance

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ABSTRACT

More often than not, responsible investing (RI) is associated with "patient" capital and sustainable development. Venture capital (VC), by its objectives to invest in projects with very high returns and exit quickly the market, is rightly considered as "impatient" capital, and as such, it is a less likely candidate to contribute to sustainability. This chapter advances the argument that VC can indeed contribute to sustainability, should it adopt the ESG factors into its investment criteria. This is illustrated using the case study of a Canadian VC firm, the Cycle Capital Management (CCM). The latter uses strict ESG criteria and rigorous decision-making mechanisms in the screening, evaluation, and the choice of highly lucrative and innovative projects with the aim to contribute to the Canadian economy's sustainability through its efforts to reduce the environmental footprint of its investments. Policy makers and regulators should develop policies that promote the growth and development of venture capital, should they care about sustainability and value creation.

INTRODUCTION

Environmental, social and governance (ESG) considerations, the so-called responsible investing (RI), are increasingly becoming an important concern for businesses, consumers, governments and many special interest groups. This awareness has repercussions on the actions and behavior of all economic agents and more particularly on corporations and their decision-making processes in the evaluation of investment projects and the impact of the latter on sustainable development (Eccles and Klimenko, 2019).

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Researchers and business analysts are actively developing new measures to gauge the impact of RI on ESG factors as well as on other key economic, financial, ethical and gender variables.

Theoretical studies (Ogachi and Zoltan, 2020; Brin and Nehme, 2019; Latapí Agudelo et al., 2019; Gentzoglanis, 2019) examine the reasons why corporations are interested in responsible investment. Many empirical studies (Gbadamosi, 2016; Kim and Kim, 2014; Karagiorgos, 2010; Van Beurden, Gössling, 2008; Waddock, Graves, 1997) are interested in knowing whether socially responsible firms, i.e., the ones that respect the ESG factors, perform better than "non-responsible" ones, using both usual and new financial and economic performance criteria. Both types of studies concern the ESG behavior and performance of industrial firms and/or investment funds but none of them deals with venture capital (VC) and how it may contribute to sustainability by investing "responsibly".

Admittedly, VC is generally perceived as "impatient" capital or short-term capital, i.e., capital aiming at realizing very high financial returns in very short periods and as such it is hardly associated with sustainability. By contrast, the so-called "patient" capital or long-term capital, i.e., capital with no expectations to realize a quick profit, does contribute to long-term growth and sustainability (Sharma and Sharma, 2019). The distinction between patient and impatient capital is important because the dominant view of patient capital is that it is more tolerant to risk and more willing to forgo high financial returns for social impact than impatient capital (Ivashina, 2021; Kaplan, 2018). According to the dominant view, investing patient capital in socially responsible firms does create economic value and contribute to real economic growth and sustainability (Lam and Tansey, 2019). Nowadays, patient capital is gaining momentum as an increasing number of individual investors and investment funds are now willing to invest in projects that are long to bring the financial returns that could justify the initial investment (HSBC, 2020).

Venture capital (VC) is generally categorized as impatient capital because normally invests in *short-run* projects with abnormal expected returns. Therefore, according to the current dominant academic thinking, VC can hardly contribute to long-run growth and sustainability. Put it simply, VC is different from responsible investing. Nonetheless, casual observation and ad hoc experience may suggest that VC is not necessarily incompatible with responsible investing (Carter, 2020). The purpose of this chapter is to investigate whether such a relationship exists and evaluate explicitly this link by analyzing the decision-making processes of a Canadian venture capital firm, Cycle Capital Management (CCM).

To the best of our knowledge, there are no studies in the literature establishing a link between venture capital (VC) and responsible investing. Although our analysis is limited to one single VC firm, it does shed more light to the debate and helps to understand better the role of VC in a sustainable economy. This study is useful for investors and other parties interested in RI, in their strategies to embrace sustainability in VC projects and for policy makers interested in the design of VC investment promotion policies and sustainable finance.

Section 2 of this chapter presents the characteristics of venture capital and examines the conditions for VC to become an active agent of responsible investment contributing thereby to long-term growth and sustainability. In addition, it makes the link between venture capital and responsible investment and argues that the strategy of venture capitalists to finance activities that respect ESG principles is compatible with the risk-return relationship and sustainable development. Section 3 briefly reviews the theoretical and empirical literature on CSR and performance. Section 4 analyzes the case of Cycle Capital Management (CCM) in order to illustrate the points developed in the previous sections. Finally, section 5 summarizes by concluding the research and offers policy recommendations. It also points out the need for further research and some of the limits of our study.

BACKGROUND

Hypotheses and Methodology

This paper examines the link that may exist between venture capital, responsible investing and sustainability. It makes the hypothesis that venture capitalists' short-termism shouldn't be an obstacle to responsible investing, provided that venture capitalists develop the necessary mechanisms and tools to safeguard the permanency of start-ups and other companies with a high potential ESG performance. It is true that VC has always been an important factor in financing start-ups and other promising ventures. In the current context where responsible investment takes on its pure meaning, venture capital could also act as a catalyst for sustainable development.

Before we delve into the intricacies of the relationship between venture capital, responsible investing and sustainability, it is advisable to define the concepts. A number of terms are used in the literature spanning from responsible investing, green investing, ESG investing, sustainable investing, impact investing, social responsible investing, and feel-good investing and so on. In this chapter, the most frequent terms we use are responsible investing, socially responsible venture capital investing and sustainable investing to refer to the actions taken by economic agents to meet the broadly defined environmental, social and governance (ESG) goals.

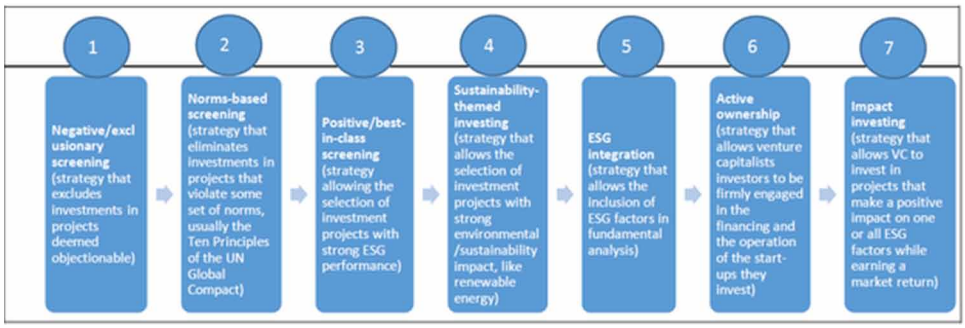
While this broad definition is appropriate from a theoretical point of view, in practice researchers may use a more narrow definition and focus solely on one single measurable ESG element, either the E, the S or the G. Even so, investments may still be considered as responsible and sustainable as long as they create economic value without depleting the current and future resources (Atz et al., 2021; Whelan et al., 2020; Kölbel et al., 2020). For the purposes of the current research, responsible investing refers to the three ESG elements. This definition is also used by CCM in its process to evaluate sustainable investment projects.

Venture capital used to invest in risky projects with high short-term returns and exit its investments quickly without utterly considering one or all ESG elements. Nowadays, sustainable or social VC does care about ESG factors (Lin, 2021; Gagni et al., 2021). However, the main challenge is how to reconcile its short-term investment objectives with the long-term ESG factors. Sustainable VC uses a menu of strategies or the so-called holistic approach to reconcile the short-term profit objectives and the long-term sustainability objectives. In a way, this holistic approach defines sustainable investing and determines the long-term impact of sustainable investment projects. Sustainable venture capitalists normally adopt this holistic approach/framework to examine and eventually invest in responsible projects that would contribute to economic growth and sustainability. The holistic approach/framework combines the following seven common strategies as indicated in figure 1.

Figure 1 illustrates the seven strategies that define sustainable investing. Sustainable venture capitalists normally adopt this holistic framework to ensure that lucrative investment-grade projects provide a high profit in the short-run while the project's life extends over and above the number of years required for the project to bring lucrative returns.

Applied rigorously, this framework is a means for venture capitalists to realize the short-term profit objectives and the long-term sustainability objectives. Thus, the first strategy to exclude projects deemed unethical and/or inappropriate using well-established norms-based screening processes provides venture capitalists the opportunity to focus on a limited number of projects and examine them further by applying strategies that are more refined. Accordingly, positive or best-in-class screening allows them to choose

Figure 1. The holistic approach/framework to the selection and financing sustainable venture capital projects
Source: Developed by the author as a synthesis of the academic literature on sustainable venture capital



projects with strong ESG performance. Sustainability being a strong criterion for financing and investing in a project, venture capitalists tend to choose among the selected projects the ones that are viable and have more chances to succeed. Sustainable projects are the ones that integrate best the ESG factors. To ensure that start-ups will have an impact on society, venture capitalists care for their financial viability and their capacity to grow even after they have sold their initial participation. Thus, they are engaged actively in the financing and the day-to-day operations of the firms they invest. When the strategies put in place bring the desired results, i.e., sustainability and profitability, venture capitalists are ready to disinvest and reinvest in new ventures.

To illustrate the link between social venture capital and responsible investing, this paper examines thoroughly the investment approach used by a Canadian venture capital company, *Cycle Capital Management* (CCM) and the impact its investment decisions have on sustainability. Although the sample is limited and generalizations may be difficult to make, nonetheless, this case study illustrates the arguments that venture capital may be compatible with responsible investing and sustainability objectives. This is important for venture capitalists and policy makers alike. If this link does exist, venture capitalists may, on the one hand, enjoy a better goodwill and have access to even more promising investment projects and policymakers, on the other hand, may have another tool to promote responsible investment and long-term growth and sustainability.

Admittedly, there may exist similar to CCM cases, or there may exist even more complex ones with unique characteristics, but their inclusion in the sample may not necessarily increase our understanding about the link between venture capital and responsible investing. Indeed, researchers, (Stake, 2006), have pointed out that grouping similar case studies with similar or even more complex features and examining the group as one entity, called *quintain*, makes the analysis more complex and does not provide any additional insights. Further, Gustafsson (2017) argues that a single case study allows researchers to make an in-depth and thorough analysis of the way venture capital firms operate in the context of sustainable investing. Additionally, a single case study allows for a more detailed exploration of "old and new theoretical relationships" and therefore "produces extra and better theory" (Gustafsson, 2017, p. 3). From a practical point of view, single case studies are less expensive, more expedient and could provide more in-depth data and detailed information (Ibid, p.2). In the current context of COVID-19, it was almost impossible for us to make a multiple case study. Executives and other knowledgeable persons

within venture capital firms capable of providing us with quantitative and qualitative data and other information were simply not available.

Although there are advantages for multiple case studies, the arguments above suffice as a justification for a single case study. It is advisable therefore to focus solely on the CCM case. Data, statistics and other useful information used in this study have been collected through a questionnaire and lengthy in-person interviews with CCM executives. The questionnaire was designed after a thorough review of the literature that allowed us to identify the research questions and ask the right ones. Colleagues and experts in the venture capital industry first validated the questionnaire. After receiving comments and suggestions, the final version of the questionnaire was sent to CCM executives. Sufficient time was given to them to read it and find the right people who could provide the data and information. Lengthy in-person interviews were realized at CCM's head offices validating the data and information they had previously sent to us. Through these interviews, we could get more information and data about the workings of the industry in general and the CCM in particular. A draft report was sent to them for comments and suggestions asking them kindly to single out any possible errors or misinterpretations of data and information.

To understand the contribution of VC to long-term growth and sustainability, we first present its main characteristics and then we analyze the conditions for VC to become more "responsible" in its investments decisions in sustainable projects.

Venture Capital Characteristics and its Role in Responsible Investing

Although there is no a universal definition of venture capital, the latter is usually not associated with responsible investing. Venture capital invests in projects with high potential returns just to exit quickly after having recouped its initial investment. Cambridge Associates (2019) report that VC investments have realized a 30-year annual average return of 18.31%, twice as much as the S&P 500.

Traditionally, VCs used to invest in sectors with high-expected returns irrespectively of the ESG factors (OECD, 2017, p. 137). In an era marked by the COVID-19, the attention of venture capitalists has shifted towards new business sectors with higher expected returns like high-tech start-ups, fintechs, healthcare, life sciences, 5G, renewable energies, to name a few. Nowadays, VCs invest massively in these industries, which happen to be "responsible" in certain regards.

Sustainable venture capital (SVC) is becoming a new field in finance as sustainable venture capitalists bind their investments in projects that respect environmental, social, governance and gender issues by including in their investment agreements specific clauses with respect to these principles (Gordon and Pohl, 2011; Beyer et al. 2010; Orlitzky et al, 2003).

Not all sustainable venture capitalists put equal weight on all these principles at once. Some may emphasize the environmental issues, others the social or governance and some others the gender issues. They will invest in the targeted sectors in anticipation of the expected, financial and non-financial results. For instance, cleantech venture capitalists will target investments in environmentally friendly technologies, as it is the case with CCM.

According to Metrick and Yasuda (2011, p. 3), venture capitalists are distinguished from other investors by the following five functions. Venture capitalists:

1. act as a financial intermediary
2. invest in private companies

3. play an important role in monitoring the companies in which they invest and offer support to the companies in their portfolio
4. maximize their financial returns by selling their stake (*exiting* the investment) or participating in an IPO (initial public offering)
5. invest in order to finance the companies' internal (organic) growth

The first characteristic defines the structure of a venture capital fund. By accepting money from investors and subsequently making private equity investments in holding companies, a venture capital fund acts as a financial intermediary (bank). In other words, a venture capital fund is structured like a limited partnership. In this structure, risk investors act as main partners (general partner) and investors act as limited partners (limited liability investors). The limited partnership is dissolved when the venture capital fund sells its shares in its holding company, reimburses its investors and starts the process over with other companies. Unlike venture investors, financial angels use their own capital and therefore do not act as financial intermediaries (violation of the current characteristic).

The second characteristic defines venture capital as a private investment. As such, the venture capitalist limited partnership is not obliged to disclose information like a publicly traded company. This is the reason why private investment is also called "alternative investment" in opposition to traditional investment in stocks and bonds.

The third characteristic is central to every venture capital fund. Start-up owner-innovators usually lack the resources and expertise to grow their business. The venture capital fund provides advisory services and direct assistance to participating companies. Direct aid can take many forms; become a member of the board of directors; act as an official recruiting agent; offer aid to better market the product or technology; help managers better manage certain parts of the business; act as a liaison, etc.

The fourth characteristic sets the tone for the investment by distinguishing between strategic and risk investments. Strategic investments are made by large corporations and are aimed at making a profit based on a long-term relationship with the target company. Strategic investments are therefore long-term investments. In contrast, risk investing is focused chiefly on the short and medium term. From the outset, the venture capital fund seeks to estimate the time it takes to exit the adventure with a profit. The exit strategies may be either a takeover bid, a merger and/or acquisition, or a subsequent sale of its stake to another company or another investor. There is therefore a need to exit the investment within a shorter time. There is no such a need though for strategic investing, at least in the short term. It becomes clear that there are differences in the evaluation process of projects classified as strategic investment or risk investment. Given that the time horizon for exiting is between five to seven years and that only a limited number of companies are able to grow rapidly within that time horizon, venture capitalists usually invests in high tech companies with new brand products (services) which allow them to enter or create new markets quickly. This is indeed the case with CCM, as we will see below.

The fifth characteristic focuses on organic, i.e., internal growth and not on external growth via acquisitions. There are three growth phases: the initial, the intermediate and the advanced phase. Venture capitalists may invest in one of these three phases of organic growth, but the majority of projects are in the middle phase as is the case with CCM. Nowadays, venture capital is not limited to private equity investment, but it can also use debt. In addition, venture capital can invest in companies using approved technologies and in mature companies (not start-ups), public or private.

Obviously, corporate profit drives investing and financing decisions in both responsible and conventional projects. The difference is that venture capitalists seek to recoup their investment in extremely short

periods while conventional investors use the traditional investment decision tools. Financial performance usually measured by the level of profits is commensurable to risk and firms' capacity to manage costs and find lucrative markets. Researchers and financial analysts compare the performance of both traditional firms and firms with CSR objectives in order to find out which form of investment has superior performance. If there are reasons to believe and empirical studies are capable to show that responsible investing outperforms the traditional one, then venture capitalists may be interested in responsible investing, should they want to increase further the profitability of their investments. Venture capitalists, by investing in responsible projects may then contribute to long-term growth and sustainability.

Literature Review of Risk-Return Relationship, Sustainability and Venture Capital

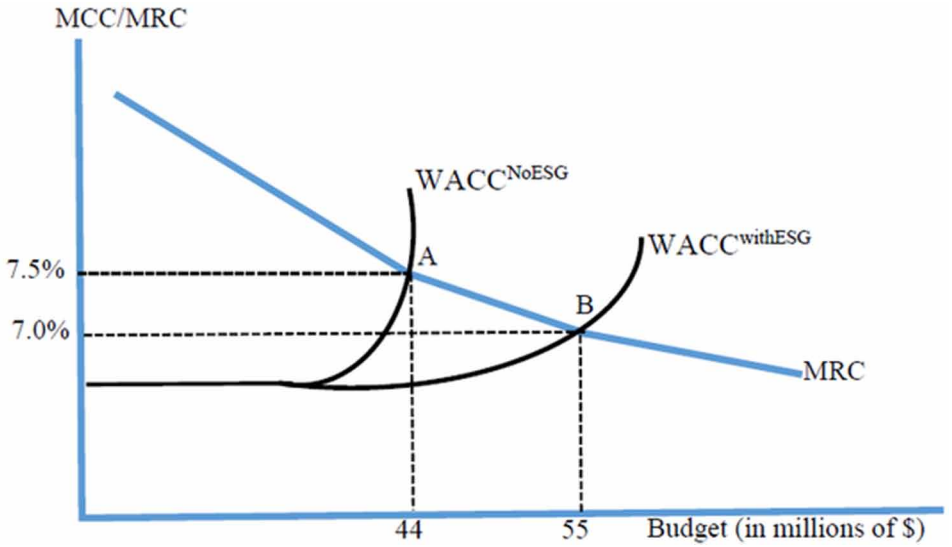
In the emerging field of responsible finance, attention has attracted the relationship between sustainability and performance. Financial analysts use two types of metrics to measure the performance of traditional firms and those with CSR objectives; the accounting measures and the financial or market measures. An important factor affecting performance is the corporate cost of capital. Cost of capital refers to the cost of financing a project by a firm's own funds (k_e) or through debt (k_d). In corporate finance, the weighted average cost of capital (WACC or k_g) is used to discount future cash flows and subtract from them the initial cost of investment (I) to find the NPV of a project and its financial contribution to the value of the firm's shareholders. Cost of capital reflects a firm's fundamental risk and the need of a firm to generate sufficient cash flows to cover this risk.

There are various reasons why the cost of capital may be lower when firms pursue the objectives of CSR. Theoretical studies (Albuquerque et al., 2019; Benlemlih et al., 2016) argue that the lower cost of capital of firms with CSR objectives is due to lower risks taking strategies employed by these firms. CSR would reduce their risks because the adoption of ESG criteria makes them less vulnerable. The lower vulnerability may be the result of having less litigation or other legal issues (Frooman, 1997), their capacity to differentiate their products and increase profitability (reducing thereby systemic risk) and the value of the corporation. The higher the differentiation is, the lower the risk. Further, the negative relationship between risk and CSR may be due to the obligation of these firms to disclose valuable information that they would not have done otherwise if they were not "responsible". This additional transparency allows them to build a good reputation and inspire trust with all stakeholders, which reduces the idiosyncratic risk of a socially responsible firm (Benlemlih et al., 2018).

Other researchers (Graham et al., 2005; Botosan, 1997) view the disclosure of information as a means to reduce the information asymmetry. If a company adheres to CSR principles, it must disclose information through reports and other means of communicating information to markets. By disclosing information about its ESG activities, the firm is reducing the information costs for financial analysts. In other words, the asymmetry of information decreases when firms adopt the ESG policies. With greater symmetry of information, firms with CSR objectives are able to attract more attention from investors. As a larger number of investors are becoming interested in companies pursuing CSR objectives, the market liquidity for the stock of these firms increases and the risk premiums demanded by investors decrease, lowering thereby the overall cost of capital (Dhaliwal and al., 2011; Reverte, 2012).

The reduction of the asymmetry of information is also viewed as a means to increase investors' base and market liquidity, both contributing to reducing risk and the overall cost of capital. Investors' base has an impact on diversification and risk. The larger the investor base is, the greater the possibility of

Figure 2. The WACC for firms with and without CS objectives
Source: Author's conception



diversification and the reduction of risk. Since a larger number of investors express interest in companies that have adopted ESG principles, chiefly those that perform well in terms of ESG, investor base increases and this attracts even more investors (Lee et al, 2009; Guenster et al., 2011). This increases market liquidity and lowers the overall cost of capital. In contrast, firms with poorer ESG performance will attract fewer investors who would prefer to invest in firms with high returns because of the adoption of CSR objectives. These firms will have a higher cost of capital (Heinkel et al., 2001).

Financing an investment project, through either equity or debt, is one of the most critical steps to its realization. It is well known that each type of financing has a different cost, equity being the most expensive. The project's capital structure (the proportion of equity to debt) plays an important role as well in the overall cost of capital. For this reason, financial economists calculate the total or overall cost of capital (k_g) called weighted average cost of capital (WACC) by weighting the cost of each source of finance (k_d and k_e) by its relative weight to total capital. Financial analysts use also the WACC to assess the profitability of an investment project.

Overall, the above brief review of the theoretical literature indicates that a negative relationship may exists between CSR and firms' cost of capital. The most important factors that may explain this relationship are the number and size of investors, diversification (and reduction of risk) and investor preferences (El Ghoul et al. 2011). Figure 2 sums up this relationship. It illustrates the correlation between the cost of capital and CSR. It compares the WACC of firms that adopt and perform well in terms of ESG ($WACC^{withESG}$) and those that do not adopt and perform poorly ($WACC^{NoESG}$).

The vertical axis shows the marginal return on capital (MRC) or the cost/return of capital, i.e., the cost for the firm to finance the project and the percentage rate of return for investors and other capital suppliers. The horizontal axis indicates projects with different budget levels. The MRC curve is the marginal return on capital of investment projects classified according to their net present value (NPV) or their internal rate of return (IRR) criteria. Companies that do not adopt ESG targets have a higher

weighted average cost of capital ($WACC^{NoESG}$) compared to the WACC of companies with ESG objectives ($WACC^{withESG}$).

Let's assume that the optimal investment budget for companies without ESG is $ 44 million and the return 7.5%. At breakeven point A, the $WACC^{NoESG}$ is equal to MRC. If a firm adopts ESG criteria, its WACC curve becomes flatter, indicating that the cost of financing investment projects is less than the cost of companies without ESG objectives. At breakeven point B, the $WACC^{withESG}$ is equal to MRC. The company's optimal budget is now $ 55 million and its cost is 7%, instead of 7.5%. By adopting ESG criteria, a company is able to lower its cost of capital and increase its investment budget.

Empirical studies (Gbadamosi, 2016; Kim and Kim, 2014; Karagiorgos, 2010) examining this relationship give, at best, mixed results. Actually, there is, more or less, the same number of studies showing positive, negative and no relationship (neutral) results. It is important to emphasize here that the positive or negative correlation between these variables is not sufficient to demonstrate their causality. There may be a positive or negative relationship between CSR and financial performance, but this is not a proof of causality. The empirical studies that do not examine causality between these two variables do not respond to the questions like "does the adoption of the ESG strategy contribute to better financial performance?" or "Is the cost of capital going down because companies are adopting CSR strategies?"

Largely, studies that find:

1. a positive relationship instill the idea that the adoption of CSR increases firms' value.
2. a negative relationship suggest that CSR decreases corporate value and short-term profit maximization is firms' best strategy.
3. a neutral or no relationship suggest that CSR strategy only serves pure marketing objectives with no real commitment to better social responsibility (green washing).

The above analysis can be fetched a bit further and include and compare the capital cost of other forms of financing. If from a theoretical point of view the cost of financing projects with CSR objectives is lower than the cost of financing conventional projects, it seems reasonable to assume that sustainable venture capital financing should have lower capital cost that the traditional venture capital financing. Given that the sustainable venture capital financing adopts the above-mentioned framework, the so-called holistic approach to investing, sustainable VC financing should also have a lower cost of capital. The latter is one of the most important costs a firm or project incurs and this is the reason why financial analysts use it to evaluate the project's profitability. Thus, projects financed by venture capitalists using the holistic approach with low cost of capital and high prospective returns contribute to long-term economic growth and sustainability. The table below resumes the hypotheses about the cost of capital and the alternative modes of financing and its relationship with a project's sustainability.

Table 1. Hypotheses linking the cost of capital to a project's sustainability using alternative modes of financing

Alternative modes of financing a project	**Conventional or traditional financing (CF)**	**CSR financing (CSRF)**	**Traditional VC financing (TVCF)**	**Sustainable VC financing (SVCF)**
Project's cost (WACC)	CF>CSRF		TVCF>SVCF	
Sustainability	Less sustainable	More sustainable	Less sustainable	More sustainable

Source: Author's conception

Conventional or traditional financing refers to the financing of conventional projects, i.e. the ones that do not take into consideration the ESG factors. The owners of the project are simply interested in the project's profitability. Corporate social responsibility financing (CSRF) refers to the financing of projects that use the holistic approach to screen and select the projects that respect the ESG factors. Traditional venture capital financing (TVCF) refers to the private financing of innovative high risk projects with promising returns. The attractiveness of these projects lies on their capacity to generate high profits in the short run without paying attention to the ESG factors. Sustainable venture capital financing (SVCF) refers to the private financing of innovative high risk projects with promising returns that have undergone a serious examination as to their suitability with respect to the ESG factors and their impact to society.

DECISION-MAKING PROCESS FOR RESPONSIBLE INVESTING: THE CCM CASE STUDY

The CCM Company

Cycle Capital Management (CCM) is a pioneer in the field of responsible investing. Its mission is to invest in companies using clean technologies, whether they are start-ups or growth companies with high potential. Aiming at shaping the future through clean investments and contributing to economic growth and sustainable development, CCM invests in companies with high technological content that would have a tangible impact on society and a lasting impact on the economy. According to CCM, sustainable economic growth and return on investment go hand in hand. Its strategy consists of developing partnerships with investors with the objective of sustainable development and investing with them in clean and technologically avant-garde companies capable of producing more with fewer resources (economic efficiency) and converting productivity gains in increased profitability. Therefore, responsible investing goes hand in hand with economic efficiency and financial profitability. In other words, the dilemma between profitability versus economic growth does not arise for CCM. "There is a need to create value by investing in 'revolutionary' companies which develop know-how differently by questioning the beaten paths of creating economic growth" (from interviews with CCM executives, Me Bérubé and Mr. Drouin).

For CCM to achieve its objectives, it relies on the in-depth knowledge of its human resources and their expertise to translate the vision of tomorrow into today's reality. Experienced professionals, the so-called "intelligent capital", committed and dedicated to CCM.s "cause" and in collaboration with its strategic partners assess the growth prospects of start-up companies or those with high potential for the development of clean technologies in order to invest in it and contribute to the sustainable development of our society. These venture capital investments are analyzed in advance and undergo a detailed review to ensure that they are indeed investments with social impact. The risk assessment of these projects is carried out exhaustively so that these risks are transferred to the parties who are more able to assume them and thus increase the profitability of its investments. Risk mitigation (derisking) is a crucial step in the process of evaluating this type of projects.

CCM's responsible investment spans all sectors of economic activity: primary; secondary; tertiary and post-tertiary. Indeed, CCM's venture capital investments are in agriculture, green chemistry, in the production of the new generation of biofuels, in the transformation of biomass, in smart electricity distribution networks, in energy storage, in renewable energies and energy efficiency, in the Internet of Things (IoT), in big data, in technologies dedicated to smart cities, etc. Large parts of CCM's investments are

in both development and commercialization stage companies, mainly in the cleantech sector (Cleantech ventures). It has Assets Under Management (AUM), i.e., the total market value of the investments that CCM manages on behalf of its clients worth more than $ 230 million. The targeted companies benefit from a leverage effect thanks to CCM's network of investors, its strategic partners and its affiliated advisers. CCM also invests in companies with high growth potential, particularly in those with new advanced technologies, exceptional administration as well as in companies with solid intellectual property. In addition, CCM plays an important role in the development of the companies, in which it invests, thus creating value. Since its inception in 2009, CCM has been successful in raising many funds. Currently, CCM manages many investment funds chiefly in the high tech sector.

In 2018, the Government of Quebec recognized CCM's importance and offered $ 50 million so that CCM can invest in technologies that will help Quebec towards the energy transition. These investments should focus on green chemistry, the new generation of biocarbons, the conversion of biomass, sustainable transport, renewable energies, energy storage, energy efficiency and sustainable agriculture.

CCM's Decision-Making Process for Responsible Investing

CCM uses a very complex decision-making process and various well-known and in-house developed tools and processes to select, evaluate and finance socially responsible investment projects. It appears that CCM, chooses its investments by excluding any projects that are viewed upfront, unethical or simply not responsible, from a social point of view. Once CCM made its choice, it uses two criteria to evaluate the impact of its investments. First, it analyzes the impact of a project to society using qualitative and quantitative criteria by taking into account the interests of all stakeholders. Second, it assesses the contribution of each investment project to its profitability in a five to seven years' time horizon. To safeguard a project's permanency and its long-term impact on economic growth and sustainability, CCM exits its investments by finding financially sound partners willing to carry on the ventures' operations to a higher end. The impact criterion is thus very important at this stage of the analysis. Finally, CCM chooses the best of the projects, according to the "best-in-class" criterion. This is not in contradiction with the long-term objectives of responsible investment, as the projects chosen by CCM are of high caliber and capable of generating a positive impact on society, even after CCM's withdrawal from the investment. CCM's approach is therefore compatible with the choice, evaluation and financing of socially responsible investments, in accordance with the holistic approach presented above.

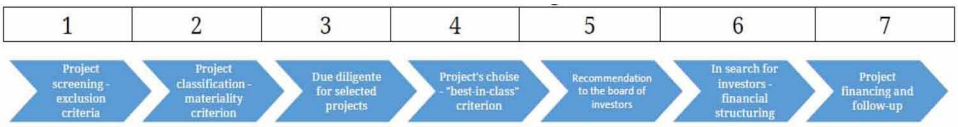
THE 7-STEP DECISION-MAKING PROCESS USED BY CCM FOR THE SELECTION OF INVESTMENT PROJECTS AND THEIR FINANCING

Figure 3 depicts in seven steps the holistic approach used by CCM to choose and fund responsible projects. CCM's decision-making process is not that different from the analytical framework presented above.

1. Screening of Projects Using the Exclusion Criterion

During interviews with CCM decision makers and administrators, we noted that CCM uses a holistic approach to investing by applying rigorous criteria for the evaluation, analysis, selection, funding and monitoring of its investment projects using venture capital. CCM's investment policy is notoriously

Figure 3. The 7-step decision-making process used by CCM for selecting and financing investment projects
Source: Author's conception



simple. It excludes any project that is illegal, unethical and not offering the necessary guarantees for good governance and social contribution. For instance, CCM excludes investments in lottery, adult entertainment, guns, drugs, tobacco, cannabis, and mining.

CCM's screening process is rather simple. It excludes from the realm of potentially acceptable projects the ones not having an "impact" in terms of ESG, or social and ethical considerations, even though some or all of them may have a very strong profit potential. CCM makes a clear distinction between responsible investment, which leads to CS, and conventional investment. The latter concerns mainly projects with great potential returns on investment. In contrast, the former concerns projects that satisfy moral, ethical and social criteria with significant profitability potential. CCM's main thrust is to contribute to the circular economy by promoting technologies that have a positive impact on one or all of the ESG elements without ignoring a return on investment. CCM adopts the 17 principles for responsible investment (PRI) developed by the UNDP (https://www.unpri.org/sdgs), but as a "thematic investor", CCM may place more emphasis on one of the ESG elements than on all of them at the same time. Nonetheless, CCM may invest in traditional "dirty" or polluting industries as long as its investment would contribute to make this industry "cleaner". For instance, CCM does not invest in the aircraft industry as such, but does invest in next generation biofuels to help the industry reduce its GHGs and thereby improve its energy balance. Therefore, CCM invests massively in the so-called "CleanTech" sector.

CCM uses short-term venture capital to finance its responsible investments. How CCM can reconcile its short-term investments with the long-term objectives of CS? As a venture capitalist and thematic investor, CCM focuses on financing clean technologies at their final stage of development, i.e., the commercialization stage. Knowing that CCM's investment horizon is relatively limited, varying between five to seven years, it makes more sense for CCM to invest in the later phases of the life cycle of innovative companies. CCM's creation of Ecofuel responded to this concern, namely, how to rapidly grow start-up companies and bring them to the stage of significant commercial success.

2. Classification and Materiality of Selected Projects

Once the exclusion criterion has been applied, the selected projects are scrutinized further and classified according to the following criteria:

1. Technological –questions are raised as to whether the selected projects with greater technological content and potential for success are new and/or have clear intellectual property rights, are "clean", have all the potential ingredients for success and what are the projects' effects on ESG.
2. Managerial – concerns the competency of the project's managerial team, its capacity to bring the technology to the market and exploit its full potential. It also concerns the management team's respect of gender equality?

3. Financing (capacity) – do selected projects overpass CCM' financing capacity (CCM finances projects between $ 50 and $ 100 million). Do CCM's partners are ready to co-finance the projects or should CCM raise funds from other investors.
4. Profitability – what is each project's profitability potential? Choose the project with the highest profitability potential.
5. Exit opportunities – what technologies allow CCM to get out of the venture as quickly as possible without compromising the company's success.
6. Materiality – classify projects according to their greatest importance and impact on society.

3. Due Diligence of Selected Projects

The third step is to do a due diligence on each of the selected projects. It is tedious, time-consuming and requires data, which are often unavailable. CCM uses either domestic or foreign benchmarks or other *ad hoc* techniques to verify whether the selected projects are as promising as their promoters claim. Due diligence goes beyond the financial statements. CCM checks managers' abilities to run the business properly and any other aspect that would allow the business to realize its full potential.

4. Choice of Project (s) According to the "Best-in-Class" Criterion

CCM uses the "best-in-class" criterion to make its ultimate choice of the project. At this stage, each selected project undergoes a financial analysis in order to find the project which best meets ESG criteria and offers the highest returns. CCM uses data from Bloomberg Energy Finance, CleanTech Group, Canadian Venture Capital and Private Equity Association (CVCA) and the traditional tools such as net present value (NPV), internal rate of return (IRR), payback and other conventional criteria to evaluate the profitability potential of the selected projects. This analysis is very rigorous but for some projects, the unavailability of data makes this task difficult. Once all the CS criteria are applied and the technology and market are validated, the remaining procedure for evaluating the investment projects is mostly conventional, i.e., "it becomes a question of financial mathematics" (interview with Mr. Drouin, CCM's executive).

At this stage, another criterion is getting very important: the capacity of CCM to exit an investment. As a venture capital firm, CCM looks to exit an investment after four to seven years. No matter the profit potential of the project, its contribution to one or all ESG elements, its social contribution, etc., CCM would not invest if it were no possible for it to exit the investment after the targeted time horizon.

5. Project Recommendation to the Investment Committee

To demonstrate the importance of financial and non-financial criteria in the process of making its final decision to fund an investment project, CCM uses five key principles (the five Ps). These are:

1. Planet – determine the environmental benefits of the technology (this is the E component of the ESG criteria)
2. "People" – quality of the management team and potential investors, gender equality (the S component)
3. Intellectual property – validate intellectual property rights in order to avoid ongoing litigation (the G component)

4. Performance – ensure the uniqueness of the technology/product and good market performance so that the investment is profitable (financial criterion)
5. Potential to exit – examine all possible avenues (takeover bid, mergers and acquisitions, presence of other investors) allowing the exit of its investment within the prescribed timeframe - (financial criterion)

CCM analyzes every selected investment project following the five Ps principles and recommends them to its investment committee for final approval.

6. Potential Investors, Financing and Projects' Financial Structure

CCM finances investment projects according to its proper guidelines and priorities. If CCM lacks financial resources and the project is promising, CCM could supplement the financing of the project by raising funds from other investors or partners.

CCM is not a specialist in "project finance" and it does not participate in this type of financing. CCM puts its own money to finance a project and if CCM needs other investors, it is possible for it to participate as a partner, without having to go through a financial arrangement like "project finance". Unlike project finance, financing an investment project does not require the creation of a specialized investment vehicle (SIV).

7. Monitoring of an Investment Project

The following up and monitoring of the companies in which CCM invests is an important part of its investment procedure. CCM gets at least one seat on the board of directors in almost 90% of the companies in which it invests and is directly involved in the development of their strategies in order to be able to follow up and monitor its investments. In addition, CCM assists the companies in which it invests, particularly the most successful ones. This is reasonable since the success of the venture business is closely related to CCM's success.

CCM tracks performance of companies it finances using the International *Private Equity and Venture Capital Evaluation Guidelines* (IPEV standards) and its own evaluation methods. In practice, CCM "measures" the social/environmental impact of its investments by comparing current performance of the companies in which it invests with that initially projected. During comparisons, CCM uses a refined methodology to take into account market developments and other distortions that may have affected final performance.

As far as financial performance is concerned, CCM measures the success of its investments using two criteria: 1) commercial success and 2) profitability. CCM assess firstly the commercial success the product or technology has had in the market and then it measures the realized returns. According to CCM, as long as its investment has a positive impact, with respect to ESGs, the performance of its investment is good, even though the financial success is not as high as expected.

In short, for CCM an investment with positive social and environmental impact and good financial profitability are indicators of the success of the investment. According to CCM, it is possible for firms with CSR to satisfy both objectives/criteria for a successful investment, the short-run profit maximization objective and the long-run ESG objective. For CCM, there is no an "intertemporal tradeoff" and the debate is not as acute as it may appear at first glance.

DISCUSSION AND CONCLUSION

Corporate social responsibility is a relatively new field of study attracting a lot of attention from academics and practitioners. The main debate concerns the performance differences between investment projects based on traditional investing criteria and the ones adopting the CSR objectives and the contribution of each type of these investments in economic growth and sustainability. It seems that projects with CSR criteria perform rather well and are more sustainable. Venture capital by focusing on high risk short-term projects with increased profitability has attracted little attention in the current debate by assuming at the outset its incompatibility with sustainability.

This chapter takes on a novel approach and argues that a link may exist between sustainability and venture capital should the latter adopts CSR criteria in its investing approach. It uses a Canadian venture capital firm, CCM as a case study to illustrate the arguments. Through interviews and the analysis of other primary and secondary sources of information and after thoroughly examining CCM's holistic approach to investing, we conclude that there are sound economic reasons to believe that venture capital can contribute to sustainability should it focus on investments in projects with CSR objectives.

The analysis and the results are useful for firm managers, institutional investors and policy makers alike. Firm managers may pursue short-term profit maximizing objectives and contribute to social welfare should they choose profitable projects with specific characteristics with respect to ESG factors and their impact to society. Institutional investors may choose to invest in firms with CSR objectives if these firms incorporate risk-return criteria to investing. Policy makers may adopt policies that promote the development of venture capital markets since the latter increase the financing opportunities of projects with impact such as the ones concerning energy efficiency, greener economy, more governance and other socially desirable objectives. Although these results are based on a single case study, we believe that the CCM case is not likely to be an outlier but it is a representative venture capital firm of a larger population. It is clear that more studies are needed to assess the role of venture capital in responsible investing and to shed more light on the debate.

Future research should develop more the theoretical relationship between venture capital and responsible/sustainable investing. It should focus on improving the theoretical framework and make a "realist evaluation" (Pawson, 2013) by identifying the optimal conditions and mechanisms that explain better the performance of firms with CSR objectives. The question "how the outcomes were caused" and the "influence of context" (Ibid, p.12) are important in the current debate. Economic agents respond differently to resources or opportunities depending on the context. This study has shown that CCM's performance is in accordance with the outcomes of our theoretical framework and performance but it is uncertain whether the Canadian context is a determinant factor for this performance. To get more sound results, we need more comparative studies, particularly at international level, that examine the researched relationship in different institutional and business contexts.

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Chapter 3
Evaluation in Impact Investing:
Where We Are and Where We Are Going

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ABSTRACT

The emergence of impact investing over the past decade has been accompanied by an increased interest of practitioners and scholars in the impact evaluation topic, one of the twofold pillars of the such an innovative financial approach. To contribute to the international debate, this study adopts a qualitative approach by obtaining results from a systematic literature review of extant research. This is useful to 1) identify the current existing impact evaluation approaches adopted in the field and 2) derive an empirical analysis in the impact investing sector with a focus on impact measurement in social impact bonds. The study opens interesting insights into recognizing the potential for the whole impact investing field, deriving both from theory and evidence of impact evaluation practices.

EVALUATION IN IMPACT INVESTING: SETTING THE SCENE

Over the last decade, impact investing (II) has been of interest to academics and practitioners because of its revolutionary approach (Cohen, 2018; Carè, Trotta and Rizzello, 2018, Trotta, 2020). Agrawal and Hockerts (2019) pointed out the unique factors of II field, clarifying its terminological and definitional distinctions: (1) capital invested, (2) degree of engagement with the investee, (3) process of selection, (4) social and commercial outcomes, (5) reporting outcomes, and (6) government role. More specifically, according to Weber (2013), II is included (together with social banking and microfinance) in the concept of social finance, defined as an "umbrella term" that "strives to achieve a positive social, environmental

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or sustainability impact". Similarly, sustainable finance is referred to "*as the process of considering environmental, social and governance factors when making investment decisions, leading to increased longer-term investments into sustainable economic activities and projects*" (Boffo & Patalano, 2020, p. 11). Because of its proper characteristics, II represents the new frontier of the sustainable finance, significantly improving a positive approach in terms of social and environmental impacts (Trotta, 2020). II is defined as *"the allocation of capital with the intention to generate positive social impact beyond financial return"* (Harji & Jackson, 2012) or as *"the investment made with the dual purpose of obtaining financial and social returns"* (Mair & Hehenberger, 2014; Vandebroek et al., 2020). Indeed, according to the GIIN (n.d.), the core characteristics of the impact investments are 1) intentionality, 2) financial returns, 3) range of asset classes, and, *last but not least,* 4) impact measurement. This last one is a pillar but also a crucial characteristic of II that differentiates this innovative approach from traditional investing, as highlighted by Höchstädter and Scheck (2015). Moreover, II unlocks innovative ways to solve some of the world's most pressing problems while simultaneously providing the financial returns required by investors, often in partnership with governments (Hebb, 2013). From this point of view, instruments and models of impact investment, such as microcredit, impact funds, crowdinvesting and social impact bonds, have the potential to contribute simultaneously to multiple Sustainable Development Goals (SDGs) of the United Nation (UN) Agenda 2030, emphasizing the role of public-private partnerships. In this regard, Rizzello et al. (2016, pp. 117-118) identified interesting linkages and cross-contaminations among three domains of research in II studies (sustainable finance, impact entrepreneurship, and public policy in the social sector), directly related to the social and investment approaches.

The impact investing market is growing. More specifically, the market for impact investments is proliferating where banks, foundations, funds, government agencies, and high net worth individuals (Weber, 2016; Agrawal & Hockerts, 2019). According to Aljiani and Karyotis (2019, p. 10), a complex web of interactions among numerous stakeholders (i.e., banks, institutional investors, portfolio managers, public, for-profit and non-profit organizations, and social enterprises) characterizes the impact investing channels.

Despite the importance attributed to II, recent research indicates an "impact paradox" within II, which is characterized by the lack of accepted evaluative approaches (Nicholls, Paton and Emerson, 2015; IDS, 2017; Caseau & Grolleau, 2020; Kah & Akenroye, 2020). There may be several reasons behind the "missing impact" phenomenon. It is worth noting that the impact investment industry is characterized by collaborative relationships among several actors and stakeholders. In this vein, a primary target group of investee organizations is social sector organizations (Bolis et al., 2017; Islam, 2021), but social investors and the public sector are equally important. Therefore, the range of actors and parts interested in impact evaluation is wide; each actor could have a perspective that needs specific measurement tools, methods and approaches. Recently, strands of research have focused on impact measurement from a public administration perspective (Ruiz-Lozano et al., 2020; Gębczyńska & Brajer-Marczak, 2020), social enterprise perspective (Gibbon & Day, 2011; Lall, 2019; Epstein & Yuthas, 2017; Costa, 2021), and investor perspective (Reeder et al., 2014; Reisman & Olazabal, 2016; Gianoncelli & Gaggiotti, 2021).

Further difficulties in carrying out the impact assessment derive from the fact that the spectrum of II tools, models, platforms, and investors are broad and extremely differentiated (ranging from microcredit to impact funds). This sometimes determines different evaluation methods, case-by-case. This also highlights various facets of social impact measurement. The variety of tools and subjects also justifies several different uses and points of view of impact evaluation by actors involved in II industry.

Islam (2021) realizes a literature review to develop cumulative insights into II in social sector organizations, and identifies four streams of II research, one of which is "*impact evaluation in II*". In this

regard, the author summarizes several different uses and points of view of impact evaluation. Regarding social organizations, impact evaluation assists in establishing legitimacy with investors to obtain future investments. Impact evaluation could help social investors legitimise investment decisions towards key stakeholders (for example, shareholders, funders, industry networks). In addition, impact measurement for investors also represents a fundamental "accountability mechanism", mandatory to certify the social impact. Often, some financial models, such as Social Impact Bond (SIB), base their functioning on public-private partnerships and on pay by results (PbR) mechanisms. The importance that impact measurement assumes in these cases from the perspective of public administration is evident. Then, in long-term relationships, impact evaluation can be used as an organizational mechanism that is useful to improve collaborative approaches for managing social and business objectives, which may be partially divergent (Mayer & Scheck, 2018; Lall, 2019). Finally, social impact measurements can be used to improve the strategic vision of institutions (Bengo et al., 2021).

Ormiston (2019) shows that impact evaluation in II plays a more "complex" and "transdisciplinary" role in nature, involving several elements of accounting, strategy, operations, marketing, and organizational learning. This justifies the multidisciplinary approach to the topic and the scientific interest of various scholars from different disciplinary fields. Islam (2021) notes that impact evaluation approaches are heterogeneous in practice. Investor organizations are experimenting with a broader approach that ranges from a case-by-case approach to a more systematic and standardized approach in evaluating impact. These findings are in line with the results of recent reports (GECES, 2014; EVPA, 2016; GIIN, 2020) provided by international organizations and practitioners' networks involved in the II field (such as the Global Impact Investing Network (GIIN) or United Nations Environment Programme UNEP-Financer Initiative), which are engaged in a collective effort of harmonization and standardization of metrics, methods, frameworks, and practices in impact issues related to II.

Similarly, scholars recognised the complexity and significant costs associated with impact measurement, especially in the case in which impact investors, investee organizations, or public administrations are in the early stage of this experience (Muers, 2017; Dufour, 2019; Andrikopoulos, 2020). Special attention is being paid to social impact measurement practices within the regulatory frameworks. Regarding the case of the European Union (EU), the social impact measurement is the missing link between EU Regulation and impact finance (Bengo et al., 2021).

However, despite the absence of a complete picture, in theory and practice, impact evaluation is becoming central to the theme of impact investment (Rockefeller Foundation, 2012; Reeder & Colantonio, 2013; GIIN, 2019) because it permits supporting impact investment decision-making and final reports (Gertler et al., 2016). One of the constantly reoccurring themes in the research on impact evaluation is the need to develop effective tools and methods for evaluating impact (Verrinder et al., 2018; Chen & Harrison, 2020).

First, it provides insights into the efficacy of investment strategies aimed at achieving impact goals (Jackson, 2013a; Reisman & Olazabal, 2016). Second, it contributes to the actual knowledge of impact data, creating an opportunity for improving impact strategies (Reisman & Olazabal, 2016). In addition, a substantiated track record of impact evaluation evidence serves to make future capital allocation decisions by both public and private sources of financing available. (Burckart et al., 2018). In fact, impact investors also look for more than data to prove their impact (Reisman, Olazabal and Hoffman, 2018). This means that the prioritization of impact requires methods for proving impact evidence, and there is an urgent need for more research, in theory and in practice (IDS, 2017).

In conclusion, the current context in terms of impact evaluation is particularly heterogeneous because of the inherent multidimensionality of the impact and the consequent ways of generating it, but especially because of a lack of an accepted terminology on the international level. Despite the growth of impact evaluation studies in II field, the literature (scientific and grey) is fragmented, and the discussion around the topic of evaluation's impact is becoming more prominent (Vandebroeck et al., 2020). More specifically, the impact measurement represents the real challenge for survival and future development of the II industry. Scholars and practitioners underline the centrality of impact measurement in II and the importance of the development of the impact investment industry (EVPA, 2016), calling for greater effort to increase effective and shared frameworks, models, and tools.

Impact Investing Market and Regulation Trends: A Context in Evolution

II sector is a rapid and growing sustainable finance market segment. According to the GIIN annual report (2020b) from 2015 to 2020, the global compound annual growth rate of capital invested for impact rose from USD 14,246 million to USD 19,549 million, with an annual growth rate of 12%. In the same interval of time, the fastest-growing regions were continental Europe along with South and East Asia, growing at CAGRs of 25% and 23%, respectively. If private debt and private equity initially dominated II market according to the cited report (GIIN, 2020b) in 2020, new capital market instruments arose to serve the liquidity needs of institutional investors such as publicly traded debt (24% of the impact capital invested) and public equity (making up another 10%). From a regulatory perspective, II market is rapidly evolving due to its interactions with sustainable finance logics. This is particularly true in the EU context, where recent regulatory developments have touched on a range of topics, including the classification of sustainable economic activities, disclosures by investors and issuers, product governance, suitability, and organizational requirements. More specifically, the EU adopted in 2020 a Taxonomy Regulation and a classification system of environmentally sustainable economic activities. This framework was originally focused on environmental sustainability, and in July 2021, the EU set out criteria for an economic activity to be classified based on its social strategies and objectives (social taxonomy). Such regulatory innovation has been introduced with the Sustainable Finance Disclosure Regulation, which aims to increase the attractiveness of sustainable investments by requesting more information on the Environmental, Social and Governance (ESG) factors of investment portfolios, both in terms of composition and risks.

RESEARCH DESIGN AND METHODOLOGICAL APPROACH

To face the growing demand for further analysis related to impact evaluation themes in II, in this chapter, we present the first results of an explorative analysis that identifies the main research strands and focuses on the current impact evaluation methods and practices existing in the field of II.

This study uses a qualitative approach (Patton, 1982; 2002) and is based on an inductive-deductive method, which implies a critical review of relevant literature and allows an adequate empirical analysis of some practices. We conducted a systematic literature review (Tranfield, Denyer and Smart, 2003), which is useful for identifying the relevant streams in the existing impact evaluation literature. To take into consideration all relevant results, we adopted a systematic procedure and a research protocol. First, on the basis of the experience matured by senior researchers both in this research field and with regard to the literature reviews (Carè, Trotta and Cavallaro, 2013; Trotta, Cavallaro and Carè, 2013; Rizzello et

al., 2016; Carè, Trotta and Rizzello, 2018), we identified suitable keywords and tried several combinations of such different keywords using several databases.

Gradually, it turned out that some keywords were redundant or not useful for the purpose of the research. Therefore, the best final search strings are identified as follows: "evaluation" and "impact investing". The search was conducted using the Google Scholar database, without limitations (cut-off: April 2021). Google Scholar is an open database that is useful for searching for articles, chapters, books, working papers, and reports (Mikki, 2009). This database may be useful for initial research and information gathering (Gray et al., 2012). It is worth underlining that the first 100 pages (of the research) were taken into consideration. The results were approximately 1000.

Later, a junior researcher, who completed her doctoral studies on these topics, realized manually cleaned operations by excluding irrelevant results. The following exclusion criteria were established: 1) works that focus on other areas, and 2) works in a different language from that of English. Therefore, the accepted results are 44.

Finally, at a later stage, considering the limitations of Google Scholar (Gray et al., 2012) and the recent flourishing scientific productions, we decided to implement and update the results, searching for additional results in the Scopus database, using the following strings: "impact evaluation" and "impact investing" (cut-off: 17 June 2021). The Scopus database includes more relevant peer-reviewed articles, also available in "early preview". This generated 42 results and a further nine accepted results.

The final list contains 53 results (which are marked in the reference list with an asterisk). This list revealed 39 journal articles, four books and chapters from edited volumes, six reports, and four working papers and conference proceedings. Figures 1 and 2 and Table 1 give an overview of the data description.

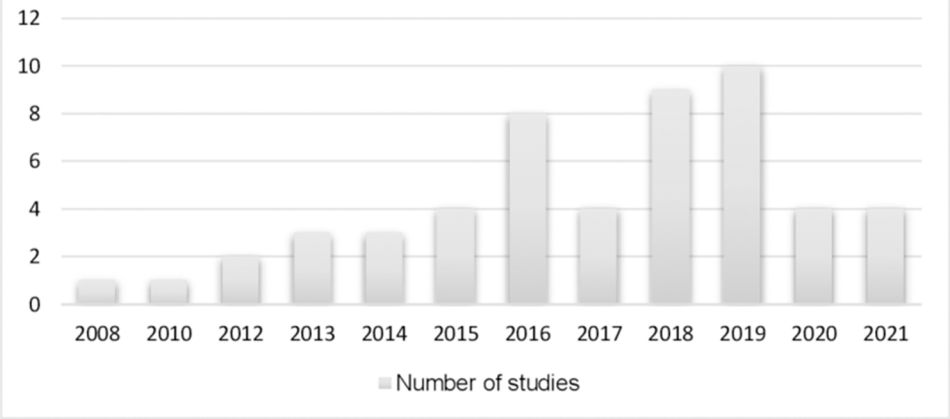
All the members of the research group have read the materials, and each researcher gave his opinion to identify the main research streams and research focus areas related to different materials (see, for detail: Table 2).

The remaining parts of the chapter are organized into four different sections. The next section performs the literature review on the topic of impact evaluation in II by highlighting the main issues, narratives, and streams of research. More specifically, we tried to provide an overview of the fragmented concepts in this issue, describing the literature trajectories. In Section 5, we depict a map of methods and models existing in the II industry. Section 6 focuses on the case of impact evaluation in SIBs. Section 7 discusses the main findings and provides perspectives useful to decrypt the complexity of the issue, also in a managerial sense.

LANDSCAPE OF IMPACT EVALUATION IN IMPACT INVESTING: A LITERATURE REVIEW

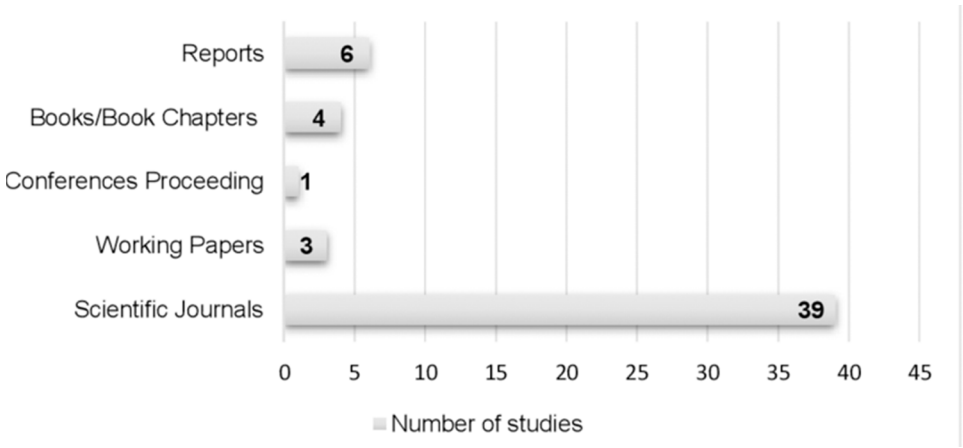
In the systematic review of the literature, 53 documents were selected, and information about their characteristics and quality are shown below. More specifically, Figure 1 proposes a categorization of studies per year (from 2008 to 2021), and Figure 2 classifies the studies per typology (scientific journals; working papers; conferences proceedings; books and book chapters; and, reports). Finally, Table 1 proposes a classification among top publishers (including only the publishers with a three or more published studies) and their country.

Figure 1. Categorization of studies per year
(Source: Our elaboration)



Moreover, a relevant result concerns the university affiliation of the authors. More than half of scholars belong to American universities, followed by the United Kingdom and South Africa; in contrast, few scholars are Italian and French.

Figure 2. Categorization of studies per type
(Source: Our elaboration)



The aim of this section is to argue the main strands of impact evaluation topic research and their underlying key focus areas, as summarized in Table 2.

A strong theme emerging from the impact evaluation field is the theme of measurement in II industry (Rockefeller Foundation, 2012; Reeder & Colantonio, 2013; Reeder, 2014; Flynn & Young, 2016; Abrahams & Walaza, 2018; Vo & Christie, 2018; GIIN, 2019).

The first focus area identifies the extension of the existing impact measurement to II. II industry used the term 'measurement' to encompass what the conventional evaluation landscape calls 'monitoring and evaluation', which is applied in social sciences, such as public, non-profit, and philanthropy (Reisman &

Table 1. Categorization of studies per top publisher and country

Top publisher	Number of studies	Country
African Evaluation Journal	6	Africa
Research in International Business and Finance	4	Netherlands
Journal of Economic Policy Reform	3	United Kingdom
American Journal of Evaluation	3	United States

(Source: Our elaboration)

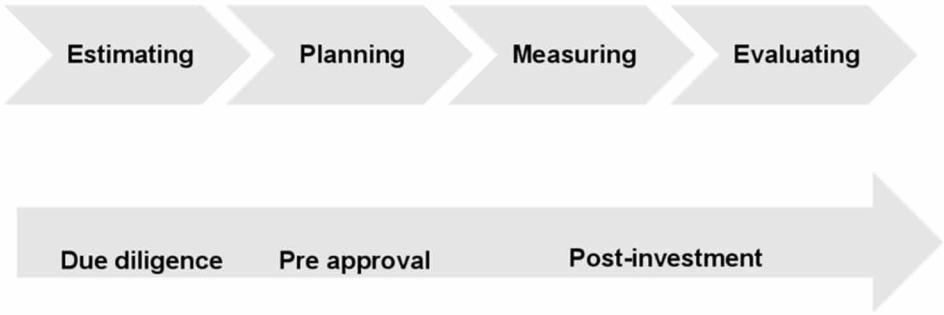
Table 2. Research strands on impact evaluation topic in impact investing

Research strand	Research focus-area	References selected in systematic review of literature
Measurement in II	Extension of existing impact measurement to II.	Olsen & Galimidi (2008); Reeder & Colantonio (2013); Reeder (2014); Reeder et al. (2014); Ebrahim & Rangan (2014); Reeder et al. (2015); Flynn & Young (2016); Reisman & Olazabal (2016); Vo & Christie (2016); Reisman, Olazabal and Hoffman (2018); Choda & Telaida (2018); Abrahams & Walaza, (2018); Viviani & Maurel (2019); Dufour (2019); Tsotsotso (2020); Lam & Tan (2020).
	The role of impact measurement among impact actors.	Brest & Born (2013); Jackson (2013a); Reeder & Colantonio (2013); Battilana & Lee (2014); Kroeger & Weber (2016); Reisman & Olazabal (2016); Bengo, Arena and Azzone (2016); Florman, Klingler-Vidra and Facada, (2016); O'Leary & Brennan (2017); O'Flynn & Barnett (2017); Choda & Telaida (2018); Hoffman & Olazabal, (2018); Harji & Jackson (2018); Reisman et al. (2018); Urban & George (2018); Islam (2019); Abrahams et al. (2019); Dufour (2019); Viviani & Maurel (2019); Agrawal & Hockerts (2019); Tsotsotso (2020); Andersen, Hansen and Rand (2021).
	The role of impact measurement in SIB context.	Scherer & Schenk (2012); Jackson (2013b); Gustafsson-Wrigh, Gardiner and Putcha (2015); Warner (2015); Reeder et al. (2015); Dimitrijevska-Markoski (2016); Berndt & Wirth (2018); Tsukamoto (2019); Fox & Morris (2019); Broccardo & Mazzuca (2019); Scognamiglio et. al (2019); Tan et al. (2019); Rania et al. (2020); Fox & Morris (2021).
	Impact "paradox"	Puttick & Ludlow (2012); Jackson (2013a); So & Staskevicius (2015); Barman (2015); Reisman & Olazabal (2016); O'Flynn & Bennett (2017); Spiess-Knafl & Scheck (2017); Verrinder et al. (2018); Urban & George (2018); Hoffman & Olazabal (2018); Reisman et al. (2018); Alijania & Karyotis (2019); Phillips & Johnson (2019); Viviani & Maurel (2019); Chen & Harrison (2020); Tsotsotso (2020); Bengo, Borrello and Chiodo (2021).
Towards a unified impact measurement framework for II	Standardization of models and frameworks	Thornley & Dailey (2010); Reisman & Olazabal (2016); Berry (2016); O'Flynn & Barnett (2017); Aggarwala & Frasch (2017); Urban & George (2018); Dufour (2019); McCallum & Viviers (2020); Tsotsotso (2020).
	Application of theory of change in II	Jackson (2013a); Vo & Christie (2016); Jackson & Harji (2017); Hoffman & Olazabal (2018); Urban & George (2018); Verrinder et al. (2018).

(Source: Our elaboration)

Olazabal, 2016). However, despite the similar use of semantics between the evaluation and measurement of impact (Ebrahim & Rangan, 2014), both approaches "*follow different processes and normally result in different outputs (forms of results)"* (Tsotsotso, 2020, p. 2). More specifically, the impact measurement process measures the output of a program, while evaluation focuses more on the outcomes; for this reason, the evaluation process is more rigorous and requires more specialized skill (Choda & Telaida, 2018; Tsotsotso, 2020). In this way, it is possible to consider the measurement as an extension of evaluation to II field (Dufour, 2019) because most impact measurement studies involve the evaluation of impact, such as cost-benefit analyses, summative evaluation, and experimental methods, which are conducted after the implementation of programs or interventions by funders such as foundations and governments to verify the achievement of outcomes (Ebrahim & Rangan, 2014). In fact, academic programs look to the more statically rigorous technique to assess the efficacy, such as randomized control trial evaluations, while the measurement approaches use a much more participatory technique (Reeder & Colantonio, 2013). Lam and Tan (2020) suggest that impact evaluation is more than a mid- or post intervention assessment analysis, incorporating both the initial outcome planning and monitoring of an intervention. Figure 3 illustrates the measurement and evaluation process in the cycle of investment.

Figure 3. Measurement and Evaluation in the cycle of investment
(Source: Our elaboration from So & Staskevicius, 2015)



In particular, impact measurement focuses on expected return metrics for computing the expected value of investments, and Social Return On Investment (SROI) represents an example based on social generally accepted social accounting principles. It monetizes social value and allows us to compare public and private benefits to costs, and in its simple form, it can be calculated as the relationship between the present value of impact and value of inputs. There are two types of SROI; the first is retrospective based on actual outcomes that have already taken place, and the second is a forecast or prediction that measures how much social value will be generated if the activities meet the intended outcomes. However, in practice, expected return measurement is used as an anticipatory means of evaluating investments rather than a retroactive measurement of outcomes and the impact of investments already made. In particular, founders adopt this metric to compare the impact of similar and dissimilar programs in a common language and to assess a potential investment's fit (So & Staskevicius, 2015).

Instead, impact evaluation comprehends experimental and quasi-experimental methods that also represent forms of measurement of impact after the fact. The experimental method involves a randomized

control group as the counterfactual analysis, and Randomized Control Trial (RCT) is the major standard, characterized by two forms. First, it includes the randomized assignment of individual treaties and a control group; second, it involves controlled procedures to ensure that all participants are treated equally. Instead, quasi-experimental designs do not involve random assignment to treatment or control, but they usually use another type of counterfactual, such as a historical baseline. In practice, both experimental and quasi-experimental methods have been used in the outcome measurement designs of SIBs (So & Staskevicius, 2015).

The second focus area shows a different role for impact evaluation and measurement among impact actors. Impact measurement has been a major factor since 2008 (Jackson, 2013a; Reisman et al., 2018), following the increase of the new impact players in the global market, such as impact investors who have dramatically increased funding intended for solving social issues (O'Flynn & Barnett, 2017). The need to develop a strong proof of impact has become an imperative to demonstrate additionality for distinguishing blended finance operations from ordinary commercial investment (Reisman & Olazabal, 2016; Kroeger & Weber, 2016; Andersen et al., 2021). This criterion indicates the desire to "*increase the quantity or quality of the social or environmental result as well what would have happened otherwise*" (Brest & Born, 2013, p. 25), where the impact has become the third dimension, in addition to risk and return (Reeder & Colantonio, 2013; Viviani & Maurel, 2019).

For this reason, the growth of II is accompanied by an increase in the bar for what constitutes 'impact' among stakeholder groups (Reisman & Olazabal, 2016; Harji & Jackson, 2018; Choda & Telaida, 2018), and impact measurement and evaluation play different roles among them. Bengo et al., (2016) underlined the strengths and weaknesses of different approaches and connected them to the information needs of key impact stakeholders. The social enterprise sector considers central in its mission the creation of value with a long-term impact and potentially public policy impact (Reeder & Colantonio, 2013; Battilana & Lee, 2014; Urban & George, 2018; Viviani & Maurel, 2019; Agrawal & Hockerts, 2019), which requires greater transparency and accountability (Nicholls, 2009). Then, impact evaluation and management improve the legitimacy with existing and potential impact investors, increasing the likelihood of future investments (O'Leary & Brennan, 2017). Agrawal and Hockerts (2019) explored the interorganizational relationship between impact investors and investee social enterprises, underlining the importance of investees to increase legitimacy for II. In contrast, in the public administration context, impact evaluation and measurement improve accountability and compliance to their constituents for testing and validating the effectiveness of policies, programs, and interventions (Hoffman & Olazabal, 2018). According to Dufour (2019), public authorities around the globe have fostered more interest in understanding social impact measurement which derived from II (Florman et al., 2016). This emphasizes how evaluation improves the challenges in impact measurement, accelerates the growth of II sector (Choda & Telaida, 2018; Abrahams et al., 2019), and consequently increases the legitimacy-building role in this sector (Islam, 2021).

The third key area revolves around the role of impact measurement in the SIB sector (Jackson, 2013b; Berndt & Wirth 2018), highlighting a strong focus on evaluation outcome methods. The presence of a cluster of research contributions focused in this field is due to the consideration that impact evaluation represents one of the distinctive elements of the contractual schemes of such instruments.

SIB represents an innovative financial mechanism where the public-sector partners with a private service provider and with impact investors in the delivery of a social preventive program (Rania et al., 2020). In this context, the evaluation of risk and return has become a major issue (Warner, 2015) because this instrument combines components of performance-based financing and public-private partnerships

aimed at aligning the interests among non-profit service providers, investors, and governments for improving the lives of individuals and communities in need (Gustafsson-Wrigh et al., 2015). SIB represents an excellent example of coproduction between finance and social services (Broccardo & Mazzuca, 2019) and is considered a new tool for the governance of social programs (Dimitrijevska-Markoski, 2016).

The transition from competitive service commissioning mechanisms to new forms of outcome-based commissioning requires collaborative approaches to service procurement (Tan et al., 2019), where evaluation plays an important role in SIBs both in the selection phase and in investor repayment, especially because evaluation refers to an improvement in the quality of life of participants, compared to what would happen without its program (Scherer & Schenk, 2012, p. 11) and allows governmental costs to be saved. In contrast, Scognamiglio et. al. (2019) proposed a framework to support the evaluation of an SIB, combining financial evaluation with social evaluation to overtake the social uncertainty measurement linked to the SIB program (Rania et al., 2020).

The last strong focus area is the "impact paradox" in II field. In response to the complexity of the sector, evaluation practice has been undergoing the growing pressure from stakeholders for leaner, more forward-looking, and learning-oriented approaches (Hoffman & Olazabal, 2018). Consequently, most of them have invested in process systems, tools, capacity building, and partnerships to make most evaluative assessments of the progress and outcomes of their work, embracing a robust approach to impact evaluation and measurement (Spiess-Knafl & Scheck, 2017; Reisman et al., 2018). The model of II requires an innovative way to face complex social issues and, mainly, to implement an evaluation approaches for measuring impact (Viviani & Maurel, 2019; Tsotsotso, 2020). Urban and George (2018, p. 73) underline *"the importance of measuring the outcomes of impact investments"*, recognizing the lack of available metrics measuring social outcomes (Barman, 2015; So & Staskevicius, 2015; Choda & Telaida, 2018).

Currently, there is agreement about the "impact paradox" within II industry, which is characterized by the lack of accepted evaluative approaches (O'Flynn & Bennett, 2017). In fact, in the literature, the need to develop new and innovative tools and methods for evaluating impact emerges (Puttick & Ludlow, 2012; Verrinder et al., 2018; Chen & Harrison, 2020). First, it provides insights into the efficacy of investment strategies aimed at achieving impact goals (Jackson, 2013a; Reisman & Olazabal, 2016). Second, it contributes to the actual knowledge of impact data, creating an opportunity for improving the impact strategies (Reisman & Olazabal, 2016). Furthermore, a substantiated track record of evidence impact evaluation evidence serves to make available future capital allocation decisions of both public and private sources of financing (Kroeger & Weber, 2016; Burckart et al., 2018); in addition, impact investors look for more than data to prove their impact (Johnson & Lee, 2013; Reisman et al., 2018). This means that the prioritization of impact needs methods for proving the impact evidence and there is an urgent need for a more evaluative approach by impact investors (O'Flynn & Bennett, 2017). Bengo et al., (2021) have proposed a major theorization of II focusing on the definition of social risk, social return, and governance mechanisms. The study of impact evaluation and its trajectory requires understanding the institutional, economic, and social factors that influence the choices of investors and their impact (Alijania & Karyotis, 2019). This premise generates an important challenge for both public and private sector funders, donors, and investors, that they must reassess the ethical practices and contracting arrangements for building impact non-profit organizations (Phillips & Johnson, 2019).

The second strong research strand underlines how II industry goes towards a unified impact measurement framework.

The first key area regards the ongoing effort by scholars and practitioners for contributing to sector standardization. The most prominent approach towards a sectoral standardization is the Impact Report-

ing and Investment Standards (IRIS) conceptualized by the GIIN (Berry, 2016; O'Flynn & Barnett, 2017; Aggarwala & Frasch, 2017; Urban & George, 2018), which promotes more harmonization and simplification of impact assessment (Tsotsotso, 2020) to make the measurement of non-financial returns more effective and widespread (Thornley & Dailey, 2010), and it provides a set of standard measures to estimate the net impact (Reisman & Olazabal, 2016). McCallum and Viviers (2020) recommend the development of a general or standardized agreed-upon reporting format, not in terms of social and environmental impact metrics, but in terms of consistent measurement categories and dimensions. Despite the growth of subsector-specific metrics, some social impact investing (SII) communities have not yet used standardization to measure their value, such as the Canadian SII community, where IRIS metrics were not used at all (Phillips & Johnson, 2019). However, a number of new and emerging standards have been traced in the sector (Dufour, 2019), such as the Global Reporting Initiative, ESG Metrics, Sustainability Accounting Standards Board (SASB), Principles for Responsible Investments (PRI), and the SDGs.

The last focus area investigates the application of Theory of Change (ToC) in II.

Among the first published works, Jackson (2013a) investigated the contribution of the ToC, exploring the efforts to develop a common set of standards and rating systems for impact evaluation in II globally. The author suggests mixing methods, both qualitative and quantitative, to promote the balance learning with accountability. Learning-oriented approaches are becoming prominent for responding, on the one hand to increasingly complex programs and contexts, and on the other to growing pressure from stakeholders for leaner (Hoffman & Olazabal, 2018). Vo and Christie (2016) have described how impact investments are evaluated, underlining how analysts typically rely on descriptive quantitative and qualitative data and analyses. In the same way, Verrinder et al. (2018) proposed using ToC for selecting the indicators to be measured and for making a critical interrogation of logic to avoid 'impact washing'. In practice, Jackson and Harji (2017) investigated the ToC framework for individuals and rural communities in West Africa to demonstrate how the framework allows us to demarcate the various dimensions of impact, embracing the multidimensional character of economic and social development and providing a more robust analysis of the appropriate use of II. Box 1 proposes the Acumen case, concerning the application of the ToC for reducing poverty.

Finally, Figure 5 illustrates the relationships among the concepts through a conceptual map.

Impact Evaluation in Practice: Methods, Models, and Experiences

The analysis of the existing literature reveals a wealth of studies about the tools and approaches for impact measurement and evaluation across the sector. In addition to academia, a large number of practitioners, associations, and networks[2] have produced a significant body of knowledge useful to advance theoretical perspectives about such topic.

Impact measurement and evaluation practices within the financial sector have advanced in an uncoordinated fashion, and only recently the emergence of generalized practices (Bouri et al., 2018; IMP, 2018; Bass et al., 2021) begun to produce coherence to the field of II. For these reasons, it is important to note that the complexity of this scene can be simplified as follows: in the academic landscape, two main concepts are predominant, identified with the expressions "impact evaluation" and "impact measurement", while in the practitioner's field, the duality can be indicated by the terms "impact management" and "impact measurement" systems. The first category refers to supporting initiatives and practices to aid all the stages of the investment process, from the decision-making to exit, and includes the evaluation

Box 1. Applying the theory of change for reducing poverty: Acumen case

In January 2016, Acumen published a Toolkit "Innovations for Poverty Action", proposing a case-study series for examining the monitoring and evaluation systems of several innovative organizations with the aim to explore how the ToC can work in practice.

Who is Acumen?

Acumen is a non-profit impact investor with the aim to generate private-sector solutions by providing debt or equity investments in early stage companies that provide goods and services to the disadvantaged, who have difficulty finding financing through the traditional banking system.

Currently, Acumen has impacted more than 263 million lives through $ 137 million invested in breakthrough innovations, with 139 companies serving low-income customers in 14 countries in Africa, Asia, Latin America, and the United States[1].

What does Acumen do?

Acumen has been a leader in defining the concrete concept of social impact in impact investing and in developing practical ways of measuring it. Its mission is to maximize both social and economic returns, and supporting the sustainability of the enterprises in the long run. To monitor and evaluate the investments, Acumen prioritizes two aspects in its approach: 1) measuring impact as rigorously as possible, and 2) generating data systems for responding to the decision-making needs of the enterprises in its portfolio. To satisfy these priorities, the organization defines a ToC during the due diligence phase for each investment in order to both map out how companies (or its products and services) will reduce poverty and to identify assumptions and risks, establishing the key social impact metrics for verifying if a ToC holds up in practice.

ToC in practice: the SolarNow case

SolarNow is an important investment of Acumen for facing up the poverty issue. It is a Ugandan company manufacturing and selling solar home systems for providing access to energy and financing solutions in sub-Saharan Africa. Mapping out theory of change is central to how Acumen understands the depth dimension of their impact, supporting the organization in identifying and predicting to what degree the work by the investee impacts the lives of their target customers.

The SolarNow ToC represents an example of the Acumen approach, and this model is illustrated below (in Figure 4).

Lesson learnt: the importance of using ToC to evaluate the investments

1. A solid ToC is relevant for demonstrating how enterprises produce social impact. The model has to identify the risks and assumptions and think about tradeoffs or the behaviour changes of individuals that may be necessary to participate in the program.
2. ToC requires that organizations consider how creating new opportunities for one group may affect the welfare of others.
3. Impact evaluation should be done only when it can be done in a credible way and when the organization intends to act on the results. If a credible impact evaluation is not possible, it will be appropriate to monitor and analyse the operational issues.

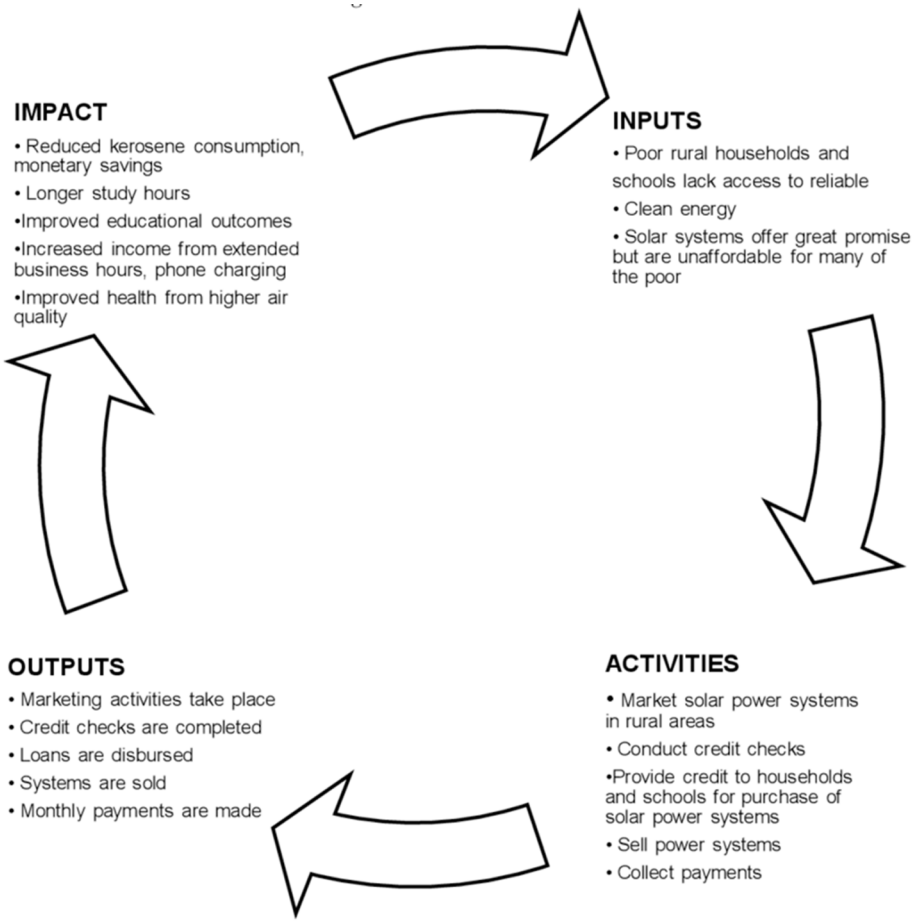
activity. The latter category refers to processes and practices to support investors in the quantifying of the positive or negative impacts produced by their investments.

Impact can be assessed before, during, and after a project or an investment. As shown in Figure 3, five main stages of impact assessment have been identified (So & Staskevicius, 2015) along the impact investment cycle: estimation, planning, monitoring, evaluation, and reporting impact. The estimation and planning of impact are typical of pre-investment or the negotiation phases of the investment and serve to help to ensure that long-term value creation is captured and considered in decision-making. On the other hand, the monitoring, evaluation, and reporting of impact are performed once an investment has been made or completed. For fund managers, as well as for banks, such stages are essential to report and demonstrate social and environmental value creation to stakeholders and investors.

On an empirical level, the heterogeneity of principles, frameworks, methodologies, standards, metrics, and indicators adopted in II industry derives from the proliferation of customized systems due to the rise in interest in measuring the impact programs and public policies, as specified in the previous section.

According to Corvo et al. (2021), from 2004 to 2015, six catalogues of ways of assessing social impact were identified (Clark & Rosenzweig, 2004; Olsen & Galimidi, 2008; Zappalà & Lyons, 2009; Rinaldo, 2010; Maas & Liket, 2011; Grieco, 2015). A primer clustering of the impact assessment method in financial ventures was provided by Olsen and Galimidi (2008), who catalogued the approaches to impact measurement useful to assessing social impact in private ventures. They identified three main clusters of approaches to impact measurement classified on the basis of their function: rating, assessment, and management. Rating systems, by indicating a score or a fixed set of indicators, summarize the impact investment's quality or potential quality. The assessment systems are focused on periodically evaluating

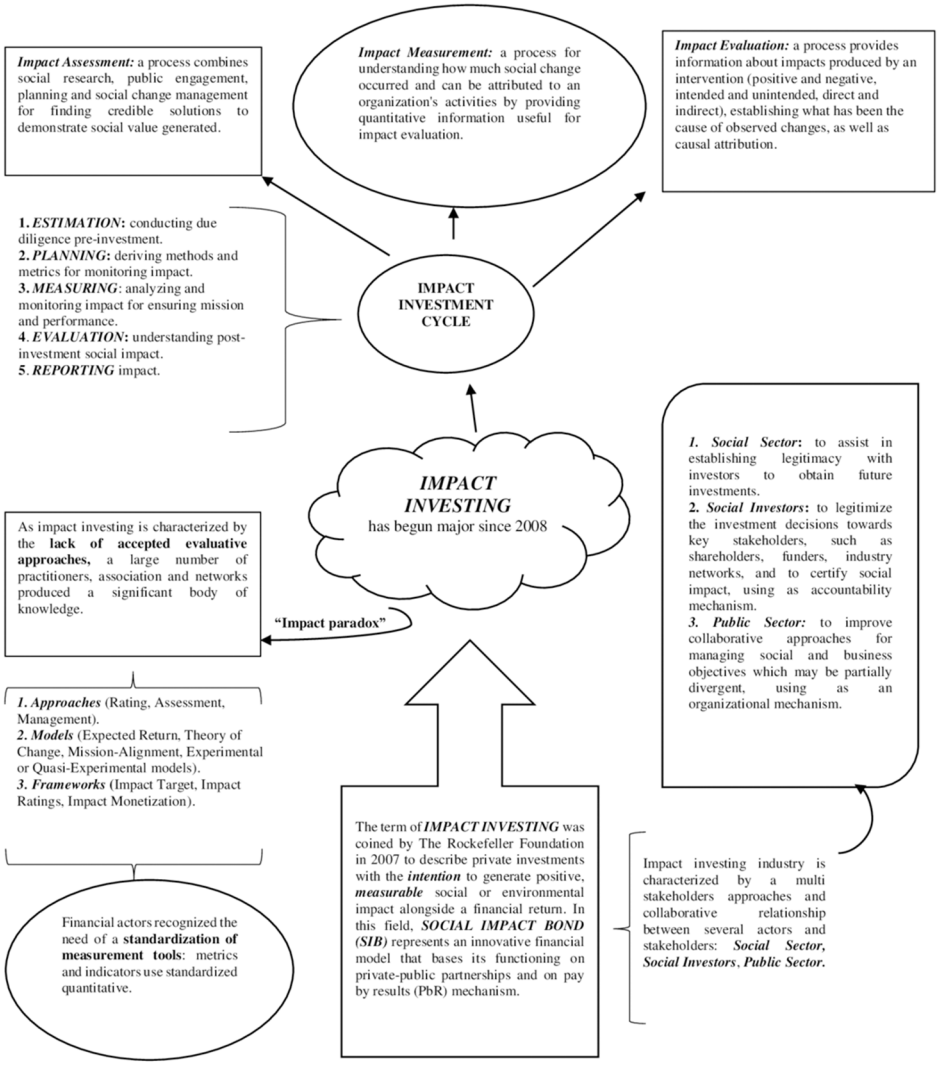
Figure 4. SolarNow ToC
Source: Our elaboration from Gugerty et al., (2016).



the characteristics, practices, and/or results of portfolio investments, while impact management systems are adapted to tracking impact over time. These three clusters have been categorized by Florman et al. (2016) into general or sector-specific approaches due to their use by a single entity or focus on a single area. To provide a full overview of such lists and categorizations, the classifications of Olsen and Galimidi (2008) and Florman et al. (2016) have been up a dated with the lists reported in Maas and Liket (2011), Maas (2014) and Sammarco et al. (2018), and then included in a matrix (Table 3) derived by crossing the classification by function with the classification by sector (general or specific).

The measurement activity is not sufficient to calculate the net social impact achieved by an intervention because an impact evaluation activity, intended as the attribution of outputs and results directly to an action (Reeder & Colantonio, 2013), it is needed by adjusting the outcomes obtained for various factors such as counterfactual or unintended consequences. For these reasons, the identified methodologies should be considered in a broader adoption of frameworks directed to turn into practice the intended impact. Within II field, such frameworks can be classified into theory-based models (which employ a results chain by identifying the logical change mechanisms of an intervention) and counterfactual schemes (which use

Figure 5. A conceptual map of impact evaluation in Impact Investing



control groups). In II industry, the adoption of theory-based models is predominant within the private sector, while counterfactual schemes are adopted overall in public-private II instruments such as SIBs (Reeder et al., 2015; Jackson, 2013b), as illustrated in the following section. So and Stankevicius (2015) identified four main clusters of impact measurement models: expected return, ToC, mission-alignment, experimental (or quasi-experimental) models.

Expected return models consider the discounted social benefits of an investment against its costs. The SROI and the benefit-cost ratio (BCR) are exemplar forms of expected returns models.

At the centre of theory-based models, three elements are essential: the intervention, the objectives, and the intervention process. For Jackson (2013a), the ToC represents the third key component of an impact investment (besides the remaining two, intent and impact) to determine the level of impact that should be achieved and, therefore, measured. Such an approach relies on a logical sequence of results

Table 3. Impact measurement methods matrix

GENERAL OR SECTOR-SPECIFIC METHODS	FUNCTIONAL CLASSIFICATION		
	SCREENING "Rating System"	SUMMARIZING RESULT "Assessment System"	ONGOING TRACKING "Management System"
General:			
Acumen Scorecard		X	
Atkinsson Compass Assessment For Investors (ACAFI)		X	
Bagnoli And Megali Model			X
B Ratings System	X	X	X
Best Available Charitable Option (BACO)	X	X	
Bop Impact Assessment Framework			
Balanced Scorecard (BSC)		X	
Comparative Constituency Feedback		X	X
Cost-Benefit Analysis (CBA)		X	
Center For High Impact Philanthropy Cost Per Impact		X	
Charity Assessment Method Of Performance (CHAMP)		X	
Chat (Charity Analysis Tool)		X	X
Compass Assessment For Investor	X	X	
Dots (Development Outcome Tracking System)	X	X	
Fair Trade Certification		X	
Hewlett Foundation Expected Return	X	X	
Hip (Human Impact + Profit) Framework	X	X	
Social Impact Navigator		X	
Local Economic Multiplier (Lem)			X
Measuring Impacts Toolkit		X	
Measuring Impact Framework (MIF)		X	X
Methodology for Impact Analysis And Assessment (MIAA)		X	
Millennium Development Goal Scan (MDG-Scan)			X
Movement Above the Us $1 A Day Threshold Project	X	X	
Ongoing Assessment of Social Impacts (OASIS)		X	
Outcome Mapping		X	
Participatory Impact Assessment		X	X
Portfolio Data Management System (PDMS)		X	
Poverty Social Impact Assessment (PSIA)		X	X
Progress out of Poverty Index (PPI)		X	
Process Tracing		X	
Political Return On Investment (PROI)	X	X	
Public Value Scorecard (PVSC)		X	
Robin Hood Foundation Benefit-Cost Ratio	X	X	X
Randomized Controlled Trials (RCT)			
Social Auditing and Audit (SAA)		X	X
Social Impact Measurement for Local Economies (SIMPLE)		X	X
Social Compatibility Analysis (SCA)		X	
Social Cost-Effectiveness Analysis (SCEA)		X	
Social Costs-Benefit Analysis (SCBA)		X	
Social E-Valuator		X	
Social Impact Assessment (SIA)		X	
Social Rating	X	X	
Social Return Assessment (SRA)		X	
Socio-Economic Assessment Toolbox (SEAT)		X	
SROI Analysis		X	
SROI Calculator		X	
SROI Framework		X	
SROI Lite		X	X
SROI Toolkit		X	X
Stakeholder Value Added (SVA)		X	X
Toolbox for analyzing sustainable ventures in developing countries		X	X
Sector-Specific:			
Civicus Civil Society			
Dalberg Approach			
Ecological Footprint		X	
Environmental Performance Reporting System (EPRS)		X	
FIT for purpose	X	X	
Gamma Model		X	
Health Impact Assessment (HIA)		X	
Leadership in Energy and Environmental Design (LEED)		X	
Outcomes Star		X	
Real Indicators of Success in Employment (RISE)			X
Scalers Method	X		
Social Investment Risk Assessment (SIRA)		X	
Social Footprint		X	X
Social Value Metrics		X	
Trucost		X	
Well Venture Monitor	X	X	
		X	X
		X	
		X	

(Source: Our elaboration from Olsen & Galimidi, 2008; Maas & Liket, 2011; Maas, 2014; Florman et al., 2016; Sammarco et al., 2018).

Table 4. Clusters of impact measurement models and frameworks identified in II sector

Source	Clusters of Impact Measurement Models and Frameworks in II	A brief description and some examples of method(s)
So & Stankevicius, (2015)	Expected Return (ER)	ER *"takes into account the anticipated social benefits of an investment against its costs, discounted to the value of today's value*" (p. 6). Examples of ER methods are: SROI, BCR, and Economic Rate of Return (ERR)
	Logical Model (LM)	LM "*is a common tool used to map a theory of change of an organization, intervention, or program by outlining the linkage from input, to activities, to output, to outcomes, and ultimately to impact"* (p. 6). Example of LM is ToC approach
	Mission-Alignment	Mission-Alignment approaches *"measure the execution of strategy against mission and end goals over time; examples include social value criteria and scorecards used to monitor and manage key performance metrics"* (p. 6). Examples of Mission-Alignment methods are: Social Value Criteria and Scorecards
	Experimental (or Quasi-Experimental) models	Experimental (or Quasi-Experimental) models "*are after the-fact evaluations that use a randomized control trial or other counterfactual to determine the impact of the intervention compared to the status quo"* (p. 6). Examples of Experimental (or Quasi-Experimental) methods are: RCT and Historical baseline
O' Flynn & Barnett, (2017)	Survey approaches	Survey approaches *"using appropriate design, can capture an investment's effect on, change in or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life"* (p. 15). Examples of Survey approaches are: lean data methodology (Acumen) and Ashoka measuring effectiveness questionnaire
	Monetization approaches	Monetization approaches *"to measuring social impact look at a base of outcomes, be they social or environmental, and set a monetary equivalent to those outcomes. They capture a broad set of values and by using accounting methodologies attempt to address wider impact, and place a monetary value on the intended and unintended effects of an intervention"* (p. 16). Examples of Monetization approaches are: SROI, cost-effectiveness analysis (CEA), cost-benefit analysis (CBA), and best available charitable option (BACO)
	Ratings models	Ratings models *"usually act as collections of outputs of an impact investment. Some of these tools seek to go further and address broader impact. Typically, key performance indicators (KPIs) mean there are limitations to addressing what may be considered as broader impact; this is usually because the causal chain has already been pre-addressed at the due diligence stage"* (p. 18). Examples of Ratings models methods are: social rating, the outcomes star, the methodology for impact analysis and assessment (MIAA), the Netherlands Development Finance Company (FMO), the environmental, social and governance (ESG) toolkit
	Qualitative tools	Qualitative tools *"are typically not used as a singular option in the evaluation of outcomes and impact. They are more likely to be a complementary activity carried out alongside other reporting tools and methods. This balance meets requirements to get a 'human touch' towards an intervention, or to find complementary supporting evidence of a perceived change in the data"* (p. 20). Examples of Qualitative tools methods are: qualitative impact protocol (QUIP), Success Measures, and social rating
	Counterfactual tools	Counterfactual tools are used *"to prove or disprove the causal links of whether an impact investment has achieved impact, this can promote accountability"* (p. 22). Examples of Counterfactual tools approaches are: RCT, and quasi-experimental methodologies
IFC, (2019)	Target Framework	Target Framework is *"based on the investor setting targets for indicators across the portfolio and/or specific to each investment* "(p. 45). Example of Target Framework methods is ToC
	Impact Ratings	Impact Rating *"uses an overarching impact scoring or rating system that can capture multiple dimensions within an investment, including multiple stakeholder, environmental, and systemic effects"* (p. 45). Examples of Impact Ratings approaches are: balanced scorecard and rating frameworks
	Impact Monetization Framework	Impact Monetization Frameworks *"use expected measures of return to calculate the expected financial value of their investments, impact investors can use a similar approach to assess expected impact returns"* (p. 46). Examples of Impact Monetization Framework methods are: SROI, benefit cost ratio (BCR), social cost benefit analysis (SCBA), and economic rate of return (ERR)

(Source: Our elaboration)

Table 5. Impact measurement: some lessons learnt from experiences

Name	Countries/ (Years)	Current phase	Description social issues and impact objectives	Key impact results
IMPACT MEASUREMENT FRAMEWORK: ***IRIS***				
Triodos Sustainable Trade Fund (TSTF)[3]	Developing Countries/ (2010-2011)	Since 2010 TSTF has been adopting IRIS (currently named IRIS+) to communicate its impact results and to demonstrate the Fund's commitments to transparency and accountability	TSTF has been operating since 2008. Its mission is to improve the livelihoods of famers and to promote sustainable agricultural methods as an alternative to conventional (chemical-intensive agriculture)	In 2011 TSTF published its first Impact Report, providing several non-financial measures about its impact objectives. The use of IRIS allowed it to improve social and environmental performance, comparing 2009 to 2010 year. Particularly, the main impact results were the following: **Operational Impact: (% years change)** *Environmental Performance: (num. of hectares)* • Cultivated Land Area: 22% • Sustainable Cultivated Land: 13% *Employees: (num. of people)* • Permanent employees: 150% • Temporary employees: 297% **Product Impact: (% years change)** *Quantity and Reach: (num. of metric tonnes)* • Units/Volume Exported (total): 78% *Quality and Performance: (EUR)* • Producer Price Premium: 115% *Supplier information: (num. of people)* • Supplier individuals: 134%
IMPACT MEASUREMENT FRAMEWORK: ***IRIS+***				
Asha Impact[4]	India/ (2019-2021)	Since 2019 (year in which GIIN released the new standard IRIS that is IRIS+) Asha Impact has been adopting IRIS+ to support its impact measurement and management practices, especially for facing up to the COVID_19 pandemic	Asha Impact is an impact investment and policy advocacy platform based in India for senior business leaders, high-net-worth individuals and family offices to fund and scale inclusive business models and share lessons learned with government to help address major social and environmental issues facing the country. It also supports the market development of impact bonds and other blended finance instruments in India.	Asha Impact first started out to build portfolio and individual investments in terms of broad social sectors. By using IRIS+, Asha was able to narrow down more effectively to generally accepted Impact Themes such as Smallholder Agriculture, Access to Quality Education, and Financial Inclusion. In 2020, it made available its impact results regarding an investment in agriculture: Gramophone, an agri-tech company supporting smallholder farmers in central India to reduce their input costs and improve their yields and incomes. Comparing 2019 to 2020 year, the main impact results were the following: **Percent change in farmer agricultural yield: (% years change)** • *Net change income*: 28.75% (after using the Gramophone platform) **Client Individuals: (Smallholder)** • Total number of farmers: 500,000 **Client Individuals: (Active)** • Monthly active farmers: 100,000 **Client Individuals: (New)** • New farmers added (in year 2020): 200,000 **Client Savings Premium** • Farmer saving: 15-25% (input costs) • Productivity improvement: 20%
IMPACT MEASUREMENT MODEL: ***SROI***				
Adie[5]	France/ (2013-2016)	In November 2016, the French Ministry of Economy and Finance with the support of Adie launched the first SIB (or Contracts à Impact Social) to promote employment. The SIB started at the beginning of 2017 and its closure is planned in 2022	Adie is an association "for the Right to the Economic Initiative" with the aim of supporting economic initiatives through the provision of microcredit. Its mission is to promote and encourage the employment of vulnerable people who live in rural regions in precarious social and economic conditions and who do not have access to a traditional banking system	In 2016 KPMG published the Survey on Adie's work, using the SROI model for evaluating its economic and social impact. The results show how Adie supports the most vulnerable people (45% of those funded live below the poverty line), generating relevant revenue for society thanks to the reduction of social welfare costs (more than 225 new jobs were created every week). In particular, the main impact results were the following: • **Social cost avoided**: € 16.7M (in year 2) • **Professional microcredit generated:** € 45.3M (in year two) • **SROI:** € 1 invested in the program generated € 2.38 for the community after two years.

(Source: Our elaboration from GIIN, 2012; KPMG, 2016; GIIN, 2020; Impact Invest Lab, 2020)

that in II sector has been identified with the name impact value chain (Clark & Rosenzweig, 2004). The impact value chain frames the results of a number of activities into a results staircase, with the outputs positioned at the base, then outcome and, finally, impact.

Mission-alignment models are used to monitor and manage key performance metrics over time by adopting, for example, scorecard techniques or social value criteria.

Experimental or quasi-experimental methods are adopted to determine the impact of the intervention compared to the status quo by using counterfactual methods.

A similar classification derives from O'Flynn and Barnett (2017). They identified five different cluster impact measurement models that usefully adapt to the ex post assessment of an impact investment. The authors identified the five models as follows: survey approaches, monetization approaches, ratings models, qualitative tools, and counterfactual tools.

More recently, according to IFC (2019), three main dominant impact measurement archetypes have been registered in the field. Such frameworks have been defined with the labels impact target, impact ratings, and impact monetization.

The characteristics of impact target, mostly adopted within private institutional investors, are funded on the investor setting targets for indicators across the portfolio as well as throughout the course of the investment. In the considerations that targets are customized, impact targets, are not easily adapted for comparison between different investments, particularly across different geographies and industries.

Impact ratings, the predominant model in the industry, can be on a numeric scale or qualitative level of a scoring system and are built after the establishment of a benchmark against which the specific investment may be assessed. Such a framework discovers current and potential levels of impact and easily provides a common way to compare and possibly aggregate results across a portfolio and geographies.

Impact monetization archetypes adopt expected measures of return to calculate the social value of their investments. Such a framework has been widely adopted in the public sector, and examples of such approaches are SROI, social benefit analysis, and economic rate of return. In such a framework, impacts are translated into monetary value by encouraging the comparability of investments and within a portfolio. On the other hand, such a framework is technically difficult to implement, especially for the identification of all the externalities of an investment. All three described frameworks may be used as part of a robust impact management system.

An overview of the clusters of impact measurement models and frameworks identified in II field is represented in Table 4.

In addition, financial actors in II recognized the need for a standardization of measurement tools since its beginning stage (Brest & Born, 2013). Metrics and indicators use standardized quantitative factors to measure, track, or compare investments. Additionally, in this area of practice, a variety of databases of standardized, defined, or commonly used indicators and measures that can be applied by investors exist. More specifically, the use of IRIS and the Global Impact Investing Rating System (GIIRS) are predominant within the industry (Bose, Dong and Simpons, 2019).

In conclusion, from a practical point of view, Table 5 proposes an overview of several experiences (Triodos Sustainable Trade Fund, Asha Impact, and Adie), showing how the impact evaluation and measurement process is applied. Particularly, it illustrates the application of the impact measurement framework (IRIS and IRIS+) and impact measurement model (SROI)

Exploring Impact Evaluation into Social Impact Bonds: Assessing, Monitoring, and Evaluating the Outcomes

In an SIB scheme, the investment is made into an instrument with predetermined financial and social impact values. In contrast to other II instruments, the SIB embeds a PbR logic and, therefore, only if the predetermined threshold of impact is achieved do they receive financial returns. The centrality of the impact in such models is confirmed by the presence, on the one hand, of an independent evaluator

Table 6. Examples of evaluation methods in SIBs

Social Impact Bond (Country)	Impact Evaluation Method adopted (intervention description)	Expected Outcome Thresholds	A brief description and examples of impact measurement
Triodos New Horizon (UK)	**Validated Administrative Data** (Triodos' "New Horizons" program: coaches deliver structured "Mental Toughness" courses and specialized vocational support to 3,900 disadvantaged 14- to 19-year-olds across Greater Merseyside)	Improved behaviour at school	The improvement is measured by a letter from a teacher with reference to the standards in Section 91 of the U.K. Education and Inspection Act 2006
		Stop persistent truancy	The data are confirmed by the school when persistent truancy stopped to the point where attendance levels have improved to that associated with the average student
		Achievement of National Qualifications Framework (NQF) Levels qualification	The data are evidenced by a letter from the school or a copy of certificate
		Entry into first employment including a training element (or into sustained employment)	The data are evidenced by a letter from the employer confirming the young person had worked for the required hours/weeks.
Thames Reach Ace (UK)	**Historical comparison and validated administrative data** (the program aims to get people off the streets and into stable accommodation, thereby increasing prospects of employment or training and stabilizing health to 415 persistent rough sleepers in London)	Comparison to set threshold by government (for the cohort as a whole)	Reduction in use of accident and emergency services
		Comparison to set threshold by government (for the cohort as a whole)	Reduction in rough sleeping (people experiencing unsheltered homelessness)
		Per person administrative data outcomes	Move to accommodation/sustained over 12 months and 18 months
		Per person administrative data outcomes	Move to another country of familial or local connections/sustained over six months
		Per person administrative data outcomes	Volunteering/National Vocational Qualification (NVQ) level 2 qualification/part-time employment/full-time employment for 13/26 weeks.
Benevolent Society (Australia)	**Quasi-experimental** (Intensive family support program of 9 to 12 months duration designed to keep children with their families and to avoid their entry into out-of-home care.). Deloitte will certify Benevolent Society's calculation of the Performance Percentage compared to a parallel quantitative and qualitative evaluation of the program impact conducted by ARTD Consultants	Performance percentage 1 of 3: Improvement Percentage	Such measure is calculated as the weighted average of three indicators for the youngest child in each family (number of entries into out-of-home care, number of Child Protection Helpline reports, number of safety and risk assessments).
		Performance percentage 2 of 3: Unmatched Children Percentage	Where children referred by Department of Family and Community Services (FACS) cannot be matched with a comparable Control Child, these children are applied a deemed success of 15%
		Performance percentage 3 of 3: Guaranteed Referrals Shortfall Percentage	Where FACS is unable to fill vacancies notified by The Benevolent Society within the agreed period of time up to a guaranteed minimum, they attract a deemed success of 40%
Junior Code Academy (Portugal)	**Randomized Control Trial** (The program is a 30-week computer programming intervention integrated in the school curriculum over three consecutive school terms)	Logical thinking and problem-solving skills (weighting 90%)	Calculated from the difference in score between control and treatment groups on a "Raven Matrices" type of test
		National exams in Portuguese and mathematics, compulsory for all 4th grade students, two terms after the intervention is finished (weighting 10%)	This measure is calculated from the difference in score between control and treatment groups

(Source: elaborated on the basis of data reported in Gustafsson-Wright et al., 2015)

within the SIB partners and, on the other hand, of a predetermined and agreed-upon outcome metrics and thresholds.

The nature of the impact on SIBs has been explored by Jackson (2013b), who indicated the importance of evaluation as a central element of the interaction between II and community development. Nazari Chamaki et al. (2019) explained how the centrality of the impact in the SIB covers different phases of an SIB life cycle. Indeed, in the feasibility study of an SIB, the question of the impact attracts a series of analyses useful for the commissioner to determine the costs and the benefits of the program, and such evaluations adopt different tools than those adopted in the ex post impact evaluation for SIBs. More specifically, as identified by Gustafsson-Wright et al. (2015), four main forms of evaluation methods in SIBs are represented: validated administrative data, historical comparison, quasi-experimental and RCT. Table 6 illustrates examples of the four mentioned evaluation methods.

Additionally, Tsukamoto (2019) confirms the use of evaluation outcome methods in the SIB sector; in particular, the author has explored evaluation methods adopted in SIBs launched in the UK in 2010-2014, underlining that validated administrative data methods are most frequently utilized for determining outcome payments. In contrast, the cases using RCT are quite limited. Instead, Fox and Morris (2019; 2021) conducted a systematic review regarding empirical evaluations of SIBs in the UK since 2010, when SIBs first appeared, underling how evaluation represents a limit because of the difficulties of evaluating such programs. More recently, the issue of the impact on SIBs has been explored under the broad topic area of risk evaluation. More specifically, the probability of missing the achievement of predetermined outcome thresholds, identified in terms of social uncertainty evaluation (for an overview, see Scognamiglio et al., 2019; Rania et al., 2020), has opened interesting insights into the role of impact assessment from the perspective of investors in SIBs. Recently, it is important to note that monetization methods, such as SROI, have also emerged in the field of SIBs in feasibility and final evaluation studies (Fischer & Richter, 2017; Yates & Marra, 2017; Reeve, Michael & William, 2020).

DISCUSSION AND CONCLUSION

From the results evidenced in this study, the complexity of principles and concepts existing around the topic of impact measurement and evaluation in the field of II clearly emerges. Most of the theoretical frameworks are derived from studies dedicated to the evaluation of public programs and intervention or from contributions focused on the assessment of enterprise impact. However, a conceptualization focused on the evaluation of impact in sustainable investments and, in particular in II, requires different models and remains at an infancy stage. More specifically, from our analysis, a variety of considerations arise that are useful for advancing both theoretical and practical knowledge on this topic.

The first main issue to be discussed relates to the theme of *simplifying the complexity* of models and frameworks. As emerged from our analysis, efforts to standardize frameworks, methods, and metrics are one of the main goals of the industry. However, the proliferation of approaches and frameworks is not a good symptom of the readiness of II industry for mainstream capital. For this reason, the central question for financial actors involved in this field is a wider agreement on the concept of what the investment impact is. In other words, there is a need to clarify whether impact refers to an *alignment* to certain standards or is the result of an intentional strategy of investors to obtain some form of change in addition to the status quo. The debate in academia has just started, and the concept of impact in II became the pillar in discourses around the preservation of integrity (Bengo et al. 2021) or the reorientation of

the field (Bush et al. 2021). In this light, the role of academia appears determinant in the resolution of such a dichotomy.

Furthermore, within the solution for reducing complexity on a practical level, it is important to clarify whether the stress on ex post impact measurement is the real need for II market or, otherwise, whether the immediate need for the market is a way to associate, ex ante, to a certain impact investment a specific amount of expected financial and social/environmental return. In this light, a mandatory impact disclosure for corporations, not only for financial actors, could represent a good starting point for reducing complexity. Indeed, such an indication is particularly true for the European context, where after the launch of the next-generation EU funds, impact disclosure for beneficiaries becomes mandatory. The use of such information could, therefore, facilitate the diffusion of impact rating systems to make comparable different investments of the same class of II solutions. At the same time, the elaboration for issuers of "impact/sustainability linked bonds" (obtained only by following precise standardized guidelines such as in the case of green bonds) could expand the readiness to mainstream the finance of the II market.

A second point of discussion relates to the issue of *impact monetization* intended as the need to adopt a tool for monetizing social and environmental impacts. Monetized impact evaluation results are intuitively understood within investors and markets. However, despite the potential benefit in terms of market growth for II, the impact monetization approach is not yet a generally accepted methodology applicable in all contexts. SROI is predominant, but the technical and data challenges of such methods influence the credibility and uncertainty of the relative measures. As a further implication of our analysis, separate consideration should be given to SIB, where the links between investors and impact evaluation find a positive *milieu.* Indeed, in SIBs, evaluation schemes and techniques are applied to public interventions and programs, the same areas from which impact evaluation practices and studies originate. Impact evaluation in SIBs therefore represents a stimulant area of investigation for scholars interested in the adoption of the best practices of impact evaluation tools in II instruments.

A third consideration that derives from the performed analysis is the *lack of regulation* concerning this issue. In the review of the literature emerged how principles or guidelines are industry-led but not regulatory-led. Such a vacancy raises two kinds of issues: the inclusion of the impact dimension in the identification of risks associated with impact investment, and a pursuit of the correct strategies to mitigate them. More specifically, the correct identification of the nature of risks embedded in an impact assessment could enable enterprises and investors to maximize their impact on people and the planet. In the same way, the consideration of risks associated with the impact dimension in the decision-making process should be particularly investigated in existing financial risk assessment theories and models, which can be useful to provide investors with standardized guides to balance and span their assets over different classes of impact portfolio risks.

In conclusion, the evidence and examples presented in this chapter demonstrate the complexity and the enormous potential that impact measurement and evaluation have within II industry. Until recently, the topic has been explored in different ways by academia and practitioners, and the recent progress in the field is essentially industry-driven. Integrating the impact dimension in a standardized way into financial routines and practices requires the adoption of impact management principles useful to easily identify both the estimated impact and risks associated with impact investments. Furthermore, the recent academic energies dedicated to preserving the "original" concept of impact should take into consideration the need of the market to obtain financial products to provide investors with a deeper understanding of the prospective impact performance and profitability of a given impact investment. At the same time,

only through credible evaluation methods and a growth of transparency of frameworks is it possible to reach the financial mainstream of the field of II.

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ENDNOTES

1 This information is available at https://acumen.org/approach/ (last consultation on 29 July 2021)

2 The main organizations and projects focused on the providing of tools and approaches in this sector are: Global Impact Investing Network (GIIN), Global Reporting Initiative (GRI), European Venture Philanthropy Association (EVPA), Impact Management Project (IMP), and Carbon Disclosure Project (CDP)

3 Source/more information is available in GIIN, (2012).

4 Source/more information is available in GIIN, (2020).

5 Source/more information is available in KPMG, (2016); and, Impact Invest Lab, (2020).

Chapter 4
Scaling Up of Green Finance in a Post-COVID-19 Era: A Sustainability Transition Perspective and Policy Insights

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ABSTRACT

Transitioning towards sustainability requires fundamental changes in policies, institutions. Green Finance is a novel concept which is discussed to address current environmental issues. This chapter illustrates obstacles and solutions to the greening of financial systems to provide an overview on the scaling up of Green Finance in a post COVID-19. The frameworks of Strategic Niche Management and Multi-Level Perspective are used to walk the reader in analyzing relevant steps for sustainability, also in light of the COVID-19 pandemic. Implications are derived focusing on the concepts of mission-oriented policies and nudges applied to financial markets.

INTRODUCTION

International institutions and the governments of developed countries are conscious of the need to reduce the dependence of the global economy on fossil fuels and direct society towards a more resource efficient energy model. Such a transition will need to be financed with adequate capital investments. Over recent years, financial intermediaries and markets have demonstrated an increased focus on investments in green projects, thereby stimulating the interest of a wide range of sectors and actors.

The growth in ethical and socially responsible investing has been met with: the development of new financial products and services aimed at providing easy access to capital for green enterprises; the reduction of perceived risk associated with green projects as an added value to companies, and thus

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the increased investment in such projects by business angels and venture capitalists; and the use of eco-efficiency criteria to screen companies, on the assumption that such criteria represent proxies for greater profitability and, over the medium to long term, increased shareholder value. However, despite substantial policy efforts to "green" the economy, the number of actual green investments remains relatively low (Clark, Reed, & Sunderland, 2018). Furthermore, there is limited involvement of commercial banks in green finance, despite the fact that – as financial intermediaries – banks have the capacity to play a crucial role in steering the economy towards a more responsible allocation of funds (Jeucken, 2010). In this vein, green investments must be fostered in a twofold manner: on the one hand, the financial sector must recognize such investments as representative of an alternative – yet highly effective – way of doing finance; and on the other hand, the financial sector must recognize green investments as attractive, due to their increased demand. Green investments are particularly relevant for resiliency, which is a prime concern in the context of the COVID-19 pandemic and its associated economic effects. In the post–COVID-19 era, economic and financial interventions should be employed to determine a resilient and green recovery from the pandemic, addressing short-term health and economic urgencies while simultaneously driving the economy towards sustainability (Sachs et al., 2020).

The present chapter aims at prefiguring the scaling up of green finance in the post–COVID-19 era, through an excursus of arguments. The chapter begins with a presentation of the evolution of environmental awareness and the concept of green finance. Following this, the dominant obstacles and solutions to green finance systems are illustrated, and the frameworks of strategic niche management and the multi-level perspective are applied to analyze the green finance scenario with specific reference to the COVID-19 pandemic. The chapter concludes with a discussion of mission-oriented policies and the economic concept of the "nudge," alongside an application of these ideas to financial markets.

ENVIRONMENTAL AWARENESS AND GREEN FINANCE

Over history, recognition of environmental issues and challenges has unfolded gradually. In developed countries, regulation related to polluting substances was considered a narrow issue prior to the 1960s, when the adoption of national laws for environmental sustainability by several governments raised environmental awareness to the level of common sentiment. Several environmental initiatives then followed: in the early 1970s, the President of the United States instituted the Environmental Protection Agency (EPA), the Prime Minister of Japan founded the Environment Agency, Stockholm (Sweden) hosted the first Conference of the United Nations on the Human Environment, and the European Community introduced an environmental protection strategy in its Agenda of environmental action of the European Communities (Hildebrand, 2014). More recently, international attention to environmental protection has been directed to the transition to a sustainable economy. In particular, this focus is underlined in three international agreements that were established in 2015:

- the 2030 agenda for sustainable development, which connects various economic, social and environmental aims;
- the Paris Agreement on climate change, which describes a global action plan to avert climate change by limiting the global temperature increase to well below 2 degrees Celsius, relative to pre-industrial levels (while pursuing efforts to limit the increase to 1.5 degrees); and

- the Addis Ababa conference and its development of a financing package that supports a global plan for financing sustainable development.

Given this mobilization of financing towards sustainable projects, green finance has gained relevance – both in the political scenario and in the real economy – to the extent that, in 2016, it was included in the program of the G20 Finance Ministers and Central Bank Governors.

As reported by Lindenberg (2014), green finance includes: i) the public and private funding of green investments in goods and services; ii) the prevention, minimization and reparation of environmental and climate harms; iii) the funding of public policies to spur the fulfilment of a cure for environmental damages; and iv) the funding of financial system factors directed towards green investments. Thus, green finance constitutes the totality of financial tools aimed at financing and achieving environmental, social and economic sustainability (Höhne, Fekete, den Elzen, Hof, & Kuramochi, 2018). It provides environmental advantages in the wider frame of environmentally sustainable development, aimed not only at ensuring capital flow for environmental projects, but also at increasing the sustainability of the entire financial system and dispersing the newest generation of innovative financial tools (pertaining to, e.g., public funds, venture capital, business angels, project financing, equity, debt, pension funds and green infrastructure).

Armed with these financial tools, socially responsible investors are increasingly examining assets on the basis of new criteria (i.e. environmental, social, ethical and governance criteria), with the aim of carrying out socially responsible investing and obtaining a return that is not only dependent on the classic framework of risk–reward maximization (Bollen, 2007). Similar to corporate social responsibility, socially responsible investing rewards firms that adhere to environmental sustainability schemes or community involvement campaigns; thus, socially responsible investing may play a central role in the transition to sustainability (Falcone, Morone, & Sica, 2018).

Nonetheless, compared to other investments, green investments have specific characteristics that contribute to reducing their attractiveness. This results in a financial gap and a scaling down of the number of accessible green assets, particularly with respect to small- and medium-sized enterprises (UNEP, 2015). First, green investments usually require significant cash injections upfront, and generate returns only over the long term (Ticci & Gabbi, 2014). Second, they present unprofitable investment profiles, due to the immaturity of green industries (Campiglio, 2016). Third, investments in renewable energy decrease the connectivity between banks, and thus increase the likelihood of failure, even though the improvement of taxes on energy represents a positive effect (Safarzyńska & van den Bergh, 2017). Fourth, the perception of instruments subordinate to public support reduces their financial risk (Scarpellini, Marín-Vinuesa, Portillo-Tarragona, & Moneva, 2018). For these reasons, the involvement of banks, financial regulators and community organizations will be indispensable for the transition to a green economy, as such a transition will require the integration of environmental and social elements in the wider financial system (Falcone, 2018).

OBSTACLES AND SOLUTIONS TO THE GREENING OF FINANCIAL SYSTEMS

To date, market and government failures have been responsible for the under-provision of green finance. With regard to the primary obstacles to the greening of financial systems, it is possible to recognize:

- Negative externalities, due to the fact that the market for energy, innovation and other relevant goods cannot be considered socially optimal as long as the real cost of greenhouse gas emissions is obscured in the market system. The presence of more sustainable finance instruments would make the system more sustainable and responsive to negative externalities, and result in the achievement of the sustainable development goals.
- Positive externalities, because the owners of new green technologies may be forced to share their innovations with "free riders," and this might hinder the profitability of green projects.
- Imperfect information, especially with respect to first mover projects, which can result in green investments being held back, financiers who are reluctant to contribute to projects for which the required resources overestimate the risks, banks that tend to ratio credits, and firms that are averse to investing in new technologies (particularly when the planning horizon is long and the cash flow streams are hardly calculable).
- Oligopoly or monopoly power, which can cause price distortions that decrease wider interest in green investments (particularly in the energy sector).

Without public intervention, the over-production of greenhouse gases – as well as other pollutants – will continue and investments will fail to reach the critical mass needed to trigger a real green transformation. According to Keech and Munger (2015), a "government failure" represents a circumstance in which it is not possible to remedy a market failure. Such a scenario may arise when the government creates inefficiencies due to a lack of intervention (Winston, 2007). Because green investments require certain externalities to be alleviated that are not commonly considered by markets and investors, the public sector must play a central role in leveraging private financing (World Bank, 2012).

Environmental legislation represents an obvious starting point for this initiative, with reasonable interventions including the requirement for producers to satisfy specific standards and the internalization of negative externalities. However, public supported guarantee strategies or subsidies may also help to overcome obstacles to the greening of finance by decreasing the risk attached to green finance and green investments. Due to their "risk neutral" nature (i.e. their ability to spread risk), governments can play an important role in supporting risky green investments by demonstrating predictable and reliable interventions, establishing a proper division of investments and decreasing pollution (Bowen, 2009).

However, the bottlenecks related to green investments are not only limited to the public and financial sector; they also pertain to the corporate sector, which needs to develop both capacity and environmental awareness. As will be shown in the proceeding section, policy makers have the ability to nudge the corporate sector along a green development path by applying tax incentives and offering concessional loans and bespoke green credit lines to increase the attractiveness of green investments (Falcone, 2020).

STRATEGIC NICHE MANAGEMENT AND THE MULTI-LEVEL PERSPECTIVE

A key feature of green finance is the determination of investment and lending decisions on the basis of an environmental screening and risk assessment, with the aim of meeting environmental sustainability standards (Volz et al., 2015). This procedure is likely to become even more critical in the post–COVID-19 era, given that green investments now require more space to ensure a sustainable transition.

The sustainability transition has the overall goal of environmental sustainability and increased resilience through the interaction of different system levels (Geels & Schot, 2007). This emphasis on systems is

based on the assumption that the sustainability transition relates to changes in the socio-technical system, wherein the financial system represents the "central nervous system of the economy" (Crockett, 2011). To understand the sustainability transition process and the role played by the financial sector therein, the frameworks of strategic niche management and the multi-level perspective are relevant, as is the concept of sustainable development.

Starting with the latter, according to the World Commission on Environment and Development, a development can be considered sustainable if the needs of the present generation can be met without the needs of future generations being compromised (Brundtland, Khalid, Agnelli, Al-Athel, & Chidzero, 1987). Although the consideration of sustainability as a driver for change is far less strong than the consideration of economic gain in this respect, over the last two and a half decades, research has increasingly investigated options for achieving the transition to sustainability with respect to socio-technical systems (Seyfang & Longhurst, 2016).

In this framework, innovation – and particularly the adoption of innovation – is considered an unstructured social experiment around which societies must rearrange themselves. Thus, strategic niche management represents the creation, development and controlled phase-out of protected spaces for the development and use of promising innovation (in this case green finance) through experimentation. The goal of strategic niche management is to understand the desirability of a particular innovation and to increase its development and rate of application (Schot, Hoogma, & Elzen, 1994).

At base, strategic niche management looks to substitute dominant (polluting) technologies with new (sustainable) technologies, which are selectively exposed to the market by means of the development of technological niches. This substitution – conceptualized in the early strategic niche management literature as a bottom-up procedure – is accompanied by the rise of a new socio-technical regime, which carries and stores the rules for producing and regulating the new technology. The successful development of a new technological niche is made possible through its evolution into a market niche, which ultimately replaces the incumbent regime. However, this replacement is bound to three internal mechanisms, which are recognized by the strategic niche management literature as fundamental for successful development (Schot & Geels, 2008):

1. the articulation of expectations and visions – particularly when this articulation is specific, of high quality and shared by actors – which provides direction for the learning process to legitimate protection and is useful for shielding the niche from external pressure, thereby nurturing the innovation evolution and empowering the regime transformation;
2. the building of social networks – particularly broad (involving outsiders) and deep (able to mobilize resources from within) networks – which allows for both fruitful interaction and the provision of resources between stakeholders; and
3. multi-dimensional learning processes – which are most successful when they aim at not only the simple accumulation of data but also the change of cognitive frames, and when they incorporate technical, commercial, cultural, infrastructural, industrial, regulative and societal aspects.

Of note, these three mechanisms should not be considered separately. To illustrate: the actors who make up the network will invest resources in experiments if the vision related to the new technology is positive and shared; the vision – together with rules and institutions – will direct the evolution of the project; and the outcomes of such experiments – possibly resulting in lessons and rules – will favor learning processes, redress previous expectations and expand the social network.

Over recent years, several contributions to the literature have focused on the role of niches in technical change. This entire body of work represents the multi-level perspective, which was first introduced by Rip and Kemp (1998). The multi-level perspective recognizes three analytical levels of socio-technical system transformation:

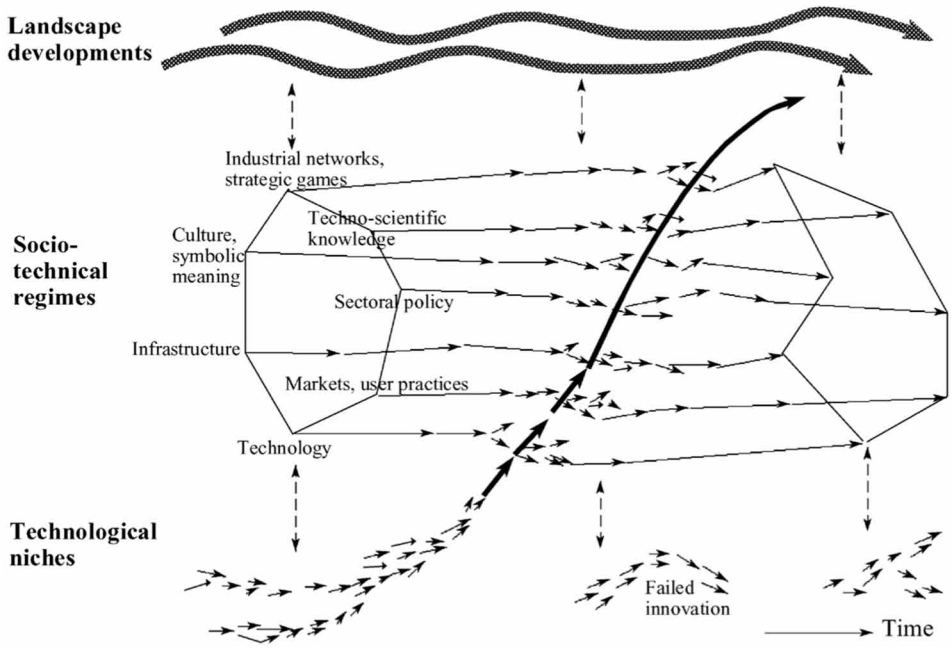
1. the landscape, which represents the macro level, is the external context that allows for opportunities for regime change with respect to structures, cultures and practices, with partial-external and partial-independent functioning;
2. the regime, which constitutes the meso level, represents the set of rules and institutions that permit and limit the behavior of actors, the dominant socio-technical system that is resistant to fundamental change, and the whole of the dominant structures, cultures and practices aimed at accomplishing social needs; and
3. the niche, which represents the micro level, is the protected space that allows for the development and application of an innovation, a new set of rules and institutions, and a whole of alternative structures, cultures and practices aimed at meeting social needs.

This differentiation underscores that the activities of social groups, which result in connections among different elements, allow for the establishment of a socio-technical order. The lower levels are embedded within the higher levels (i.e. niches are embedded within regimes and regimes are embedded within landscapes). Although niches – which provide the seeds for change – appear crucial for technological transitions, the multi-level perspective suggests that transitions are not the result of a simple bottom-up process of niche expansion, but the outcome of interactions between processes at different levels. In more detail, simultaneous to the development and application of innovations by a niche, pressure from the landscape destabilizes regimes, creating windows of opportunity for such innovations. Thus, the multi-level perspective represents the configuration of processes within niches, strengthened by changes at the regime and landscape levels, which allow for a regime shift to occur (Kemp et al., 2001).

Figure 1 provides an overview of the actual scenario, considering both the evolution of the green finance niche and the pressure from the landscape level associated with the COVID-19 pandemic. The literature on socio-technical transitions recognizes seven dimensions of socio-technical regimes: technology, the market, policy, scientific knowledge, industrial networks, cultural meaning and infrastructure. These dimensions are not only interrelated, but they also co-evolve, presenting typical continuing processes (illustrated in the figure in the form of long arrows). Furthermore, despite the correlation between these dimensions, endogenous mechanisms (characterized by the shorter, deviated arrows) may also exist, representing "tensions" pointing to weak linkage periods. Changes at the landscape level (which commonly occur over the long term) are represented in the figure in the form of fat long arrows; those at the niche level are depicted in small arrows pointing in all directions, as a dominant design has not yet stabilized. Niche level networks are ephemeral and their innovations are radical; thus, they are illustrated with arrows that grow longer and fatter as they progressively stabilize into a ruling structure.

As already described, the foundational principle of the multi-level perspective is that technological transitions (illustrated in the figure in the form of vertical dotted arrows) emerge from the interaction between processes at different levels: the breaking out of radical innovation at the niche level and the opening of windows of opportunity from tensions at the regime level and/or shifts at the landscape level. As Figure 1 shows, technological transitions may also regard the connections between different

Figure 1. The multi-level perspective and technological transitions (adapted from Geels, 2002, p. 1263)



technologies; that is, they do not need to refer to changes to technology and the market, but they may also be associated with changes to other dimensions (such as those presented above).

However, different from the earlier considerations of strategic niche management, the multi-level perspective holds that niche innovations do not always have to oppose the regime they replace; rather, they can become integrated into that regime, from the beginning. Again, niche development may be affected by multiple regimes (Raven, 2005; Raven & Verbong, 2007), as well as by other niche innovations. Thus, there exist different types of niches and several transition pathways (see Berkhout et al., 2004; Geels & Schot, 2007).

THE WAKE-UP CALL OF COVID-19 AND "MISSION-ORIENTED" POLICIES

The COVID-19 crisis has effected a strong destabilization of the dominant regime, issuing a wake-up call for financial systems to be better prepared for the long-term climate crisis. It has also reminded global economies that stimulus efforts can offer new "windows of opportunities" for green finance to develop and channel capital to the low-carbon transition.

Now more than ever, green investments from the public and private sector are crucial for the achievement of global sustainability prerogatives. Such investments will require a progressive financial system, the maintenance of responsible behaviors that emerged during the pandemic, and the revision of financial instruments and practices that are unable to mobilize capital to realize the sustainability transition. However, although the number of assets labelled as "green," "responsible" or "sustainable" has grown since 2012, achieving a value of 30.7 trillion US dollars in 2018 (Uzsoki, 2020), investments aimed at generating a positive impact corresponded to only 502 billion US dollars in the same year (Mudaliar

& Dithrich, 2019). In this respect, the multi-level perspective, applied to the COVID-19 crisis and its impact on the financial system, may represent a useful tool for identifying challenges and opportunities, and thereby providing tailored policy support.

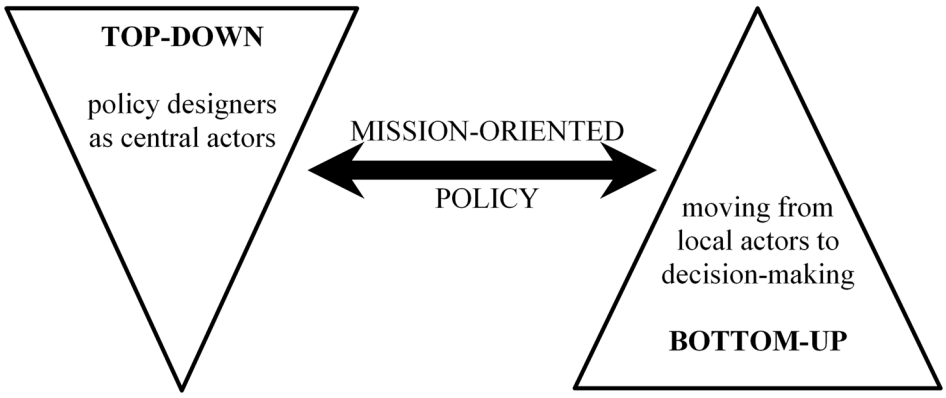
Regarding the policy dimension, in recent years, the international community has applied relevant policy frameworks to catalyze the role of finance in spreading a comprehensive green economy (Quatrini, 2021). Making this scenario more challenging, the COVID-19 pandemic has deviated the interest of governments far from their long-term sustainability goals, forcing them to quickly inject assets to save national economies; while understandable, this has potentially added years to the timeline for achieving the Sustainable Development Goals (United Nations, 2020). However, at the same time, COVID-19 has increased the global interest in sustainability – which, prior to the pandemic, was not fully acknowledged as financially relevant – increasing the appetite for more positive impact–driven policy strategies. Thus, policy makers now have a great opportunity to guide society towards sustainability by raising expectations and catalyzing the required activities for economic resilience.

For decades, the principal goals of innovation policy have been to resolve market failures, increase research and development within private firms and strengthen national innovation networks. However, more recently, the relevance of societal problems, as well as the presence of path dependencies preventing simple changes of innovation direction within innovation systems, have legitimized government interventions to address "transformation failures" (Weber & Rohracher, 2012) and fostered a new generation of innovation policy (Schot & Steinmueller, 2018). In particular, the adoption of mission-oriented innovation policy, which aims at directing public investments to societal transformations and coordinating the efforts of a broad range of actors, may be considered a successful step towards the implementation of transformative innovation policy (Kattel & Mazzucato, 2018; Mazzucato, 2016). The distinguishing element of mission-oriented innovation policy is that it directly deals with societal challenges in an effort to better understand and spearhead changes in socio-economic systems.

Innovation scholars have emphasized the role of mission-oriented policies that originate new markets, rather than simply fix them, in the process of transformative change (see Foray, Mowery, & Nelson, 2012; Mazzucato & Penna, 2015). Such policies have tackled important societal challenges and driven economic growth and industrial leadership (Hekkert, Janssen, Wesseling, & Negro, 2020; Robinson & Mazzucato, 2019). Different from general innovation policy, which aims at institutional development, mission-oriented innovation policy considers the evolution of particular technologies, focusing on systemic public policies that draw on frontier knowledge to attain specific goals and address large societal problems. While previous policy missions pertained to technological challenges and well-defined aims, modern policy missions do not (Foray et al., 2012). Rather, modern challenges require wider efforts to develop technological solutions, targeting both institutional factors and a high rate of technological change (Freeman, 1994). In addition, the literature recognizes two types of mission-oriented innovation policy: "traditional" policy, which adopts radically innovative projects to pursue national-level objectives, with central decision making process and aims established by a public agency; and "challenge-driven" policy, which is not governed by a single decision making authority but by a committed multitude within a decentralized innovation system.

In this vein, challenge-driven mission-oriented innovation policy may provide a fertile ground for green finance through the involvement of the public sector and stakeholders focused on the sustainable transition. In general, a new criterion for policy making considering both a top-down and a bottom-up approach, as shown in Fig. 2, is needed.

Figure 2. A joint approach to policy making



However, despite this suggested "orientation," the lack of a framework to evaluate and shape successful interventions represents an ongoing challenge to policy makers seeking to delineate mission-oriented innovation policy. The multi-level perspective may be useful for policy missions related to generic societal goals, but not to policy missions focused on multiple societal functions or highly specific challenges.

For this reason, a new system framework has been introduced – the mission-oriented innovation system. The mission-oriented innovation system represents a network of agents and institutions aimed at understanding the innovation dynamics related to the resolution of societal missions. The realization of mission-oriented innovation policy is difficult for policy makers lacking a full understanding of innovation system dynamics. In particular, four aspects of mission-oriented innovation systems must be understood (Hekkert et al., 2020): how mission-oriented innovation systems arise and how they exert an effect; the presence of strong directionality in these systems; the level of technological variety under intense guidance in these systems; and the role of governments in designing these systems.

NUDGES IN THE FINANCIAL MARKET

Considering the societal problems that mission-oriented innovation policy aims at addressing, it may be useful for policy makers to understand the practical dynamic between top-down and bottom-up approaches. In this regard, the authors recommend the application of a policy framework based on the "nudge" concept. The idea of the nudge was first developed in cybernetics, where it was identified as a general behavioral influencer, without consideration of its degree of impact (Hausman, McPherson, & Satz, 2016). The term became more widespread when it appeared in a seminal work by the economists Thaler and Sunstein (2008), which described it as any dimension of the choice architecture – easy and cheap to avoid – that could predictably alter people's behavior without forbidding any possibility or modifying the economic stimulus. Previously, until the contribution of Simon (1957), which introduced the psychological factor to the decisional path, the earliest approach to individual decision making in economics and business assumed that man was completely rational. In this regard, Simon (1957) argued that people's rationality is bounded by the manageability of the decisional problem, the limitations of

the mind and the time available to decide. However, the later theory of "nudging" derived from the work of the psychologists Kahneman and Tversky (1979), which demonstrated that, when making decisions influenced by cognitive failures, people regularly fail to act in line with the forecasts of utility theory.

Thaler and Sunstein (2003), introducing the concept of "liberal paternalism," argued that public policy should protect freedom of choice (i.e. espouse liberal values) while, at the same time, authorize both private and public institutions to guide individuals in the direction of welfare (i.e. reflect paternalistic motives). Although the concepts of liberal paternalism and nudging may seem equivalent, there are subtle differences between them. Specifically, liberal paternalism is an example of nudging in policy making, but nudging can be applied to a far wider set of contexts. Indeed, influential and beneficial political approaches have paved the way for nudge theory to be applied to business and even financial markets, in order to influence the behavior of participants.

Because nudging is a key instrument of liberal paternalism, its moral qualities have been debated, with some suggesting it is akin to psychological manipulation (Kemmerer, Möllers, Steinbeis, & Wagner, 2016). However, while only the person who has been nudged is able to evaluate whether the nudge was beneficial or not (Thaler & Sunstein, 2008), choice architects have the capability to construct and apply nudges to arouse specific behaviors, and therefore to guide people in pre-determined (assumed advantageous) directions (Thaler, Sunstein, & Balz, 2013).

Thaler et al. (2013) recognized a set of choice architecture tools that includes: default options (choices that will be obtained if the chooser does nothing, for reasons of laziness, fear or distraction), error expectations, feedback loops, an understanding of how information is mapped (which, in the best case, may help to improve the chooser's ability to select options that will make him/her better off), incentives (with salience considered the most important modification applicable to a standard analysis) and an understanding of the structure of complex decisions (i.e. an understanding that a small number of well-understood alternatives is preferred to a larger set of alternatives) (Brown & Krishna, 2004). More generally, Johnson et al. (2012) divided choice architecture tools into two categories. The first category includes tools for organizing the choice function; these tools determine what to submit to decision makers (e.g. a reduced number of choices, technology aids, default options, and time windows). The second category includes tools for delineating choice alternatives; these tools suggest how these options should be proposed (i.e. how attributes should be partitioned and designed).

Applied to financial markets, choice architecture tools can be executed to adjust the presentation of investment choices and to provision information on sustainable alternatives in a specific way, for a specific purpose (Cai, 2020). For this reason, over recent years, financial regulators have increasingly appealed to the behavioral sciences to improve their understanding of consumer behavior and the activity of financial firms. On the one hand, their goals have been to recognize biases, improve decision making and increase the protection and education of investors; on the other hand, they have also aimed at analyzing and learning from reactions to situations and policies, in order to increase financial oversight and regulation.

Although nudging may be applied by financial firms and advisors to improve human welfare, conflicts of interest may arise in the process. For example, products that represent good investments for clients may generate low profits for financial advisors; or, vice versa, products that constitute bad investments for clients may produce high profits for advisors. Furthermore, in addition to the market failures already discussed, financial markets may present behavioral biases due to: the complexity of some financial products with respect to ordinary products; the trade-off between present and future (which favors short-term over long-term interests); and the relative rarity of some products, which does not allow stakeholders

to learn from past mistakes (Erta, Iscenko, Hunt, & Brambley, 2013). Overall, despite these limitations, nudging may be used to guide and improve methodologies and strategies, on the condition that there is commitment from regulators and professionals to ensure that all nudges are used exclusively to improve the well-being of individuals.

CONCLUSION

With the aim of discussing the scaling up of green finance in the post–COVID-19 era, the current chapter has underlined the necessity for a green recovery to lead the economy towards sustainability. In this regard, international institutions and governments are increasingly expressing the urgent need to reduce economic dependence on fossil fuels and redirect society towards a more efficient model of resource use.

As has been shown, the recognition of environmental issues has unfolded gradually, from the 1960s onwards. Recently, this history culminated in three landmark international agreements in 2015: the 2030 Agenda for sustainable development, the Paris Agreement on climate change and the Addis Ababa conference and financing package. Within this context, the totality of financial instruments known as green finance – aimed at financing for environmental, social and economic sustainability – represents a promising model for achieving a sustainable economy. However, despite good intentions, market failures (including negative and positive externalities, imperfect information and the presence of oligopolies or monopolies) and government failures have undermined green finance, compromising its potential.

This chapter has underlined the importance of strategic niche management and the multi-level perspective in understanding the role played by the financial system in the sustainability transition. COVID-19 has destabilized the dominant regime, providing new windows of opportunities for green finance to implement a low-carbon transition. In the post-COVID-19 era, the multi-level perspective, in particular, may represent a useful tool for identifying challenges and opportunities, and thereby informing policy development.

Policy makers now have a great opportunity to lead society to sustainability by adopting mission-oriented innovation policies and policy frameworks based on the nudge concept. Now more than ever, political leadership is needed to guarantee that COVID-19 represents a turning point, rather than a point of no return, in our journey to achieve our goals. In practice, the policy interventions needed to spread the viability of green options must augment the interdependence of instruments that encourage the financial sector to provide fair terms for green investments. This interdependence should be supported by public guarantees that transfer the off-putting initial risk of green investments to public actors. Additionally, a circle of trust must be built between project initiators, institutional investors, the banking system and governments, in order to scale up green finance (Hourcade et al., 2021).

However, although the achievement of the sustainable economy is possible through the greening of a number of sectors, in the post-COVID-19 era, finance must be reintroduced to the forefront of science and technology policies to achieve a complete socio-technological transition with a sustainable financial system (Falcone et al., 2018).

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Chapter 5
Trends and Prospects in Climate Finance

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ABSTRACT

An effective response to climate change that assures a sustainable development pathway will require a fundamental transformation towards a low carbon, climate-resilient societies. Each change need for solid financial support, financial solutions, and dedicated instruments, taking into account ESG factors and taking into account the impact of financial crises. This chapter aims to bring together theories, trends, dilemmas, and directional concepts to answer the question about changes in the existing paradigm of climate finance. On the other hand, the analysis of trends and presenting future prospects regarding sustainable finance will be aimed at enhancing the substantive and practical knowledge of the target audience. In addition, in this chapter, the following issues will be presented in particular: changes in the sustainable finance paradigm and the emergence of the climate finance paradigm, macro-and micro-financial aspects of climate change taking into account the influence of risk (including ESG risk), and a new landscape of climate finance.

INTRODUCTION

Over the last five decades, the rapid growth and the progressive degradation of the natural environment have had numerous negative environmental impacts as a result of the combustion of fossil fuels, Co2 emissions, soil pollution, air and water pollution, climate warming or aggressive management of natural resources. These effects, in the form of atmospheric greenhouse gas emissions, growth CO2 in the air, noise emissions and destruction of land and natural resource depletion, wasteful economy against natural resources have direct and indirect impacts on human quality of life and health and business conditions (Larsson et al., 2019).

Global security and defence, economy and human life, health and safety are however not only affected by, but also contribute considerably too, global warming. Even though there have been some attempts

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to "green" certain aspects of the functioning of enterprises, institutions and social life are insufficient due to the existing inequalities between states or continents. This is due to the still insufficient funds or the growing need to adapt to changes in financing needs resulting from the disproportion between the expanding sustainable development goals (currently 17 goals) and public policy towards sustainability. It can be said that the growing tasks require constant adjustments of government policies (local, regional and international), evaluation and adjustment of financial instruments and private capital activation programs, including making profound changes in the financial system (Macquarie, 2020; Ziolo et al., 2021; Mauderer, 2021).

Climate change is no longer a "future" risk that will strike decades from now, but one that is already actively shaping the security environments, management future conditions and interests of all countries. In the literature on the subject, one can observe an ongoing deep discussion on the development of the sustainable development paradigm. This discussion covers tools, activities, effectiveness, or meets the needs with the intentions. Needs and directional actions are known. The analysis of this discussion results in the fact that the role of finance is not sufficiently understood (Ziolo et al., 2019; Ziolo et al., 2021), especially climate finance in supporting climate change. Existing studies show the advantage of the functional side of climate finance over the paradigm and adaptation of changes in the financial system to sustainability and climate goals.

This chapter aims to bring together theories, trends, dilemmas and concepts, focusing on practices and strategies for climate finance problems. Addressing the challenges will aim to answer the question about changes in the existing paradigm of climate finance. On the other hand, the analysis of trends and presenting prospects regarding sustainable finance will be aimed at enhancing the substantive and practical knowledge of the target audience. The chapter will contribute to a better understanding of what are the links between climate finance and the directions of achieving the sustainable development goals (SDG's) taking into account climate goals.

THE IMPACT OF SUSTAINABLE DEVELOPMENT ON SHIFTS IN THE FINANCIAL PARADIGM

Provide from the key definition of sustainable development that appeared in the 1987 Brundtland Report (Brundtland 1987), there have been changes in the perception and development of the sustainable development paradigm (Moffatt, 2000; Steurer et al., 2005). One issue remains unchanged, because sustainable development is considered as a phenomenon that raises and restores the quality of life and the natural environment, thus progressing without destroying the livelihood of future generations (Witt, 2014). According to the classical approach, it is necessary to ensure that the three dimensions are in balance: economic sustainability, environmental sustainability and social sustainability (Muñoz et al., 2013), which means that the modern economy and its financing should be economically profitable, but also socially and environmentally and socially responsible (Anand & Sen, 2000; Guinot, 2020).

The discussion in the subject literature indicates that the development of assumptions of a sustainable development paradigm took place for a rather long period of time. The reason for the delays was undoubtedly the need to discuss its assumptions on a global level, to reach an agreement to respect it by the largest economic players and to accept changes and new concepts are taking place at the international.

This discussion shows the problems of joining forces and efforts for the sake of achieving SDG's, and also indicates the need to cooperate and remove all obstacles in support of economic development

and growth, levelling the level of social development and building a new (after the financial crisis) the stability of financial systems. The development of the sustainable development paradigm was perceived differently, but it is best reflected in the research conducted by Salim (2007), Jensen (2013), Agapova and colleagues' (2016) and Dobrovolska (2018) and the research showing the development of sustainable finance against the background of the development of the SDGs conducted by Dyllick & Muff (2016) and Schoenmaker (2017).

As the paradigm of sustainable development develops, risks are identified, and their impact on finances is also analyzed. The concept of ESG risk is related to the emergence of external effects resulting from the decisions taken and thus the actions of entities using the environment (society, entrepreneurs, financial institutions, etc.) on the one hand, and from the actions of governments and international organizations on the other. From the point of view of sustainable development, externalities are classified using the three basic pillars: environmental (E), social (S) and governance (G). Economic ESG risk (G - governance) is identified as it may pose a threat to the perception of government or financial institution policy, the ability to incur debt (through ratting or the investors themselves), or the issuer's (corporate or government) ability to repay debt. It is dealt with by financial institutions, but also the institutions themselves are susceptible to its operation (Ziolo et al., 2019; Zumente & Bistrova, 2021).

Finance plays this role at different levels of development, as well as their importance for different entities. If the financial sector chooses to finance entities, enterprises and their projects, the use of sustainable finance products and services can accelerate the transition. More and more attention is being paid to this acceleration and it is showing effects (Schoenmaker, 2017). Table 1 presents the main links between the evolution of the sustainable development paradigm and the framework for sustainable finance.

Table 1 shows that the formation of the sustainable development paradigm influenced the changes in the financial paradigm and the emergence of sustainable finance. The primacy of finance, and especially the approach based on achieving goals, was shifting towards the perception of the role of the environment, socially responsible investment of business, or recognition of common good value. An analysis of the changes in the paradigm of sustainable development shows the servant role of sustainable finance in the implementation of SDG's goals. It is visible to the financial system that the procedures and financial products are directed towards the changing goals of sustainable development. As the paradigm of sustainable development develops, finance accepts the (gradually) growing influence of non-financial factors on their decisions, which is related to ESG risk. A special place in the new financial paradigm is occupied by the "S" (social impact) factor. Financial institutions and the entire financial sector are currently transforming their business models towards sustainability (Ziolo et al., 2021) and closing themselves to the "brown economy".

It is necessary to emphasize that finances in the dimension of sustainable development have been subordinated to the implementation of activities supporting the implementation of SDG's goals. Thus the developed paradigm assumptions postulated the need to (Dobrowolska, 2018):

- to revise approaches to entities and their way of conducting an activity, which too actively involves existing natural resources;
- eliminate harsh economic and social imbalances in the conditions of life of the population at the global level;
- strive to equalize the gap between the incomes of different social groups in different countries;
- develop mechanisms to close the income gap between the low-income and high-income population.

Table 1. Links between the development of the sustainable development paradigm and the framework for sustainable finance

Period	the development of the sustainable paradigm	development of the framework for sustainable finance
The first stage: 1950–1960's	• recognition of the economy's dangerous and harmful implication on the environment and human beings, not only locally, but also regionally and globally; • defined interconnections between the processes of economic development and the degradation of the environment, getting to know their potential effects and implications on socio-economic life; • focusing the discussion on the interests of nature conservation in the process of economic growth with the simultaneous lack of multi-faceted discussions on global environmental effects; • discussions and preliminary agreements on documents shaping sustainable development.	Phase of transition from classic solutions to the perception of the possibilities offered by sustainability - the "zero" phase: • focusing on the role of finance as an instrument that provides funds to counteract the effects of climate change, causing damage to a large part of their production capacity; • using tax revenues as an instrument to restore production capacity and mitigate increases in poverty.
The second stage: 1960–1970	• showing that the excessive use of natural resources and pollution caused by economic development negatively affects material and resource base and the quality of life of the society and future economic processes; • there is lowering the human welfare; • the need for rational economy formation occurs.	Finance-as-usual phase - strengthening the concept: • Continuation of the use of finances as an instrument that provides funds to counteract the effects of climate change, causing damage to a large part of their production capacity; • use of existing financial instruments, such as taxes and subsidies; • extended discussion on the use of tax instruments in maximizing shareholder value and building economic growth; • short-term financial perspective.
The third stage: 1970–1980	• environmental protection system (Stockholm Declaration); • UN Environmental program; • formulation of the definition of "sustainable development", the indication of the basic components: environment, society, economy.	Finance-as-usual phase - strengthening the concept: • continuation of the use of finances as an instrument that provides funds to counteract the effects of climate change, causing damage to a large part of their production capacity; • wider use of previously known financial instruments; • seeing sustainability as a means to maximizing shareholder value; • the need to take into account the impact of social factors on the economy and the environment - the financial dimension; • short-term financial perspective - perceiving the need for change.
The fourth stage: 1980-2000	• evolution of sustainable development goals (from Agenda 21 to Millennium Summit) - broader and more accurate approach to climate problems; • the rapid and leap development of "green" technologies in developed countries, but very slow changes in underdeveloped countries; • high variation between countries targeting "green" technologies (so-called "North" countries) and countries with poor development ("brown economy", so-called "South" countries or "sin" companies); • promoting the idea of sustainability to obtain additional economic benefits.	Finance-as-usual phase - the declining role of the concept: • financial institutions restrict cooperation or avoid investing in, or lending to, so-called 'sin' companies or "South" countries; • shareholder value and ranking of factors based on financial value (F); • the emerging very loose connections of financing sources with social factors and corporate social responsibility; • the need to flexibly adjust financial instruments to climate needs (the problem of financing climate change by the financial market); • forcing changes in public (government) financial instruments as a result of international cooperation for the climate - the beginnings of national policies; • short-term financial perspective.
The fifth stage: 2000 to 2010	• financial institutions have been re-positioned vis-à-vis the financing of SDG's and the goals of the "brown economy"; • appointment of the Millennium Development Goals by 2015; • emphasizes the need to move away from a high-emission economy (reducing CO2); • sell tobacco, anti-personnel mines and cluster bombs are assessed negatively; introducing a transparent policy of waste management, including waste going to the oceans and the sea; • highlights the "S" pillar of sustainability by stigmatizing those that exploit child labor; • pro-environmental changes in national legislation and its relationship with targeted global solutions; in business and mass media environmental issues and the impact of climate change on life and the economy are discussed; • the role of non-governmental organizations is growing, especially those aimed at supporting the achievement of SDG's goals.	Sustainable Finance 1.0: • primacy of finance (profit maximization) over sustainability; • refined shareholder value; • ranking of factors based on financial value (F) but there is a visible influence on the decisions on financing the factors describing the sustainable development of such societies: S and environment: E, the dependence can be generally presented as: F> S and E, which means: the economic factor is the key in decisions; • Shareholder value and profit maximization is still the guiding principle for the organization, though with some refinements, which can be described by the relationship: Max F subject to S and E, • designing instruments dedicated to sustainable finance (mainly in "North" countries); • short-term financial perspective.
The sixth stage - after Conference on Sustainable Development (Rio+20)	• a key turning point in changing of the sustainable development paradigm towards the "green" economy; • launching a process to develop a set of Sustainable Development Goals (SDGs) detailing the Millennium Development Goals; • ground-breaking guidelines on green economy policies have been developed and adopted; • preparing options on a strategy for sustainable development financing; • triple bottom line in values creation; • launching a programme of work in the area of measures of progress to complement gross domestic product to better inform policy decisions.	Sustainable Finance 2.0: • waning primacy of finance (profit maximization) over sustainability; • financial institutions lead the policy towards sustainability; • perception of ESG risk by financial institutions; • focusing on the formation of "green" finance; • financial programs created by international organizations and governments to support the achievement of SDG's goals; • governments slowly redirect tax policy towards sustainability objectives; • ranking of factors based on the concept of total value (T), which can be characterized by the equation F (financial value) + S (societies) + E (environment), which means: financial and non-financial factors are of equal importance; • stakeholder value and optimisation total value (T) are still the guiding principles for the organisation; • medium financial perspective.

continued on following page

Table 1. Continued

Period	the development of the sustainable paradigm	development of the framework for sustainable finance
The seventh stage -after Agenda 2030	• legitimacy theory underpins Sustainable Finance 3.0; • starting with sustainability challenges; • correction and adoption of the current position on Sustainable Development Goals (17 - SDGs); • New Environmental Economics, and in particular giving priority to the functioning of ecosystems (sustainability and resilience); • within corporate governance, we can speak of an extended stakeholder approach, whereby not only direct stakeholders, such as shareholders, suppliers, employees and clients, but also society; • and environment, as indirect stakeholders, are included • strengthening the problem of efficiency and optimizing the use of resources; • a marketing and PR formula of sustainability accepted and used by the political, business and financial elite; • building patterns of a socio-ecological economy based on creating value for the common good; • the impact of government policy and legislative actions to change the financial system towards sustainability; • strong social pressure to adapt.	Sustainable Finance 3.0: • a change in the approach to sustainable finance from risk to opportunity; • a change in the policy and perception of risk in financing institutions financial towards sustainable entities, companies and projects; • investment projects selection based on their potential to generate positive social and environmental impacts and mitigation of ESG risks; • acceptance of ESG risk, management of ESG risk towards its minimization through the use of dedicated financing sources; • finance is a means to foster for SDGs goals, climate risk mitigation and sustainable development; • the key change to the role of finance turns from primacy (profit maximization) to serving (a means to contribute to sustainable development); • society preferences play a meaning for investors (SRI of investors) funds, while financial motives appear to be of limited importance; • ranking of factors based on social impact concept (S) of which can be characterized by the equation: S and E (environment) > F (financial value), which means: social and environmental factors dominate over the economic one; • common good value and striving to optimize S (social impact) and E (environment); optimization subject to F (financial value); • the financial system serves to realize the SDG's in the medium to long term.

Source: Baumgautner & Quaas (2010); Dixon-Fowler and colleagues' (2013); Schoenmaker & Zachmann (2015); Dyllick &Muff (2016), Whiteman and colleagues' (2013); Schoenmaker (2017); Riedl & Smeets (2017), Dobrowolska (2018), Ziolo and colleagues' (2019); Ziolo and colleagues' (2021).

Sustainable finance, evolving along with the balanced paradigm, had to distinguish a new finance paradigm, based on: superiority of sustainable development goals, adjusting values to the idea of sustainability, changes in customer perception, integration into business models of social responsibility and ESG risk.

Global climate change is of prime concern at a global scale, especially in science and economy (Zhang, et al. 2012), but they require consideration of several environmental factors and ESG risks, due to the rapid pace of industrialization, urbanization, changes in the number of natural resources as well as the quality of global environment (Rai &Tripathi, 2009; Rai, 2013). An economic growth that effectively addresses the most important problems of society's survival without depletion, degradation and environmental pollution (Trehobchuk, 2002) is supported by climate finance, which is becoming the basic tool for accelerating favorable climate change.

EVOLUTION OF CLIMATE FINANCE IN THE PARADIGM OF SUSTAINABLE FINANCE

Climate change requires companies and entities to move away from the current business model focused on profit maximization and other goals, different from SDG's goals. World economies are feeling the environmental and social crisis and more and more often indicate that the hitherto structured business models do not work (Guinot, 2020).

It becomes necessary to address the current environmental and social crisis, business strategies to be formulated that are linked to fairer and more sustainable economic systems such as the economy of the common good and the circular economy (Guinot, 2020). These economic alternatives focus on promoting a fair and sustainable economic, social and ecological reality (Finkbeiner et al., 2010), but also on changes in the financial system, especially in the attitudes of financial institutions, capital suppliers, financial markets and goals of government aid. Changes in the financial system are more and more

often aimed at financial support for the use of renewable energy sources, reduction of CO2 emissions, elimination of inequalities or financing environmentally friendly investments (Ryszawska, 2018; Talan & Sharma, 2019; Ziolo et al., 2021).

Sustainable finance is a response to unfavorable economic, environmental and social changes occurring in the environment, mitigating their negative impact and existing inequalities, and at the same time stimulating positive directions of changes. Actions to counteract climate change or other unfavorable environmental and social phenomena require a specific type of financing, which is the domain of climate finance. Many types of financing (e.g. instruments, funds, financial constructions, preferences) and policy measures (public policy, central bank policy, policy of commercial banks and other financial entities) for encouraging the climate finance, including direct public finance, co-finance of public and private finance, risk mitigation by the public for private investment, incentives to low carbon investment including emission trading, tax incentives, subsidies and regulation for in-efficient investment are important instruments for sustainable finance, and thus the essence of climate finance. The literature review shows, the concept of sustainable finance extends to individual financial sub-disciplines (Warren, 2019) which means that climate finance has been included in the paradigm of sustainable finance. In a narrow sense, sustainable finance is treated as a source of financing projects in the field of environmental protection or the so-called green finance or financing that supports and promotes social inclusion (Ryszawska, 2018). Sustainable financing in a broader context means a type of financing that includes non-financial factors in the decision-making process and tries to eliminate the risk they create (Gerster, 2011). This approach is reflected in the models of sustainable finance referred to as model 1.0 (the economic factor is the key in decisions), model 2.0 (financial and non-financial factors are of equal importance) and model 3.0 (social and environmental factors dominate over the economic one) (Schoenmaker, 2017).

It is worth noting here that next to the concept of sustainable finance, there are terms that are often treated interchangeably or complementarily, and refer to the financial aspects of supporting the achievement of sustainable development goals and climate goals (Table 2).

The terminological scope of the definition and concepts presented in the table was influenced by the relationship between finance and sustainability. Table 2 shows that the concept of sustainable finance extends to individual sub-disciplines of finance and one of them is climate finance. Sustainable finance (in the narrow sense) is treated as a source of financing projects in the area of environmental protection or the so-called green finance or financing that supports and promotes social inclusion (Soppe, 2009). A little later, the concept of climate finance emerges, which include in its scope financial support for climate change (from mitigation, to structural change and innovation). Sustainable financing in a broader context means a type of financing that includes ESG factors risk in the decision-making process and tries to eliminate the risk they create (Schoenmaker, 2017; Ziolo et al., 2019; Mauderer, 2021).

Climate finance, apart from its official separation and definition, occupies a special place in financing sustainable development from the point of view of financial flows. It should be emphasized that the role of funds financing climate change and meeting climate goals is significant, as shown in Figure 1.

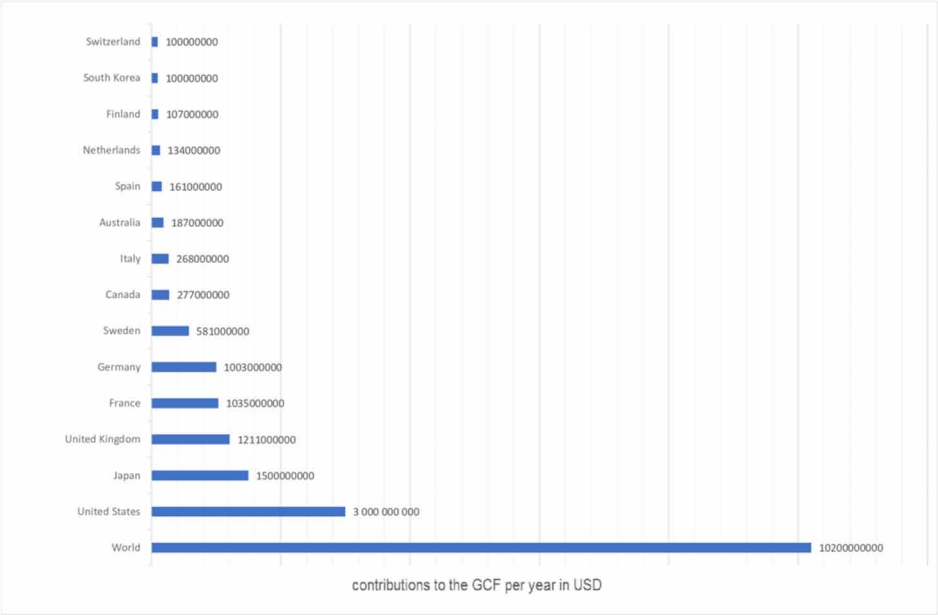
The data presented shows contributions to the Green Climate Fund (GCF). The chart shows data from 2018 (no data for 2019 and 2020) for the countries with the highest contributions. It should be noted that there are countries from different continents there, but above all, they are highly developed countries that have significantly contributed to climate change. As an analysis of the Fund's databases shows, contributions to the GCF are growing year by year, which translates into greater opportunities to finance projects and investments conducive to the achievement of SDG's climate goals.

Table 2. Sustainable finance – evolution towards the separation of climate finance

Term/type of Sustainable Finance	Author	Characteristics of the concept
Responsible finance	concept by Asutay (2008); Scholtens and colleagues' (2008)	Responsible finance consists of ethical investment and socially responsible initiatives and investments. They focus on systematic monitoring on financial providers and measures for financial stability through consumer indebtedness restriction.
	concept by McKee and colleagues' (2011)	The essence of this concept is focus in responsible delivery of financial services and on client protection and social performance.
	concept by Porter & Kramer (2011)	They focus on creating shared value for customers and communities as well as shareholders.
Finance for green development	concept by Tierney and colleagues' (2011)	This concept focuses on the use of green financial instruments like loans or grants from governments, official government aid agencies and green non-financial instruments like to promote the economic development and welfare (broadly defined). Green financing is focused on environmental perspective of sustainable economic and related to public financing sustainable goals.
	concept by Zadek and colleagues' (2016)	The essence of this concept based on strategy for financial sector and broader development which is aimed at stimulation banking institutions to focusing on green credit, adjust credit structure to the idea of sustainable financing of the economy, effectively management of ESG risk, creating solutions friendly to financing "green" economy.
Targeted definitions of green finance	concept by Höhne and colleagues' (2012)	The concept is based on the use of financial instruments and encouraging to the development of a more sustainable economy.
	concept by Zadek & Flynn (2013)	The approach suggests taking into account, in addition to traditional costs, also operational costs of green investments that were not included in the traditional account.
	concept by Böhnke and colleagues' (2015)	The concept focus on a key element is sustainable investment and banking, where investment and lending decisions are taken on the basis of environmental screening and risk assessment to meet environmental goals.
	concept by Wang & Zhi (2016)	The essence of this concept is focused on relation between finance and business and analyzes the ecological environment benefits and pays more attention to environmental protection industry.
Green finance	Pricewaterhouse Coopers Consultants (2013)	The process of designing financial services, making decisions, monitoring financial products takes into account the impact of environmental factors and is subject to risk management processes. Actions taken are provided to promote environmentally responsible investments and stimulate low carbon technologies, industries and businesses with the use of financial instruments dedicated to sustainability.
	Höhne and colleagues' (2012)	This concept indicates the importance of stimulating the development of a more sustainable economy through the use of financial investments, environmental products and policies.
	Volz (2018)	The definition includes all forms of investment or lending that consider environmental effect and enhance environmental sustainability.
	Berensmann & Lindenberg (2016)	This approach focuses on two main tasks, which are: to internalize environmental externalities and to reduce risk perceptions in order to encourage investments that provide environmental benefits.
	Spinaci (2021)	This approach points to green finance as a subset of sustainable finance and indicates that alternatively sustainable finance can be considered as an evolution of green finance.
Environmental finance	Fang &Zhong (2010)	Environmental finance's essence is a new innovative financial model based on environment protection, and its contents should include four parts.
	Chesney and colleagues' (2016)	This concept brings green finance and carbon finance together.
Carbon finance	Kaifeng & Chuanzhe (2011)	Carbon finance is defined as investment and financing activities in low-carbon economy field based on "Kyoto Protocol" or carbon financing and carbon substances trading.
	Simon and colleagues' (2012)	Carbon finance mitigates both the health and climate impacts of domestic carbon-based emissions.
Climate finance	Falconer Stadelmann (2014); Kato and colleagues' (2014)	financial resources that are paid to support climate change mitigation and adaptation activities, and thus to cover the costs of the transition to a global low-carbon economy, and to build resilience against current and future climate change impacts.
	Spinaci (2021)	Climate finance provides funds for addressing climate change adaptation and mitigation.

Source: own elaboration.

Figure 1. Signed pledges of contributions to the GCF per year in selected countries in 2018
Source: own elaboration based on data of Green Climate Fund (GCF, 2018).



Macro- and Micro- Financial Aspects of Risk in Climate Finance

So far, actions taken by institutions climate risk finance was voluntary and based on independent recommendations entities such as Task Force on Climate-related Financial Disclosures (TCFD). Regulatory activities were significant for climate finance. For the countries of the European Union, in 2018 the "Action Plan: financing sustainable economic growth" was adopted, aimed at achieving three goals: redirection of support funds sustainable growth to fill the investment gap, mainstreaming sustainability considerations in risk management, promoting transparency and a long-term approach in financial markets.

In 2019, the European Banking Authority published the planned activities in the field of ESG agenda (i.e. strategy and risk management, key measures and disclosures, stress-tests and scenario analyzes, precautionary approach). In 2020, the European Central Bank began consultation on risk-related guidelines climate. The presented activities take into account the macro and micro-financial aspects of climate finance risk, but also indicate activities aimed at changing the policy in the field of the use of financial instruments (applies to the financial system) and public policies (the sphere of activity of governments and their organizations, e.g. the EU).

It belongs, to explain why you should analyze climate change taking into account finance, ESG factors and financial risk. In the literature on the subject, several reasons are given. Practice confirms them. The first argument is risk preferences, risk tolerance, type risk and its impact on the climate (see table 3). The second argument is that funds (public and private) are an important role in dictating the optimal response to climate policy. Climate finance mitigates climate risk. Thanks to dedicated financial instruments, flow is easier, of capital toward "green" projects and investment. Climate finance procedures move funds away from "brown" industries and firms. The third argument is the fact that financial markets

use appropriate tools and instruments for mitigating and hedging climate risk. The fourth argument is to control the impact of climate finance. Climate finance products and instruments are ranked in terms of countries' exposure to climate change (heterogeneity in exposure to climate change).

The implications of climate change in different regions are different and resulting in an increased need to finance climate goals, but also a different need to mitigate the risk. Risk tolerance is different in different regions of the world, and investors and financial markets are differently prepared for the presence of climate risk. In addition, the changing range of instruments related to climate finance should be highlighted. These instruments are developed and applied with varying strength at the international (e.g. international institutions such as the European Union), regional and national levels. They are related to local, regional and international climate policies of governments and their organizations. As well as they are created by financial institutions within the financial system, and their task is to finance climate goals (Curtin, 2013; Giglio et al., 2020; Guinot, 2020).

Climate finance provides evidence of changes in investor attitudes. Studies by Alessi et al. (2021) on European stocks show evidence of the existence of a pricing factor linked to climate risk and the associated risk premium, which is negative and highly statistically significant. Research by Kruger et al. (2020) demonstrated that institutional investors believe climate risks have financial implications for their portfolio firms. Furthermore, they point out that consider risk management and engagement, rather than divestment, to be the better approach for addressing climate risks. Research by Buch & Weigert (2021) indicates that there is a problem with the correct pricing of financial instruments and the occurrence of "greenwashing". These issues were also addressed by Alessi et al. (2021). The result of the considerations is the conclusion that if physical and transitional risks are generally underestimated, it may result in turn give rise to systemic risk in the financial sector and the internalization of these risks would affect the relative prices of financial assets.

Meirovich et al. (2013) classified climate finance instruments. However, their classification does not take into account the risk, changes in the markets and the need to mitigate clinical risk. Nevertheless, it is worth pointing out that their division concerns the division of financial support for the implementation of climate goals into instruments (non-concessional and concessional loans, multilateral and bilateral grants, debt swaps, guarantees, insurance instruments, "climate and green" taxes, contingent capital, contingent credit and loans, and multi-country risk facilities.) and mechanisms (international climate funds, national climate funds, domestic / national carbon markets or "green" financial market).

The climate change impacts the financial system, but in particular there are links between macro-financial risks and developments. Climate change - related risks magnify macro - financial risks, while at the same time macro - financial vulnerabilities limit the scope for effective action for climate change mitigation and adaptation. There are also destabilizing factors in internal financial systems, exacerbating internal and adjustment problems related to changes for sustainable development, including those related to CSR and the mitigation of ESG risks. Climate change-related risks can be grouped into two categories: physical risks which are a consequence of changes in climate, and transition risks which derive from the transition to a low carbon economy (Feyen et al., 2020). Table 3. presents interactions and implication between macro - financial factors, climate risks and climate finance.

The transitions risk factors indicated in table 3 trigger the necessity of: adaptation, mitigation, change in preferences, change in technology, expansion, research and development of technology, elimination of the uncertainties regarding the timing and speed of the adjustment to a low carbon economy. The risk exposure presented in table 3 and changes in the financial system caused by the climate and ESG risks exposure (Ziolo et al., 2021) require a presentation of the following dependencies:

Table 3. Interactions and implication between macro - financial factor, climate risks and climate finance

<table>
<tr><th colspan="5">The impact of climate change – implication to climate finance</th></tr>
<tr><th colspan="2">Physical risks</th><th colspan="3">Transition risks</th></tr>
<tr><td colspan="2">• gradual climate impacts from weather events;
• extremal climate impacts from weather events.</td><td colspan="3">• climate policies as well as shifts in technology and consumer preferences;
• carbon - intensive sectors will face changes in their asset values;
• likely higher costs of production in the economy
• the impact on public and private balances caused by policies;
• designed for the adaptation to climate change
• changes in regulatory policy;
• shifts in the private sector's consumption and investment decisions.</td></tr>
<tr><td colspan="5">Interactions (influence and mutual implication): deep uncertainties/ macro - financial and climate related risk interactions / scope for adaptation and mitigation / magnify and creation new direct economic impacts for climate change with using fund (private and public)</td></tr>
<tr><td>• economic growth</td><td>• uncertainty</td><td>• financing needs</td><td>• distributions of income and wealth</td><td>• structural change through sector specific impact</td></tr>
<tr><td>• the move towards a more resilient, low carbon economy;
• shifts in technology and consumer;
• probably weaknesses in the balance sheets of "brown" entities;
• probably lower economic; growth related to the transition to a "green", low carbon economy.</td><td>• carbon-intensive sectors will face changes in their asset values and the economy; might face higher costs of production;
• the impact on public and private balances caused by policies designed for the adaptation to climate change.</td><td>• change in climate policy generate very significant financing needs;
• financial risk and mitigating instruments;
• adaptation changes and new products friendly to "green"; investments and "green" changes; departure from financing "brown" investments;
• a new funding policy towards "green" structural change.</td><td>• adaptation and mitigation measures create significant financing needs, which may crowd out public and private investment, but on the other, could also provide new growth impulses towards a green economy;
• change of instruments to "green" transformations, capital flows towards "green" investments; changes in wealth structure.</td><td>• encourage shifts in the private sector's consumption and investment decisions;
• change in climate policy result in structural changes in the transition to a low carbon economy.</td></tr>
<tr><td colspan="5">Effects of transmission of climate risks to macro-financial conditions:</td></tr>
<tr><td>Perception and minimization of ESG risk</td><td colspan="2">Changes in macroeconomic condition and management due to "green" policy</td><td>Changes in fiscal and monetary condition and management due to "green" policies</td><td>Changes in the financial sector condition, socially responsible management due to the "green" policy</td></tr>
</table>

Source: own elaboration on Feyen et al. (2020).

1. macroeconomic factors (Feyen et al., 2020; Migliorelli, 2021; Ziolo et al., 2021):
   - impact of macroeconomic risks - in particular, it becomes necessary to the links between of macroeconomic factors with their effect the acquisition of "green capital" and to determine the impact of changes in macroeconomic outlook towards the perception of risk by investors in the financial market;
   - public sector risks – analysis of: expenditure related to climate adaptation and mitigation policies, increased demand for capital financing "green state policy", revenue potential from carbon taxes and other instruments (fees) affecting climate change, risks related to public debt level and fiscal position;

- banking risks - global bank policy towards "green" sectors, changes in risk exposure to "green" customers;
- monetary and financial conditions – analysis of: green finance policy (policy, services and products, ESG risk, CSR); increased economic volatility and uncertainty regarding banks' balance sheets exposure to climate impacted assets; monetary policy stance towards sustainability; availability of bank credit (Dafermos et al., 2018);
- market and liquidity risks - market and bank funding and liquidity conditions, sudden re-evaluation of carbon-intensive assets and industries, financial market volatility;
- internalization of risks may have an impact on the relative prices of financial assets and on systemic risk in the financial sector (Buch & Weigert, 2021; Alessi et al., 2021);

risk appetite - risk aversion towards carbon-intensive assets and industries; higher demand for green assets;

2. microeconomic factors:
   - spillover risks from the external environment - analysis of: external shocks through trade and financial channels, resistance to exchange rate market pressures, possibility and level of creating buffers against external shocks, level of raw material prices and availability of green capital flows;
   - banking risks (local market) - changing banks' exposure to the corporate, household, and public sectors "brown" towards "green"; bank risk indicators (leverage, asset quality, currency and maturity mismatches); banks 'buffers against shocks;
   - corporate sector risks - the viability of climate-change exposed business models and assets; transition costs; corporate debt level, maturity mismatch, profitability and stock market returns; capital availability;
   - household risks - household debt, property, price growth, stock market returns, impact on labor productivity and employment - unemployment; risk caused by structural shifts a low carbon economy, access to capital related to changing needs;
   - ESG risk - the emergence of external effects resulting from the decisions taken and thus the actions on the one hand of entities using the environment (society, entrepreneurs, financial institutions, etc.) (Aisbl, 2021).

Impacts of climate change generate decisions by investors, companies, financial institutions and households. The existing pressure is building up mainly due to risk. But also climate change has an impact on revenue and expenditure pressures and adds uncertainty to public management and cause an increased demand for green policies and financial resources. Climate-related risks can affect public sector decisions concerning (Pigato, 2019; Amirali, 2020; Migliorelli, 2021):

- policies towards financial institutions operating for sustainability and implementing instruments supporting climate goals (including intermediation in the distribution of subsidies for structural changes in enterprises and households);
- the stability of the public sector itself, including the shape of fiscal policy and financing "green" public investments;
- conducting activities aimed at helping other countries or economic entities adjust to an LCT through technology, financial cooperation, and trade agreements that would provide them with revenue visibility to invest in low-carbon growth and diversification.

Table 4. The impact of climate finance, including ESG risks, on socio-economic changes

Instruments of climate finance	Directions of impact on climate change	Effects of using of instruments of climate finance
"Green" taxes on: • Pollutions, • energy, • transport, • other, e.g. waste, sugar.	• to maximize positive climate impact; • tax shifting from „brown" economy to „green" economy; • development of "green" technology; • the adjustment to a low-carbon economy; • reducing the negative impact on human health.	• health and disease; • climate benefits: Co^2 limitation, help achieve nationally determined contribution, reduce risk, cleaner air; • environmental benefits: environmental quality, safety, quality of the environment, nutrition, shelter; • fiscal benefits: tax revenues focused on solving environmental problems.
Expenditure policies: • reduce labor taxes; • public investments; • social spending, • compensation, • subsidies and surcharges.	• energy efficiency; • security efficiency; • environmentally friendly technological changes; • structural changes and transition to energy-saving technologies; • sanitation; • education.	• macro-economic benefits: increased economic activity (GDP, labor, etc.), energy savings and cost reduction, less congested roads, financial stability; • social benefits: water and energy access, safety, rights and freedom, education.
Supplementary policies: • fossil fuel subsidy; • "green" innovation policy; • instruments dedicated to solving specific problems related to the occurrence of ESG risk.	• shifting away from fossil fuels; • changing the energy economy; reducing CO2 emissions; • reducing the negative impact on human health; • reduction of diseases associated with a polluted environment; • help achieve nationally determined contribution in environmental quality changes; • protection of natural resources; • PPP dedicate to climate policy.	• health and disease; • macroeconomic benefits for "green" society and enterprises; • other social benefits; • solving problems related to environmental changes.
Financial instruments: • private capital, • private financial investments, • subsidies and surcharges, • "green" financial policy; • sustainable financial reporting.	• climate-friendly activities, • CSR, • disclosure of irregularities in financial reports; • financing climate-friendly structural change; • pressure on sustainability and improvement of climate quality.	• education; • environmental awareness of customers; • change of attitudes towards sustainability.

Source: own elaboration on Pigato (2019), Feyen and colleagues' (2020), Migliorelli (2021).

Considering the problem of the effectiveness of climate finance, four different types of climate finance can be distinguished (Coony et al., 2020):

1. Dedicated climate finance: This type is based on resources from governments at concessional or grant terms with the explicit goal to achieve low-carbon resilient development, i.e. climate goals. Financial instruments are designed and managed in this way to maximize positive climate impact;
2. Climate-related development finance: This refers to funding provided by multilateral and bilateral sources with the primary goal of economic development in a climate-friendly way. The financial instruments are designed to allow for development impact as the primary goal using development finance governance structures;
3. Private capital: It is based on the use of financial flows from financial institutions and companies, but financial instruments are built to take into account the risk factor (including ESG risk) and commercial return basis. In addition, projects are funded that serve climate purposes, both commercial and governmental;

4. Government spending: This includes domestic government budgets for climate-friendly activities.

A feature of climate finance, in addition to having to take into account climate risk and ESG, is the combination of environmental taxes (i.e. carbon taxes, "green taxes"), expenditure policies and supplementary policies, which are an effective tool to pursue climate goals belonging to the goals SDG's. The practice of highly developed countries shows that carbon taxes and "green taxes" can be used to reduce other taxes that have a negative impact on the economy's competitiveness (tax shifting), fund adaptation to low-emission economy and mitigation measures, or increase socially targeted transfers and services. Changes in tax policy increasing the contribution of "green" financial instruments to eliminate the negative effects of change climate. Table 4 shows the impact of climate finance, including ESG risks, on socio-economic changes.

As shown in table 4, the combination of environmental taxes, expenditure policies and supplementary policies must be supported by climate finance instruments at various levels. This approach allows mobilized different sources of capital to accommodate climate change-related financing needs related to the implementation of climate goals. Financing needs for climate adaptation and mitigation are large, requiring comprehensive financing strategies and combining various instruments as well as combining government actions (government policy) and private capital.

THE NEW CLIMATE CHANGE FINANCE LANDSCAPE - SOLUTIONS AND RECOMMENDATIONS

The main trend in the development of climate finance is the fact that financial institutions, the financial market, governments and customers (broadly understood the finance community) not only work together to finance climate goals, but also become active partners in the challenge of responding to climate change. Literature on the subject shows that cooperation brings many benefits, but also recognizes that: investment levels remain too low (this depends on the country and the internal interests of governments and the most important actors on the local political and business scene); not all countries are seeing benefits even though they declare support, and their actions are very passive and insufficient; despite the jointly defined policy and directions of action, there is no uniform force of action, which means leadership by some in the sector and weak interactions from others (UN Report, 2015). There must be a clear division of roles between financial sector institutions. The public sector has a vital role to play as policymakers and mobilizers of public financial instruments to support investment in a low carbon economy. The role of the private sector will be defined as: entities the financing, active distributors of public funds (the role of banks as intermediaries between the government and entities investing in the environment) and entities insurance driving the transition. Governments and their organizations have at their disposal a range of public finance and policy instruments. They will continue to use taxes (although their effectiveness is assessed differently in the literature on the subject), but they will also be based on several funds, subsidies, or they will influence the behavior of banks through the connection between central banks and banks located in the local banking system (Ziolo et al., 2021).

The special role of public funds, found in government policy, is recognized. But the sources for the creation of these funds and the strength of their impact will change. It should be pointed out that climate finance was based on three main flows of funds, namely (Dupuy, 2018):

- bilateral flows, where reference to the financial commitments made in a given period by a developed country directly to a developing country;
- outflows from multilateral development banks and climate funds attributable to developed countries;
- contributions from countries to specialized United Nations Bodies.

Developed countries, taking their role in supporting change to meet climate goals, have committed to providing funding and through funding from the GCF. The projections show the growing role of GCF financing.

Governments and their organizations have at their disposal a range of public finance and policy interventions to increase private sector investments in climate-relevant activities in developing countries. Public interventions might mobilize private finance directly (mainly the case of public finance at the project- or fund-levels), or have a more catalytic effect over time (typically the case of capacity building and climate policies) (Mauderer, 2021). Table 5 shows the directional use of climate finance instruments.

Table 5. The directional use of instruments in new landscape of climate finance

International and domestic finance instruments based on public intervention or on joint efforts of the public and private sectors	Changes in the potency of use	Domestic or international climate-related public policies
Green Climate Fund	increase	domestic/ international
Grants	decrease	domestic
Subsidies	const.	international
Loans (including credit lines)	const.	International/domestic
Mezzanine finance	increase	International/ domestic
Direct and fund-level equity investments	increase	international
Guarantees	increase	domestic
Insurances	increase	domestic
PPPs	increase	domestic

Source: own elaboration.

The application of these instruments will differ from the level of GDP, structural demand, technology costs, the absorptive capacity, investment environment and social attitudes, the existing legal framework (typical for a community, region, country), political stability.

There must be changed in the current roles of the financial system entities, and in particular, supplementing the existing roles with the following new tasks (UN Report, 2015):

- institutional investors need not only to change their strategies, but to orient towards entities needs and preferences in the field of financial instruments dedicated to projects for low carbon and climate-resilient;
- banks will perform an intermediary function in discovering pro-climatic investments, assessing risks and returns, and lending;
- all actors must develop a system of effective information sharing (responsible reporting system);

- insurance companies, will have to develop a climate risk mitigation and management system.

Financial institutions in financing SDG's climate targets should consider the following: consider priorities for public financing and options for private sector solutions; examine increasing revenue, especially through environmental taxes; mainstream climate change considerations into the design, appraisal, and selection of public investment projects; and examine the scope and rationale for the use of debt financing. It is also necessary to introduce innovative new instruments dedicated to climate-resilient investments and risks. Take action to strengthen those of climate change that are fragile or have a narrow geographic focus. These actions will require international funding and the involvement of governments. A special role will be played by dedicated climate finance and government spending.

Earlier, the need for interaction between public and private financial institutions towards the achievement of climate goals was highlighted. An important instrument of climate finance is PPPs in climate finance, which can be understood as an interaction between public and private financial institutions for the delivery of climate finance (Gardiner et al., 2016). Literature studies and the practice of climate finance show that PPPs have been included in climate finance. However, the use of PPPs remains limited and continued efforts are required to remove barriers to their deployment.

Climate-related concessional development finance has also increased, both in absolute terms and as a share of total concessional development finance. This trend will not continue to develop. The impact of the COVID-19 on climate finance will vary greatly across countries and over time. This fact results from the decline in world GDP and the significant impact of face lockdown measures. Advanced economies will likely experience a larger drop in growth, but middle- and low-income countries will suffer from declining domestic resource mobilization, especially resource-rich countries, where tax revenues are vital for governments. This situation will necessitate a redefinition of the climate policy and goals due to the ESG feature and the mitigation of COVID-19 risk (Macquarie, et al. 2021).

WHO considers climate change to be the biggest global health threat, which coexists with the COVID-19 pandemic risk. This situation has shown that, in addition to financing climate change, preventive measures are needed to bring the SDG's goals together. This means that climate finance has become not only an important area of countering environmental threats but also an instrument that the condition on human health. The COVID-19 pandemic is replicating a series of changes in the financial systems of various countries (Klioutchnikov & Kliuchnikov, 2021). For climate finance, this means:

- the architecture of the financial system will change, new values will emerge, but also new financial instruments will be arranged for the purpose of eliminating the effects of disasters and new pandemics;
- governments are changing priorities towards tackling the COVID-19 pandemic, preserving human health and safety, with climate targets set. This means that government financial instruments must evolve, and states on the financial market will report several needs and will combine goals, in this case, climate goals with health protection goals;
- pandemic and climatic emergencies show that governments and international organizations show that money can be raised when there is the will to do so. This practice positively confirms the belief that climatic crisis phenomena are becoming a driving force for the emergence of new financial opportunities and the creation of changes in the architecture of financial products adequate to the needs; - investors will perceive climate risk differently, in addition to the indicated issues of

an impact on the relative prices of financial assets and on systemic risk in the financial sector, an important aspect will be the risk related to COVID-19;

- new instruments will be needed on the financial market to deal with the effects of climate change and the effects of new pandemics, but also a challenge for climate finance is the increase in the cost of raw materials, water or raw materials and products. Operators will have to change their approach to price uncertainty for energy production, transportation, and insurance;
- as a result of growing climate awareness, there will be greater pressure from investors to purchase climate instruments, but also to monitor the activities of the government and enterprises, especially those "brown" or those operating in the grey zone.

Constructive action to achieve climate goals requires the definition of global investment and project needs, and the amounts needed to bridge the financial gap. As shown in Table 1, actions towards sustainable development and the achievement of climate goals are ahead of the responses from the financial system. The financial system might not immediately anticipate the consequences of climate change, the necessary financial instruments (financial assembly of private and public instruments), or capital flows. The main future trends and recommended actions for climate finance are as follow:

1. here should be integrating policies on climate action with COVID -19 stimulus to minimize incremental investment requirements and optimize co-benefits as a result of risk management;
2. from the point of view of the possibility of influencing climate change and counteracting the COVID-19 pandemic, governments should optimize debt (developed countries) or seek to reduce it (developing countries) to create fiscal space to finance their green, climate policy;
3. state interference is required to use state funds, guarantees and create space for the development of PPP to reduce investment risk and catalyze private finance;
4. increasing developing countries access to the green financial market;
5. increasing the pressure of the financial system (financial actors) on "brown" entities or entities supporting environmentally unethical activities.

The measures outlined above are also largely recommended (though not all) by the Green Climate Found (Hourcade et al., 2021).

CONCLUSION

As the COVID-19 pandemic has so starkly demonstrated, many countries are unprepared to manage multiple crises simultaneously. Climate changes, environmental changes, economic crises or financial crises connected with the indicated changes are becoming more and more difficult not only for the economy itself, but above all for society. The confluence of COVID-19 lockdowns, health problems after COVID-19 society and their impact on the economy, subsequent economic shocks, and climate change-related droughts and flooding increased food insecurity globally, risking greater instability and conflict.

Mainstreaming climate change considerations into the realization of the seventeen sustainable development goals offers a way forward to deliver adaptation and mitigation results as part of sustainable development. This trend suggests that larger shares of climate-related finance can be expected in development finance portfolios over time, both on the side of government involvement and the private

gap. The strength of climate finance is its connection with other aspects of sustainable development, such as gender, health, poverty reduction, ESG risk reduction and so on. Climate change threatens the economy and investors' goals. This is one of the main factors that is causing the increased interest in climate finance. It should also not be concealed that the actions of governments to mobilize private capital. The mobilization policy and the instruments used (old, well-known instruments, often found in new programs or new constructions) will evolve and change.

A feature of climate finance is its link to sustainable development and its subordination to the SDG's goals. As it has been shown that climate finance is part of sustainable development finance, it will be strengthened. Both the importance of sustainable finance and climate finance will grow with environmental pressures and the need to mitigate climate change.

The chapter contributed to a better understanding of what are the links between climate finance and the directions of achieving the SDG's goals aimed at mitigating climate change. The directional changes in the climate finance paradigm indicated in the chapter shows not only the necessity of cooperation of the main actors of the financial system (financial institutions and the government), but also the directional change in financial instruments, emphasis on cooperation (also in international and bilateral systems), but also the servant role of finance towards achieving climate goals.

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KEY TERMS AND DEFINITIONS

CSR: Corporate social responsibility.
ESG Factors: Environmental, social, and governance factors.
ESG Risks: Environmental, social, and governance risks.
GCF: Green Climate Fund.
GDP: Gross domestic product.
LCT: Language and communication technologies (human language technologies).

PPP: Private public partnership.
SDGs: The Sustainable Development Goals.
TCFD: Climate-related financial disclosures.
WHO: The World Health Organisation.

Chapter 6
Sustainable Finance in Europe: The EU Taxonomy and Green Bond Standard

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ABSTRACT

The European Union has a clear strategy on how sustainable development should be financed. However, there is still no regulation that defines which activities can be considered sustainable and which cannot. Private initiative has taken the lead in recent years with the publication of different taxonomies and principles applicable on a voluntary basis to green financial products and social projects. The EU taxonomy, issued in 2020, establishes criteria to determine whether an economic activity is environmentally sustainable, and the green bond standard is in the consultation period in 2021. The EU taxonomy will increase investor confidence in green financial products, prevent greenwashing, and reduce information costs. This chapter reviews the evolution and future application of the EU taxonomy, the EU green bond standard, and the need to adopt a taxonomy for socially sustainable activities.

INTRODUCTION

Europe wants to be the first climate-neutral continent, and the European Green Deal (European Commission, 2019a) is the action plan to face this challenge: achieve European Union climate neutrality by 2050 and advance toward fulfilling the United Nations' Sustainable Development Goals by 2030. But on this path towards decarbonization and the fight against climate change, the coronavirus pandemic has represented a new challenge, and countries must face a double objective: to restore the social situation and the environment.

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All decisions have consequences, though the financial impacts of climate change and social inequality are not always considered as risks. The financial risks derived from climate change include economic damages from adverse natural phenomena (physical risk), as well as the costs certain companies may incur in the face of stricter legislation to preserve the environment (transition risk), for example, the penalty for a high carbon footprint (Marqués & Romo, 2018). The ecological transition to a low-carbon economy involves all stakeholders, including governments, companies, and consumers, as well as financial institutions and investors. In fact, many investors are already interested in sustainable financial products and base their investment decisions on social and environmental factors.

Such investors consider long-term environmental and social issues in investment and financing decisions; include environmental, social, and governance (ESG) factors in their analyses; and redirect capital flows towards sustainable investments. Where am I investing? What does the company do with the financial resources raised? The financial sector must be able to cope with these new demands and understand that this new business model does not have to mean lower profitability.

The Paris Agreement, adopted in December 2015, sets very ambitious goals to address climate change and reduce carbon emissions. The decarbonization of the economy, through energy, transport, heating systems, and many other economic activities linked to fossil fuels, is a challenge that cannot be financed only by the governments of the countries of the European Union; the private sector must intensify its investments in sustainable projects in order not to lose competitiveness and industrial leadership in the path to decarbonization. However, currently fewer than 10% of European companies are Paris aligned (CDP Worldwide, 2021).

One of the requirements for finance to be sustainable is the reorientation of capital flows towards sustainable investments. Europe has an annual deficit in investment to support a sustainable economic system. The objectives set by the European Union for 2030 call for reducing greenhouse gas emissions by 40% (in relation to 1990 levels), reaching a 27%-renewable share of energy, and improving energy efficiency by 27% (European Commission, 2018).

One of the weak points of current regulations is the classification of which activities can be considered sustainable and which cannot. Legislation on labeling sustainable financial products can help investors search for such products and ensure the transparency of the objectives pursued with their investments. Several countries and institutions have created sustainable finance taxonomies. Taxonomies can improve market confidence and assurance to investors, by guaranteeing the environmental and social sustainability of investments.

The new European Taxonomy (European Commission, 2020) "establishes the criteria for determining whether an economic activity qualifies as environmentally sustainable" and constitutes a tool for real implementation of the European Green Deal, specifically when it comes to adopting a common language in financing Europe's sustainable growth. This straightforward and practical approach to classifying assets and measuring impacts has already fostered accountability and comparability in green finance and the green economy (Technical Expert Group, 2019).

Green and social bonds are forms of sustainable financing and are becoming more and more consolidated in our markets as a financing alternative. Green bonds are intended to finance projects related to environmental protection; social bonds must finance specific social projects. In 2020, sustainable debt got a big boost. The size of the green bond market was USD 290 billion, 9% higher than in 2019; in contrast, the size of social market was USD 249 billion, a 1017% jump (Harrison & Muething, 2021). This striking growth is due to the adverse effects of the pandemic. Another instrument, pandemic bonds,

created in 2017 by Mundial Bank in the wake of the Ebola epidemic, can help finance addressing the consequences of the Covid-19 pandemic.

This chapter aims to highlight the important role that the financial sector plays in the fight against climate change and the transition to a decarbonized economy. It proposes a framework for understanding the EU's system for classifying environmentally sustainable economic activities and its green bonds standards. At the same time, the coronavirus pandemic has revealed a high number of dramatic social situations that make the financing of social projects more necessary than ever. Therefore, this chapter argues that when talking about sustainable financing one must include both green and social projects or combinations of them. This broader approach to sustainability is linked to the 2030 Agenda and the Sustainable Development Goals (SDGs), as it encompasses all three dimensions of sustainability: economic, social, and environmental.

The next section of this chapter analyzes the European legal framework for sustainable finance. The following section explains the need for a taxonomy of environmentally sustainable economic activities that provides a common language for investors, financial market participants, and issuers. It also analyzes Regulation (EU) 2020/852, called the EU Taxonomy, which establishes the criteria for determining whether an economic activity qualifies as environmentally sustainable. The penultimate major section comments on the EU Green Bond Standard. The final section and its accompanying figure summarize the current situation of the European regulation process on sustainable finance.

THE EUROPEAN LEGAL FRAMEWORK FOR SUSTAINABLE FINANCE

From its origins, the European Union has shown its concern for sustainability. Article 3.3 of the consolidated version of the Treaty on European Union establishes that

The Union shall establish an internal market. It shall work for the sustainable development of Europe based on balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment. It shall combat social exclusion and discrimination, and shall promote social justice and protection, equality between women and men, solidarity between generations and protection of the rights of the child (European Commission, 2016).

To achieve a sustainable and climate-neutral European Union by 2050 (European Commission, 2019a), the EU needs to incorporate into its framework of action the seventeen Sustainable Development Goals (SDG) established in the Union Nations 2030 Agenda for Sustainable Development and the 2015 Paris Agreement. The agreement highlights the importance of encouraging the financing of investments that support sustainable growth. By channeling financial resources towards investment, the financial system contributes to growth and employment and can play a fundamental role in achieving the objective set by the agreement. To achieve this objective, it is necessary to increase the volume of financial flows destined for sustainable investments as well as to increase the issuance of financial products labeled as sustainable. But what is a sustainable investment? Investors have not found a single, clear answer to this question, and the confusion has led to underinvestment in sustainable activities.

Therefore, investment in sustainable projects must be linked over time to the so-called ESG (environmental, social, and governance) factors—that is, to activities that represent a brake on climate change

(water and air pollution, depletion of natural resources, loss of biodiversity, or risk of natural disasters); that allow greater development of society (equality, inclusiveness, labor relations, and investment in human capital); and that contribute to good corporate governance of public and private entities (relations with workers, the composition of management boards, incentives, or remuneration of managers). Investors need tools and taxonomies to recognize sustainable activities, investment projects, and companies and reduce the risk of investing in doubtfully sustainable financial assets or the risk of unfair competition from unsustainable issuers (Romo, 2021).

Therefore, various private institutions anticipated public legislation and began to publish their own definitions of sustainability, focusing preeminently on green bonds. The Climate Bonds Initiative published its first taxonomy for green assets and projects in 2013, updated in 2020. The International Capital Market Association published its voluntary process guidelines for the green bond market in 2018 and for social bonds in June 2020.

In March 2018, the European Commission published its "Action Plan: Financing Sustainable Growth," which is considered as the beginning of an ambitious European strategy to connect finance with sustainability. The plan indicates that, to achieve this objective, it is necessary to reform the functioning of the financial system. It defines sustainable finance as "the process of taking due account of environmental and social considerations in investment decision-making, leading to increased investments in longer-term and sustainable activities." Also, in June 2018, the European Commission set up a Technical Expert Group (TEG) on sustainable finance to assist the Action Plan's implementation.

First, the plan proposed to create a common system for classifying sustainable economic activities—in other words, a set of definitions accepted by all participants in the financial system (companies, investors, and policymakers) that determine what projects and what financial assets can be considered sustainable. Second, the plan highlighted the need to create labels and standards for green financial products, such as green bonds, that will give investors confidence and facilitate their search. Green bonds allow companies, banks, public organizations, etc. to obtain loans from investors to finance and refinance green projects or activities (European Commission, 2018).

In November 2019, Regulation (EU) 2019/2088 on sustainability-related disclosures in the financial services sector defined as sustainable

an investment in an economic activity that contributes to an environmental objective, as measured, for example, by key resource efficiency indicators on the use of energy, renewable energy, raw materials, water and land, on the production of waste, and greenhouse gas emissions, or on its impact on biodiversity and the circular economy, or an investment in an economic activity that contributes to a social objective, in particular an investment that contributes to tackling inequality or that fosters social cohesion, social integration and labour relations, or an investment in human capital or economically or socially disadvantaged communities, provided that such investments do not significantly harm any of those objectives and that the investee companies follow good governance practices, in particular with respect to sound management structures, employee relations, remuneration of staff and tax compliance.

In June 2020, taking into account TEG technical reports (2020a, 2020b), the European Commission published Regulation (EU) 2020/852 establishing criteria for determining whether an economic activity qualifies as environmentally sustainable, called the European Taxonomy or the EU Taxonomy (European Commission, 2020). According to Romo (2021), this regulation was intended to avoid two types of conflicts: first, the coexistence of different national definitions of sustainability, which could fragment

the European market or impede cross-border investment; and second, the possibility that companies and investors exploit looser or less transparent national regulations to label their products sustainable.

Concerning the need to create labels and standards for green financial products, the TEG published a proposal for a European Union Green Bond Standard or EU GBS (Technical Expert Group, 2019) and a usability guide on the EU GBS (Technical Expert Group, 2020c). The European Commission is exploring the possibility of a legislative initiative for the EU GBS in 2021. Both the EU Taxonomy and the financial products labeled as sustainable will allow the financial sector to channel more financial resources towards sustainable activities, helping the European Union to achieve its sustainability objectives.

TOWARDS A COMMON CLASSIFICATION SYSTEM FOR SUSTAINABLE ECONOMIC ACTIVITIES: THE EU TAXONOMY

The early taxonomies arising from private initiatives (Climate Bonds Initiative, 2021a; International Capital Market Association, 2018) led to the incipient growth of the green bonds market. In the following years, various countries, banks, and organizations wrote other taxonomies. However, investment in sustainable activities was not quite taking off, since each taxonomy included a different definition of sustainable economic activity.

Faced with this situation, in 2018, the European Union got down to work and began to develop a system for classifying sustainable activities that would be common to all its member states. After two years of work and the publication of the TEG's final report on the EU Taxonomy and its technical annex on sustainable finance (Technical Expert Group, 2020a, 2020b), the European Parliament approved Regulation (EU) 2020/852 of 18 June 2020 (European Commission, 2020) on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088 (European Commission, 2019a).

The 2020 regulation establishes

the criteria to determine whether an economic activity is considered environmentally sustainable in order to determine the degree of environmental sustainability of an investment and will be applicable to participants in financial markets[1] or issuers, with respect to financial products or emissions of private fixed income that are offered as environmentally sustainable[2], participants in financial markets that offer financial products and companies that are subject to the obligation to publish non-financial statements or consolidated non-financial statements[3]. For this, they must include in their non-financial statements information on the manner and extent to which the company's activities are associated with economic activities that are considered environmentally sustainable following this regulation and, in particular, non-financial companies will disclose information of its turnover that comes from products or services related to economic activities that are considered environmentally sustainable and the proportion of its total fixed assets and its operating expenses related to assets or processes associated with economic activities that are considered environmentally sustainable (European Commission, 2020, Art. 1 and 2).

The EU Taxonomy has been developed with great rigor, providing homogeneous definitions, and is the backbone for the rest of the European Union sustainability regulations needed to meet the climate objectives. It is the first attempt by a policymaker to develop such a comprehensive classification (Climate Bonds Initiative, 2019).

The great European effort in developing its taxonomy is comparable only to that of China. Coinciding with the European taxonomy, the People's Bank of China (PBoC) published its Catalogue of Projects Supported by Green Bonds in 2020 (Climate Bonds Initiative, 2021b). The EU and China have the most advanced taxonomies, although each is based on different areas and different definitions of sustainability. Along with China and the EU, other countries strive to develop their taxonomies as an essential tool to guide their sustainable finance (Almeida, Mork, & Tukiainen, 2020).

But a single taxonomy for the European Union or China is not enough; it is also necessary to establish common ground between the different existing taxonomies at the international level. This great project is being launched with the creation of the International Platform on Sustainable Finance (IPFS), which will see the light in 2021. It will enable comparison and coordination of initiatives and approaches to environmentally sustainable finance while respecting national and regional contexts. The 17 IPFS members—Argentina, Canada, Chile, China, the EU, India, Indonesia, Kenya, Morocco, New Zealand, Norway, Singapore, Japan, Switzerland, Hong Kong, the United Kingdom, and Senegal—represent 55% of global greenhouse gas emissions, 55% of global gross domestic product, and 50% of the world population (Almeida, Mork, & Tukiainen, 2020; European Commission, 2021).

Advantages of Having a Common Taxonomy in the European Union

The EU Taxonomy will increase investor confidence about how to identify green assets and projects or avoid greenwashing. In addition, the taxonomy will be useful for companies that want to measure their environmental impact and want to disclose this information transparently as part of their long-term strategy, and also for financial institutions, municipalities, and central banks. All types of investors will benefit from a common taxonomy that defines quantitative thresholds and standardizes the measures used to assess the sustainability of their portfolios (OCDE, 2020; Romo, 2021), in the following ways.

Reduction of Greenwashing and Information Costs

In the first place, it reduces the risk of greenwashing, that is, the practice of misleading about the company's environmental commitment (Flammer, 2021; Lyon & Montgomery, 2015). The lack of a common public regulation that establishes a consensus on what are considered environmentally sustainable activities has been one of the reasons for the proliferation of greenwashing (Park, 2018).

Second, it brings clarity to the market, reducing investors' research and information costs, and information asymmetries between them and companies. Investors can thus more easily identify which are the most sustainable companies in which to invest (Flammer, 2010; Lyon & Montgomery, 2015; Williamson, 1985). They can then analyze whether their portfolio is aligned with their own sustainability goals or with global goals such as the SDGs. These advantages benefit all types of investors, from retailers to central banks.

Channeling Private Investment Towards Sustainable Activities

A common taxonomy should make it easier for economic operators to obtain cross-border financing for their environmentally sustainable economic activities. Comparing these economic activities against uniform criteria would increase the functioning of the internal market in raising funds for sustainability projects. Differing national requirements would deter cross-border investments because the difficulty of

comparing different investment opportunities would increase costs. In contrast, a single taxonomy would allow financial market participants or issuers to meet specific requirements when labeling a financial product or private bond issue marketed as environmentally sustainable (European Commission, 2020).

Increased Disclosure of Sustainability Information

Environmental information is one of the most relevant issues in the disclosure of nonfinancial information. The EU taxonomy extends the nonfinancial disclosure obligations set out by Directive 2013/34/EU (amended by Directive 2014/95/EU), called the Non-Financial Reporting Directive (NFRD), and Regulation (EU) 2019/2088 on disclosure of information related to sustainability in the financial services sector.

To preserve transparency regarding sustainable investments, Article 8 of the EU Taxonomy establishes that any company that is subject to the obligation to publish nonfinancial information under the NFRD will include in its nonfinancial statements or consolidated nonfinancial statements information on how and to what extent the company's activities are associated with environmentally sustainable economic activities, as defined by the EU Taxonomy itself. The NFRD affects companies of public interest with more than 500 employees, such as listed companies, credit institutions, banks, insurance companies, and other companies designated by national authorities. Nonfinancial companies must disclose the proportions of their turnover, capital expenditure (CapEx), and operational expenditures (OpEx) that come from products, processes, or services related to sustainable economic activities.

In addition, all financial market participants or issuers offering financial products traded in EU financial markets that are offered as sustainable must provide information on sustainability in accordance with the taxonomy (financial products are defined in Article 2.12 of Regulation (EU) 2019/2088 and do not include products such as bonds; see endnote 2). All other conventional products must include a disclaimer clarifying that the underlying investments do not meet the EU Taxonomy criteria on sustainable economic activities (Romo, 2021). This makes it easier for investors to obtain information on companies and participants in the financial market. Also, the taxonomy encourages companies that do not fall within the regulatory framework of the NFRD to voluntarily disclose information about the environmentally sustainable economic activities that they carry out.

On April 21, 2021, the European Commission published a proposal for a Directive on Corporate Sustainability Reporting (CSRD), which will replace Directive 2013/34 / EU. This proposal seeks to increase the dissemination of information about companies' impact on people and the environment and to increase the credibility of the sustainable investment market. The new proposal will expand the number of companies that will be required to report, since all large companies will be included whether or not they are listed, as will all listed small and medium-sized enterprises. Information related to sustainability will no longer be called "nonfinancial."

The Axis of Sustainability: Environmentally Sustainable Economic Activities

Of course, some of a company's activities may be sustainable and others not. Therefore, the axis of sustainability is the activities and not the companies. According to Article 3 of Regulation (EU) 2020/852 (European Commission, 2020), an economic activity will be considered environmentally sustainable if it

1. Contributes substantially to at least one of the six environmental objectives of the EU Taxonomy (Article 9 of Regulation (EU) 2020/852):

a. Climate change mitigation. An economic activity is considered to contribute substantially to climate change mitigation when it tends to stabilize greenhouse gas emissions in the atmosphere by preventing or reducing them or improving their absorption; such an activity must be consistent with the long-term temperature objective established in the Paris Agreement to keep the increase in global average temperature well below 2°C and to continue efforts to limit it to 1.5°C, compared to preindustrial levels.
b. Climate change adaptation. An economic activity is considered to contribute substantially to climate change adaptation when it tends substantially to reduce or prevent current or future adverse climatic repercussions or the risks of these adverse repercussions, whether on the activity itself, people, nature, or assets.
c. The sustainable use and protection of water and marine resources. An economic activity is considered to contribute substantially to the sustainable use and production of water and marine resources when it conduces to the good health of surface, underground, and marine waters or prevents their deterioration when they are already in good condition.
d. The transition to a circular economy. An economic activity is considered to contribute substantially to the transition to a circular economy, in particular to the prevention, reuse, and recycling of waste, when such activity, for example, reduces the use of construction materials and promotes their reuse or the development of circular value chains, in order to maintain products, components, and materials at their maximum level of utility and value for as long as possible, or when it reduces waste in the production, transformation, manufacture, or distribution of food.
e. Pollution prevention and control. An activity contributes substantially to the prevention and control of environmental pollution by, for example, cleaning up abandoned waste or reducing polluting emissions to water, land, or the atmosphere that are not greenhouse gases.
f. The protection and restoration of biodiversity and ecosystems. An economic activity is considered to contribute substantially to this objective by protecting, conserving, and recovering biodiversity and ecosystems and protecting those that are already in good condition.

2. Does not significantly harm any of these objectives. Articles 17 and 18 of Regulation (EU) 2020/852 establish that no activity that contributes significantly to achieving an environmental objective can be sustainable if, in turn, it significantly damages other environmental objectives or does not meet minimum social guarantees. This "do no harm" principle differentiates the EU Taxonomy from other principles or taxonomies.
3. Contributes directly to other activities that make a substantial contribution to one or more of these objectives (Article 16 of Regulation (EU) 2020/852). The inclusion of these "facilitators" is another fundamental difference from other taxonomies.
4. Is carried out in compliance with the basic social safeguards. The activity must align with "the OECD Guidelines for Multinational Enterprises and the UN Guiding Principles on Business and Human Rights, including the principles and rights set out in the eight fundamental conventions identified in the Declaration of the International Labour Organization on Fundamental Principles and Rights at Work and the International Bill of Human Rights," without prejudice to the application of EU regulations when those regulations are stricter in the areas of environment, health and safety, and social sustainability (Article 18 of Regulation (EU) 2020/852). The activity must also comply with the technical screening criteria (TSC), which determine in detail what constitutes

substantial contribution to an objective and what can be considered nonsignificant damage to the other environmental objectives (Article 19 of Regulation (EU) 2020/852).

The TSC for each environmental objective are established through delegated acts. The first delegated act was drawn up by the TEG and published on April 21, 2021; it will come into force in 2022. It analyzes 72 economic activities and states the criteria for determining the conditions under which each one qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives. A second delegated act for the third to sixth objectives (Article 9 of Regulation (EU) 2020/852) will be published in 2022 and will come into force in 2023. These criteria will be quantitative, will contain compliance thresholds, and will harden over time, taking into account the life cycle of the activity and guaranteeing the principle of technological neutrality.

It is necessary (and will soon be done) to extend the current taxonomy to economic activities that do not significantly affect environmental sustainability and those that significantly harm it, as well as to social objectives, of special relevance during the COVID-19 crisis. Thus economic activities could be classified as social, green, nongreen, or an intermediate that neither contributes to nor damages the environment or society (according to the current taxonomy, an unsustainable activity need not be harmful to the environment) (Romo, 2021).

The regulation also expands the transparency obligations of companies that must report nonfinancial information in accordance with the NFRD.

The Platform of Sustainable Finance

In October 2020, the TEG was replaced by the Platform of Sustainable Finance, a permanent group of the European Commission whose composition and duties have been established under Article 20 of the EU Taxonomy. This platform advises the European Commission on the usability of the Technical Screening Criteria (TSC) for the EU Taxonomy and on the revision of the Taxonomy and its extension to other sectors and areas. The platform is composed of 67 experts (57 members and 10 observers) across all stakeholder groups, public as well as private and international institutions.

Successful Implementation: Future Challenges

The EU Taxonomy has become the pillar of European sustainable finance and has represented a great advance on the path towards achieving the sustainability objectives set by the European Union, especially the environmental ones. Its implementation will begin in 2022 with the first delegated act, referring to the first two environmental objectives: mitigation of and adaptation to climate change. Its technical criteria are very rigorous, but this makes it difficult for companies to verify compliance, either for lack of data or because the data are unreliable. It can be particularly costly to verify compliance with the criteria of no significant harm and basic social safeguards, especially in non-EU companies and small or medium-sized companies (Romo, 2021). This difficulty can prevent an economic activity from being classified as sustainable simply for lack of information (especially lack of standardized information). Thus only a small percentage of listed companies can classify their economic activities as sustainable, which reduces the possibility of financing sustainable investments in Europe (Romo, 2021).

In addition, such exhaustive regulation is slow: from the first proposal of the EU Taxonomy in 2018 until the entry into force of the first technical criteria in 2022, four years will pass, although it can be used voluntarily before this date—a process much slower than that of private taxonomies.

Moreover, the current EU Taxonomy is incomplete. Not all economical activities have been considered in the six objectives of significant contribution to the environment, and others must be analyzed that also contribute to sustainability in a significant way. It is also incomplete because it has not analyzed activities that do not have a significant environmental impact and those that damage the environment. Lastly, activities with social objectives are also ignored.

Time will make companies disclose their information according to the taxonomy, and the Sustainable Finance Platform will continue to work on completing and updating the taxonomy.

THE EU GREEN BOND STANDARD (EU GBS)

Before the EU Green Bond Standard

The green bond market took its first steps in 2007, and since then the environmental bond market has seen exponential growth, especially in recent years. Traditionally, both public and private companies have issued bonds in international financial markets to fund their investments. The placement of these bonds depended on the investor's analysis of the issuer's risk (credit risk) as well as its profitability (interest payments). However, the investor did not bother about the use of the funds. Green bonds do provide that information, allowing the investor to be involved in the company's environmental strategies and making the green bond market a powerful force in the development of sustainable finance (Technical Expert Group, 2020c).

The first green bonds were issued in 2007 by the European Investment Bank (EIB). In 2013, the green bond market took off, and the Climate Bonds Initiative (CBI) launched the Climate Bonds Standard (CBS). This standard is regularly updated according to the latest climate science and can be used by any entity looking to identify which assets and activities and associated financial instruments are compatible with the 2-degree global warming target set up by the 2015 Paris Agreement (Climate Bonds Initiative, 2021a).

In 2017, another private initiative, the International Capital Market Association (ICMA), launched a set of practical recommendations to promote transparency and disclosure of information regarding the issuance of green bonds, called the Green Bond Principles (GBP), which were updated in 2018. According to the GBP, which promote the integrity of the green bond market, "green bonds are any type of bond whose funds are used exclusively to finance or refinance, in part or whole, eligible green projects, whether new and/or existing," related to renewable energy, energy efficiency, pollution prevention and control, sustainable management of natural resources, water security, biodiversity conservation, clean transport, adaptation to climate change, and products adapted to the circular economy or green buildings, without being limited to these categories (International Capital Market Association, 2018). The GBP recommends the use of external evaluators to review and confirm a bond's alignment with GBP requirements. The GBP is the main tool used by issuers when placing green bonds (Torres, 2021).

The EU Green Bond Standard

According to H1 2020 data from the Climate Bonds Initiative (Almeida, Mork, & Tukiainen, 2020), the European Union remains the top issuer of green bonds, with France in second place and the Netherlands and Germany in third and fourth places, followed by Spain, in the top five for the first time.

The European Union has proposed to standardize the concept of the green bond and provide it with a legal framework. The proposal, made by the TEG, is based on widely used best market practices such as the CBS and the GBP. The European Commission is exploring the possibility of a legislative initiative for a European Green Bond Standard (EU GBS), based on the TEG Final Report. Consultations and dialogues with stakeholders have been conducted, and all that remains is for the Commission to present a legislative proposal in 2021.

The EU GBS will be not an official standard; it will be a voluntary standard for use by market participants, and it will coexist with other green bond standards. It can be adapted to listed or unlisted bonds and capital market debt instruments issued by financial and nonfinancial entities, whether sovereign, European, or international, and whether public or private.

The TEG proposes, first, that the projects to be funded by green bonds be aligned with the EU Taxonomy. The EU GBS has been developed in parallel to the taxonomy because the latter does not directly affect bonds: under the taxonomy "financial market participants" are those that generate investment-based products such as investment funds, and an issuer of fixed-income securities is not considered a "financial market participant" (Technical Expert Group, 2020a).

Second, before the issuance of a European green bond, the issuer must publish a Green Bond Framework (GBF), explaining to investors and other market participants the alignment of the bond with the EU GBS (Technical Expert Group, 2020c).

Third, the issuer must submit two types of reports: allocation reports and impact reports. Both the Green Bond Framework (GBF) and at least the final fund allocation report must be externally verified.

The funds must be used exclusively to finance or refinance, in part or in full, new or existing green projects aligned with the EU Taxonomy. In this way, investors can determine which companies are working for environmental purposes.

According to the TEG (2020c), green projects can include

1. Green assets: physical and financial assets such as loans. Green assets can be tangible or intangible.
2. Green expenditures: capital expenditure (CapEx) and selected operating expenditures (OpEx) such as maintenance costs related to green assets, that increase either the lifetime or the present or future value of the assets, as well as research and development costs.
3. Green expenditures of sovereign and subsovereign entities: relevant public investments, subsidies, and expenditures.

Although the EU Taxonomy is designed to identify environmentally sustainable economic activities using the statistical classification of economic activities in the European Community, it can be applied at project level, as is required under the EU GBS. Issuers of green bonds must identify potential green projects and check the Technical Screening Criteria (TSC) to identify environmentally sustainable economic activities. The TEG proposes that the alignment of the green bond with the EU GBS must be verified by an authorized, supervised, or registered verifier. Until the European Securities and Markets

Authority (ESMA) can legally direct supervision, a voluntary registration of verifiers of green bonds may be set up for a transition period of up three years (Technical Expert Group, 2020a).

Certified green bonds issuing involves a higher cost for the issuer than issuing traditional bonds. However, as of 2020, there is evidence that investors are willing to pay a higher price for these green bonds than traditional bonds. On the one hand, the issuer can pass on the cost of green bond certification (green premium or greenium) to the investor. On the other hand, the investor is willing to pay this premium because the green bond conveys information about the issuing company's sustainability efforts, which will result in lower risk in the future (Harrison & Muething, 2021).

An investor who acquires green bonds in accordance with the EU GBS will be able to report that the corresponding portion of their portfolio is 100% aligned with the EU Taxonomy. It is expected that this alignment of the EU GBS with the EU Taxonomy will allow the growth of Europe's green bond market, which still represents a very small percentage of total bonds issued.

Future Challenges: EU Social, Sustainable, and Pandemic Bonds Standards

BBVA Global Markets Research (2021) estimates that the size of the green, social, and sustainable bond market in 2020 was close to USD 1 trillion, equivalent to an estimated 0.86 percent of total outstanding bonds, despite the market volatility caused by Covid-19. However, the sustainable bond market structure has changed in favor of social bonds.

The sustainable debt market grew in the first half of 2020 (USD 250 billion in six months versus USD 341 billion for the full year of 2019), but its composition is noticeably different. Until 2019, green bonds were the principal type of sustainable debt. In 2020, the sustainable bond market was more divided among green, social, and pandemic bonds; pandemic issuers were more than double green bond issuers (447 vs. 221, respectively) and represented around half of the total sustainable debt market (Almeida, Mork, & Tukiainen, 2020).

The most significant difference between green and social bonds and other, "regular" bonds is their intended use, so to distinguish between them one must employ a transparent and reliable method of evaluating the investment project. Currently, the European Union is concerned only with the development of the EU Green Bond Standard. That standard has many advantages over private initiatives, in particular, the rigor of its development. However, it has the disadvantage of being slower to adapt to new formats of sustainable instruments. Private groups such as the Climate Bonds Initiative or ICMA adapt more quickly to the emergence of new kinds of sustainable debt and create labels for them like social, sustainable, or pandemic bonds or sustainability linked bonds.[4]

In 2020 the International Capital Market Association published voluntary process guidelines for the issuance of social bonds. According to its Principles of Social Bonds (SBP), social bonds are any type of bond instrument where the proceeds will be applied exclusively to finance or refinance, in part or in full, new and/or existing eligible social projects, including, but not limited to, providing and promoting affordable basic infrastructure, access to essential services, affordable housing, employment generation and programs designed to prevent unemployment, food security and sustainable food systems, and socioeconomic advancement and empowerment (International Capital Market Association, 2020).

IN SUMMARY

The European strategy for sustainable finance can be summarized in Figure 1, which lists the following steps.

1. In 2018, the European Commission published its Action Plan: Financing Sustainable Growth (European Commission, 2018) and set up a Technical Expert Group (TEG) on sustainable finance to assist its implementation.
2. In 2019, Regulation (EU) 2019/2088 on sustainability-related disclosures in the financial services sector was published to define sustainable investment.
3. In June 2019, the TEG Final Report on the EU Green Bond Standard was published.
4. In March 2020, the TEG published its Final Report on the EU Taxonomy and Technical Annex.
5. In March 2020, the TEG published the EU Green Bond Standard Usability Guide.
6. In June 2020, the European Commission published the EU Taxonomy or Regulation (EU) 2020/852, establishing criteria for determining whether an economic activity qualifies as environmentally sustainable (European Commission, 2020).
7. In October 2020, the TEG was replaced by the Platform of Sustainable Finance.
8. In April 2021, delegated acts with technical screening criteria on climate change mitigation and adaptation objectives (Technical Expert Group, 2021) and proposal for a Directive on Corporate Sustainability Reporting (CSRD) were adopted.
9. During 2021, the legislative initiative for an EU GBS is in the consultation period.
10. In January 2022, the first delegated acts will come into force and the second delegated acts with technical screening criteria on remaining environmental objectives will be adopted.
11. In 2022, the second delegated acts with technical screening criteria will be adopted.
12. In 2023, the second delegated acts with technical screening criteria will come into force.

CONCLUSION

The EU's recent regulation in the field of sustainable finance highlights the need to guarantee transparency about the financing of sustainable economic activities. However, the rigor sought by the public initiative implies a lot of bureaucracy and that private associations and organizations go ahead when establishing criteria and principles applicable by participants in financial markets.

The EU Taxonomy is a pioneering regulation that identifies and classifies environmentally sustainable economic activities. This taxonomy will reduce greenwashing and investors' information costs, and will improve the disclosure of sustainability information. It will be useful for companies that want to disclose their environmental impact transparently as part of their strategy, and also for investors, participants in the financial market, financial institutions, municipalities, and central banks. One of its most novel aspects is the "do no harm" principle, which establishes that no activity, even if it contributes significantly to achieving an environmental objective, can be sustainable if it significantly damages other environmental objectives or does not meet minimum social guarantees.

The European Union has established a clear sustainable finance strategy, which it has started to develop through the EU Taxonomy and the EU Green Bond Standard. However, the pandemic makes it

increasingly necessary to extend the taxonomy to socially sustainable activities to promote investment and financing of both environmentally and socially sustainable projects.

Figure 1. European Union sustainable finance strategy
Source: Compiled by authors from European Union regulations

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KEY TERMS AND DEFINITIONS

Delegated Acts: Nonlegislative acts adopted by the European Commission to modify and/or supplement legislation.

Green Bonds: Bonds whose funds are used exclusively to finance or refinance, in part or in full, green projects with a positive impact on the environment.

Green Financial Products: Financial products issued by institutional investors (such as insurance companies, pension funds, or investment funds) whose funds are used to reinvest in financial products issued by companies exclusively to finance green projects with a positive impact on the environment.

Greenium: The premium over green bond prices, i.e., the spread between green and non-green bonds of the same issuer.

Pandemic Bonds: Bonds designed and issued by the World Bank in 2017 with the objective that, in the event of a pandemic, necessary financing should reach countries with fewer resources.

Social Bonds: Bonds whose funds are used exclusively to finance or refinance, in part or in full, social projects with a positive impact on society.

Sustainable Bonds: Bonds whose funds are used exclusively to finance or refinance, in part or in full, a combination of both green and social projects with a positive impact on the environment and society.

ENDNOTES

1 A financial market participant is (art. 2.1) "(a) an insurance undertaking which makes available an insurance-based investment product (IBIP); (b) an investment firm which provides portfolio management; (c) an institution for occupational retirement provision (IORP); (d) a manufacturer of a pension product; (e) an alternative investment fund manager (AIFM); (f) a pan-European personal pension product (PEPP) provider; (g) a manager of a qualifying venture capital fund registered in accordance with Article 14 of Regulation (EU) No 345/2013; (h) a manager of a qualifying social entrepreneurship fund registered in accordance with Article 15 of Regulation (EU) No 346/2013; (i) a management company of an undertaking for collective investment in transferable securities (UCITS management company); or (j) a credit institution which provides portfolio management" (European Commission, 2019b).

2 A financial product is (art. 2.12) "(a) a portfolio managed in accordance with point (6) of this Article; (b) an alternative investment fund (AIF); (c) an IBIP; (d) a pension product; (e) a pension scheme; (f) a UCITS; or (g) a PEPP" (European Commission, 2019b).

3 Therefore, the taxonomy does not affect financial products such as bonds.

4 Performance or KPI-linked debt instruments. They do not finance a specific pool of assets and projects, but raise general-purpose finance (Almeida, Mork, & Tukiainen, 2020).

Chapter 7
Green Certification, Credit Rating, and Mainland Chinese Green Bonds in Hong Kong

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ABSTRACT

This chapter discusses green certification and credit rating on Mainland Chinese green bonds in Hong Kong. These green bonds are mostly denominated in USD, distributed to global investors, and issued with international practices of green certification and credit rating. Using qualitative analysis and case study method, the chapter finds four external reviewers sharply different in their assessment framework although they attempt to assess degree of compliance of a bond issuance or a bond issuer with some international green standards. All the three global credit rating agencies claim their incorporation of green assessment into their credit rating process. However, the chapter finds no clear evidence on such claim from their credit rating comments on selected bond issuers.

INTRODUCTION

For the past 10 years, green bonds have been developed to address climate change issues. They become an asset class well recognized by many institutional investors and wealthy families/individuals. Many countries and regions also support this market development.

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Green Bonds in the Global, Mainland China and Hong Kong Markets

According to the statistics provided by Climate Bonds Initiative, worldwide green bond issuance reached US$269.5 billion in 2020. The following statistics list out the top 10 domestic markets for green bond issuance:

1. United States (US$51.1bn)
2. Germany (US$40.2bn)
3. France (US$32.1bn)
4. China Mainland (US$17.2bn)
5. Netherlands (US$17.0bn)
6. Sweden (US$13.3bn)
7. Japan (US$10.3bn)
8. Canada (US$9.0bn)
9. Spain (US$ 8.7bn)
10. Norway (US$.5.6bn)

Although green bonds are well-accepted investment assets today, green bond market does have its relatively short history. The World Bank issued the first green bond in 2007. At that time, Climate Bond Initiative (CBI) was set up to become an organization to certify green bonds. Later, International Capital Market Association (ICMA), an industry-based organization for major bond market participants, developed its Green Bond Principles (GBP) in 2014. This GBP helped accelerate the growth of green bond issuance. In 2012, the total amount of green bond issuance in the global market was just around US$2.1 bln. It grew to US$12.6 bln in 2013, to US$32.7 bln in 2014, and to US$36.7 bln in 2015. In 2016, it reached US$81.6 bln. In 2020, it was over US$260 bln. These figures illustrate exponential growth of the global green bond market.

China domestic bond market had no green bond issuance until 2016. In December 2015, China announced two new policy and regulatory documents to support green bond issuance, namely (a) "Green Bonds Endorsed Project Catalogue" of the People's Bank of China (the central bank of China), and (b) "Guidance on Green Bond Issuance" of the National Development and Reform Commission (NDRC). After these two documents, new green bond issuance in China Mainland reached US$36.2 billion in 2016. As reported by Fitch (Fitch 2020b), the cumulative market size of green bonds in China grew to US$164.9 billion at the end of November of 2020. Data from Climate Bonds Initiative shows that, in 2020, Mainland Chinese companies have more than 200 green bonds issued. These green bonds raised new capital of around US$22 billion in both the China domestic bond market and offshore (or international) bond market. To support the development of the green bond market, China implements its own rules on green bond certification and bond issuance. Summarizing all related laws and regulations in China, Zhang (2020) points out that, although China definitions on green bonds are in line with standards, China practices are slightly different from global practices in terms of eligible uses of proceeds from bond issuance and information disclosures.

Hong Kong, as an international financial centre, had its first green bond issued in late 2015. The issuer was a Hong Kong subsidiary of a Mainland Chinese corporation. Its notional amount was US$300 million. According to CBI (2021), there was around US$12 bln green debts issued in 2020 in Hong Kong, in which US$1.3 bln were loans and others were bonds. These green debt issuers in 2020 came

from Germany, Philippines, Singapore, UK, India, Australia, Hong Kong, Mainland China and others. Mainland Chinese green bond issuers accounted for 60.3% in terms of new issuance amount, while Hong Kong issuers accounted for 25.9%. With regard to currency denomination, 69% of the green bond issuance in Hong Kong belonged to USD and 20.4% belonged to HKD. The remaining issuance (around 10.6%) was denominated in either Euro, Renminbi or Australian Dollar. Hong Kong conventionally follows international financial rules and attracts global investors. Those Mainland Chinese green bond issuers are required to follow international standards on bond issuance in Hong Kong.

Academic Research on Green Bonds

In fact, there is very limited academic research on green bonds before 2018. Previous studies relevant to green bonds are mainly studies on corporate social responsibilities and ESG disclosures. However, they are irrelevant to green bonds certified with either CBI standards or ICMA GBP.

Kilo (2019) is one of the earlier works on green bonds, addressing the issues on how green bonds could tackle climate changes, the characteristics of green bonds, and those possible growth factors of the green bonds market. With more market data on green bonds available in recent years, researchers began to analyse green bond pricing. Some studies, for instance, Elders and Packer (2017), Hachenberg and Schierech (2018), Karpf and Mandel (2018), Agliardi and Agliardi (2019), and Zerbib (2019), find that green bonds have negative premium on their yields. That means, given the same bond issuers, green bonds offer lower yields than ordinary bonds. This negative premium is known as greenium. There are two financial implications on the greenium. First, bond investors are willing to ask for lower yields in order to invest for "good" reasons. Second, corporate bond issuers are able to reduce their funding costs if they issue green bonds rather than ordinary bonds. However, Tang and Zhang (2018) finds find no negative premium on green bonds' yields but finds positive stock price reactions to green bond issuance for the first-time green bond issuers. It means that green bond issuance adds value to shareholders. Either less funding costs or better share prices or both are good news to green bond issuers. Studying around 1200 green bonds from 400 issuers, Flammer (2021) concludes that green bond issuance announcements attract investors' positive response. These announcements signal that the green bond issuers have strong commitment on environment protection and attract "an investor clientele—such as long-term and green investors—that values the environment".

Studies on US municipal bonds, for instance, Partridge and Medda (2018), find that green bonds do offer better return than ordinary bonds. Their better returns come from capital gains (i.e. bond price appreciation). Probably it is a result of continuously growing demand for green bonds. Li and et. al. (2020) studies 58 Mainland Chinese green bond issuers in China domestic bond market and finds that credit ratings, corporate social responsibility (CSR), and green certification have their significant impact on yield spreads of the China bonds. This suggests green bond pricing in Mainland China is not just a result of credit quality. Green certification helps lower bond yields and increase bond prices.

Research Objectives

China Mainland has much larger green bond market size than Hong Kong. However, China domestic green bond issuance follows mainly China domestic rules. This article shifts its focus to Mainland Chinese green bonds in the Hong Kong bond market. This market can be known as an offshore bond market of Mainland Chinese issuers. These green bond issuers are Mainland Chinese corporations with most of

(or almost all) their operation in Mainland China. These corporations may have been publicly-listed on the Hong Kong exchange or may have their subsidiary offices in Hong Kong to deal with international financial matters. Currently only a small number of Mainland Chinese issuers have their offshore green bonds issued in Hong Kong. However, each of their issuance amounts tends to be very sizable.

Mainland Chinese offshore green bonds generally help their issuers get some better financial benefits than ordinary bonds. The keys of green bond issuance in the international market include both green bond certification and credit rating. Mainland Chinese offshore green bonds without proper certification and recognized credit rating would be hard to attract global buyers. However, very few studies discuss how those Mainland Chinese green bonds get green bond certification in Hong Kong and how international credit rating agencies consider "green" components in assigning credit rating to these green bonds. Applying a qualitative approach with selected case studies, the article examines green certification standards on those Mainland Chinese green bonds in Hong Kong and evaluates how international credit rating agencies deal with green or ESG issues in assessing the risk of these Mainland Chinese offshore green bonds.

This chapter will firstly discuss the development of Mainland Chinese offshore green bonds and the Hong Kong green bond market respectively, as well as underlying government policies and related incentive schemes for green bond issuance. Both China Mainland and Hong Kong governments are proactive in supporting green bond market development although their underlying agendas differ.

Since most green bonds go through external review or external certification. The chapter will further evaluate how external reviewers certify Mainland Chinese green bonds issued in Hong Kong. Currently two global credit rating agencies, namely S&P and Moody's, provide green finance certification framework to assess the international green bonds in Hong Kong. Most of international green bonds are denominated in US dollar. Sustainalytics, an active ESG rating and research company acquired by Morningstar in 2020, provides a green certification scheme in the Hong Kong green bond market. Hong Kong Quality Assurance Agency (HKQAA), a local government-supported company in Hong Kong, also promotes a green finance certification scheme.

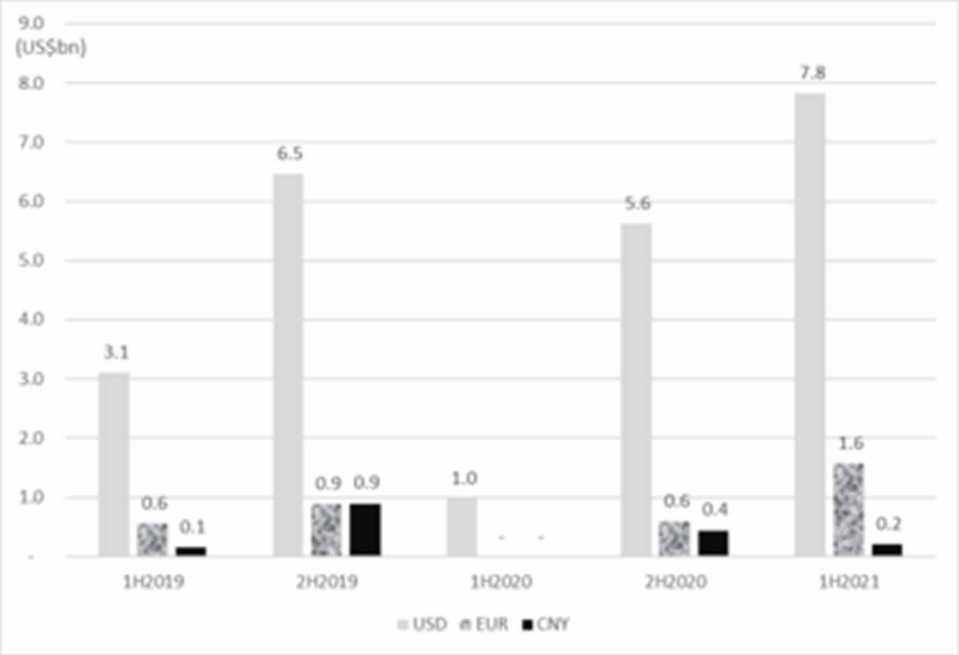
The last issue to be addressed in this chapter is association between credit rating and green certification. Will international credit rating agencies incorporate ESG rating or green rating into their credit rating outcomes on Mainland Chinese bond issuers? Although the credit rating agencies claim the incorporation of ESG issues in their credit rating, there is no clear evidence on such claim.

Green bond market will have much potential to grow further in both China Mainland and Hong Kong. In the global bond market, as well as Hong Kong bond market, there were increased number of green bond issuance during the pandemic period in 2020 and 2021. The pandemic may have driven investors' interest in environment and in green bonds. Mainland Chinese offshore green bonds will continue to grow in Hong Kong. This article can contribute to understanding of the practices of green bond certification and credit rating on green bonds in the Hong Kong bond market.

MAINLAND CHINESE OFFSHORE GREEN BOND ISSUANCE

The China government's pledge to reach peak carbon emissions by 2030 and achieve carbon neutrality by 2060, together with the global appetite for ESG investment, causes green and sustainable bonds to become an increasingly important part of the Mainland Chinese offshore bond market. There were 27 Mainland Chinese offshore green and sustainable issuances for the first half (1H) of 2021, which already

Figure 1. Total issuance amount of China offshore green bonds (2019-2021)
Note: 1H (first-half year); 2H (second-half year)
Data source: Bloomberg



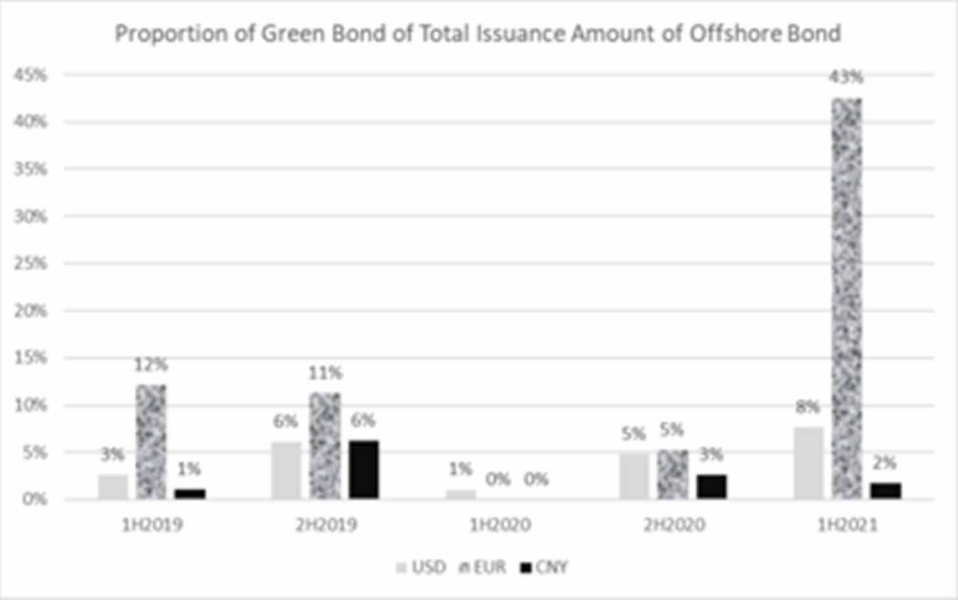
exceeded the total 18 issuances for 2020. The 27 offshore issuance comprises USD7.8 billion (24 issuances), EUR1.6 billion (2 issuances) and CNH208 million (one issuance). CNH is the offshore Renminbi in Hong Kong. The major green and sustainable issuance sectors for 2021 include financial institutions and real estate. Figure 1 summarizes the total amount of Mainland Chinese offshore green bonds, mostly issued in Hong Kong in 2019-2021. Issuance denominated in US Dollar is the most popular. Figure 2 summarizes the percentage of China offshore green bonds with respective to total China offshore bonds. In 1H2021, over 40% of China offshore green bonds denominated in Euro are green bonds.

China zero carbon policy likely attracts more green bond issuances and more international funds investing in Mainland Chinese offshore green bonds. While the green and sustainable bond yields may not differ much from the non-green/non-sustainable bond yields, such green and sustainable issuance definitely helps enlarge their investor base, especially from the European green dedicated funds.

Contrary to the top-level design of China domestic green bond market, the development of Mainland Chinese offshore green and sustainable bonds is mostly driven by corporate social responsibility, and the bond issuance framework is mostly in line with the international green and sustainable standards.

Some Mainland Chinese property developers have their green and sustainable financing frameworks established, which detail the use of proceeds for eligible green projects, green project evaluation and selection, management of green issuance proceeds, and proceed allocation reporting, to guide the Mainland Chinese property industry towards sustainability. Examples of Mainland Chinese property developers which issued green and sustainable bonds and notes in 2021 include, but are not limited to, Agile Group Holdings Limited, CIFI Holdings (Group) Co. Ltd., Redco Properties Group Limited, Redsun Properties Group Limited, Shinsun Holdings (Group) Co., Ltd. and Sinic Holdings (Group) Company Limited.

Figure 2. Percentage of mainland Chinese offshore green bond to total mainland Chinese offshore bonds
Note: 1H (first-half year); 2H (second-half year)
Data source: Bloomberg



HONG KONG GOVERNMENT POLICIES ON GREEN BONDS

Hong Kong, as an international financial centre and an international city of China, actively supports the development of green bond market. In 2020, there were 18 green bonds issued in Hong Kong. Many of these issuers came from Mainland Chinese corporations with their issuances denominated in US dollar, Euro and offshore Renminbi. These green bonds raised a total capital of around US$8.5 billion. In January of 2021, Hong Kong government issued its own green bonds with a total capital of US$2.5 billion.

Green bonds issued in Hong Kong mostly solicit external reviews to certify their compliance with green bond standards. One commonly-applied green bond standard is the Green Bond Principles (GBP) of ICMA (International Capital Market Association). With external certification, green bond issuers of China and Hong Kong can quickly address the interest of international investors. Certification by international reviewers tends to more recognized by these investors.

In 2016, the Hong Kong Government via the Hong Kong Quality Assurance Agency (HKQAA) formally launched a green finance certification scheme, establishing an independent certification framework for entities seeking to raise green financing within the Hong Kong. Under the green finance certification scheme, the HKQAA makes references to a number of recognised standards on green finance, including international standards such as the ICMA GBPs and China national standards.

To further promote the Hong Kong green finance certification scheme, the Hong Kong Government announced its first-ever Hong Kong green bond grant scheme in June 2018, as promulgated in the 2018-19 Budget, to subsidise eligible green bond issuers in obtaining the HKQAA certification, which aims to encourage green bond issuances to make use of Hong Kong's competitive capital markets and sophisticated financial and professional services.

The full cost of obtaining certification under the scheme for eligible green bond issuances will be granted, up to a maximum of HKD800,000 per bond issuance. First time and repeated issuers with their green bonds of any tenor issued and listed in Hong Kong, and denominated in any currency at a minimum size of HKD500 million (or the equivalent in foreign currency), can apply. The scheme was valid for a period of three years.

In September 2018, the Hong Kong Securities and Futures Commission (SFC) also issued the strategic framework for green finance, which covers three major areas: (i) enhancing listed company, asset manager and investment product disclosures and their consideration of ESG factors, especially environmental and climate risks; (ii) facilitating the development of green or ESG-related investment products, and supporting investor awareness and capacity building, and; (iii) promoting Hong Kong as an international green finance centre. The SFC has established an internal cross-divisional working group to consider policies to develop Hong Kong as a green finance hub.

In 2019, the Hong Kong Government formally established its first government green bond programme and carried out a green bond issuance under the established programme. The inaugural green bond received the green finance certificate (pre-issuance stage) from HKQAA.

Following a roadshow in major international financial centres including New York, London, Paris, Amsterdam, Frankfurt and Hong Kong, the issuance attracted orders more than four times the issuance size, including many green investors who are signatories to the Principles for Responsible Investment or investors who incorporate ESG factors into investment decisions, with the aim of better managing risk and generating sustainable, long-term returns. 50% of the green bonds was distributed to Asia, 27% to Europe and 23% to the United States.

This green bond was included in four major indices - Bloomberg MSCI Barclays Green Bond Index, the BAML Green Bond Index, the S&P Green Bond Index and the Solactive Green Bond Index. The issuance won the award of "Asia Pacific Green/ SRI Bond Deal of the Year" presented by GlobalCapital, FinanceAsia's "Sustainable Deal of 2019" and "The Asset Country Awards 2019 Best Government Bond Hong Kong Sustainable Finance" by The Asset.

In May 2020, the SFC initiated the establishment of the Green and Sustainable Finance Cross-Agency Steering Group (CASG) to accelerate the growth of green and sustainable finance in Hong Kong and support the Government's climate strategies. Co-chaired by the SFC and the Hong Kong Monetary Authority (HKMA), the group comprises the Financial Services and the Treasury Bureau, the Environment Bureau, Hong Kong Exchanges and Clearing Limited (HKEX), the Insurance Authority and the Mandatory Provident Fund Schemes Authority.

In May 2021, the HKMA released a guideline on the green and sustainable finance grant scheme as announced in the 2021-22 Budget, to provide subsidy for eligible bond issuers and loan borrowers to cover their expenses on bond issuance and external review services. The scheme consists of two tracks, covering:

- General bond issuance costs: covering bond issuance expenses (e.g. arrangement, legal, audit, listing fees, etc.) for eligible first-time green and sustainable bond issuers; and
- External review costs: covering transaction-related external review fees (e.g. including pre-issuance external review and post-issuance external review or reporting) for eligible green and sustainable bond issuers and loan borrowers, including first-time and repeated issuers and borrowers.

The eligible issuers/borrowers include green and sustainable bond issuers and loan borrowers, including first-time and repeated issuers and borrowers. The grant amount includes the full cost of eligible expenses paid to recognised external reviewers, capped at HKD800,000 per bond issuance/loan. It will commence on 10 May 2021 and last for three years. To qualify for the scheme, a bond or loan must be issued on or after 10 May 2021.

The eligible green and sustainable bonds must satisfy the following criteria:

- having procured pre-issuance external review services related to the bond issue that is provided by a recognised external reviewer;
- being issued in Hong Kong;
- having an issuance size of at least HKD200 million (or the equivalent in foreign currency);
- being lodged with and cleared by the CMU in its entirety, or being listed on the SEHK; and
- being, at issuance, issued in Hong Kong to (i) 10 or more persons or (ii) less than 10 persons none of whom is an associate of the issuer.

The eligible green and sustainable loans must satisfy the following criteria:

- having procured pre-issuance external review services related to the loan that is provided by a recognised external reviewer;
- being issued in Hong Kong; and
- having a loan size of at least HKD200 million (or the equivalent in foreign currency).

GREEN BONDS AND EXTERNAL REVIEWS

Green bonds are any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance, in part or in full, new and/or existing eligible green projects. Certain green projects may have social co-benefits. Proceeds from green bonds should be spent on green projects specified by the issuers. Green bond issuers may simply label their bonds as green bonds as there is no mandatory requirement to get green certification. However, most international institutional investors are inclined to invest in those green bonds with certification by recognized external reviewers. The ICMA's Green Bond Principles (GBP) are widely adopted as green certification standards in international capital market. GBP has four core components:

(a) Use of proceeds
(b) Process for project evaluation and selection
(c) Management of proceeds
(d) Reporting

External reviewers mostly play their role to certify the alignment of bond issuances and/or bond issuers with these four core components. Services of the reviewers can include: second party opinion, verification, certification, and/or green bond scoring/rating. These services are discussed further in the following paragraphs:

- Second Party Opinion: An institution with environmental expertise, that is independent from the issuer, may issue a second party opinion. The institution should be independent from the issuer's adviser for its green bond framework, or appropriate procedures, such as information barriers, will have been implemented within the institution to ensure the independence of the second party opinion. It normally entails an assessment of the alignment with the GBP. In particular, it can include an assessment of the issuer's overarching objectives, strategy, policy and/or processes relating to environmental sustainability, and an evaluation of the environmental features of the type of projects intended for the use of proceeds.
- Verification: An issuer can obtain independent verification against a designated set of criteria, typically pertaining to business processes and/or environmental criteria. Verification may focus on alignment with internal or external standards or claims made by the issuer. Also, evaluation of the environmentally sustainable features of underlying assets may be termed verification and may reference external criteria. Assurance or attestation regarding an issuer's internal tracking method for use of proceeds, allocation of funds from green bond proceeds, statement of environmental impact or alignment of reporting with the GBP, may also be termed verification.
- Certification: An issuer can have its green bond or associated green bond framework or use of proceeds certified against a recognised external green standard or label. A standard or label defines specific criteria, and alignment with such criteria is normally tested by qualified, accredited third parties, which may verify consistency with the certification criteria.
- Green Bond Scoring/Rating: An issuer can have its green bond, associated green bond framework or a key feature such as Use of Proceeds evaluated or assessed by qualified third parties, such as specialised research providers or rating agencies, according to an established scoring/rating methodology. The output may include a focus on environmental performance data, the process relative to the GBP, or another benchmark, such as a 2-degree climate change scenario. Such scoring/rating is distinct from credit ratings, which may nonetheless reflect material environmental risks.

In June 2021, the ICMA issued its GBP 2021 edition, which is expected to become the new industry standard for sustainable bond issues in the post-Covid-19 pandemic era. This new edition includes:

(a) two key recommendations on the bond framework and external reviews, designed to increase transparency alongside the four core components;
(b) a recommendation of heightened transparency for issuer-level sustainability strategies and commitments; encouragement to supply information, if relevant, on the degree of alignment of projects with official or market-based taxonomies; promotion of transparency on issuer processes to identify and manage perceived and known social and/or environmental risks; and
(c) links and references to the complementary guidance of the climate transition finance handbook, the harmonized framework for impact reporting, and the guidelines for external reviews, which are supplemented by the guidance handbook.

At the same time, the ICMA also issued new illustrative examples on the selection of key performance indicators for sustainability-linked bond issuers, underwriters and investors; a pre-issuance checklist for social bonds/social bond programmes; new guidelines for green, social, sustainability and sustainability-linked bond impact reporting databases; new impact reporting metrics for circular economy and/or eco-

efficient projects; an update of the green project mapping to GBP environmental objectives and other green classifications; and an update to the comprehensive GBP guidance handbook.

GREEN CERTIFICATION APPROACHES

Even though GBP are widely used for green certification, external reviewers do differ in their certification approaches. This section summarizes the approaches of Moody's, S&P, Sustainalytics, and HKQAA on their green certification frameworks and rating products. The case of CIFI, a Shanghai-based company with offshore green bonds issued, is used in this section for illustration of the different approaches of external reviews.

Moody's Green Bond Assessment (GBA)

Moody's GBA provides forward-looking opinions of relative effectiveness of an issuer's approach for managing, administering, allocating proceeds to and reporting on environmental projects financed by green bonds. Moody's GBA assesses relative likelihood that bond proceeds will be invested to support environmentally beneficial projects as designated by an issuer. Moody's (Moody's 2019) considers the following factors in its GBA scorecard model:

1. Organization (15%)
2. Uses of proceeds (40%)
3. Disclosure on the use of proceed (10%)
4. Management of proceeds (15%)
5. Ongoing reporting and discourse (20%)

The percentages in the brackets are factor weightings. Moody's assigns 1 (very good) to 5 (very poor) to each factor and calculates a weighted average score. Its rating grades, GBA scores and opinions are shown in Table 1.

In general, Moody's analysts apply their qualitative analysis on related information and make judgmental decisions on the factors.

S&P Green Evaluation (GE)

Green Bond Principles provide a framework of recommended processes and measures that an issuer may use as the basis for self-labelling its bond green. S&P Green Evaluation (GE) is a point-in-time second opinion about relative environmental impact of a financing based on S&P GE analytical approach aligned with the Green Bond Principles. The evaluation of a transaction involves the assessment of transparency, governance, and relative net environmental impact or mitigation on a scale of 0 to 100. S&P combines these three elements to provide a final green evaluation score from 0 to 100. These scores are categorized into Grades E1 to E4.

S&P GE is not limited to issuer self-labelled green bonds. S&P also evaluates unlabelled bonds, equity transactions, bank loans, private placements, project finance debt, hybrids, portfolios, asset-backed securities, and other financial transaction types. As a point-in-time assessment, S&P GE is in part based

Table 1. Moody's Green Bond Assessment: Grades and opinions

Grade	Score Range	Opinion
GB1	≤ 1.5	Green bond issuer has adopted an excellent approach to manage, administer, allocate proceeds to and report on environmental projects financed with proceeds derived from green bond offerings. Prospects for achieving stated environmental objectives are excellent.
GB2	1.5 to 2.5	Green bond issuer has adopted a very good approach to manage, administer, allocate proceeds to and report on environmental projects financed with proceeds derived from green bond offerings. Prospects for achieving stated environmental objectives are very good.
GB3	2.5 to 3.5	Green bond issuer has adopted a good approach to manage, administer, allocate proceeds to and report on environmental projects financed with proceeds derived from green bond offerings. Prospects for achieving stated environmental objectives are good.
GB4	3.5. to 4.5	Green bond issuer has adopted a fair approach to manage, administer, allocate proceeds to and report on environmental projects financed with proceeds derived from green bond offerings. Prospects for achieving stated environmental objectives are fair.
GB5	> 4.5	Green bond issuer has adopted a poor approach to manage, administer, allocate proceeds to and report on environmental projects financed with proceeds derived from green bond offerings. Prospects for achieving stated environmental objectives are poor.

Source: Moody's (2019)

on an estimate of the expected lifetime net environmental impact of a project should it perform to an industry average. S&P does not maintain any ongoing surveillance on a green evaluation.

The case of CIFI, a Shanghai-based company in property development and investment, can illustrate on how S&P GE is done. According to S&P GE report on CIFI (S&P 2020a), CIFI requires all properties to meet at least the national one-star green standard. The company has developed a green finance framework (GFF) to ensure funding projects that deliver positive environmental impact, while fostering sustainable practices. Eligible projects of CIFI must align with the company's objective to promote sustainable environment development and to provide future generations with a clean planet. In S&P's viewpoint, CIFI's GFF is aligned with the four components of the Green Bond Principles.

S&P GE considers three factors in its scoring (S&P 2021b): Transparency, Governance, and Mitigation/Adaptation. Transparency evaluates both use of proceed reporting and reporting comprehensiveness. Governance considers both management of proceeds and impact assessment structure. Mitigation considers effectiveness of environmental protection, while Adaptation evaluates effectiveness of resilience (such as flood defence or asset protection). S&P eventually assigns CIFI Grade E1 with a GE score at 87. E1 is the highest GE rating in the S&P green certification framework. It is obvious that S&P analysts go through qualitative analysis on related information of CIFI's green practices and draw their final GE conclusion on CIFI.

Sustainalytics Second-party Opinion (SPO)

Sustainalytics SPO provides independent opinion on the alignment of the reviewed framework with the current market standards and the extent to which the eligible categories are credible and impactful. As a part of the second-party opinion, Sustainalytics assesses on the basis of the following principles:

- The framework's alignment with the GBP 2018, Social Bond Principles 2020, and

- Sustainability Bond Guidelines 2018, as administered by ICMA;
- The credibility and anticipated positive impacts of the use of proceeds;
- The alignment of the issuer's sustainability strategy and performance and sustainability risk management in relation to the use of proceeds.

Sustainalytics SPO, while reflecting on the alignment of the framework with market standards, does not guarantee alignment with future versions of relevant market standards. Sustainalytics SPO addresses anticipated impacts of eligible projects expected to be financed with bond proceeds but does not measure actual impacts. In addition, SPO opines on the intended allocation of proceeds but does not guarantee realised allocation of the bond proceeds towards eligible activities.

Sustainalytics also analyses CIFI, the green bond issuer in Shanghai. According to its SPO report on CIFI (Sustainalytics 2020), CIFI has its Green Finance Framework (GFF) developed. The firm will issue green bonds or loans and use those proceeds to finance projects that improve the carbon footprint and environmental performance of its operations. CIFI's GFF defines eligibility criteria in seven areas: (i) Green Buildings, (ii) Clean Transportation, (iii) Energy Efficiency, (iv) Pollution Prevention and Control, (v) Sustainable Water Management, (vi) Climate Change Adaptation, and (vii) Renewable Energy. Sustainalytics considers that the projects funded by the CIFI green bond or loan proceeds will provide positive environmental impact.

The CIFI GFF outlines a process by which proceeds will be tracked, allocated, and managed, and commitments have been made for reporting on the allocation and impact of the use of proceeds. Furthermore, Sustainalytics states that the CIFI GFF is aligned with the overall sustainability strategy of the firm and that the use of proceeds from its bond issuance will contribute to the advancement of the UN Sustainable Development Goals (SDGs), particularly SDG 6, 7, 9, 11 and 12 (3). Additionally, Sustainalytics opines that CIFI has sufficient measures to identify, manage and mitigate environmental and social risks commonly associated with the eligible projects funded by the use of proceeds.

Based on the above criteria, Sustainalytics states that CIFI is well-positioned to issue green bonds or loans and that the CIFI Green Finance Framework is robust, transparent, and in alignment with the four core components of the Green Bond Principles 2018 and Green Loan Principles 2018.

HKQAA Green Finance Certification

The HKQAA green finance certification scheme was developed with reference to, among others, the CDM, the ICMA GPBs and the PBOC Green Bond Categories. The benefits of the scheme include (i) enhancing the credibility of, and stakeholder confidence in, green financial instruments via independent, impartial third-party conformity assessments, (ii) reaching out to potential green finance investors with the aid of the HKQAA green finance certificate and certification mark, (iii) demonstrating issuers' efforts to promote environmentally friendly investment; and, (iv) promoting a common understanding of green finance.

Under the scheme, an applicant may apply for either (i) a pre-issuance stage certificate or (ii) a post-issuance stage certificate. An applicant may apply for a pre-issuance stage certificate ahead of green finance issuance. Green finance is defined in the 'Green Finance Certification Scheme Handbook' published on August 24, 2018 as financing of investments that provide environmental benefits in the broader context of environmentally sustainable development. A pre-issuance stage certificate is an ''as-at'' certificate and provides assurance that the green finance with its projects activity or activities

financed with proceeds from the issuance of green finance to make a positive impact on the environment (''green projects'') (up to the assessment completion date which is also the issue date on such certificate) comply with the scheme.

An annual surveillance assessment by the HKQAA to verify the continuous implementation and effectiveness of the environmental method statement is not required. When the HKQAA has completed its assessment and validation of the environmental method statement and no non-conforming issues are outstanding, it will make a recommendation of certification to the certification review board which reviews and approves the recommendation. Upon such approval, a pre-issuance stage certificate and a certification mark (a trademark designed by the HKQAA indicating that the applicant's green finance is duly certified under the scheme) are issued to the applicant.

With regard to the case of CIFI's green bond issuances, HKQAA (2020) provides its external review statements with the coverage of the following significant/major environmental and social impact constituted by the project activities associated with the use of proceeds:

- *Green Projects category 1 (Green Buildings): The green and sustainable buildings could help preserve material at the construction stage, and cause less environmental impact to the construction sites. Once commence operations, the technology allows actively manage the use of energy and help monitor the status of the facilities to allow timely replenishment and improve efficiency.*
- *Green Projects category 2 (Clean Transportation): No adverse significant environmental and social risk due to small scale project activity nature.*
- *Green Projects category 3 (Energy Efficiency): The green and sustainable buildings could help preserve material at the construction stage, and cause less environmental impact to the construction sites. Once commence operations, the technology allows actively manage the use of energy and help monitor the status of the facilities to allow timely replenishment and improve efficiency.*
- *Green Projects category 4 (Pollution Prevention and Control): To adopt the pollution management standard into different construction stage and property management to reduce the negative impact to the land.*
- *Green Projects category 5 (Sustainable Water Management): The systems are embedded in the green buildings to ensure effective control on water supply and effectively manage the usage of water.*
- *Green Projects category 6 (Climate Change Adaptation): With more reservation of energy, waste management and sustainable resources containment, it is expected the green buildings could contribute to prevent climate change.*
- *Green Projects category 7 (Renewable Energy): The solar panels have been installed with the green buildings to sustain part of the electricity required for property and help preserve resources.*

A Comparison on the Above Green Certifications Approaches

In general, the four external reviewers apply qualitative review and judgemental analysis. Both Moody's and S&P develop their respective rating scales to grade degree of compliance with the GBP. However, they do differ in the choices of factors considered in their analysis. Both Sustainalytics and HKQAA adopt a detailed qualitative approach to describe what an issuer is doing and what Sustainalytics thinks regarding the issuer's compliance with related green standards. The standards Sustainalytics applies have a broader coverage, while HKQAA incorporates both international and China domestic standards. Both

Table 2. Fitch ESG Rating: Score and description

Score (E, S & G)	Credit Relevance	Description
1 (Very good)	No Impact	Irrelevant to the entity, transaction or programme rating and irrelevant to the sector
2	No impact	Irrelevant to the entity, transaction or programme rating but relevant to the sector
3	Low Impact	Minimally relevant to rating; either very low impact or actively managed resulting in no entity, transaction or programme rating impact
4	Medium Impact	Relevant to the entity, transaction or program rating but not a key driver - has a rating impact in combination with other factors
5 (Very poor)	High Impact	Highly relevant, a key rating driver that has a significant impact on the entity, transaction or programme rating on an individual basis.

Source: Fitch 2020a.

Sustainalytics and HKQAA do not provide any rating scale. The grades and scores of both Moody's GBA and S&P GE allow international to develop metrics on assessing how much extent the GBP are matched. That may be better than pure qualitative comments provided by Sustainalytics. However, the details of Sustainalytics' analysis may help international investors to identify specific issues in supporting their investment decisions. On the other hand, HKQAA conducts annual surveillance assessment that can help bond investors monitor continuously their green bond portfolios. It is the only one external reviewer providing continuous surveillance assessment. Since green bond standards are evolving quickly in different countries, it is hard to conclude which approaches are better.

GREEN/ESG IMPACTS ON CREDIT RATING

Green certification may help an issuer sell its bonds to ESG-focused investors. However, will green or ESG assessment impact credit rating and bond pricing? Theoretically, ESG assessment and credit assessment are two separate issues. This section will discuss how the three big credit rating agencies consider ESG in their credit rating process. Their ESG-related comments in their credit rating reports on some China property developers are quoted for illustration.

Fitch ESG Rating

In 2019, Fitch developed ESG relevance scores to demonstrate how the ESG factors impacted individual credit ratings. Credit rating analysts use the unique ESG sector templates in their assessment of an issuer or issuance, and assign ESG relevance scores, which, according to Fitch, can directly affect a firm's credit rating.

In this ESG rating process, E, S and G scores will be assigned respectively, with scores between 1 (very good) and 5 (very poor). Scores "1-2" indicates no impact on credit rating; "3" indicates minimal impact; "4-5" indicates an emerging ESG risk which can impact a credit rating decision and "5" is a risk that can drive a rating change. Table 2 summarizes ESG impact on Fitch credit rating actions:

Fitch ESG scores are designed to demonstrate the materiality of ESG considerations specifically to Fitch's credit rating decisions. ESG sector-specific issues identified by Fitch are extracted from its

existing ratings criteria. This means, the ESG issues do not have its second effect on Fitch credit rating results. The able table simply helps bond analysts and investors get an idea on how ESG has been incorporated into credit rating results.

In the case of CIFI, Fitch (2021a) mentions, under the ESG considerations, that

"unless otherwise disclosed in this section, the highest level of ESG credit relevance is a score of '3'. This means ESG issues are credit-neutral or have only a minimal credit impact on the entity, either due to their nature or the way in which they are being managed by the entity."

Fitch (2021b) also mentions ESG issues in its credit rating report of Logan, a China property developer, with the following statements:

"unless otherwise disclosed in this section, the highest level of ESG credit relevance is a score of '3'. This means ESG issues are credit-neutral or have only a minimal credit impact on the entity, either due to their nature or the way in which they are being managed by the entity."

On assigning credit ratings to other Mainland Chinese property developers, Fitch considers various sector-specific key factors including the market position, operational scale, operational profile and sales efficiency, and various financial profile key factors for Mainland Chinese homebuilders: profitability, financial structure and financial flexibility. Based on the published information of Fitch, ESG score has limited impact on the credit rating assigned by Fitch.

Moody's ESG Rating

As a part of its credit analysis, Moody's (Moody's 2021b) considers how ESG risks could affect the qualitative and quantitative factors (including the sub-factors) in the relevant scorecard. ESG impacts are incorporated, for example, in Moody's qualitative assessment of scorecard factors such as business profile, institutional strength or regulatory environment. Moody's would also incorporate ESG considerations into the projections. Moody's may establish issuer profile scores (IPSs), which indicate Moody's opinion of the extent to which a given issuer or transaction is exposed to E, S and G risks or benefits from its such exposure. In other words, Moody's has incorporated ESG as a factor on credit rating.

In the case of CIFI, Moody's (Moody's 2021a) mentions that

"in terms of environmental, social and governance (ESG) factors, Moody's has taken into account CIFI's concentrated ownership. Its controlling shareholders, Lin Zhong and his family members, collectively held a 52.2% stake in the company as of 31 March 2021. Moody's has also considered (1) the fact that the company's audit and remuneration committees comprise independent non-executive directors who maintain oversight of the company; (2) the application of the Listing Rules of the Hong Kong Stock Exchange and the Securities and Futures Ordinance in Hong Kong to oversee related-party transactions; and (3) CIFI's moderate dividend policy. The company distributed 30%-35% of its profits as dividend during 2018-2020."

In the case of Logan, Moody's (2021c) mentions that

"in terms of environmental, social and governance (ESG) factors, Moody's has considered the company's concentrated ownership, in its controlling shareholder, Mr. Kei Hoi Pang, who held a 61.62% stake as of 31 December 2020. Moody's has also considered (1) the fact that the audit and remuneration committees all comprise independent non-executive directors; (2) Logan's stable 40% dividend payout ratio over the past three years; and (3) the application of the Listing Rules of the Hong Kong Stock Exchange and the Securities and Futures Ordinance in Hong Kong to oversee related-party transactions."

On assigning credit ratings to Mainland Chinese property developers, Moody's considers five major factors including 1) the scale (15%) using the revenue, 2) business profile (25%), 3) profitability and efficiency (10%) using the cost structure (pre-impairment gross margin), 4) leverage and coverage (30%) using the ratios of revenue to debt and EBIT interest coverage, and 5) financial policy (20%). The percentages in the brackets show weighting of the factors considered. From published information of Moody's, ESG related description has limited impact on the credit rating of Mainland Chinese property developers.

S&P's ESG Rating Methodology

S&P (S&P 2021a) defines ESG credit factors as those ESG factors that can significantly influence the credit rating of a rated entity or issue and for which S&P's has sufficient visibility and certainty to include in S&P's credit rating analysis. ESG credit factors affecting credit ratings include, but are not limited to, the following:

- A change in the size and relative stability of an obligor's current or projected revenue base
- Operating costs and requirements
- Risk planning
- Governance controls and standards
- Profitability or earnings
- Cash flows or liquidity
- The size and maturity of its financial commitments.

In the case of CIFI, S&P (S&P 2020b) mentioned in its issuer rating report:

"… the homebuilder and developer has moderate exposure to environmental and social risks because the sector is not as energy-intensive and labour-intensive as others, but it can face some social issues such as safety concerns around construction, environmental issues in meeting increasing stringent requirements in emission, and waste management. Governance is subject to factors that are more individual."

"…CIFI has similar social risks compared with its peers in the sector. Given its fast-churn turnover model, the company is exposed to a certain degree of safety management risk. That said, CIFI places great focus on training its employees to ensure safety and it encourages its contractors and other vendors to follow the same standards. There were no fatalities, significant labor disputes, or noncompliant cases reported by CIFI in 2019."

"CIFI has also implemented measures to manage and control environmental risks arising from the construction work in its projects. For instance, the company regularly monitors its third-party contrac-

tors on their environmental performance and requires them to implement various emission and waste reduction measures. The company's vehicles are also required to have regular inspections and maintenance to control exhaust emission. The proportion of residential housing with full fittings and interior renovation has also increased such that resources can be more systemically integrated to avoid wastage from fittings by individual owners."

On assigning credit ratings to Chinese property developers, S&P considers various business risk factors including country risk, industry risk and competitive position, and various financial risk factors including EBITDA/interest expenses, DEBT/EBITDA and EBITDA margin, to arrive at the anchor rating. Modifiers including diversification/portfolio effect, capital structure, financial policy, liquidity, management and governance, and comparable rating analysis are considered in order to arrive at the stand-alone credit profile of an issuer. According to S&P published information, the ESG description helps increasing the related disclosure, but has limited impact on the credit rating assigned by S&P.

Observations from the Global Credit Rating Agencies

The big three international rating agencies adopt hybrid approaches using qualitative and quantitative factors to arrive at their respective credit ratings. Qualitative factors focus on the industry analysis, operating environment, management quality, corporate governance and legal and regulation, while the quantitative factors focus on the cash flow and profitability, coverage and leverage ratios, and financial flexibilities. Then modifiers or qualifiers are included to consider the other credit aspects of an issuer not included in the above qualitative and quantitative factors.

The "G" component of the ESG has long been considered and analysed in the credit rating, either as one of the qualitative factors, or part of the modifiers/qualifiers. In term of ESG disclosure, Fitch is the first international big three rating agency analysing and disclosing such ESG relevance to the credit rating to bond investors, but the other two agencies are catching up with updated methodologies (by Moody's) or request for comments (by S&P).

The ESG related terminologies and the scoring may look different among the big three rating agencies, but the current reality is that ESG is largely qualitative in nature and there is no direct linkage between ESG and specific sub-factors or qualifiers/modifiers used in the scorecards by the credit rating agencies. The asset class or industry specific criteria and methodologies do not have tangible and specific description on how the ESG work done by issuers could be quantified and hence directly impact the credit rating levels.

CONCLUSION

This chapter has introduced the development of China offshore green bonds and Hong Kong green bonds market. Obviously, China and Hong Kong have their respective agenda to develop green bond markets. China can motivate domestic corporations to focus more environmental protection via a green bond market. Hong Kong, as a small economy, can facilitate international green bond issuance and trading via its long-established international capital market. Both the two governments demonstrate their policy commitment to support green bond development.

The chapter has also summarized the green certification approaches of Moody's, S&P, Sustainalytics and HKQAA. These external reviewers attempt to assess whether a green bond issuance or an issuer complies with some international green standards. Both Moody's and S&P provide grades on degree of such compliance, while both Sustainalytics and HKQAA focus mainly on qualitative comments on such compliance. The former practices would suit international investors who want simple metrics to justify their investment decisions. The latter practice will suit those who want more details on related compliance. Among the four reviewers, HKQAA is the only one providing annual surveillance assessment. Although all these approaches are purely judgemental analysis, they substantially reduce investors' workload on green compliance analysis and may hence accelerate their investment making process.

It is hard to conclude whether these approaches are perfect because green bond standards are evolving fast over time. Yet, with the presence of these external reviewers, international investors can get conveniently some second opinions to support their asset allocation. Meanwhile, these external reviews help green bond issuers reach out to international investors who may have less knowledge on local practices.

So far, all external reviews on green bonds are voluntary. There is no international standard on how to conduct green certification. ICMA's GBA standards are popular in many bond markets but China has its own national standards. Given the same green standards, external reviewers mostly differ in their assessment methodologies.

Assessment on green-standard compliance is a tedious work. External green certification likely helps investors' reduce workload on their compliance analysis. That would then accelerate the process of green bond issuance and investing in green bonds. Therefore, to support further development of green bond market, related bond exchanges in different regions should issue clear guidelines on what green standards will be required. With clear guidelines and related certification, investors can easily identify which green bonds are eligible green bonds in the exchanges.

With regard to ESG impacts on credit ratings, all the three global credit rating agencies claim that they have considered ESG issues in reaching their credit rating decisions. However, their rating comments on Mainland Chinese offshore bond issuers do not show clear evidence on such claim. For bonds with maturity of 3 to 7 years, amount of future cash flows and stability of future cash flows remain to be very critical in credit rating conclusions. ESG practices of a company generally have impact on the company's future cash flows but such impact is less likely to take place in the next several years. This may explain why credit rating agencies do not weight too much on ESG issues in their credit rating conclusions.

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Chapter 8
Towards a Greenification:
Exploring the Green Bond Premium

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ABSTRACT

This study provides an empirical analysis on the existence of a green bond premium on the secondary market. The green bond premium is defined as the yield differential between a green and a comparable brown bond, while controlling for liquidity. The EUR-denominated green bonds are studied to determine if they diverge from comparable conventional bonds in terms of yields, during the period from January 2018 to December 2020. Through a matching method, a sample composed of 35 bond couples is obtained. On average, this study reports a negative greenium of -3.20 bps within the sample. The greenium differs across the sub-samples, being negative for green bonds issued by financial institutions, in domestic currency, by AA- and A-rated issuers, and for those issued by issuers with low or medium ESG risk levels. Finally, the ESG risk level has been found to be the driver of the negative green bond premium.

INTRODUCTION

Starting from the Industrial Revolution, the quality of our life has been increasing over the years, due to the unbelievable development of new technologies. Despite the improvements in people's daily lives, there have been also more and more damages to our planet. The continuous growth of the World's population, associated with the scarcity of resources, has required an immediate response to the problems associated with the exploitation of the planet and climate change occurring in the last years, before it will be too late. Consequently, a transition towards a *greenification* of our economy has been become a central topic by countries over the world. To promote this new challenge and to satisfy the ethical intentions of some investors, some financial tools have been used to address capital flow into green projects.

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Green bonds may be thought as a suitable financial instrument to promote the transition towards a greener and more sustainable economy. There is not a universal definition of them, but from a financial perspective, they are comparable to conventional bonds. The difference between the two debt instruments lies in the use of the earmarked proceeds. In fact, green bonds build a bridge between the financial system and the environmental goals, using their proceeds to finance green projects.

Nowadays, one of the most discussed topics regarding green bonds is the existence or not of a green bond premium. Some studies are in support of lower yields for green bonds, and hence the existence of a negative *greenium*, others do not. Consequently, there are mixed results in the literature, depending on the choice of the sample and the method used by each author.

One of the objectives of this study is to increase the existing literature, providing further analysis on the research of the green bond premium on the secondary market. Different hypotheses are formulated and tested: first, the existence of a green bond premium on the secondary market, within the sample; then, if the green bond premium varies across different sub-samples. Two datasets are defined, a green one and a brown one, and through the matching method, a bond-pair sample is created. A panel regression model with fixed effects is run to estimate the green bond premium. Inspired by previous studies, also the definition of the potential determinants of the green bond premium is investigated in this analysis, through a cross-sectional regression model. The analysis is performed on 35 bond-pairs, all EUR-denominated and investment-grade, on the secondary market, taking a period from January 2, 2018, to December 14, 2020. The results show that, on average, a negative *greenium* of -3.20 bps exists for the EUR-denominated bonds present in the sample on the secondary market. Further, the ESG risk levels are significant drivers of the green bond premium: the negative *greenium* is greater for low ESG risk level rated bonds.

The rest of this study is organized as follows. Section 1 provides an overview of the green bonds, giving their definition, the regulatory framework, an examination of the evolution of the green bond market, and their benefits and limitations. Moreover, it introduces the green bond premium concept and collocates it in the current literature. Section 2 presents the empirical analysis conducted to assess the green bond premium on the secondary market. In particular, the two datasets are described, the matching method is explained, the methodology is detailed, and finally the results are reported. Finally, Section 3 summarizes the results and offers some conclusions.

BACKGROUND

What is a Green Bond?

In the last few years, investments in the green economy have become more and more important. The reasons can be different: *from* the will to reach the United Nations' 17 Sustainable Development Goals within 2030 and to respect the Paris Agreement on climate change *to* the growing demand for Socially Responsible Investments (SRI) by both retail and institutional investors.

Anyway, even if the green bond market is increasing importance, there is still a great deal of confusion about "*what does green mean?*", and particularly about "*what is a green bond?*".

Regarding the first question, the Climate Bonds Initiative (CBI) states that the way for growing green investments is the development of taxonomies, which will help in the naming of green assets and projects, so that issuers and investors meet each other in a clearer way (Climate Bonds Initiative, 2019a). The

clarification of *green borders*, and hence the creation of a common language, may be useful to avoid market fragmentation and to draw a harmonized system, to encourage governments in targeting their climate and infrastructure goals, but most of all, to let investors trust the good intentions of issuers and feel protected against *greenwashing* (Climate Bonds Initiative, 2019a). In this regard, CBI provides a regularly updated taxonomy – *Climate Bonds Taxonomy* – which identifies eligible assets and projects in the following sectors: energy, transport, water, buildings, land use & marine resources, industry, waste & pollution control, ICT (Climate Bonds Initiative, 2020a).

Unfortunately, also the answer to the second question is difficult to be given, due to the missing of a universal definition of green bonds. Currently, there is no common consensus on the definition, leading actors to misinterpret the potential benefits of the green bond market (Shishlov, Morel, & Cochran, 2016).

In general terms, green bonds are innovative debt instruments, issued by financial institutions, governments, or companies to raise funds to finance green projects or assets. Their main goal can be summarized in the fight against climate change. The *green bonds* are functionally like any other *conventional bond*. It can be understood that the structures, risks, and returns of the two bonds are identical, but green bonds differ from the latter in the purpose of their issuance, as the proceeds are only used in *environmentally-friendly* investments.

Despite this definition seems to be simple, it is not. In fact, it is not easy to really define which are the *environmentally-friendly* investments, for the reasons abovementioned. The lack of taxonomies leads to a lack of universal definition, which in turn leads to a lack of commonly acknowledged standards.

The Growth of the Green Bond Market and the Regulatory Framework

Going back in time, and in particular in 2007, the birth of the first green bond can be seen, thanks to the European Investment Bank (EIB), which issued the first climate-focused bond i.e., the *Climate Awareness Bond*, worth EUR 600 million. Over the years, green bonds started to become *fashionable* and to attract always new investors. In general, it was not only the entrance of corporations on the market that led to an increase in the issue size but also the publication of the first voluntary standards and guidelines, such as the Green Bond Principles and the Climate Bonds Standards. The expansion has further been encouraged by the entry into the market of emerging countries, such as India and China, which issue a large total outstanding amount of green bonds, and by the launch of environmental sustainability initiatives, like the Sustainable Development Goals (SDGs). The volume dimensions are growing hugely, and they are finalized to further grow in the following years, letting the green bond market always reaches new peaks. In December 2020, the green bond market has reached its first one trillion (in USD) in global cumulative green issuance since its inception. Before the advent of the pandemic, the green bond market was riding the wave. The total issuance of 2019 was higher than the CBI's forecast, so that also for the year 2020, the CBI's expectations were really encouraging, worth around USD 350 – 400 bn (Chestney, 2020). Unfortunately, the year 2020 has been hit by a serious pandemic, which has also had effects on the green bond market, slowing down somewhat its rapid expansion.

Despite all, there are optimistic forecasts around the green bond market, making it important to question: "*Who regulates what is green?"*. As the market grew, due to the entry of new issuers, the need for more transparency increased, and hence many guidelines and standards have emerged to avoid any act of *greenwashing* and to increase transparency. However, as said before, it is also true that the growth of the market has been linked to the development of regulatory frameworks, which helped issuers and investors to meet and trust each other. Nevertheless, even if there are several frameworks and taxonomies, they are

non-binding. The *punishment* for those who do not respect them is the loss of credibility on the market, going to increase the lack of confidence in investors, for whom it is difficult to assess the green nature. Consequently, it becomes clear the reason why the development of global official green bond standards and guidelines assumes relevant importance. Without it, there are too many doubts and misunderstandings, and hence it is difficult to scale up the market and properly fight against climate change.

The most widespread *international good practices* are the Green Bond Principles (GBP) and the Climate Bonds Standards (CBS), which are useful tools for investors and issuers, even if they are *soft*. In general, the GBP has been the first set of voluntary guidelines, aiming to promote integrity within the market, by recommending "*transparency, disclosure and reporting*" (ICMA, 2018). Following these principles, issuers release *credible* green bonds, and consequently, investors are safeguarded by undesirable situations. They were developed by ICMA along with thirteen major investment banks in January 2014. The Climate Bonds Initiative has designed the Climate Bonds Standards and Certification Scheme. The Climate Bonds Standards provide some requirements to be met by the issuers to launch a *credible* bond and get the Climate Bond Certification. Unlike the GBP, which only recommends the use of an external reviewer, to get the Climate Bonds Certification, the use of it is mandatory.

In addition to the international good practices, countries and regional bodies have published their local definition and standards for green investments. Country-specific regulations could better fit the country's environmental priorities, but it is also important that they are aligned with global regulations, otherwise, it could generate higher transaction costs and confusion (Berensmann, 2017).

Benefits and Limitations of Green Bonds

In addition to the environmental benefits, green bonds can offer various advantages for issuers and investors.

Issuers could benefit from the enlargement of the pool of buyers. It is more likely that investors devoted to green and responsible behaviour will be attracted to this kind of investment, since they want their portfolios to be, in a certain way, ESG. Moreover, issuers benefit from a strengthening of reputation in the creation of sustainable value, letting them appear more *appetizing* on the market. Indeed, even if it is not always in this way, recent evidence suggests that there exist also pricing benefits on their issuance. In other words, green bonds may be financed less expensively since they could enjoy a higher price and lower yield, compared to conventional bonds. As reported in *Green Bond – Treasurer Survey*, published by CBI in 2020, several noteworthy results were:

- Almost every respondent (98%) agreed that their green bonds have attracted new investors.
- Most of them (75%) agreed that the demand for their green bond was higher than that for their vanilla bonds.
- Almost half of them (48%) agreed that the costs of funding a green bond were similar to those of a vanilla equivalent, while another relevant percentage (42%) agreed that the costs were lower.
- The main reasons for issuing resulted to be the reputational benefits and the market signal.

On the other hand, investors benefit from investing in activities with environmental impact, getting comparable financial returns, and hence without renouncing anything. Moreover, green bonds are characterized by greater transparency and disclosure into the use of their proceeds, increasing awareness on green issues in the investors, and enabling them to better assess the associated risks (Sustainable Bank-

ing Network (SBN), 2018). This feature is not common in conventional bonds, where specific reports on the use of proceeds are not included. Finally, green bonds tend to be less volatile than conventional bonds since they are oriented towards long-term institutional investors with a buy-and-hold strategy (Deschryver & de Mariz, 2020).

Obviously, "all that glitters is not *green*", and there are also risks and barriers. While the green bond market is growing fast, the main problem in its further growth is the lack of a universal clarification on what a green bond really is, namely a lack of harmonized standards (Climate Bonds Initiative, 2015). The regulatory framework is still fragmented, and mostly it is non-binding. The evaluation of green credentials is a crucial key point for all market participants. On one hand, issuers want to know if they are really doing something positive for the environment by supporting the green bond market. On the other hand, investors need to know if their green investments are really as *genuine* as they think. Then, both of them are subject to the risk of *greenwashing* i.e., the risk that, even if a bond is labeled as green, its proceeds may be allocated to projects with questionable environmental merits (Climate Bonds Initiative, 2015). The need for external reviews appears to be essential, in order to verify the green nature of the bonds and to monitor the real allocation of their proceeds; but it is also true that this need requires supporting higher transaction costs, both initial and ongoing, which may become a disincentive for issuers (OECD, 2017). By analysing the CBI's *Green Bond - European Investor Survey* (2019), some of these issues emerge. Most of the respondents (64%) declared to have a preference for green bonds, when available and competitively priced. Although, a similar percentage of respondents (67%) highlighted unmet demand for green bonds. A lack of suitable assets could be a barrier to entry into the green bond market. Issuers should enter in all the sectors and with all types of green bonds, but mostly by applying transparency and disclosure. The most attractive investment features resulted, from the survey, to be positive fundamentals and transparency. Most of the respondents (79%) declared that they would not have bought a green bond if, at issuance, the proceeds had not been clearly allocated in green projects. In addition, more than half of them (55%) declared that they would have sold the green bonds if post-issuance reporting had been poor.

Consequently, it is evident that standardization of green bond definitions, consistency of reporting, and disclosure (pre- and post-issuance) are highly recommended for scaling up the green bond market (Climate Bonds Initiative, 2019b).

Literature Review

Nowadays, the central topic that turns around the green bond *field* is the existence of a green bond premium both on the primary and on the secondary market. Several studies have been conducted on this argument, finding contrasting evidence.

The green bond premium, or *greenium*, refers to the yield difference between green and conventional bonds, *ceteris paribus*. A negative *greenium* means that the green bond trades at a lower yield relative to an equivalent conventional bond. Because of the inverse relationship between price and yield, it implies that the green bond is priced higher than a comparable conventional bond (traded at a premium), and hence investors have to pay more for the green feature. Of course, the opposite is true in the case in which there exists a positive *greenium*, and hence green bonds are traded at a discount.

Among the several studies present in the literature, one of the most known is that conducted by Zerbib (2019). According to him, *green* investors can be motivated by the expectation of a better financial performance of these assets, by lower risk and volatility associated with them, or by non-pecuniary

motives. The will of the investors to support green projects and to contribute to the *greenification* can be represented by the green bond premium, which could evidence their willingness to pay for financing green projects over others. Traditionally, risks and returns are the factors that influence investment decisions. Concerning green bonds, also sustainable preferences could drive investment decisions. If the *greenium* is negative, an attitude for *green preferences* emerges. Investors are not only interested in the returns, but they could care also about the green intentions of the bond, and hence they would be willing to undertake such kind of investment, receiving a lower yield than investing in comparable conventional bonds. The more is negative, the more the non-pecuniary, or *green*, motives influence the investors. Otherwise, in the case in which there is a positive or a neglectable green bond premium, it could mean that investors consider as substitutes the two investments, and so it is not necessary to give up a part of returns for *green* intentions, sometimes asking for a higher yield to hold green bonds.

In his study, Zerbib (2019) wanted to identify the effect of pro-environmental preferences on bond market prices, through the green bond premium. For the analysis, it was taken a sample composed of 110 bond pairs on the secondary market, issued between July 2013 and December 2017. The matching method based on maturity was used to build synthetic bonds, which were compared to green bonds to estimate the difference in yield. A negative, but small, green bond premium of 1.8 bps (on average) emerged from that sample. Furthermore, the author pinpointed that the rating and the sector have behaved like significant drivers of the premium, since low-rated bonds and financial bonds presented a more accentuate negative green bond premium. Finally, through robustness tests, he showed that the premium was not a market premium, nor a risk premium. As a result, the author concluded by saying that the pro-environmental preferences had a low effect on bond prices. The small green bond premium would not have been a disincentive for investors to invest in green bonds, but an opportunity for issuers to broaden their bondholder base.

Some researchers belonging to the "*negative green bond premium team*" are Ehlers & Packer (2016), Schmitt (2017), Baker er Al. (2018), Hachenber & Schiereck (2018), Gianfrate & Peri (2019), Kapraun & Scheins (2019), and Partridge & Medda (2020).

In particular, Schmitt (2017) concentrated his research on three questions: firstly, he wondered on the existence of a green bond premium; then, in which market or industry it could have occurred; and finally, whether it could have been constant over time. By taking a sample of 160 global labelled green bonds, issued between January 2015 and May 2017, he estimated the difference in yield with synthetic conventional bonds, ceteris paribus. Differently from others, he compared each green bond with twenty comparable conventional bonds. Consequently, the existence of a negative green bond premium of 3.2 bps in that sample was found by him; then, he did not notice relevant differences between developed and emerging markets, nor among different industry groups; finally, as expected by him, the premium was not constant over time, but it declined in 2016 and 2017, due to the increased issuance (Schmitt, 2017).

Then, Hachenberg & Schiereck (2018) based their research on the belief that the green feature was attractive for investors, leading to an increase in the demand, which would justify the hypothesis that "green bonds trade tighter than conventional bonds, ceteris paribus". To conduct their analysis, each green bond was matched with two equivalent conventional bonds, which should have fulfilled the following criteria: same issuer, ranking, and currency, no structured, either fixed or floating coupons, both secured or unsecured, and minimum issue size of USD 150 million (Hachenberg & Schiereck, 2018). The final sample was composed of 63 green bonds and 126 conventional bonds, issued between October 2015 and March 2016. Once classified the sample into different ratings (AAA, AA, A, BBB), they noticed that, on average, green bonds were traded tighter than equivalent conventional bonds (-1.18), but highly

rating green bonds (AAA) were traded wider (+0.45). In addition, the sample was also classified by type of industry, obtaining the following, and expected, results: green bonds issued by financial institutions and corporations traded tighter, while those issued by government-related issuers traded wider. Finally, they concluded by saying that the differences in pricing were due to industry and ESG rating, and not to issue size, maturity, and currency.

Finally, Kapraun & Scheins (2019) structured their analysis on the research of three main topics, regarding: the difference in yields between green and conventional bonds; the variation across markets (primary vs. secondary), currencies, issuers (corporates vs. governments), and time; the green credibility. For the primary market analysis, they considered 1.520 green bonds and 202.394 conventional bonds in a fixed-effects regression analysis. For the secondary market analysis, they matched green bonds with conventional bonds of the same issuer, with the same rating, seniority, currency, and bond type, and with similar issue sizes and maturities (Kapraun & Scheins, 2019). It allowed them to compare 4.609 bond pairs. Finally, they tested the credibility. Regarding the primary market, they obtained a negative green bond premium of 20 – 30 bps, and substantial variation of green bond premium across currencies, issuer types, and over time. Differently, in the secondary market, they obtained a positive green bond premium of 10 bps; the only exceptions were the green bonds issued by governments or supranational institutions, showing the importance of the issuers' credibility. Finally, regarding the green credibility, they obtained a positive green bond premium for green bonds issued by low-rated ESG companies, because of greenwashing effects, and for those issued by very high-rated ESG companies, because of green labeling effects.

On the other hand, among those who assume that the green bond premium does not exist or it is even positive, there are Karpf & Mandel (2017), Hyun et al. (2018), Bachelet et al. (2019), and Larcker & Watts (2020).

In particular, Hyun et al. (2018) wondered how greenness was priced in the green bond market. They collected data from 2010 to 2017 about green bonds in compliance with GBP, obtaining 60 pairs of green and synthetic conventional bonds to be analysed, through the liquidity-adjusted yield premium. They found, on average, no evidence on the green bond premium, neither positive nor negative. However, externally reviewed green bonds and CBI certificated green bonds were shown to enjoy, respectively, a negative greenium of around 6 and 15 bps, compared with other green bonds without this additional greenness information (Hyun, Park, & Tian, 2018).

And, Bachelet et al. (2019) questioned the impact of the green feature on the green bond pricing, liquidity, and volatility in the secondary market. To compare the yield spreads, they adopted an exact matching method. The green bond and the conventional bond should have had the same issuer, currency, rating, bond structure, coupon type, and they should have been as similar as possible in terms of the maturity date, coupon rate, and amount issued (Bachelet, Becchetti, & Manfredonia, 2019). The sample, composed of labeled green bonds and listed on the CBI website, included 89 bond couples, issued from 2013 to 2017. A positive green bond premium, ranging from 2.06 and 5.9 bps, was found from that sample. For an in-depth analysis, the sample was divided into private and institutional issuers. Regarding private issuers, a positive green bond premium of around 2 – 3 bps emerged, and precisely it was much higher for private issuers without third-party verification of around 7.5 bps (on average). Regarding institutional issuers, a negative green bond premium was found of 4 bps (on average).

EMPIRICAL ANALYSIS

Hypotheses Development

Before supporting one of the two points of view, also the authors of this study implemented an analysis to search the existence of the green bond premium on the secondary market.

The first point of this analysis was to assess if a green bond was traded at a lower yield than a similar conventional bond on the secondary market, due to the non-pecuniary preferences of the investors.

Hypothesis One: There exists a negative green bond premium on the secondary market.

A further interesting point for the analysis was to assess if the size of the green bond premium could differ across various factors.

In fact, the degree of renunciation of a part of returns by investors could depend on the issuer's sector. As explained by Hachenberg & Schiereck (2018), green bonds issued by government-related trade wider than green bonds issued by financial institutions and corporates. Even Zerbib (2019) found evidence that the green bond premium differs across sectors.

Hypothesis Two: The green bond premium varies across sectors.

Moreover, the non-pecuniary motives of the investors could be correlated to the credit quality of the green bonds. As reported by Hachenberg & Schiereck (2018), green bonds with a high degree of creditworthiness, and hence the lowest risk of default, are traded wider than comparable conventional bonds. The situation could be equal in the case of green bonds with low credit quality. While in the first case the reason could lie in seeing the two types of bonds as substitutes, in the second case the investors could not feel safe in giving up a part of their returns for investing in a *green* project with such kind of investments.

Hypothesis Three: The green bond premium varies across credit ratings.

Furthermore, in a sample composed only of EUR-denominated green bonds, there are some entities that issue bonds in domestic currency, and others in foreign currency, to broaden their investor base. It was plausible to question if the two different issuances are perceived in the same way by investors.

Hypothesis Four: The green bond premium varies between domestic and foreign currencies.

Finally, the ESG risk level attributed to each issuer could influence the size of the green bond premium. A green bond with a high ESG risk level could not be traded at a lower yield since investors do not feel encouraged by the *green* intentions of those issuers.

Hypothesis Five: The green bond premium varies across ESG risk levels.

To conclude, also the potential determinants of the green bond premium were researched. Previous studies have identified different determinants, such as the credit ratings, the ESG risk levels, and the issuers' sectors.

Data Collection

The starting point for the construction of a *green* dataset consisted of the collection of all the bonds contained in "*iShares Global Green Bond ETF*", retrieved on December 2, 2020. The initial sample reported 488 active green bonds, excluding cash positions and derivatives such as futures and currency forwards. Therefore, some selection criteria to clean the sample were set:

- *Sector criterion*: among others, only Corporates and Government-related sectors were selected since almost 90% of the full sample was represented by them, while Treasury and Securitized were discarded.
- *Currency criterion*: only EUR-denominated green bonds were selected since more than half of the full sample was represented by them.
- *Coupon criterion:* coupon rates equal to 0% or higher than 2.50% were excluded from the sample, due to their large concentration in the range 0.10 – 2.50%.
- *Location criterion*: among others, France, Germany, Supranational, United States, Netherlands, Spain, Canada, Italy, Belgium, China, United Kingdom, Australia, Denmark, Japan, and Sweden were selected, due to their weight in that ETF.
- *Maturity criterion*: since most of the green bonds were characterized by maturity in 3-5 years or 7-10 years, all the green bonds with a maturity higher than 2030 were excluded.

After the cleaning process, the remained *green* dataset was composed of 182 bonds. The obtained green bonds were all EUR-denominated bonds, issued by 103 different issuers in 15 different countries. The majority of the issuers were located in France (19%). Moreover, Corporates[1] represented 60% of the full sample, while Government-related[2] only 40%.

The next step consisted of the selection of the *brown* dataset. All the conventional bonds were retrieved from *Datastream Thomson Reuters*. To be included in the *brown* sample, bonds had to:

1. Be active.
2. Be issued by the same issuers as the green bonds.
3. Be denominated in EUR.
4. Have the same ranking as green bonds.
5. Have fixed coupon rates as green bonds.
6. Have the maturity date at most 2032.
7. Have the issue date at least 2015.
8. Have the coupon rate at most 2.75%.

Finally, a conventional bonds database composed of 1.624 bonds was obtained.

The Matching Method

The most used approach is the *matching method* i.e., matching green bonds with equivalent conventional bonds, to investigate in the yield differences. When such a difference is obtained, and it is negative, the green nature of the bond is identified as the potential *guilty*. Therefore, two groups were taken: a *green* group, that received the treatment, and a *brown* group, that received the control.

The first step was to determine if an observation was a good match for another one. According to Stuart (2010), to define the *closeness*, it is important to first identify which variables to include in the matching process, in order to satisfy the assumption of "*ignorable treatment assignment*". Consequently, the distance between the two observations should be defined. Among the four primary ways to define the distance, exact matching is considered the ideal one. Unfortunately, it could lead to many observations not being matched. In fact, even if it is possible to match a green with a conventional bond for certain characteristics, it could be difficult, if not impossible, to match them according to others. For

this reason, the exact matching has to be combined with other distance measures (Stuart, 2010). After looking for conventional bonds issued by the same *green* issuer, with the same *green* rating, country of risk, currency, and bond type, it was selected a conventional bond with similar characteristics in terms of the issue date, maturity, amount issued, and coupon rate. For the issue date, a maximum difference of six years between the issue dates of the green and conventional bonds was allowed (Zerbib, 2019). For maturity, a maximum difference of two years between the maturities of the green and conventional bonds was allowed (Zerbib, 2019). For the amount issued, a maximum difference in the issue amount of 400% between green and conventional bonds was selected (Zerbib, 2019). Finally, for the coupon rate, a maximum difference of 0.25% between the coupon rates of the green and conventional bonds was allowed (Bachelet, Becchetti, & Manfredonia, 2019). The decisions behind such criteria were consistent with the findings of previous studies, in order to mitigate potential differences between the two bonds, which could emerge in terms of credit risk premium, currency risk premium, maturity risk premium, liquidity risk premium, and interest risk premium.

As stated by Zerbib (2019), the yield difference between green and comparable conventional bonds is "*the cumulative effect of the liquidity differential and the green bond premium*". The green bond market and conventional bond market differ in size, and hence the latter is characterized by greater liquidity. In order to control for differences in liquidity, which could lead to bias in the estimation of the green bond premium, previous studies impose restrictions concerning the amount issued and the issue date. Doing in this way, some liquidity risk should be controlled for. However, different researchers suggest also adding a liquidity proxy, as a control variable. Following Zerbib (2019), the analysis used the difference in the bid-ask spread of the green and the conventional bonds as a liquidity proxy.

$$" BidAsk = BidAsk_{i,t}^{GB} - BidAsk_{i,t}^{CB} \tag{1}$$

where " $BidAsk$ .is the difference between the Bid-Ask spread of the green bond i at time t ($BidAsk_{i,t}^{GB}$) and the Bid-Ask spread of the conventional bond i at time t ($BidAsk_{i,t}^{CB}$)

To compute the bid-ask spread for each bond, the closing percent quoted bid-ask spread was used, defined as the bid-ask spread divided by the average:

$$BidAsk_{i,t} = \frac{Ask\ price_{i,t} - Bid\ price_{i,t}}{Ask\ price_{i,t} + Bid\ price_{i,t} \Big/ 2} \tag{2}$$

The next step was to implement a *1:1* match, namely each green bond was compared to a conventional bond with the smallest distance from the first one. The matching procedure was successful for 35 of the previous 182 green bonds in the dataset.

Descriptive Statistics

An important step was to assess the quality of the resulting matched sample, by analysing both qualitative and quantitative variables.

As stated before, the final matched sample was composed of 35 couples, and hence 70 bonds. These bonds were issued by 27 different issuers from 13 different countries. Most of the issuers were from Europe (77%), while the others were from Asia-Pacific (14%) and North America (9%). Among them, 66% of the issuers had issued in their domestic currency, while 34% in foreign currency. At the issuer type level, there were Government-related (Agency and Supranational), Financial Institutions, and Corporates (Industrial and Utility). The financial sector was the most representative one, accounting for 48.6%, while Corporate and Government-related accounted both for 25.7%. Regarding the ESG ratings, retrieved from *Sustainalytics*[3], most of the issuers had a good reputation in terms of sustainability, showing an average score of 19.24 (out of 100). Almost all the government-related issuers showed a negligible ESG risk. Only one financial institution showed a high ESG risk. Finally, three issuers were not rated by *Sustainalytics*, and hence considered as "*no rated*" in the following steps. Regarding the credit rating, all the bonds resulted to be investment-grade, ranging from Aaa to Baa3 according to Moody's scale. The data showed prevalently a good credit quality (43%). From a quantitative point of view, some descriptive statistics for the green and conventional bonds were provided to evaluate if the matching criteria were correct.

The largest variation between the *green* and *brown* samples was related to the issue amount. Although they were mainly concentrated in the same range, there were two exceptions i.e., two conventional bonds issued by government-related borrowers, which had larger issue amounts. It led to an average green issue amount of EUR 742.14 million, and an average brown issue amount of EUR 1,077.86 million. The presence of positive outliers was confirmed by the mean greater than the median. The relationship changed when comparing the 25 and 75 percentiles. However, it should not be a big issue since the liquidity risk was controlled for by also using a liquidity proxy. The other characteristics were quite similar. In fact, almost all of them have been issued at a discount, with an average of EUR 99.52 for green bonds, and EUR 99.61 for conventional bonds. Among the green bonds, 3 of them have been issued at par. Also, among the conventional bonds, 3 of them have been issued at par, but there was also 1 of them that has been issued at a premium, with an issue price of EUR 100.11. The *green* and *brown* coupons were concentrated in the same range, with an average of 0.782% for green bonds, and 0.76% for conventional bonds. Finally, also for the maturity, there were no differences, with an average of 7 years for green bonds, and 7.20 years for conventional bonds.

Once assessed that the two samples shared quite similar characteristics, the authors proceeded by computing the variables of interest for the analysis. For all the bonds, daily observations of ask prices, bid prices, ask yields, and bid yields from their issue date until December 14, 2020, were retrieved from *Bloomberg*. When a bond in a couple missed a daily yield observation, that line was removed from the panel. The panel data sample consisted of 19,810 daily observations for 35 cross-sectional units across a period of 5 years. As a historic timeframe for the analysis, the period from January 2, 2018, to December 14, 2020, was taken. The decision was consistent with the higher concentration of starting days around 2018. Finally, a panel data composed of 16,825 daily observations for 70 bonds was obtained.

The difference between the ask yield of the green bond and the ask yield of the conventional bond was identified as ΔY. On average, the ask yield difference was around -2.55 bps, with a median of 3.88 bps. A positive median evidenced the presence of outliers, indicating that, in reality, less than 50% of the bond-pairs in the sample had a negative yield difference. The yield difference ranged from -90.52 bps to +25.98 bps, being skewed to the left (-1.2907) and with a kurtosis of around 2,846. Due to extreme values recorded during 2020, the differences between the ask yields of the green and the conventional bonds were winsorized at 0.5 and 0.95 percentile for the full dataset, through *Eviews*.[4] The new variable

Table 1. Descriptive statistics of green and brown bonds

Green bonds	Min.	25%	Median	Mean	75%	Max.	Std. Dev.
Issue Amount (mln EUR)	500	500	500	742.14	937.50	2.050	387.62
Issue Price (EUR)	98.41	99.365	99.55	99.52	99.805	100	0.38
Coupon (%)	0.125	0.375	0.625	0.782	0.99	2.50	0.56
Maturity (years)	4	5	7	7	8	12	2
Conventional bonds	**Min.**	**25%**	**Median**	**Mean**	**75%**	**Max.**	**Std. Dev.**
Issue Amount (mln EUR)	400	500	750	1.077.86	1.050	5.000	1.067.03
Issue Price (EUR)	98.94	99.385	99.68	99.61	99.82	100.11	0.30
Coupon (%)	0.125	0.375	0.60	0.76	0.989	2.625	0.57
Maturity (Years)	3	6	7	7.2	8	11	2

Source: Personal Elaboration

was identified as ΔY_wns, and it ranged from -41.3 bps to +31.04 bps, showing a reasonable negative skewness (-0.5794) and kurtosis of around -0.4050. In this case, a green bond traded at a lower yield than a conventional bond of -1.19 bps, on average. Regarding the liquidity proxy, $\Delta BidAsk$, its distribution was concentrated around zero, with a slightly positive skewness (0.0753) and kurtosis of -0.6319. In general, the chosen liquidity proxy seemed to be adequate to control for differences in liquidity.

Model

The fixed-effect panel regression model was the following one:

$$\Delta y_{i,t} = greenium_i + \beta" BidAsk_{i,t} + u_{i,t} \quad (3)$$

Table 2. Descriptive statistics of some variables

	Min	25%	Median	Mean	75%	Max	Std. Dev.
No. of trading days	138	269	449	480.91	747.50	755	220.78
Ask Yield GB, Y_{GB}	-0.2998	0.0262	0.1652	0.2617	0.5189	0.9879	0.3286
Ask Yield CB, Y_{CB}	-0.3971	0.0716	0.2560	0.2872	0.5332	1.7957	0.4073
Δy	-0.9052	-0.1486	0.0388	**-0.0255**	0.1184	0.4063	0.2598
Δy_wns	-0.413	-0.1486	0.0388	**-0.0119**	0.1062	0.3104	0.1945
Bid-Ask Spread GB	0.0013	0.0024	0.0031	0.0035	0.0044	0.0071	0.0014
Bid-Ask Spread CB	0.0009	0.0024	0.0034	0.0034	0.0040	0.0071	0.0015
ΔBidAsk	-0.0014	-0.0006	0.0001	0.0001	0.0007	0.0018	0.0008

Source: Personal Elaboration

where $u_{i,t}$ .is the error term, " $BidAsk_{i,t}$ .is the liquidity proxy, as defined in Equation (1), and $greenium_i$ .is the entity-specific time-invariant fixed effect, representing the green bond premium since all the other differences in bonds characteristics were already accounted for.

The dependent variable was $\Delta y_{i,t}$. calculated as the difference between the ask-yield of the *i-th* green bond and the ask-yield of the comparable *i-th* conventional bond at time *t:*

$$\Delta y_{i,t} = y_{i,t}^{GB} - y_{i,t}^{CB} \tag{4}$$

Finally, several tests were performed to validate the use of a fixed-effect regression model. In particular, both the F-test and Breusch-Pagan test were performed to examine the existence of individual effects. In both cases, the null hypothesis was rejected at the 1% significance level, concluding with the presence of individual effects. Consequently, a Hausman test was performed to determine the best method between fixed and random effect models. The null hypothesis that fixed and random effect models were equal was rejected at the 1% significance level, concluding with the preference for a fixed-effect model.

In addition, to identify which characteristic of the green bond determined a potential variation in the green bond premium, an OLS regression model was implemented. The model was:

$$\widehat{greenium_i} = \beta_0 + \beta_1 \ln\left(IssueAmount\right) + \beta_2 Maturity + \beta_3 Rating + \gamma_1^{'} ESGrisk + \gamma_2^{'} Sector + \varepsilon_i \tag{5}$$

where ε_i .is the error term.

The dependent variable $\widehat{greenium_i}$ .was the previously estimated time-invariant green bond premium for each couple *i*. The characteristics considered were the issue amount, the maturity, the issuer sector, the credit rating, and the ESG risk level. The currency was not considered since all of them are EUR-denominated. Like Zerbib (2019), the *Issue amount* was assumed to be the natural logarithm of the green bond's issue amount to linearize the values, while the *Maturity* was the remaining green bond's maturity on December 14, 2020. For the *Rating*, an integer number was assigned to the respective credit rating (Aaa, Aa, A, or Baa), based on a scale of 1 – 4, where 1 represented the lowest credit rating and 4 represented the highest one. The *Sector* was a vector of dummy variables, representing Government-related, Financial Institutions, and Corporates. The reference group was Government-related. Finally, the *ESG risk* was a vector of dummy variables, representing No rated/High, Medium, Low, and Negligible. The reference group was No rated/High.

Results and Discussion

The results for the estimation of the green bond premium were reported for both the dependent variables $\widehat{\Delta \boldsymbol{y}}$ .and $\widehat{\Delta \boldsymbol{y}}\_wns$. as previously defined. In particular, model (a) reported the results considering the ask yield difference *without* winsorization, while model (b) reported the results considering the ask yield difference *with* winsorization.

First, tests for heteroskedasticity and serial correlation were implemented. In particular, both the Wald test and the LR test were conducted to detect the presence of heteroskedasticity in the residuals. Then,

Table 3. Results of the regression model

	(a)	(b)
	$\widehat{\Delta y}$	$\widehat{\Delta y}\_wns$
ΔBidAsk	**-12,96180***** (0,355845)	**-12,21232***** (0,347955)
within R2	0,011621	0,033556
F-statistic	3.313,780	6.827,288
p-value (F-statistic)	0,0000	0,0000

Source: Personal Elaboration

the Wooldridge test and the Pesaran's CD test were conducted to detect the presence of serial correlation. These tests showed that there were heteroskedasticity and serial correlation in the residuals. Therefore, the estimation of the standard errors needed to be robust to heteroskedasticity and serial correlation.

The estimate for the coefficient of the liquidity proxy i.e., the difference in the bid-ask spread (*ΔBidAsk*), was around -12.96 for model (a) and -12.21 for model (b). The results indicated that there was a negative correlation between the difference in yield and the difference in liquidity. A 1 bp increase in the bid-ask spread between green and conventional bonds implied a 12.96 bps (or 12.21 bps) decrease in the yield difference between green and conventional bonds. The coefficient was significant at the 1% level for all the models.

Similar to Zerbib (2019), R^2 was very low in both models. It means that the liquidity proxies explained only a small percentage of the total variation in the difference in yield. However, it was not a big issue since through the matching method almost all the differences in yield were already controlled for, except for the *green* nature.

The green bond premium was isolated and estimated for each of the 35 couples. It varied in sign and magnitude in a range from -92.34 bps to 42.20 bps for model (a), and from -43.40 bps to 31.01 bps for model (b). On average, there was a green bond premium of -3.20 bps for model (a), and -2.18 bps for model (b). The different signs between mean and median indicated the existence of large outliers in the sample.

Before testing if the mean (or median) of the green bond premium was statistically significant, normality tests were performed to decide the use of parametric or non-parametric tests. Both the Jarque-Bera and Shapiro-Wilk tests were performed, rejecting in both cases the null hypothesis of normal distribution.

Consequently, the authors proceeded by using a non-parametric test i.e., the Wilcoxon signed-rank test, under the null hypothesis that the median of the green bond premium is zero. In both models, the authors could not reject the null hypothesis, and hence the green bond premium was not significantly different from zero. Although the authors found that *"there exists a negative green bond premium"* in their sample, this hypothesis was not statistically supported.

In order to verify the other hypothesis, the matched sample was split into different sub-samples, based on sector, currency, rating, and ESG risk level.

Regarding the sector, green bonds issued by financial institutions showed a negative *greenium* of around -12.26 bps for model (a) and -8.91 bps for model (b). Financial institutions are one of the most active players in the green bond market, and hence they are assumed to have greater intentions in fi-

Table 4. The distribution of the green bond premium

	(a)	(b)
	$\widehat{greenium}$	$\widehat{greenium\_wns}$
Min	-0,9234	-0,4340
25%	-0,1610	-0,1646
Median	0,0346	0,0310
Mean	**-0,0320**	**-0,0218**
75%	0,1123	0,1035
Max	0,4220	0,3101
Skewness	-1,2335	-0,5703
Kurtosis	2,5958	-0,4080

Source: Personal Elaboration

nancing *green* projects, leading investors to accept lower yields for green bonds. Whilst the green bonds issued by Government-related showed a positive *greenium* of around 2.93 bps for model (a) and 2.58 bps for model (b). According to Hachenberg & Schiereck (2018), the explanation has to be searched by looking at the issuer's perspective. In fact, they declare that being government-related issuers one of the most active in promoting the growth of the green bond market, they may fear that asking investors to give up a part of returns compared to conventional bonds might hurt the market growth (Hachenberg & Schiereck, 2018). Instead, the results for green bonds issued by Corporates were different from what was expected by previous findings. In fact, a positive *greenium* of around 7.77 bps for model (a) and 5.76 bps for model (b) emerged. A possible explanation could be searched in the type of issuer considered in the sample. Almost all of them were energy companies, and therefore the investors could not feel the necessity to give up a part of returns to finance a normal activity for them.

Regarding the currency, green bonds issued by countries in their domestic currency were traded at a lower yield than their comparable conventional bonds of around -6.88 bps for model (a) and -5.02 bps for model (b); whilst those issued by countries in a foreign currency were traded at a higher yield of around 3.85 bps for model (a) and 3.26 bps for model (b). The results could be explained by several reasons, such as the different numerosity of the two sub-samples, the greater willingness of some investors to give up a part of returns for the *green* intentions of Europe, the higher credibility of a country issuing in its domestic currency, and hence the lower exchange risk associated with them, or just being randomness.

Regarding the rating, Aa- and A-rated green bonds traded at a lower yield of around -8.62 bps and -13.28 bps for model (a) and -7.76 bps and -11.95 bps for model (b). Green bonds issued by more credible entities are expected to be traded at lower yields than their comparable conventional bonds. Consistent with the findings of Hachenberg & Schiereck (2018), the situation was opposite for Aaa-rated green bonds, which traded at a higher yield of around 9.30 bps for model (a) and 8.92 bps for model (b), and for Baa-rated green bonds, which traded at a higher yield of 1.73 bps for model (a) and 3.03 bps for model (b). The reason for the former can be that, within the sample, the high-rated *green* issuers were almost all government-related issuers. Instead, for the second one, the reason could lie in the fact that Baa-rated green bonds might be too close to non-investment grade, and hence investors may not be so confident in giving up part of the returns for the *green* aspect.

Table 5. Green bond premium by sub-samples

		(a)		(b)		
Category	**Sub-sample**	**Mean**	**Median**	**Mean**	**Median**	**#couple**
Sector	*Corporate*	0.0777	0.0781	0.0576	0.0747	9
	Financial Institutions	-0.1226	-0.1573	- 0.0891	-0.1606	17
	Government-related	0.0293	0.0254	0.0258	0.0217	9
Currency	*Domestic*	-0.0688	0.0138	-0.0502	0.0107	23
	Foreign	0.0385	0.0565	0.0326	0.0524	12
Rating	*Aaa*	0.0930	0.0703	0.0892	0.0666	4
	Aa	-0.0862	-0.0279	-0.0776	-0.0313	8
	A	-0.1328	-0.1610	-0.1195	-0.1646	8
	Baa	0.0173	0.0781	0.0303	0.0747	15
ESG risk level	*Negligible*	0.0193	0.0195	0.0157	0.0161	8
	Low	-0.1705	-0.1685	-0.1413	-0.1711	5
	Medium	-0.0752	0.0193	-0.0563	0.0158	18
	High	0.2940	0.2940	0.2854	0.2854	1
	No rated	0.2119	0.2059	0.1810	0.2020	3

Source: Personal Elaboration

Regarding the issuers' ESG risk level, the green bonds with a negligible ESG risk level showed a slightly positive *greenium* of around 1.93 bps for model (a) and 1.57 bps for model (b). In the sample, almost all the green bonds with a negligible ESG risk level, and hence with the highest reputation in terms of sustainability, were issued by government-related. Green bonds with low and medium ESG risk levels showed a negative *greenium*, of around -17.05 bps and -7.52 bps for model (a) and -14.13 bps and -5.63 bps for model (b); then, as proved also by Kapraun & Scheins (2019), green bonds with a high ESG risk level, or without an ESG risk rating, showed a positive *greenium*, of around 29.40 bps and 21.40 bps for model (a) and 28.54 bps and 18.10 bps for model (b). The lower reputation in terms of sustainability leads investors not to trust their *green* intentions, asking for higher yields.

Again, a Shapiro-Wilk test was performed on each sub-sample, with at least 8 bond pairs, to verify the null hypothesis of the normal distribution. For all of them, the null hypothesis of normality could not be rejected, except for domestic currency and Baa rating in the model (a). Consequently, a Wilcoxon signed-rank test and a t-test were performed on each sub-sample, under the null hypothesis that the mean/median is equal to zero. None of the null hypotheses was rejected, meaning that none of the average green bond premium in the sub-samples was found to be significantly different from zero. Finally, the previous results confirmed the hypothesis that the green bond premium varied across different sub-samples, but again this conclusion was not statistically supported.

Moreover, the different characteristics of the green bond were considered to assess which one could be a potential determinant of the green bond premium. By varying the independent variables, different specifications were implemented:

Issue amount, Maturity, and Rating

$$\widehat{greenium_i} = \beta_0 + \beta_1 \ln\left(IssueAmount\right) + \beta_2 Maturity + \beta_3 Rating + \varepsilon_i \quad (6)$$

Issue Amount, Maturity, and ESG risk level

$$\widehat{greenium_i} = \beta_0 + \beta_1 \ln\left(IssueAmount\right) + \beta_2 Maturity + \gamma_1' ESG\,risk + \varepsilon_i \quad (7)$$

Issue Amount, Maturity, and Sector

$$\widehat{greenium_i} = \beta_0 + \beta_1 \ln\left(IssueAmount\right) + \beta_2 Maturity + \gamma_1' Sector + \varepsilon_i \quad (8)$$

Issue Amount, Maturity, Sector, Rating, and ESG risk level

$$\widehat{greenium_i} = \beta_0 + \beta_1 \ln\left(IssueAmount\right) + \beta_2 Maturity + \beta_3 Rating + \gamma_1' ESGrisk + \gamma_2' Sector + \varepsilon_i \quad (9)$$

Assuming as a dependent variable the estimated green bond premium for each couple means that the authors were dealing with cross-sectional data. In order to verify if the assumption of homoskedasticity was satisfied, the Breusch-Pagan test was implemented for each specification and for both model (a) and model (b), as defined so far. Regarding model (a), the assumption of homoskedasticity was satisfied only by specification (2), at the 10% level. Regarding model (b), it was satisfied by all, but specification (2), at the 10% level. Consequently, White robust standard errors were applied in those specifications where the assumption of homoskedasticity was not satisfied. Since several explanatory variables were included in the model, to investigate for multicollinearity problems, the Variance Inflation Factors (VIF) were computed for each of them. None of them showed a value greater than 10, therefore there were no multicollinearity problems.

All the results from the specification (1), (2), and (3) both with $\widehat{\textbf{\textit{greenium}}}$ .for model (a), and $\widehat{\textbf{\textit{greenium\_wns}}}$ .for model (b) as dependent variables, are presented in *Table 7* and *Table 8.* In order not to confuse the lector and not to be redundant, only results from the model (a) are deeply commented; the reason is that the results from the model (b) appear to be similar. Moreover, the lector should not forget that the model (b) is based on an artificial dataset.

By looking at the sign of each estimate, it is possible to define which one has a positive or negative impact on the green bond premium. Assuming that the green bond premium is negative, a positive impact means less negative green bond premium, while a negative impact means more negative green bond premium.

The results showed that the issue amount of the green bond and the green bond premium were positively related. In particular, a more significant issue amount decreased the negative *greenium*, in absolute terms. This result was not consistent with Zerbib (2019), who finds a negative linkage between them. In this sample, green bonds issued by government-related were those with higher issue amounts, which traded at positive *greenium*, providing support for the results. The estimate of the issue amount was significant at the 5% level in the specification (1) and at the 10% level in the specification (3).

Table 6. Tests for heteroskedasticity and multicollinearity

	Test	H_0	(1)	(2)	(3)	(4)
			p-value	**p-value**	**p-value**	**p-value**
Heteroskedasticity	Breusch-Pagan test	Homoskedasticity	0,0781	0,1283	0,0624	0,0416
			0,1859	0,0928	0,1101	0,4744
		Variable	**(1)**	**(2)**	**(3)**	**(4)**
Multicollinearity	VIF	*Issue Amount*	1,180	1,088	1,056	1,336
		Maturity	1,022	1,151	1,164	1,850
		Fin. Institutions			1,590	4,331
		Corporates			1,539	6,745
		Rating	1,159			2,454
		Negligible		2,498		4,758
		Low		1,999		2,021
		Medium		2,699		3,550

Source: Personal Elaboration

As for Zerbib (2019), the magnitude of the estimate of maturity was nearly equal to zero, meaning that a longer maturity in the green bonds did not increase/decrease the green bond premium. Differently from Zerbib (2019), it was significant at the 5% level in the specification (1) and at 10% level in the other specifications.

The credit quality characteristic was not statistically significant in defining the green bond premium. However, a 1-level increase in the bond rating (higher credit quality) led to a decrease of 3.51 bps in the green bond premium. Therefore, green bonds with higher credit quality increased more the negative greenium. The result was consistent with Zerbib (2019) and Karpf & Mandel (2017).

A green bond with a negligible ESG risk level decreased by 30.94 bps the green bond premium level, compared to a no rated/high-risk level green bond, meaning that it became more negative. Similar results were obtained for low ESG risk levels and medium ESG risk levels. The estimates were all significant in both the specification (2) and the specification (4).

A green bond issued by a corporate increased only by 3.44 bps the green bond premium, compared to a green bond issued by a government-related, meaning that it became less negative. The result supported previous findings of this analysis, knowing that both corporate and government-related green bonds were traded wider. A green bond issued by a financial institution decreased by 10.41 bps the green bond premium, compared to a green bond issued by a government-related, meaning that it became more negative. Again, it was consistent with previous findings of this analysis, knowing that only financial institutions were found to trade tighter.

Finally, the ESG reputation had a statistically significant impact in determining the negative green bond premium, differently from the credit quality and the sector.

The R^2 ranged from 16.36% to 40.13%, while the adjusted R^2 ranged from 8.26% to 21.70%. It means that only a little variation in the green bond premium was explained by the characteristics considered.

Table 7. Determinants of the green bond premium: model (a)

	(1.a)	(2.a)	(3.a)	(4.a)
Constant	-1.3666*** (0.5237)	-0.7499 (0.7086)	-0.9844* (0.5732)	-0.5212 (0.4705)
Issue Amount	**0.1898**** (0.0764)	0.1223 (0.1065)	**0.1341*** (0.0806)	0.1199 (0.0749)
Maturity	**0.0001**** (4.22E-05)	**0.0001*** (6.16E-05)	**7.22E-05*** (4.28E-05)	**8.95E-05*** (4.84E-05)
Corporates			0.0344 (0.0673)	0.0216 (0.2306)
Financial Institutions			-0.1041 (0.0876)	-0.1376 (0.1347)
Rating	-0.0351 (0.0356)			-0.0298 (0.0616)
Negligible		**-0.3094*** (0.1526)		**-0.3346***** (0.1244)
Low		**-0.4188**** (0.1638)		**-0.4447***** (0.1161)
Medium		**-0.3035**** (0.1333)		**-0.3490***** (0.1216)
R^2	0.1636	0.3156	0.1938	0.4013
R^2-adjusted	0.0826	0.1976	0.0863	0.2170
F-statistic	3.1471	2.6746	2.4075	5.6845
p-value	0.0389	0.0417	0.0713	0,0003

Note:* p<0.10; **p<0.05; ***p<0.01
Source: Personal elaboration

The results from model (b) confirmed the significative role of ESG risk level in determining the green bond premium, without finding anyone else.

CONCLUSION

Climate change and global warming represent an increasing threat to economies around the world. Hence, there is an urgent need for environmentally friendly projects. In 2007, an innovative financial tool to address into sustainable projects emerged, namely the green bonds.

The idea behind this study was to assess if the growing class of *green* investors is willing to pay a premium i.e., accept lower yields, to invest in climate-friendly projects through green bonds compared to an otherwise identical conventional bond.

In the literature, there is an ongoing debate about this argument, leading to mixed results. Some studies report that green bonds trade at lower yields, or at a premium, than their comparable conventional bonds; whilst other studies report no significant differences or even higher yields for green bonds.

The empirical analysis of this study could be summarized in the formulation of three questions:

Table 8. Determinants of the green bond premium: model (b)

	(1.b)	(2.b)	(3.b)	(4.b)
	$\widetilde{greenium}\_wns$			
Constant	**-1.0402*** (0.5516)	-0.4994 (0.3688)	-0.7316 (0.5609)	-0.3830 (0.5272)
Issue Amount	0.1447 (0.0885)	0.0846 (0.0535)	0.0975 (0.0843)	0.0966 (0.0826)
Maturity	**8.48E-05*** (4.63E-05)	**0.0001***** (3.23E-05)	6.44E-05 (4.98E-05)	8.69E-05 (5.46E-05)
Corporates			0.0179 (0.0925)	-0.0355 (0.1685)
Financial Institutions			-0.0766 (0.0822)	-0.1257 (0.1181)
Rating	-0.0324 (0.0330)			-0.0373 (0.0421)
Negligible		**-0.2705***** (0.0574)		**-0.2916*** (0.1445)
Low		**-0.3656***** (0.1144)		**-0.3838***** (0.1152)
Medium		**-0.2620***** (0.0634)		**-0.2824**** (0.1069)
R^2	0.1846	0.3834	0.1997	0.4746
R^2-adjusted	0.1057	0.2772	0.0930	0.3129
F-statistic	2.3406	5.4457	1.8717	2.9358
p-value	0.0925	0.0011	0.1413	0.0177

Note:* p<0.10; **p<0.05; ***p<0.01
Source: Personal Elaboration

1. Does a green bond trade at a lower yield than a comparable conventional bond?
2. Does the green bond premium vary across bonds' characteristics?
3. Is the good sustainable reputation of the bond issuer a driver for determining a negative *greenium*?

The EUR-denominated green bonds were considered and analysed if they trade at a lower yield than comparable conventional bonds on the secondary market, during the period from January 2018 to December 2020.

On average, green bonds trade 3.20 bps (or 2.18 bps with winsorization) tighter than their comparable conventional bonds on the secondary market in the sample considered. Unfortunately, the results are not statistically significant. The existence of a negative *greenium* of just a few bps is not a big challenge for this asset class, leading the green bonds to be still attractive as much as conventional bonds.

Although the evidence of a negative *greenium* in the sample, only 43% of the green bonds trade tighter (i.e. 15 out of 35). Consequently, the results could be influenced by the main presence of green bonds issued by financial institutions (i.e., 10 out of 15) and by issuers located in Europe (i.e., 12 out of 15), which benefit from higher credibility in the green bond market.

The negative *greenium* may be explained by different factors. The first one is a possible mismatch between supply and demand. The market for green bonds is in full development, and it is destined to grow more and more since always more issuers, such as companies, governments, and multinationals, are seeking to raise funds to carry out environmentally friendly projects, and, moreover, always more investors are attracted to these assets. Despite its remarkable growth, the size of the green bond market represents only a small percentage of the overall bond market, being also concentrated in a small perimeter. For example, green bonds are mainly rated with good credit qualities, limiting some investors' risk profiles. Therefore, the growing demand for sustainable investments is satisfied by a limited number of green bond issues. The second one turns around the investors' preferences, who could prefer to sacrifice a few bps for non-pecuniary motives. Since the green bonds are addressed to help the environment, these good intentions could offset the lower cash flows received. Finally, green bonds are less risky or volatile than comparable conventional bonds. Consequently, they tend to be more stable during periods of risk aversion, such as the current pandemic. Hence, investors could accept to receive lower yields due to the compensation for lower volatility.

Furthermore, the green bond premium has been analysed across different sub-samples, finding that it varies within each segment. Green bonds issued by financial institutions trade, on average, tighter than their comparable conventional bonds, while those issued by corporates and government-related trade, on average, wider. Regarding the currency, there were bonds denominated in domestic currency and others denominated in foreign currency. The obtained results are opposite, namely the green bonds issued by the former trade tighter, while the others trade wider than their comparable conventional bonds. Then, a positive *greenium* has been found for Aaa- and Baa- rated green bonds, while a negative one for Aa- and A-rated green bonds. Finally, the largest gap between the max and min green bond premium has been found within the ESG risk level sub-sample (around 46.50 bps). Green bonds with a low ESG risk level show the largest negative *greenium*. Green bonds with medium ESG risk levels show negative *greenium*, too. Whilst the other two show a positive *greenium*.

In conclusion, the ESG risk level i.e., a good sustainable reputation, has been found to be the only statistically significant driver of the negative *greenium*.

The comparison of these results with findings of other studies is not properly correct. Even if the idea outstanding in the various studies is similar, they differ from each other for several reasons, such as the type of issuers examined, the sample size, the method used, the matching criteria proposed, the characteristics assessed, and so on, leading to different interpretations. A possible future analysis could be to start from the same bond-pairs used in this study and evaluate possible different results in the following years, especially considering the upcoming EU Recovery Fund.

In conclusion, this model presents some limitations, which could explain the insignificant results of the analysis: small sample size, which should be increased by setting less stringent matching criteria; underrepresented categories, leading to a disparity among the sub-samples' numerosity; some bonds have been issued recently, carrying only a few days with available data on yields; finally, this study has been written during the COVID-19 pandemic, which may have affected the results.

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KEY TERMS AND DEFINITIONS

ESG Risk Level: A measure of company's exposure to ESG risks and their management.
Green Bond: A bond whose proceeds are used to finance green projects.
Green Bond Premium: The yield difference between a green and a comparable conventional bond.
Greenification: The act to greenify.
Greenwashing: The risk that green proceeds are allocated in projects that are not properly green.
Matching Method: The procedure to compare units of different samples with observable characteristics very close.
Winsorization: A statistical procedure to substitute outliers with extreme values from the data.

ENDNOTES

1 Financial Institutions, Industrial, and Utility.
2 Agency and Supranational.
3 The ESG Risk Ratings are categorized across five risk levels: negligible, low, medium, high and severe. The rating scale is from 0-100, with 100 being the most severe.
4 All the values outside a given interval are converted into the values observed at the interval's maximum and minimum percentiles [-0,413; 0,345].

Chapter 9
Testing the Green Bond Premium in COVID-19 Pandemia

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ABSTRACT

The purpose of this chapter is testing the existence of the green bond premium in the secondary market by using a most update data set involving the market developments in the pandemia times. The variables such as rating, sector, amount of the issue, maturity, and external review are balanced by using a matching procedure of a green bond with conventional bond issued by the same issuer. The ask-bid spread differential is regressed by using a panel regression method under fixed and random effects. The results of the analysis revealed that there exists negative premium of 39 basis points, and the green bond premium is more profound for USD denominated twins than for Euro ones as there exist a negative premium of 59 basis points for USD-denominated green bonds whereas it is -26 basis points for Euro-denominated bonds.

INTRODUCTION

The environmental concerns, especially the climate change mitigation efforts created a new type of marketable debt which is named as Green Bonds. The green bonds are considered to be amongst "theme" bonds. In the past such theme bonds were issued as railway bonds in 1900s, the war bonds of the early 20th century or the highway bond of the 1960s. The proceedings of the green bonds have been typically used for financing the projects of renewable energy, energy efficiency, clean water, sustainable natural resources and land use, climate change adaptation, and pollution prevention and control.

Under the framework of sustainable finance, the most widely used financing method has been green bonds. International Capital Markets Association (ICMA) defines green bonds as "any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance, in part or in full, new or/and existing eligible green projects".

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European Investment Bank and World Bank issued the first Green / Climate Awareness Bonds in 2007. The Climate Bond Initiative (CBI) launched the Climate Bond Standard and Certification Scheme in December 2010. The market making issues were realized by IFC which sold the first benchmark USD 1 billion Green Bond in March 2013, by Massachusetts which sold the first municipal green bond in June 2013, by Gothenburg which sold the first City Green Bond in October 2013 and Tesla Energy which sold the first solar ABS in November 2013. The first corporate Green Bond by Vasakronan, a Swedish property company in November 2014. In 2014, ICMA established its Green Bond Principles. ICMA updated and revised its Green Bond Principles in 2018.

The governments and municipalities are in the market to finance specific local projects or meet selected environmental targets. Financial institutions also can issue green bonds to diversify their portfolios by enabling them to apply environmental standards to their borrowers. Also, private companies, particularly energy and utility companies have issued green bonds to finance specific environmental projects. Under current conditions, nearly 90% of the green bond issuers are mainly of investment grade quality that have above BBB ratings. Not only conglomerates such as Apple, Intesa and Iberdrola, but also sovereigns such as Republic of France, Republic of Poland and Kingdom of Belgium have at least one green bond. Furthermore, especially issuer corporates from China and India have interest in order to finance especially renewable energy projects.

The purpose of this study is twofold; firstly, to elaborate the characteristics of the green bonds as an actively utilized sustainable finance tool as well as that of the green bond market as of 2021. The peculiarities of the green bonds in terms of the utilization of the proceedings make it as a special investment alternative for many institutional investors. In this regard, the investors are supposed to accept lower yields as compared to plain vanilla bonds in primary and secondary bond markets. The second and more relevant purpose of this paper is determining the existence and magnitude of the green bond premium in the secondary market in the times of Covid-19 in the period between March 2020-April 2021 as compared to before Covid-19 times. However, making a rational comparison requires the acceptable amount of the market data of the selected bond pairs before Covid-19, which is generally unavailable. In fact, this is the constraint of the study and in order to overcome this, the prior research findings are used as they are assumed to use the required amount of market data for analysis. In the analysis a matching procedure is used by pairing a green bond and a conventional of the same issuer. By that way, the variables such as rating, sector, amount of the issue, maturity and external review are balanced The pairing process is realized by using three main variables which are issue amount, issue date and maturity date under some principles and all other criteria represent full match.

The contribution of this study to the relevant literature is twofold; there exists higher negative greenium for USD denominated issues as compared to Euro denominated issues. Secondly, as the purpose of the study is determined as the elaboration of greenium in Covid-19 times, the finding of a negative premium of 39 basis points may indicate an increase in green premium as compared to the results of research realized using the market data of normal times.

BACKGROUND

ICMA published procedural guidelines that "recommend transparency and disclosure and promote integrity" of the green bond market known as the Green Bond Principles (GBP). The 2018 Edition of the GBP was revised especially for external reviewers to incorporate further guidance and updated

definitions. A new document is drafted, namely "Guidelines for Green, Social and Sustainability Bond External Reviews". It defines the eligible project categories contributing to five high level environmental objectives which are climate change mitigation, climate change adaptation, natural resource conservation, biodiversity conservation, and pollution prevention and control.

There exist four core components of the GBP that indicate the dynamics and features of a green bond as explained below:

Use of Proceeds

The commitment of the issuer to use the proceeds of the green bond issuance for the sole purpose of financing green projects should be clearly specified in the legal documentation. At the issuance date, all the designated green projects are expected to be assessed and/or quantified. Refinancing of the green projects should be separately identified. Under the broad five main environmental objectives the financed and/or refinanced green projects can be in the fields of:

- renewable energy
- energy efficiency
- pollution prevention and control
- environmentally sustainable management of living
- natural resources and land use
- terrestrial and aquatic biodiversity conservation
- clean transportation
- sustainable water and wastewater management
- climate change adaptation
- eco-efficient and/or circular economy adapted products, production technologies and processes
- green buildings which meet regional, national or internationally recognized standards or certifications.

There are some initiatives in order to develop a generally accepted taxonomy which enable the comparability amongst the green bonds. It is also noteworthy to mention that some institutions provide independent analysis and also advise and guidance about the assessment process.

Process for Project Evaluation and Selection

The issuer of the green bond should disclose the objectives of the environmental sustainability of the peculiar structure together with the justifications of the selection of the specific eligible green projects. In this framework the eligibility and exclusion criteria should also be defined. The disclosures should be transparent and preferably audited by an external reviewer.

Management of Proceeds

The proceedings of a green bond issue should be transferred to a subaccount or directly to the accounts of green projects or otherwise monitored by the issuer by a formal internal system linked to the lending operations to the green projects. During the term of the green bond net proceeds should be periodically

revised to match the requirements of the green project financings. The monitoring and adjustment process should be transparent and preferable supplemented by an independent auditor or an entitled third party to verify the allocations to green projects.

Reporting

Until the proceeds of a green bond issue are fully allocated to green projects, the issuer shall report the use of the proceeds annually. The annual report should include the list of the green projects financed, as well as the expected impact of each of the projects. The GBP recommended the use of qualitative performance indicators and, where feasible, quantitative performance measures[1]. The key underlying methodology and/ or assumptions used in the quantitative determination should also be clarified in the documentation. The quantitative measures can be energy capacity, electricity generation, greenhouse gas emissions reduced/avoided, number of people provided with access to clean power, decrease in water use, reduction in the number of cars required etc.

Green Bond Certification

The green bond certification process as approved by Climate Bonds Standard can be in two forms which are:

- Pre-Issuance Requirements which need to be met for issuers seeking certification ahead of issuance,
- Post-Issuance Requirements which need to be met by issuers seeking ongoing certification following the issuance.

In order to be labeled as green bond, the issuer should firstly fulfill the pre-issuance process but the certification can be realized for the debt instrument that is already been issued. Programmatic Certification is also available for frequent issuers which increases the flexibility and reduces the verification burden for issuers with large scale or longer term green bonds or sustainable finance programs.

The Green Bond Principles (GBP) recommends that in connection with the issuance of a Green, Social, issuers appoint external review provider(s) to confirm the alignment of their bond with the four core components of the Principles. The regulatory framework applied in different countries in relation with the process of external review are Assurance Framework for the Climate Bond Standard, Guidelines for the Conduct Assessment and Certification of Green Bonds (Interim) jointly issued by the People's Bank of China and the China Securities Regulatory Commission, the draft EU Green Bond Standards produced by the High-Level Expert Group (HLEG) on Sustainable Finance, and the ASEAN Green Bond Standards. All of these provide voluntary guidance relating to professional and ethical standards for external reviewers, as well as to the organization, content and disclosure for their reports[2].

The services provided by the external reviewers can be in the forms of secondary party opinion, verification, certification and green bond scoring or rating. The external reviewers are generally independent research institutions that expert in the evaluation of whether the proceeds of the financings are utilized for environment friendly investments such as the Center for International Climate Research (CICERO) and ISS-Oekom. Those institutions facilitate the development of the green bond market by building a communication channel between the prospective borrowers and investors. They monitor the conformity

of the usage of the proceeds of the green bonds with the GBPs, or with their own criteria set for the greenness (Dorfleitner et al., 2021).

Second-party opinions (SPOs) are the most widespread type of external reviews for green bonds provided by independent research institutions such as CICERO, ISS-Oekom, and Sustainalytics. A typical SPO includes a comprehensive evaluation of the approach of the issuer in relation with the acceptable green utilization. Even some SPOs provide qualitative grading such as 'dark green', 'medium green', 'light green', and 'brown' as CICERO applies. According to CICERO's criteria, 'dark green' is only awarded to green projects and solutions contributing directly to the long-term vision of a free climate future. While CICERO grades 'light green' grade to especially for energy efficiency projects but enabling fossil-based activities as well. The 'brown' shade indicates a bond's negative ecological impact (Dorfleitner et al., 2021).

Verification reports are less comprehensive, less lengthy and detailed as compared with SPOs. They are issued by auditing companies such as KPMG and PwC. In verification reports, the confirmation with the usage of the proceedings of the bond issue in alignment with the GBPs or other related national regulatory rules is presented. As it is the case of regular audit reports, such reports end with a statement on the question of whether the issuer has violated any requirements of the GBPs. It is accepted that verification reviewers evaluate green bonds more objectively, while SPO reviewers deliver subjective opinions on green bonds under their own standards (Dorfleitner et al., 2021).

CBI certification realized under the Climate Bonds Standard and Certification Scheme which incorporates scientific criteria ensures that the proceedings of the bond issue are used in consistency with the goals of the Paris Climate Agreement to limit warming to under 2 degrees. CBI certification provides the benefits such as robust label, diverse investor base, ease to be recognized by the investors and reputation backed by Climate Bond Initiative and international standard recognition[3].

Green Rating Reports are issued by international credit rating agencies such as Moody's and S&P. Although these reports are similar to SPOs, they are provided by rating agencies and are more quantitative and focus on issuers' environmental performance data.

Types of Green Bonds

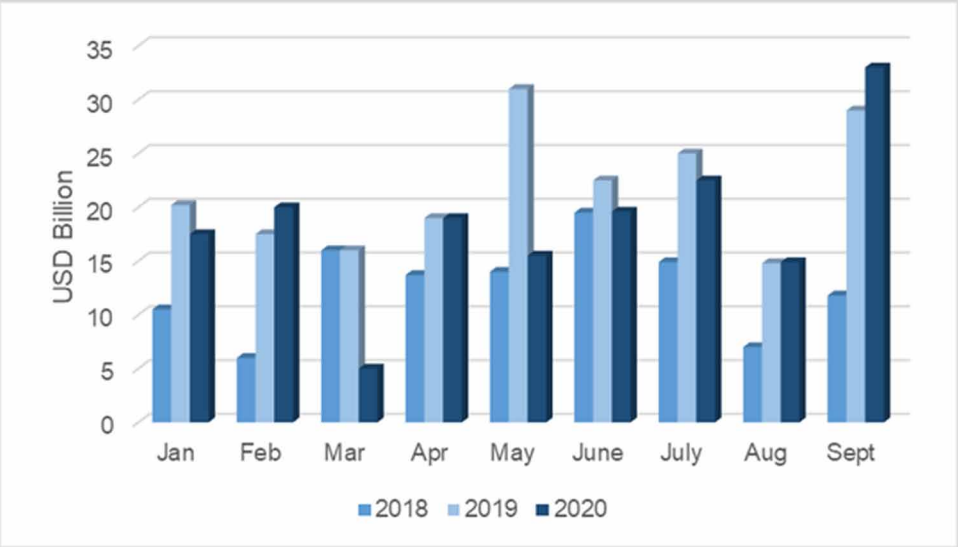
There are currently four types of Green Bonds:

- Standard Green Use of Proceeds Bond: This is the most common type of green bond and is a standard recourse-to-the-issuer debt obligation aligned with the GBP.
- Green Revenue Bond: The credit exposure is created by referring to the pledged cash flows of the revenue streams, fees, taxes etc. created by the green projects. The bond is a non-recourse-to-the-issuer debt obligation aligned with the GBP.
- Green Project Bond: This is a typical project bond type whereby the proceedings are used for financing single or multiple green project(s). The issuer has direct exposure to the risk of the project(s) with or without potential recourse aligned with the GBP.
- Green Securitized Bond: The bond is collateralized by one or more specific Green Project(s), and aligned with the GBP. The first source of repayment is generally the cash flows of the assets.

The Green Bond Market

Despite the turmoil in the financial markets because of Covid-19, the green bond issuance was picked in 2020 and the total market size was reached to USD 948 billion. It is estimated that the market reached to a level of 1 trillion easily as of 2020. Figure 1 shows the monthly issuance level in the period between 2018-2020.

Figure 1. Monthly green bond issuance
Source: Climate Bond Initiative (2020)

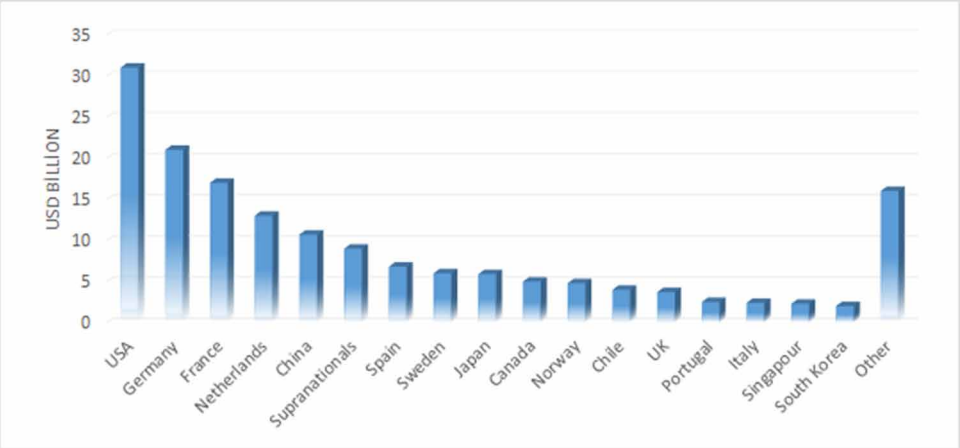


The increasing concerns about the carbon neutrality targets by many countries have contributed to the development of the green bond market. Figure 2 presents the top green bond issuers by country. The green bond market has been led by US issuers with a cumulative issue amount of USD 117 billion followed by Germany and France. China also has the second largest cumulative green bond portfolio in the amount of USD 117 billion. EU officials have also announcements about their plans about green bond issues over the next years in the amount of EUR 225 billion. The announcements of the governmental authorities of those three main issuers indicate that the interests of both issuers and investors to environment friendly projects will further increase.

Financial and non-financial corporate issuers have been the biggest source of green bonds issuance together with the supranationals since 2018. It is determined that the green bond market has been dominated by financial corporate as the system requires specific funding in order to finance the increasing volume of environmental-friendly projects. While the share of the sovereign issues has diminished, the issuance backed by the governments has increased which stipulate that the governments prefer to use indirectly support the environment friendly projects.

As the market size has increased as parallel to the issue number and issuers, some green indexes have been developed by the financial intermediaries as benchmark to track the performance of the green bond

Figure 2. Top 2020 green bond issuers- Countries: Amount issued (2020 vs. Cumulative)
Source: Climate Bond Initiative (2020)



investments. These are Solactive Green Bond Index, S&P Green Bond Index, BoA Merrill Lynch, Green Bond Index, and Bloomberg Barclays MSCI Green Bond Index.

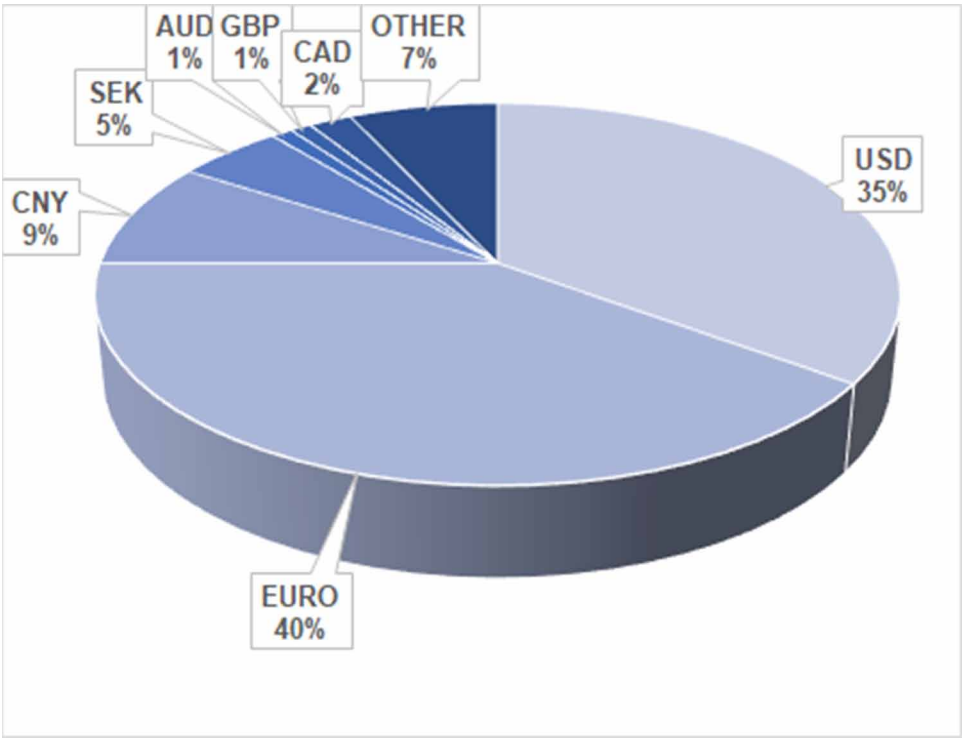
The green bond market is dominated by Euro issues (40%) and USD issues come the next (35%) in the overall issuance of USD 1,010.6 billion in total as stipulated in Figure 3. Chinese Yuan (9%) and Swedish Krona (5%) are the other two important currency types leading the market.

Literature Review

Literally, green bond premium has been defined as the difference between the green bond yield and the equivalent synthetic conventional bond yield. The green bond premium, sometimes named as *Greenium*, has been analyzed by using both, primary and secondary market data. The literature focused on the pricing differences between green and conventional bonds issued by the same issuer. The effects of the green label on the Yield at Issuance for green and conventional bonds by controlling for different bond characteristics and time effects have been evaluated by some researchers. The researchers used different samples from different types of issuers or geographies so the findings in relation with the yield differences are mixed.

Kapraun and Scheins, (2019) define the existence of the greenium as "green credibility" and analyzed more than 1,500 Green bonds with respect to their pricing on the primary and secondary market. They reported that there exists green premium for the green bonds issued by governments or supranational entities, denominated in EUR or USD, or corporate bonds with very large issue sizes. For the primary market analysis, they used yields at issue regression model applied by Baker et al. (2018), and determined that Green bonds are issued at a lower yield of around 15 basis points than comparable conventional bonds. For the secondary market analysis, they focused only on those Green and conventional bonds, which are issued by companies with both types of bonds and regressed the Yield to Maturity on the Green dummy variable, they reported that Green bonds trade at 10 bps higher yields than comparable conventional bonds. Gianfrate and Peri (2019) used a propensity score matching approach and analyzed 121 senior bullet Euro-denominated green bonds. They reported that green bonds are issued with a statistically

Figure 3. Currency distribution of green bonds issuance
Source: Unicredito (2021)



significant average negative premium of around 18 basis points which increases to 21 basis points is for corporate issuers. Zerbib (2019) analyzed 110 bond pairs by building counterfactual bond with the same terms of the green bond and used a two-step regression procedure to estimate the yield differential. The results suggest a small negative premium of negative 2 basis points for the entire sample and for euro and USD bonds separately. They also indicated that this negative premium is relatively higher for financial and low-rated bonds. Baker et al. (2018) especially focused on the greenium of Bloomberg and CBI certification difference at the issuance. They reported a negative premium of 6 basis points for municipal bonds and the premium doubles doubles or triples for bonds that are not only self-labeled as green (and confirmed by Bloomberg) but also registered with the CBI. Karpf & Mandel (2018) analyzed the municipal green bonds by using Oaxaca-Blinder decomposition method and reported that there is on average a positive and statistically significant spread between brown and green bonds. Bachelet et al. (2019) determined 89 bond couples determined by exact matching method in terms of currency, rating same bond structure, and same coupon type (fixed rate bonds). They reported that institutional green bonds display a negative premium and are far more liquid, whereas private green bonds have a positive premium. Nanayakkara and Colombage (2019) used Option-Adjusted spread (OAS) to measure the credit spreads of 43 green bond issues and found that there exists a negative premium of 63 basis points. Hachenberg and Schiereck (2018) used the second market data for 132 green bonds to analyze, issued by 73 different counterparts. By using the method of panel regression with the daily delta between green and non-green i-spreads. They determined statistical significance for single A-rated bonds, with green bonds trading 3.88 bps tighter than comparable non-green bonds. Green bonds with rating classes AA

and BBB trade economically tighter than their non-green comparable bonds, but we could not find any statistical significance. Löffler et.al (2021) analyzed Chinese used both propensity score matching and coarsened exact matching methods to determine 577 pairs of bonds and showed that show that the yield for green bonds is, on average, 15–20 basis points lower than that of conventional bonds, both on primary and secondary markets. Fatica et al. (2019) also used the model of asset pricing developed by Baker et al. (2018) and used a sample of 1397 green and nearly 270,000 conventional bonds. Their results for the overall sample show a negative premium at 28 bp, however the regression results are not statistically significant. They also analyzed the sub-samples of the different categories of issuers, namely supranational institutions, financial and non-financial corporations. While results for the green bonds issued by supranational institutions (80 bps) and non-financial corporations (20bps) are statistically significant, this not the case for the financial institutions. Wang et al. (2020) utilized a comprehensive sample of 159 Chinese green bond issues from 56 corporate issuers. They determined that the premium of the green bond issuance in the primary market with third-party certification or supported by an underwriter with a high social responsibility profile (Wang et al. 2020) is lower. Moreover, they reported that green bonds issued by publicly listed corporations trade 33 bps tighter than their conventional bonds.

Bour (2019) focused on the effect of non-financial disclosure and analyzed a dataset containing 631 bonds. He identified four types of non-financial disclosure that a green bond may incorporate; commitment to the Green Bond Principles, Second Party Opinion, Assurance and Certification. He determined a green bond Premium of -23.2 basis points compared to otherwise similar conventional bonds in the secondary market. He also noted that while external review has the strongest effect on the size of the green bond premium, alignment with the Green Bond Principles and CBI certification shows no additional effect. Slimane et.al (2020) analyzed 532 bond pairs of green and conventional bonds issued by the same issuer that are included in an established green bond index. By using a two tier methodology consisting of an intra-curve method at the security level and a matching method at the asset class level, they reported that on average there is a statistically significant overall negative premium on green bonds as compared to the conventional ones and the premium is more pronounced in certain fixed income sub-segments.

Nanayakkara and Colombage (2019) panel data regression with to analyze daily observations of on bonds denominated in local currencies by using Option-Adjusted spread (OAS) to measure the credit spreads of bonds while controlling for bond specific, macroeconomic and global factors that influence the spread. The results of this hybrid indicated that green bonds are traded at a premium of 63 basis points as compared to conventional bonds.

A research realized by Sheng et.al. (2021) focused on the estimation of the green bond premium in China. The results of the propensity score matching method showed that the green bonds are priced at an average negative premium of 7.8bps, implying that green projects may be issued at a lower cost. They also proposed that the negative premium is more pronounced for state-owned enterprises and varies across the financial and corporate groups. The effect of the ownership decreases if bond issues incorporate a third-party verification which curtails the issues of information asymmetry and the possibility of greenwashing.

Despite a set of research reporting the existence of negative premium on the yield at issue and/or yield to maturity of the green bonds as compared to the conventional bonds, there exist some others that reported no premium at all. Ostlund (2015) was one of them on this subject, by using the early data set of 28 pairs of green and conventional bonds. He reported that no evidence for the existence of a green preference among investors and proposed that as long as there are no targeted policies, green bonds are unlikely to be a major source of green investments. Hyun et al. (2019) analyzed the green bond Premium

by using liquidity-adjusted yield and concluded that there exists no significant yield premium or discount on green bonds. Larcker and Watts (2020) examined analyzed the green bonds issued by municipalities and determined that there exist 0.45 basis points, a very small green bond yield discount that can be accepted as essentially zero. Wulandri et al. (2018) focused on liquidity premium on the green bond yield spread by using two measures of liquidity which are LOT measure and the bid-ask spread. They determined that LOT liquidity measure has explanatory power for the yield spread of green bonds, they also proposed that possible increase in demand and decrease in the issuance of green bonds may end up with shortage in the financial markets which may lead to a premium in the form of a liquidity premium but not the green bond premium. One of the recent research on green bond premium belongs Lau et al.(2020) used a very broad data set and reported that the green bond premium is on average amounts to just over one basis point. Despite that they underlined the greenium can vary for individual issues depending on the risk of green washing. They decomposed the greenium into a time-varying market component which is common to all green bonds and an idiosyncratic component which is specific to a certain green bond. Fatici et al. (2019) eTechnical report to the European Commission, analyzed the pricing of green bonds and reported that there exists a premium when green bonds are issued by supranational institutions and corporates but not by the financial institutions.

Finally, Macaskil et al.(2021) realized a systematic literature review revealing premium determinants in the period between 2007-2019 and the findings confirm a consensus on the existence of a green premium within 56% of primary and 70% of secondary market studies, particularly for those green bonds that are government issued, investment grade, and that follow defined green bond governance and reporting procedures.

MAIN FOCUS OF THE CHAPTER

Data and Methodology

The Ordinary Least Square (OLS) Panel Regression is a widely used methodology for analyzing the yield difference between various types of fixed-income securities. This is the case for green premium researchers as well. Some of them used a dummy variable to represent the characteristic of greenness of a bond issue which may create a multicollinearity problem as the greenness and other characteristics of a bond such as credit rating affect each other concurrently. In order to avoid this major problem, many of the green premium researchers prefer a matching procedure to create a series of matched pairs of investment assets with the same characteristics except for one feature which is the yield. While some of them use exact matching procedure, the others created a synthetic conventional bond by using the already available bond of the same issuer Zerbib (2019) or Helwege et al. (2014). In doing so, the major aim of the researchers is to isolate the effects from other factors affecting bond yields and increase the comparability of the green bond and conventional bonds.

In this analysis the exact matching approach is employed. A pair of securities with similar properties, except for one property is created. In order to determine the bond pairs, for each green bond a comparable conventional bond is determined. Referring to Zerbib (2019) and Bachelet et al. (2019), the following criteria are set to identify comparable non-green bonds.

In order to determine the list of outstanding green bonds, Refinitiv (Thompson Reuters) is searched. In this population there exist 2.077 issues in the total amount of more than 682.5 billion USD. When

Table 1. Matching criteria of green bonds with plain vanilla bonds

Characteristics	Matching criteria		
Issuer	Exact match		
Issue Amount	At least 300 million USD or Euro		
Issue Date	+/- 6 years		
Maturity Date	+/- 2 years		
Credit Rating	Exact match		
Sector	Exact match		
Currency	USD or Euro: Exact match		
Market of Issue	Exact match		
Seniority	Exact match		
Collateral	Exact match		

only Euro and USD denominated issues are selected the number reduced to 1.154. Firstly, the amount criterion is applied and the issues the amount of which is above 300 million USD and Euro are listed in order to address the liquidity concerns and the sample size decreased to 639. Then, as the same issuer may have more than one green issue, the maturity date criterion is applied. The comparable conventional bond is selected amongst the outstanding bonds of the same issuer with a maturity of 2 years longer or shorter. The list of the bond pairs is given in Appendix 1. As expected, the sectoral distribution of the USD denominated bonds is dominated by financial services and banking (50%), utilities and electricity (14%) and IT related services (7%) and others (29%). 32% of the bonds belong to US issuers, and 25% to European region countries . The sectoral distribution of the Euro denominated bonds is dominated by financial services and banking (40%) and transportation (15%), and 70% of the issues belongs to European region countries and UK.

For daily bond yields and prices, the ask yield of each bond together with ask and bid prices of 48 bond pairs are downloaded from Refinitiv (Thompson Reuters). Literally, it is revealed that the yield of the green bonds is generally lower than that of a conventional bond of the same issuer in the secondary market. This means that investors are eager to accept a lower yield in exchange of the commitment with the issuer to use the proceeds for financing environment friendly projects under the process guarantee given by a third party certifier.

Table 2. Average figures of green and conventional bonds pairs

	Green Bonds			Conventional Bonds		
	Amount	Maturity years	Coupon	Amount	Maturity years	Coupon
EUR Denominated Bonds	1,462,843,500	6.89	1.14	2,300,850,000	6.56	1.59
USD Denominated Bonds	800,810,735	6.75	2.22	1,112,500,500	6.2	2.96

Table 2 reports the average figures of green and conventional bonds pairs. The average amount of Euro denominated green bonds is considerably lower than that of the conventional bonds. Nevertheless, it is higher than the average amount of USD denominated bond pairs. For Euro denominated bonds average coupon rate of green bonds is 1.14% and it is slightly lower than the average coupon rate of conventional bonds which is 1.59%. The same is true for USD denominated bonds which are 2.22% and 2.96% and the spread is larger. The lower coupon of the green bonds may also indicate that they are perceived as less risk as the use of proceeds is known in detail. Even some of the investors are known as "sustainable investors" that use the funds for especially financing the sustainable instruments. The maturities are also comparable around 6 years for both types of bond pairs as they are selected by using a matching procedure.

After a true matching procedure, 20 pairs of Euro denominated and 28 pairs of USD denominated exact match are determined. By using the bid and ask yields and prices of these exact matches, a panel regression with fixed and random effects were realized. In this framework the following hypothesis is tested to verify the existence of green bond premium:

Hypothesis: Green bonds trade tighter than non-green bonds.

In order to test the hypothesis, it is aimed to determine the unobserved effects creating the yield differentials between green and conventional bonds by measuring the maturity variable and liquidity control variable. Some researchers deal with maturity variable by creating a synthetic conventional bond with the same maturity with the green bond by using two conventional bonds of the same issuer. The yields are linearly interpolated or extrapolated according to the term of the corresponding green bond(Zerbib, 2019). However, in this analysis, an exact matching procedure is used to address the maturity variable but this limited the number of bond pairs. In order to address the liquidity variable, the differences between the bid-ask spreads of the matched pairs of green and plain vanilla bonds as a proxy for limiting the liquidity bias referring to the approach of Zerbib (2019). This approach is based on the study of Fong et al. (2017) suggesting that the bid-ask spread is the most effective method to measure liquidity for low-frequency bond data. The same approach is used by Ngan (2020) who determined that green bonds are traded at lower -0.45 basis points yield compared to their conventional peers. In this framework, the regression equation for testing the hypothesis is determined as the following:

$$\Delta Yieldi, = {}_{\alpha i} + \beta 1 \Delta_{BA} i, + {}_{\varepsilon} i,t$$

where $\Delta Y_{ieldi},t$ is the yield difference between green bond i and its paired conventional bond on day t. αi reflects the unobserved cross-sectional fixed effects in the panel regression. ΔBAi, is the difference in bid-ask spread of green bond i and its paired conventional bond on day t, with εi, being the error term.

RESULTS AND DISCUSSION

The panel regression is conducted under the assumption that the error terms are homoscedastic and have a zero mean value. The robustness test results are submitted in Table 3, there exists autocorrelation in the residuals generated by both the fixed and random effect models. Except Durbin-Watson test all other unit root tests report that the residual series are stationary, then it is concluded that there exists no serial correlation problem.

Table 4 displays the outputs of the panel regression of Equation (1) under fixed and random effects. The first part of the table gives the results of 13,550 observations including all the bond pairs, denominated in USD and Euro. The adjusted R2 is 19% and the coefficient for the independent variable (ΔBA) is estimated to -39 basis points and statistically significant even at 1% level. This figure indicates that a 1% increase in residual liquidity which is defined as the difference in bid-ask spreads of the green and plain vanilla bonds results with a 0.39% decrease in the yield spread twins. This finding is consistent

Table 3. Test results of fixed-effects and random-effects panel regression

	Test	Statistic	Pvalue	Conclusion
FIXED EFFECTS				
Serial correlation	Durbin-Watson	0.4804		Serial correlation
Unit root test	Levin, Lin & Chu	-6.333	0.000	Stationarity
Unit root test	Im, Pesaran &Shin	-21.6302	0.000	Stationarity
Unit root test	ADF-Fisher	943.27	0.000	Stationarity
Unit root test	PP-Fisher	1418.48	0.000	Stationarity
Fixed vs. Random effects	*Hausman*	*1.212*	*0.282*	*Random effects*
RANDOM EFFECT				
Serial correlation	Durbin-Watson	0.4102		Serial correlation
Unit root test	Levin, Lin & Chu	-6.332	0.000	Stationarity
Unit root test	Im, Pesaran &Shin	-21.6302	0.000	Stationarity
Unit root test	ADF-Fisher	749.53	0.000	Stationarity
Unit root test	PP-Fisher	695.89	0.000	Stationarity

with the findings of the previous studies on green bond premium in the secondary market (Barclays, 2015; Zerbib, 2019; Partridge & Medda, 2020).

It is fact that different factors affecting the level and fluctuations in the pricing of USD and Euro denominated bonds4. In the second stage, t^{h}e panel regression conducted by using USD and Euro denominated bond twins individually. The results are reported in the second part of Table 4 for USD denominated bonds and third part for Euro denominated bonds.

The results show that the green bond premium is more profound for USD denominated twins than for Euro ones. The adjusted R2 is 25% and the coefficient for the independent variable (ΔBA) is estimated to -59 basis points and statistically significant even at 1% significance level. This figure indicates that a 1% increase in residual liquidity which is defined as the difference in bid-ask spreads of the green and plain vanilla bonds results with a 0.59% decrease in the yield spread twins. This estimator is higher than the coefficient estimated for the whole series. The adjusted R2 falls to 12% for Euro denominated bonds and the coefficient for the independent variable also falls to – 26 basis points. This indicates that the greenium which is defined as the yield difference between the green bond and plain vanilla bond pair is considerably higher for USD denominated issues. The Breusch-Pagan test results indicate that there does not exist sufficient evidence showing that heteroscedasticity is present in the original regression model.

When analyzing the green premia across different currencies, there exist a limited number of research that have similar results. The results of the analysis are parallel to that of Zerbib (2017) who reported that the average green bond premium is negative and higher for USD bonds. Also, Kapraun and Schein (2019) who also analyzed Euro and USD denominated green and conventional bond pairs reported that bonds issued in USD have higher yields of 12 basis points, while bonds issued in CNY and EUR have on average 22-25 basis points higher yields than their conventional counterparts in the secondary market. However, they also report a reverse relation in the primary market as they reported a negative premium of 20 – 30 basis points for green bonds, implying that at issuance, green bonds are trading at lower yields than their conventional counterparts. The effect is much stronger for green bonds issued

Table 4. Results of fixed-effects and random-effects panel regression

		Fixed Effect		Random Effect	
All pairs					
ΔBA		-0,3943	***	-0,388	
		(0.000)		(0.000)	***
Constant		-0,3532		-0,3522	
		(0.000)	***	(0.000)	***
Observations		13550			
Adjusted R2		0,19			
Breusch-Pagan Test		16,85	(0.053)	*	
USD denominated pairs					
ΔBA		-0,5919	***	-0,5801	***
		(0.000)		(0.000)	
Constant		-0,2919	***	-0,2942	**
		(0.000)		(0,076)	
Observations		8910		8910	
Adjusted R2		0,154			
Breusch-Pagan Test		18,03	(0.0720)	*	
EUR denominated pairs					
ΔBA		0,4626	***	0,4625	***
		(0.000)		(0.000)	
Constant		-0,6532	***	-0,6532	***
		(0.000)		(0.000)	
Observations		4640		4640	
Adjusted R2		0,12			
Breusch-Pagan Test		0,09	(0.7604)	*	

Note: Standard errors are reported in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

in USD than in EUR (41 basis points vs. 17 basis points) and not significant for green bonds issued in CNY. Ngan (2020) reported that while CNY denominated green bonds have a significant average green premium of -9.4 basis points, EUR and USD-denominated green bonds do not show any statistically significant mean values.

From a broader perspective, Table 5 summarizes the research of different researchers using different periods, type of the bonds analyzed and models. There exists no consensus about the magnitude of the negative green premium, even some research reported positive premium. As the purpose of the study is determined as the elaboration of greenium in Covid-19 times, and the finding of a negative premium of 39 basis points may indicate an increase in green premium as compared to the results of research realized using the market data of normal times.

Table 5. Summary of research about greenium in the secondary bond market

Study	Market	#GBs	Universe	Period	Method	Premium estimate
Bachelet et al. (2019)	Secondary	89	Global	2013 - 2017	OLS model	2.1 to 5.9 bps
Baker et al. (2018)	Secondary	2 083	US Municipals	2010 - 2016	OLS model	-7.6 to -5.5 bps
Bour(2019)	Secondary	95	Global	2014 - 2018	Fixed effects model	-23.2 bps
Gianfrate and Peri(2019)	Secondary	70 – 118	EUR	3 dates in 2017	Propensity score matching	-11 to -5 bps
Hachenberg and Schiereck(2018)	Secondary	63	Global	August 2016	Panel data regression	Not significant
Hyun et al. (2020)	Secondary	60	Global	2010 - 2017	Fixed effects GLS model	Not significant
Kapraun and Scheins(2019)	Secondary	769	Global	2009 - 2018	Fixed effects model	+10 bps
Karpf and Mandel(2018)	Secondary	1 880	US Municipals	2010 - 2016	Oaxaca-Blinder decomposition	+7.8 bps
Larcker and Watts(2019)	Secondary	640	US Municipals	2013 - 2018	Matching & Yield comparaison	Not significant
Lau et al. (2020)	Secondary	267	Global	2013 - 2017	Two-way Fixed effects model	-1.2 bps
Nanayakkara and Colombage(2019)	Secondary	43	Global	2016 - 2017	Panel data with hybrid model	-62.7 bps
Ostlund(2015)	Secondary	28	Global	2011 - 2015	Yield comparison	Not significant
Preclaw and Bakshi(2015)	Secondary	Index	Global	2014 - 2015	OLS model	-16.7 bps
Schmitt(2017)	Secondary	160	Global	2015 - 2017	Fixed effects model	-3.2 bps
Zerbib(2019)	Secondary	110	Global	2013 - 2017	Fixed effects model	-1.8 bps

FUTURE RESEARCH DIRECTIONS

Future research can focus on specifically the effects of Covid-19 on the greenium. The research can use a data set of new issues of the same issuers with comparable terms of conventional and green bonds in the times of Covis-19.

CONCLUSION

The sustainable finance concept is originated mainly from the climate change mitigation efforts. However, the experience of Covid-19 pandemic has contributed to the awareness about the sustainability issues addressed by the Environmental, Social and Governance (ESG) criteria. These criteria are integrated into the investment decisions about new financial products such as green bonds. Under the framework of sustainable finance, the most widely used financing are green bonds. International Capital Markets Association (ICMA) defines green bonds as "any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance, in part or in full, new or/and existing eligible green projects".

The peculiarities of the green bonds in terms of the utilization of the proceedings make it as a special investment alternative for many institutional investors. In this regard, the investors are supposed to

accept lower yields as compared to plain vanilla bonds in primary and secondary bond markets. The purpose of this paper is testing the existence of the green bond premium in the secondary market by using an update and comprehensive data set. The variables such as rating, sector, amount of the issue, maturity and external review are balanced by using a matching procedure of a green bond with a plain vanilla bond issued by the same issuer which is the core determining process in the analysis, ask-bid spread differential is regressed by using a panel regression method under fixed and random effects. The results of the analysis revealed that there exists a small negative premium of 39 basis points. The major finding of this study is that the green bond premium is more profound for USD denominated twins than for Euro ones as there exists a negative premium of 59 basis points for USD denominated green bonds whereas it is -26 basis points for Euro denominated bonds and -39 basis points for the whole data set.

From a broader perspective, the results reported by the different researchers using different periods, universe and models, there exists no consensus about the magnitude of the negative green premium, even some analysis reported positive premium. The second and more relevant purpose of this paper is determining the existence and magnitude of the green bond premium in the secondary market in the times of Covid-19 in the period between March 2020-April 2021 as compared to before Covid-19 times. However, making a rational comparison requires the acceptable amount of the market data of the selected bond pairs before Covid-19, which is generally unavailable. In fact, this is the constraint of the study and in order to overcome this, the prior research findings are used as they are assumed to use the required amount of market data for analysis. In this framework it can be said that the finding of a negative premium of 39 basis points may indicate an increase in green premium as compared to the results of research realized using the market data of normal times.

As the green bonds are a relatively new instrument type, it can be proposed there exist a mispricing by the market. Also, this small difference does not indicate green bonds are a cheaper source of financing compared to conventional bonds. Nevertheless, it signals that investors can accept slightly lower yields for environmental-related financial assets. The enhanced transparency incorporated in the design of the bond issues, may contribute to the attraction of the green bonds that may lead to a larger green bond premium in the future.

The increasing awareness about the public health as driven by Covid-19 and the ongoing efforts in order to deal with the effects of the climate change has shifted the focus of investments towards environment and public health supporting investments. These environmental priorities have also been shared by the investors, especially institutional ones that have reporting preferences. So called sustainable finance has been one of the main issues elaborated by both market participants and the academicians. This new era created its own funding sources, especially green bonds. Future research is proposed especially in relation with the effects of the characteristics such as rating, sector, amount of the issue, maturity and external review on the pricing and marketability of the green bonds. The research is supposed to contribute to the development of the green bond market.

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KEY TERMS AND DEFINITIONS

Center for International Climate Research (CICERO): It is an independent research institution that provide Second-party opinions (SPOs) are the most widespread type of external reviews for green bonds.

Green Bond: Any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance, in part or in full, new, or/and existing eligible green projects.

Green Bond Principles (GBP): It is issued and revised by International Capital Markets Association (ICMA). It defines the eligible project categories contributing to five high level environmental objectives which are climate change mitigation, climate change adaptation, natural resource conservation, biodiversity conservation, and pollution prevention and control.

Green Project: A project that makes products or develops technologies that are primarily aimed at reducing greenhouse gas emissions or supporting the use of clean energy.

Greenium: The greenium is the spread of a green bonds to the issuer's non-green curve.

Second-Party Opinions (SPOs): They are the most widespread type of external reviews for green bonds provided by independent research institutions such as CICERO, ISS-Oekom, and Sustainalytics. A typical SPO includes a comprehensive evaluation of the approach of the issuer in relation with the acceptable green utilization.

Sustainable Finance: It refers to the process of taking environmental, social and governance (ESG) considerations into account when making investment decisions in the financial sector, leading to more long-term investments in sustainable economic activities and projects.

ENDNOTES

1 https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/Green-Bonds-Principles-June-2018-270520.pdf

2 https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/June-2020/External-Review-GuidelinesJune-2020-090620.pdf

3 https://www.climatebonds.net/certification

APPENDIX 1

Table 6. USD Denominated Green Bonds

				GREEN BOND				PAIRED CONVENTIONAL BOND	
	Description	**Country**	**Sector**	**Maturity Date**	**Amount Outstanding**	**Currency**	**Coupon**	**Maturity Date**	**Coupon**
1	AARKA 0.50 06/29/28	Switzerland	Banking	29.06.2028	307.700.592	U.S. Dollar	0,5	13.04.2028	0,625
2	ADB 3.125 09/26/28	Supranational	Development Bank	26.09.2028	750.000.000	U.S. Dollar	3,125	19.01.2028	2,75
3	AQN 2.050 09/15/30	Canada	Utilities	15.09.2030	600.000.000	U.S. Dollar	2,05	29.01.2029	2,6
4	CHMBK 1.200 09/10/25	China	Banking	10.09.2025	800.000.000	U.S. Dollar	1,2	19.06.2023	0,93
5	EGGV 5.250 10/06/25	UK	Global Finance	6.10.2025	750.000.000	U.S. Dollar	5,25	20.11.2023	5,25
6	EIB 0.750 09/23/30	Supranational	Development Bank	23.09.2030	1.500.000.000	U.S. Dollar	0,75	8.03.2031	1
7	GOOGL 0.450 08/15/25	US	IT	15.08.2025	1.000.000.000	U.S. Dollar	0,45	15.08.2026	1,998
8	HASI 6.000 04/15/25 ‘22	Hongkong	Asset Management	15.04.2025	400.000.000	U.S. Dollar	6	15.06.2024	5,25
9	EQIX 1.000 09/15/25 ‘25	US	Real Estate	15.09.2025	700.000.000	U.S. Dollar	1	8.11.2024	2,625
10	METLF 0.950 07/02/25	US	Life Insurance	2.07.2025	750.000.000	U.S. Dollar	0,95	19.05.2027	3
11	NDBNK 0.625 09/29/25	Holland	Banking	29.09.2025	2.000.000.000	U.S. Dollar	0,625	3.04.2023	2,43
12	MTRCN 1.625 08/19/30	Hong Kong	Public transport	19.08.2030	1.200.000.000	U.S. Dollar	1,625	28.06.2030	1,3
13	NXPI 3.400 05/01/30	Canada	Energy	1.05.2030	1.000.000.000	U.S. Dollar	3,4	1.12.2028	5,55
14	PPSIB 2.300 06/23/25	South Africa	Mutual Fund	23.06.2025	750.000.000	U.S. Dollar	2,3	29.03.2026	4,55
15	JICA 1.000 07/22/30	China	Financial services	22.07.2030	500.000.000	U.S. Dollar	1	20.10.2028	1,125
16	KEPCO 0.750 01/27/26	Korea	Electric	27.01.2026	450.000.000	U.S. Dollar	0,75	30.01.2026	1,125
17	KIM 2.700 10/01/30	US	Real Estate	1.10.2030	500.000.000	U.S. Dollar	2,7	1.11.2028	1,9
18	NXPI 3.400 05/01/30	Holland	IT	1.05.2030	1.000.000.000	U.S. Dollar	3,4	1.12.2028	5,55
19	ING 1.400 07/01/26 ‘25	Holland	Banking	1.07.2026	1.000.000.000	U.S. Dollar	1,4	29.03.2027	3,95
20	INGRH 5.375 04/29/24	US	Technology	29.04.2024	325.000.000	U.S. Dollar	5,375	2.05.2025	5
21	STRGY 4.850 10/14/38	US	Banking	14.10.2038	790.000.000	U.S. Dollar	4,85	24.04.2037	5,75
22	VZ 1.500 09/18/30 ‘30	US	Communication	18.09.2030	1.000.000.000	U.S. Dollar	1,5	15.09.2029	2,6
23	HKGV 0.625 02/02/26	Hong Kong	Asset Man	2.02.2026	1.000.000.000	U.S. Dollar	0,625	24.04.2026	2,32
24	CIFIG 5.950 10/20/25 ‘23	US	Property Man	20.10.2025	500.000.000	U.S. Dollar	5,95	29.05.2025	4,8
25	KOMEF 0.375 06/19/24	Sweden	Development Bank	19.06.2024	1.000.000.000	U.S. Dollar	0,375	2.10.2024	1
26	SUMFG 0.948 01/12/26	Japan	Finance	12.01.2026	1.000.000.000	U.S. Dollar	0,948	15.06.2024	0,508
27	ELLEV 1.7280 11/6/2028	Sweden	Electric	11.06.2028	300.000.000	U.S. Dollar	1,728	31.08.2027	2,72
28	PPSIB 2.300 06/23/25	US	Education	23.06.2025	750.000.000	U.S. Dollar	2,3	29.03.2026	4,55

Table 7. EUR Denominated Green Bonds

				GREEN BOND					PAIRED CONVENTIONAL BOND	
	Description	**Country**	**Sector**	**Maturity Date**	**Amount Outstanding (USD)**	**Currency**	**Coupon**		**Maturity Date**	**Coupon**
1	ACEX 09/28/25	Philippines	Oil and gas exploration	28.09.2025	358.980.000	Euro	2		3.03.2025	2,5
2	SOGRP 11/25/30	UK	Media	25.11.2030	3.589.800.000	Euro	2		20.10.2028	1,125
3	BPCSA 0.010 05/27/30	France	Banking and insurance	27.05.2030	1.495.750.000	Euro	0,01		3.03.2031	0,75
4	CPPIB 0.250 04/06/27	Canada	Pension fund	6.04.2027	1.196.600.000	Euro	0,25		4.03.2025	1,25
5	DEGV 08/15/30	US	Fund	15.08.2030	7.777.900.000	Euro	2,5		4.07.2032	3,25
6	EFIMA 2.100 05/20/30	Euro	Transportation	20.05.2030	897.450.000	Euro	2,1		4.02.2030	2,875
7	ENGIE 2.125 03/30/32	UK	Renewable energy	30.03.2032	897.450.000	Euro	2,125		30.10.2028	2
8	EWRSF 0.010 07/07/28	UK	Education	7.07.2028	598.300.000	Euro	0,01		26.08.2027	0,75
9	IBE 0.875 06/16/25 ‘25	Spain	Utility	16.06.2025	897.450.000	Euro	0,875		3.05.2028	3,01
10	NOEHL 0.375 06/25/24	US and LA	Project management	25.06.2024	598.300.000	Euro	0,375		17.10.2023	0,125
11	KEXIM 0.829 04/27/25	Korea	Development bank	27.04.2025	837.620.000	Euro	0,829		1.06.2023	0,963
12	LITOO 3.500 04/09/25	Italy	Printing	9.04.2025	598.300.000	Euro	3,5		7.06.2025	3,415
13	MADRD 0.827 07/30/27	Spain	Municipality	30.07.2027	837.620.000	Euro	0,827		23.12.2026	1,771
14	ROSCG 2.000 04/06/29	Holland	Transportation	6.04.2029	897.450.000	Euro	2		5.11.2030	1,5
15	STIAB 0.198 10/07/22	Singapore	Education	7.10.2022	358.980.000	Euro	0,198		3.09.2021	0,58
16	SNCFE 0.625 04/17/30	France	Transportation	17.04.2030	1.735.070.000	Euro	0,625		18.06.2030	0,227
17	VOWG 0.875 09/22/28	Germany	Financial services	22.09.2028	1.495.750.000	Euro	0,875		3.06.2027	0,75
18	MNCHY 0.375 03/09/29	Germany	Banking	9.03.2029	598.300.000	Euro	0,375		27.06.2031	0,3
19	LRENT 09/22/27	Germany	Banking	22.09.2027	2.393.200.000	Euro	1		20.12.2027	1,215
20	CABKX 0.375 11/18/26	Spain	Banking	18.11.2026	1.196.600.000	Euro	0,375		7.06.2025	3,415

(Data Source: Refinitiv, Thompson Reuters)

Chapter 10
Is Corporate Social Responsibility Really Able to Create Long-Term Sustainability Value?

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ABSTRACT

This chapter analyzes the academic debate regarding the need to adopt a long-term vision of CSR strategies. It's based on the premise that short run is the dominant approach in financial markets, and this situation could be negatively conditioning the long-term sustainability value creation. New social values may be requesting different management decisions from companies, prioritizing long-term over short term results. A thorough literature review has been done across specialized journals, international reports, and key legislation, trying to determine and model the elements facilitating this sustainable value creation. It shows the alignment needed between CEO and their shareholders within the framework of corporate governance to create long-term value within CSR. There are signs of a possible financial over-performance of companies that strategically create a shared value with stakeholders based on environmental, social, and governance objectives, selected due to their materiality. A model is proposed to consider a long-term approach creating sustainable value in organizations.

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INTRODUCTION

More and more voices claim the need for a change in the way companies are managed. The call for change comes not only from economists (academia), but also from investors and business leaders, such as Larry Fink, which in his recent statements presented in his annual letters (Fink, 2018 and 2019) or even the document signed by 181 Chief Executive Officers (CEO) in the United States (Business Roundtable, 2019), redefines the purpose of corporations. These statements set out the need to incorporate a social purpose in organizations based on a long-term perspective, this is, going beyond serving shareholders to commitments to all stakeholders, promoting a sustainable economy serving all. According to the CEOs, the problem lies in investors, who must share the value generated with other stakeholders, in contrast, according to Fink, the issue lies in CEOs, who must establish strategies for generating financial and social value in the long term. Both apparently want to move forward using the same approach, but they criticize each other for their inaction, and stress inefficiencies in corporate governance (CG). It seems then, this could be the same problem leading to risky strategies aimed to obtaining short-term benefits during the last economic crisis, which ultimately, were opaque to the long-term global risks of the economy. Doing so, hindered the performance of financial institutions, and left their stakeholders (customers, shareholders, workers and society in general) exposed (Ellul, 2015).

Together with the high levels of indebtedness generated in the wake of the crisis, this markedly short-term perspective could be the reason for the current stagnation in investment, growing economic inequalities and a decline in trust in institutions and in CEOs (Barton, 2017; Fink, 2018). The acronym VUCA[1], Volatility (V), Uncertainty (U), Complexity (C) and Ambiguity (A), which refers to general conditions and situations, could be adapted to this economic scenario; it is aggravated by individuals' bias towards short-termism, involving a tendency to avoid uncertainty (Friede, 2019), encouraging heavily diversified investors who are also focused on the short term.

The world is changing, as well as the beliefs and expectations of general stakeholders – beyond shareholders –, which have to be considered by the companies. Thus, new values should be integrated to corporate governance, business management and accounting. It is increasingly common to find examples illustrating this change of paradigm: During the recent COVID-19 crisis, pharmaceutical companies have been the object of harsh social questioning in relation to which stakeholder's expectations should prioritize: profit maximization according to shareholder expectations, priority distribution of vaccines to the countries that have subsidized research, or attending the need to balance social inequalities and provide vaccines to developing countries. The different responses from pharmaceutical companies will generate diverse results in the short and in the long term, which probably will affect their reputation, access to future markets or institutional support, for example. In this context, shareholders could even request the introduction of new values into decision management. Corporate Social Responsibility (CSR) could be crucial in solving the problem, although its implementation is often criticized as being more cosmetic than real, and as often being banished to the area of communication, thereby rendering the information available on sustainability open to question and creating doubts around the capacity of CSR to improve the situation (Durand et al, 2019; Porter & Kramer, 2006; Friede, 2019). The problem could lie in the widespread opinion that sustainability is a serious obstacle to profitability, although this perception could also be related to the short-term perspective and to the problems of governance outlined above.

The Edelman Trust Barometer Global Report (Edelman, 2018), Barton (2017), Porter & Kramer (2011), Schoenmaker, & Schramade, (2019) and Sewchurran, et al. (2019) all agree that short-termism is a problem. From their own perspective, each suggests that if companies refocus towards the long term, this

could provide a solution to this situation. As pointed out by authors such as Dou et al. (2017), they argue that a proactive environmental strategy as part of an ethical commitment would ease the long termism.

Although there seems to be a clear discourse aimed at building sustainable value through a long-term strategy, the literature, both academic and non-academic (i.e. grey literature), appears to disagree, or even to differ in speed or scope, on how to do it. As for international organizations and global consulting firms, the standards and recommendations are based on a value creation proposal grounded on three dimensions; financial, social, and environmental, for which a wide range of indicators exist. Public administration regulation developments in contrast, are beginning to consider elements beyond the financial arena and integrate social and environmental issues that improve corporate transparency. Firms and companies by their side, are more focused in trying to undertake business practices based on the before mentioned developments, namely those related to good governance and accountability. Last, most of the academic literature seems to continue focusing, on evaluating the financial effects of good governance, with a short-term vision.

Hence, the purpose of this investigation is to delve about this literature gap, focusing on the following questions. Can Corporate Social Responsibility (from now on, CSR) create long-term sustainable value? And if so, under what conditions? Furthermore, are business practices really changing to meet these new trends? In fact, how are both companies and shareholders committing with the long-term purpose, this is, on creating long-term sustainable value?

These group of questions provide the basis for this chapter, which building from this body of knowledge gap, integrates all the elements to illustrate how the traditional model represents/becomes a "vicious circle" anchored in short-termism, but in the face of the (increasing) changes in values and demands of the interested parties, should and could transform it, moving towards a "virtuous model" whose impact promises the generation of true sustainable shared value in the long term.

To address these questions, a thorough documentary review of three main areas was done: the specialized academic literature, the main international standards for reporting non-financial information by organizations, and the most important regulations on the subject in Spain and the European Union. Their main contents are presented in section 2. An analysis of this issue shows the possible conditions that would enable the purpose and modelling of the requirements and subjects that could facilitate the generation of sustainable value in the long term. This sustainable value is assumed to be able to become economic value that encourages investors, and consequently CEOs, towards establishing long-term strategies that take environmental, social and governance (ESG) aspects as key elements in this "transformative process".

BACKGROUND

The Process of Generating Sustainable Value: Contributions from the Academic Literature

CSR analysis within the academic literature shows several concepts that have consistently appeared over time, which have shaped how it has been incorporated into business management. The first idea that clearly emerges is that the primary corporate responsibility aims to maximize profits for shareholders (Friedman, 1970). Market forces correct any other imbalances, as long as their efficiency is protected.

This approach was called into question by Stakeholder Theory, among others, according to which all interest groups (IG or stakeholders), and not only shareholders, are important for the organization, and must be taken into account by CEOs in their management (Freeman, 1984; Blair, 1998).

The results stemming from the relationship with stakeholders were subsequently studied from the perspective of creating a competitive advantage (Porter & Kramer, 2006), which addressed the result of the dialogue with stakeholders, aligned with the corporate culture and values and based on ESG issues. For Porter, an organization's strategy means choosing the ESG issues that can provide a competitive advantage for the organization to generate value and from the perspective of sustainability. This is his proposal for determining the materiality of ESG objectives as a whole. To do so, he considers the internal aspects of the organization (operational practices) and the external ones (social dimensions of the competitive context). Shared value appears in the long term in the form of a competitive advantage resulting from an ESG strategy.

Dialogue with stakeholders becomes crucially important. To facilitate dialogue, some authors propose sectoral support for companies, with educational and public institutions that promote it (Porter & Kramer, 2011; SDG Compass, 2016; COSO/WBCSD, 2018).

Meanwhile, Pivato et al. (2008: 3) (cited in Carroll & Shabana, 2010) set out the need to consider a new concept in obtaining financial profitability. Pivato makes a distinction between a direct return (with a direct impact on financial returns) and an indirect return associated with CSR (with an indirect impact through intangibles). The latter is only apparent through mediating variables, such as brand loyalty, which ultimately leads to an economic benefit. Like Porter & Kramer (2011) and Carroll & Shabana (2010) state, the interactions between the organization and its stakeholders are one of the key factors in obtaining this direct or indirect return. It seems reasonable to assume that the indirect financial return (both internal and external) may be the most relevant return, and only transferable to a direct return in the long term.

Sulkowski et al. (2018) go one step further, and argue that in order to extract all the potential for sustainable value creation with stakeholders; they must be encouraged to engage in a dialogue within an open and innovative network. This value would exceed the shared value presented by Porter & Kramer (2011), and would lead to profound and systemic changes as a result of improving social and environmental aspects in the long term. In other words, it would improve the positive impact on society.

Argandoña & Weltzein (2009) completes this approach to strategic CSR by adding the ethical dimension to the previous approaches - a moral or social obligation to meet responsibilities as regards the negative impacts generated, even when this is not legally mandatory and it does not generate economic value. This is all based on the principle of due diligence to offset negative ESG impacts. They also talk about retrospective and prospective responsibilities and remark that "in practice, CSR will be the result of the dialog between the firm and its stakeholder about the obligations of the fist and the expectations of the second": Schaltegger et al. (2019) complement Argandoña by highlighting the need to take the most vulnerable stakeholders into consideration, even if their capacity to influence the organization is limited. Melé et al. (2011) point out the idea of moving toward a new humanistic synthesis for business.

In short, the academic literature suggests that in the long term, value creation based on strategic CSR must be based on a relationship of active and innovative dialogue with all the stakeholders. To improve the situation, companies should be actively involved even with stakeholders not related to the company or which have a much broader scope of action (e.g. sectoral). Innovation involves aspects such as promoting, monitoring and measuring sustainable value, and redefining the value chain by improving environmental and social aspects (Porter & Kramer, 2011).

Contributions from the International Standards on Non-Financial Information

Sustainable value creation processes has also been discussed by international multi-stakeholder organizations (such as the Global Reporting Initiative, the International Integrated Reporting Council and the Sustainability Accounting Standards Board), which provide international standards for preparing reports containing non-financial information for organizations based on various approaches.

The underlying principle of the fourth guide of the Global Reporting Initiative or G4[2], (GRI, 2013:17) is that reports (and reporting practices) focus on issues that are material (significant) for the organization and/or for the stakeholders. Although the G4 has not been in force since it was replaced in 2018, its principles still apply. Furthermore, although the guide does not focus on a joint definition of materiality between the stakeholders and the organization, it does constitute a major breakthrough compared to reports traditionally focusing on shareholders as the only stakeholders. In this respect, the GRI 101 document: Fundamentals 2016 (GRI 2018, 18:27) provides a justification of "materiality" based on economic, environmental and social impacts, which have a major influence on stakeholders' assessments and decisions. These impacts may be positive, negative, actual, potential, direct, indirect, short-term, long-term, intended or unintended. However, the underlying idea is that the GRI is more focused on remedying impacts than on creating value.

Ad interim, the International Integrated Reporting Council has produced its own guide, the International Integrated Reporting Framework (IIRC, 2013) or IR. In addition to the aspects previously provided by the GRI, this framework includes the consideration that the relationship with stakeholders is part of a company's capital and is involved in the value creation process. In specific terms, it is part of what is known as social and relational capital, one of the six types of capital included in IR. It could to some extent complement the more defensive attitude of the GRI with an approach to value creation based on social and relational capital.

Last, the Sustainability Accounting Standards Board (SASB) presents a series of sectoral standards for providing non-financial information within the framework of the regulations of the North American Securities Exchange Commission (SEC). The SASB bases its concept of materiality on the study by Lydenberg et al. (2010), which selects material issues taking into account the achievement of a competitive advantage for the company (risks, opportunities and innovation), attention to stakeholder concerns, legality and sector comparison[3]. Compared to both the GRI and the IR, the SASB seems to provide an approach focused on creating a competitive advantage (in this case financial and shareholder-oriented) by selecting sectoral material aspects.

In short, the long term, transparency (for shareholders and other stakeholders), the materiality of ESG aspects and innovation (GRI and SASB) are all important in the three standards. Taken as a whole, they enable a practical application of the areas analyzed in the academic literature, with each considered from its own perspective: the management of ESG impacts (GRI), consideration of the relationship with stakeholders as a key factor in the creation of value (IR), and the selection of material issues aimed at creating a competitive advantage (SASB).

Contributions from the Legislation

Regarding legislation, a large proportion of the major breakthroughs in governance and sustainability have taken place as a result of legislative developments. Focus will be placed in the significant contributions propelled by the European legislator for encouraging strategic CSR.

Table 1. European Regulation encouraging strategic CSR management and transparency

Year	Regulation
2014	Directive 2014/95/EU of the European Parliament and of the Council of 22 October 2014 amending Directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups (NFRD)
2016	Directive (EU) 2016/2341 on the activities and supervision of institutions for occupational retirement provision (IORPs)
2017	Directive (EU) 2017/828 of the European Parliament and of the Council of 17 May 2017 amending Directive 2007/36/EC as regards the encouragement of long-term shareholder engagement.
2018	Action Plan: Financing Sustainable Growth
2019	Regulation (EU) 2019/2088 on sustainability-related disclosures in the financial services sector Presentation of the European Green Deal (December)
2021	Proposal for a Directive of the European Parliament and of the Council amending Directive 2013/34/EU, Directive 2004/109/EC, Directive 2006/43/EC and Regulation (EU) No 537/2014, as regards corporate sustainability reporting (CSRD Proposal)

Source: own elaboration based on disclosed regulation

Two very interesting directives have been published in the European framework: Directive 2014/95/EU, on non-financial information, based on the reporting and disclosure of ESG aspects; and Directive 2017/828/EU, on the encouragement of long-term shareholder engagement (European Parliament, 2014 & 2017).

Directive 2014/95 (NFRD) focuses on improving transparency in companies' non-financial information (environmental, social and governance). However, some argue that it has fallen short in its objectives, as it obliges them to explain rather than to comply. The principle of "comply or explain"[4] is used, which means that companies can limit themselves to giving clear and reasoned explanations in the event of non-compliance. It sets the path towards transparency and disclosure of information, but does not specify how things should be done. A new regulatory proposal (CSRD), which establishes more rigorous requirements in sustainability transparency for European companies, is being discussed in order to amend NFRD and achieve the objectives of the European Green Deal.

Meanwhile, Directive 2017/828 directly justifies the need for management focusing on the long term by highlighting the mistakes made as a result of organizations focusing on short-term management in its introduction, in line with the contribution by Ellul (2015). It holds shareholders and other participants in the investment chain responsible for the problem, due to their support for management in order to obtain a short-term return by yielding to the pressure of the capital markets. It considers the introduction of a medium and long-term approach (periods of seven to ten years or more) as an essential factor in the responsible management of assets. To focus towards the long term, the Directive proposes greater involvement by stakeholders (mainly shareholders and workers) in Corporate Governance. As for shareholders, it believes it is important to improve the involvement of institutional investors and asset managers, among other things, on the basis of the Principles for Responsible Investment (UNEP Finance Inititative & UN Global Compact, 2016). As tools for change, it proposes an increase in the transparency of asset managers (which means they can be analyzed from a medium and long-term perspective) and in the remuneration of administrators. This latter aspect is essential for ensuring that the interests of companies are consistent with those of their administrators and with the long term.

The proposal for a Regulation of the European Parliament and of the Council on disclosures of information relating to sustainable investments and sustainability risks has been materialized on the Regulation

(EU) 2019/2088 on sustainability-related disclosures in the financial services sector, which entered into force as of March 2021.-. It completes the Directive (EU) 2016/2341 on the activities and supervision of institutions for occupational retirement provision (IORPs) and pushes participants in financial markets to publish their policies on the integration of sustainability risks related to environmental, social and governance issues in the investment decision-making process (article 3[5]). The obligation also applies to financial advisers. This regulation is supported by the parallel regulatory development that is forcing European companies to improve and standardize their sustainability report (Directive 2014/95/EU and CSRD Proposal).

Additionally, the Action Plan: Financing Sustainable Growth, launched by the European Commission in 2018[6], highlights the need to promote transparency and long-termism in issues of sustainability. The aim is for financial market actors to properly assess the long-term value creation of companies and their management of sustainability risks.

Summarizing, the legislative developments examined also contain interesting developments that can facilitate the creation of sustainable value in the long term. They make the Board of Directors (BD) responsible for socially responsible policies, and they recommend the participation and commitment of stakeholders, and of shareholders and workers in particular. Improvements are also proposed in the transparency of ESG issues, the approach to the long term, the remuneration of administrators and the management of their risks. These issues affect participants in the investment decisions in financial markets and company administrators.

LOOKING FOR A POSITIVE RELATIONSHIP BETWEEN A FINANCIAL BENEFIT AND ENGAGING IN STRATEGIC CSR

The arguments shown above, especially from the legislation point of view, suggest that the commitment of the shareholders improving non-financial reports and providing an adequate response to the requirements of the legislator, is advisable for co-creating value in the long term with stakeholders. Furthermore, shareholders should be guided primarily by the profitability/risk binomial in their investment decisions, as suggested by Carroll & Shabana (2010) on the importance of stakeholders in creating value for the shareholder.

These aspects are examined from different points of view, providing empirical evidence from academic literature, in order to answer the questions set out in the introductory section about the ability of CSR to create value, and under what conditions.

On the Primacy of Financial Value over Ethical Issues for the Shareholder

For shareholders, financial value versus other aspects such as ethical values seems to be necessary for ESG issues to be taken into consideration. This is argued by authors such as Sewchurran et al. (2019), who emphasise the growing importance of financial motivations in boosting ESG performance for institutional investors, as discussed by Crifo et al. (2019) referring to the limited importance of the ethical principles of shareholders in the development of business sustainability; and Amel-Zadeh & Serafeim (2018), who discuss both aspects. According to Hsu et al. (2019), the weakness of ethics as a driving force for CSR must be taken into account, but a poor CSR performance has an impact on financial ana-

lysts, who then review their forecasts, probably downwards. In other words, it appears that CSR is only of interest to investors from an ethical point of view when it is poorly managed.

The Empirical Evidence for Over-Profitability from CSR

Multiple studies have been carried out on financial performance and its relationship with sustainability, although many authors argue that they are inconclusive (Amel-Zadeh, 2018: 37; Khan et al, 2016). The meta-analysis by Friede et al. (2015) attempts to find a positive correlation by compiling more than 2000 studies presenting various results, although tending to show a positive relationship. Some authors, such as Giese et al. (2019) and Bennani et al. (2019), have attempted to go one step further, by looking for a causality between sustainability and performance based on the information provided by ESG information providers. However, these studies should be considered with caution as the quality of the available ESG information is open to doubt. In fact, Bennani shows contradictory results between the periods analysed and between Europe and the USA.

However, if the aim is to find reasonable indications about obtaining financial value in the long term based on a specific management of ESG issues, far fewer authors provide results. Those authors include Clark et al. (2015). In their compilation of studies relating sustainability and financial performance, they appear to identify a higher operative performance and lower risk in companies which integrate sustainability closely aligned with business culture and values in their management, and which are managed based on materiality criteria. Based on this idea, Khan et al. (2016), Betti et al. (2018) and Schoenmaker & Schramade (2019) argue that obtaining a higher financial return depends on the type of investments in sustainability that the company is making, since not all of them generate the same return. Khan et al. (2016) and Betti et al. (2018) conclude that companies that invest resources in sustainability for material aspects for their sector (according to the SASB) have a higher economic return in the long term for the shareholder than those that do not.

Since the study by Khan et al. (2016) is based on the SASB sectoral classifications, it is not unreasonable to assume that a study on the materiality specified for each company and based on the creation of a shared value with the shareholders, and aligned with business culture and values (Clark et al. 2015), would provide better results for long-term financial performance for the shareholder than the performance shown in the study by Khan.

Empirical Evidence of Lower Risk based on CSR

In addition to higher shareholder returns in the long term, some indications suggest that CSR management carries less risk for shareholders. Dunn et al. (2018) confirm a negative correlation between risk and ESG management in the company, which is mainly apparent in the long term: companies with the greatest exposure to ESG risks have higher volatilities and betas. These conclusions are based on the ability to make predictions, by correlating poor management of ESG aspects with greater future risks.

Investments in Intangible Aspects of ESG

In addition to investments in CSR aimed at creating shared value, companies must invest or spend to cover the possible negative ESG impacts caused by their business activity, based on the criterion of due diligence. Khan et al (2016) argue that these expenses ultimately generate a neutral financial impact. As

a result, this spending should not be ruled out from the point of view of shareholder returns, especially bearing in mind that if CSR is not undertaken correctly, financial analysts may revise their forecasts downwards (Hsu et al, 2019).

The contents of this section suggest that the answer to the questions raised above about the ability of CSR to create value under some specific conditions can be answered in the form of reasonable empirical indications.

A LOOP ANCHORED IN SHORT-TERMISM: HOW CAN IT BE BROKEN?

Describing the Loop

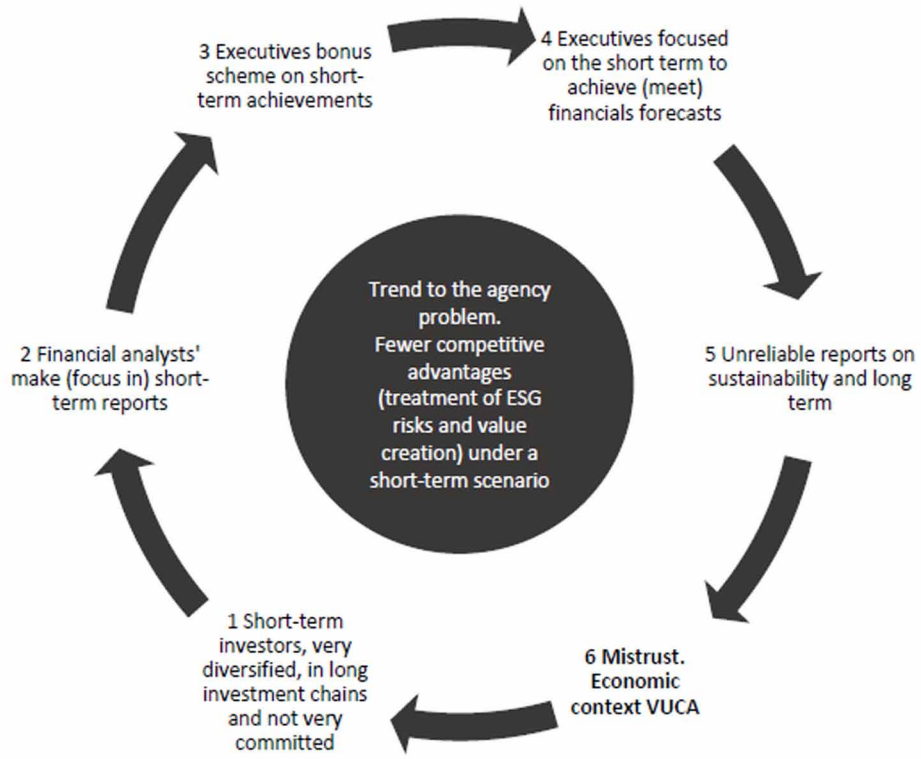
The need to adopt a long-term perspective to show the financial benefits of a well-managed CSR has been apparent throughout this chapter. To that end, it is first necessary to ascertain what is preventing a departure from the short-termism that has taken root in the financial markets. Figure 1 explains how short-terminism can be reinforced by the traditional decision making and management processes of both corporate directors and shareholders. A series of factors could be involved, acting in the form of a loop based on the lack of confidence created in the VUCA environment (Figure 1):

1. In an environment where investors lack confidence, as a defence mechanism, they would focus their objectives for returns on the short term (Barton, 2017; Directive 2017/828). There are also other investment practices in a VUCA environment that limit the development of CSR, set out in the following theories:

    a. According to the Efficient-Market Hypothesis (Fama, 1970) in an efficient market the price of an asset includes all the available information; as a result, the commitment of investors makes no contribution to management, and is therefore unnecessary (Schoenmaker & Schramade, 2019). This would support passive investment approaches (indexed funds, funds of funds, etc.) and long investment chains. In practice, many shareholders would be investing through *software* that are becoming the largest shareholders in many companies (Friede, 2019), leading to disaffection and agency problems (the distance between the CEO and investors is too great, with links that are not aligned and lacking transparency (Directive 2017/828). This misalignment is reflected in investment objectives, the appetite for risk, incentives, timeframes and information. This situation favours short-termism, in which it is easier to manage uncertainty.
    b. Portfolio Theory (Markowitz, 1952) is based on a historical analysis, which makes it difficult to consider new situations. Likewise, diversifying investments to minimise risk makes it difficult to analyse sustainability in each company in the portfolio.

2. Financial analysts produce short-term reports (Rappaport, 2005). They are probably pressured by the needs of their market, which works in the short term.
3. The 2016 McKinsey Quarterly survey (Barton, 2017) shows that a large percentage of CEOs feel under increasing pressure from short-termism. Companies are forced to try to exceed the forecasts of financial analysts to maintain their share value. They therefore establish the objectives of their

Figure 1. The six links short-termism "vicious circle"
Source: Own elaboration based on the Directive 2017/828, Barton (2017)



CEOs and their incentives in the short term, and both they and their shareholders are affected by the bias of the short-term perspective when defending themselves against uncertainty.

4. In this situation, CEOs generally do not present any opposition, and behave gregariously towards the financial markets, focusing on the short term. The academic literature offers some ideas to improve this situation. Yuan et al. (2019) point to the need for professional training for CEOs, and argue that this training would provide them with a less short-term vision. Other authors emphasise incentives for executives which are linked to CSR (Flammer et al, 2019) or directly to long-term objectives (Zhang & Gimeno, 2016), as well as penalties (Barton, 2017) in circumstances such as breaches of ethics.
5. In this scenario, it is difficult for companies to take action and produce reports that take the long term into account, as required by CSR to create value. These non-financial reports are probably to some extent cosmetic, and are more closely related to a philanthropic rather than a strategic CSR, which is linked to communication departments. This expenditure on CSR should be able to protect companies against depreciation of their share value due to poor management of CSR (Hsu et al, 2019), but it would be difficult for them to create value. Shareholders are indifferent to this CSR, and ignore whether or not a security belongs to a sustainability index such as the Dow Jones Sustainability Index (DJSI) (Durand et al., 2019) and engagement with sustainable investment to a

limited extent according to Sulkowski et al. (2018). In practice, shareholders reinforce the vicious circle of short-termism with this indifference.

6. This less strategic and more cosmetic CSR does not fulfil one of its functions, which is to create confidence by doing things right (Barton, 2017: 188). In their pursuit of short-term financial objectives, companies could be taking away resources for the development of products with greater added value, in addition to increasing social mistrust in the economic system.

The European legislator understands the problem, and in Directive 2017/828 includes many of the points covered here and which are presented in Figure 1.

A genuine paradigm shift in the analysis of investments by shareholders appears to be necessary to get out of this short-term loop (Schoenmaker & Schramade, 2019) which helps us to understand the advantages of a sustainable long-term strategy.

Different Proposals to Break the Vicious Circle in the Academic Literature

The academic literature contains few contributions as to how the vicious circle can be overcome. To date, it appears that one of the key factors is the alignment between the CEO and shareholders towards the creation of financial value through CSR projects in the long term. Based on this perspective, an interesting method has been proposed by Sewchurran, et al. (2019), which could facilitate this alignment by presenting the shortcomings of short-termism and the advantages of the long term in each company. It is based on four phases: construct a diagram on the specific causes of the short-term loop in each company; make a documented proposal for the creation of value; evaluate the starting point based on the state of the company's capital; and finally, design a programme for investment in intangibles for the long term.

Less directly, but stressing the need for a paradigm shift in investment analysis, some authors have presented proposals aimed at evaluating ESG objectives and long-term risks. Along these lines, Lo (2017), in his Adaptive Market Hypothesis, presents the fundamental analysis of investments as an analytical tool that show the adaptability of each company to an economy in transition towards sustainability. Meanwhile, Carroll & Shabana (2010), justify Stakeholder Theory by using a business case to show the economic benefits of CSR for the company. The COSO/WBCSD ESG risk management standard (COSO/WBCSD, 2018) and Sewchurran et al. (2019) agree with these proposals, and add Scenario Analysis to visualise the benefits and problems involved in failing to adopt a long-term approach to ESG issues.

The proposals above require the necessary transparency to be taken into account by the shareholders. According to Sulkowski et al. (2018), as well as a natural aversion to risk and short-termism, it is one of the reasons why private investors do not engage with sustainable investing. The development of new metrics that facilitate transparency must therefore be included in this paradigm shift. Progress has been made in this respect with the publication of the COSO/WBCSD guide (2018) on the protection of ESG objectives and the model for the measurement of intangible value in the long term proposed by the Coalition for Inclusive Capitalism & EY (2018). Despite this progress, the issue of measurements is still a problem that has not yet been fully resolved (Friede, 2019).

Another possible trigger for alignment is the situations of necessity. An example of this is the need to defend the high intangible value reflected in the value of the shares of some companies (Brand Finance Institute, 2017). This value reflected in stock prices is often associated with reputation, which is related to CSR. Philanthropic CSR may not be sufficient in this case, and CSR that is more heavily integrated into the business strategy may be required to defend the intangible value.

Continuing with situations of need, Sewchurran et al. (2019) discuss the creation of value for the client that is necessary for many companies with narrow margins. The solution involves investing in the creation of intangibles able to generate value for the client, which would ultimately be transformed into greater economic value in the long term. This approach may be independent of CSR, but it introduces the long term.

Finally, other authors argue that taxes are needed for companies to take into account ESG impacts in their management (Schaltegger et al., 2019). They argue that taxes introduce an economic approach by companies to environmental issues related to carbon, by means of their economic quantification through taxes. However, this approach would only produce concrete results where and to the extent that taxes are in force, and relegate other issues.

These tools could make the benefits of strategic CSR visible to shareholders and CEOs, and facilitate alignment. According to some authors, such as Clark et al. (2015), Schoenmaker & Schramade (2019), Barton (2017) and the EU Directive 2017/828 mentioned above, a commitment and active participation by shareholders is required for this alignment to occur and persist in the long term.

Which Shareholders Could Adopt the Shareholding Commitment?

Shareholders are the owners of companies, although not all would be interested in making the commitment that CSR demands. According to Kim et al. (2019), the shareholders who might be interested would be institutional investors, since the timeframe involved in CSR could coincide with the timeframe of their investments, which are usually long-term. García-Meca et al. (2018) are more specific: the institutional investors who are most pressure-sensitive (mainly banks and insurance companies) would be those most interested in the long term. This is the case because of the commercial relationships (e.g. in the form of loans or insurance) that they can establish with the companies in which they invest and their success (loan returns, or better quality of risks for insurers, CRO FORUM (2014), and because of the ethical and reputational issues that could affect them. Pressure-resistant institutional investors such as mutual funds would be more favourable to short-termism, and therefore more resistant to CSR. However, there could be exceptions, such as pension funds (Clark et al., 2015) and investors who follow the theory of "investment in value" such as Warren Buffet (Rajablu, 2011). The fact is that the funds that may be receptive are a minority due to the dominance of passive funds.

Shareholders deciding to make the commitment and using the tools presented would do so within the scope of Corporate Governance. The legislation makes it responsible for the design of CSR policies and controls (article 529 (iii), of the Corporate Enterprises Law), and at the same time it is where the greatest moral and CSR failures occur. Appropriate CSR may therefore depend on its correct development. Indeed, some studies relate the positive incidence (correlation) of good management in Corporate Governance of CSR/Sustainability to economic performance (Andreu et al, 2018), thus reinforcing the importance of CG in the development of CSR.

THE ALIGNMENT BETWEEN THE CEO AND SHAREHOLDERS IN CORPORATE GOVERNANCE

As we have seen, one of the keys to promoting strategic CSR is that CEOs and shareholders understanding about the advantages of strategic CSR in the long term are aligned in the CG. Furthermore, the financial

advantages of CSR would be achieved by dedicating resources to ESG objectives that are material for both the company and the stakeholders. This alignment should overcome agency problems that appeared in the vicious circle of short-termism.

We must look for robust references on good CG in the long term for a better understanding of how to manage this participation in CG. These include the Swedish Model for Active Ownership. In this model, shareholders are in control, choose the BD and are involved in major strategic decisions. They act like the owners of a small family business, promoting stability and focusing on the long term. Milne, R. (2013) explains that the long-term focus of this model is defined within the objectives of the organization, and is evaluated in the short term. The choice of the BD is made based on the participation of the largest shareholders in the nomination committee of the BD, with a proposal for the directors, which is put to the vote at the general shareholders' meeting. In this model, the Board is usually chaired by an investor. This modus operandi makes the administration of an organization subject to more controls, its decisions are subject to more discussion, and are therefore richer and more extensively checked. The Owner-Founder Model has also succeeded in incorporating long-term strategies (Tesla, Apple, Facebook, etc.) and has interested authors such as Barton (2017). In practice, it operates in a similar way to the Swedish model, since the owner plays the same role as the shareholders in that model.

In the Swedish Model, large shareholders have replaced financial institutions as owners, which is very different from the Anglo-Saxon model, in which ownership is widely distributed. In the Anglo-Saxon Model, it is difficult to ask an investor to participate actively in the multiple investments they make, which means that the oversight of companies is in the hands of administrators (Pucko, 2005) and under the guidance of the rating agencies. This model has been called into question since the most recent crisis. Incorporating the advantages of the Swedish Model into other European companies is being discussed at the legislative level in order to improve it, with the creation of two categories of shares: those linked to shareholders committed to remaining in the long term, and others with fewer rights (Milne, 2013). This approach has its problems, as it could confer privileges on large investors to the detriment of small investors, which is a highly controversial issue. Shareholder voting on directors' compensation agreements has been promoted in the United States. This is a form of shareholder participation which could facilitate disagreements taking place in an accessible and inexpensive way. For example, this happened with the "No vote" at Citigroup with the departure of Vikram Pandit, its executive director (Ferracone, 2012).

Cevian Capital (2012), the largest active ownership investor in Europe, proposes the election of independent directors as a tool for stimulating shareholder promotion. In the United Kingdom, shareholders have currently rejected these appointments, and left them to presidents and boards, which does not help reduce inappropriate alignments of interests. This practice would also substantially improve accountability, as these directors are accountable to the shareholders who appoint them, although their access to information could be less than that of executive directors (involved in management). Despite the benefits of independent directors, some authors (Ramon Llorens et al, 2019) have suggested caution, as not all outside directors (i.e. those with political experience) are equally effective in improving CSR strategy and disclosure, or even supporting shareholders/stakeholders interests. Finally, Barton (2017) proposes investor coalitions, and providing those who exceed 10% with representation on the BD.

From a practical point of view, the conclusions of Andreu (2017) could be used for shareholders to take action by means of any of the proposals above, in the establishment and management of an Executive Committee of the Board on CSR, which is coordinated with the other executive committees and bodies; and a Specific Committee on Risk Management on the Board that takes non-financial risks into account (ESG, ethics and business conduct). Clark et al. (2015) argue that in order to align CEO and investors

in the long term, CG must have clearly assigned responsibilities, in addition to specifying measurable objectives, incentives and sanctions for employees, and have auditable metrics for the presentation, measurement and monitoring of strategic plans.

In short, and taking into account their composition, the shareholders in each company must promote the best system to facilitate their commitment and alignment with the CEOs in CSR.

SOLUTIONS AND RECOMMENDATIONS

Knowledge based on the academic literature, standards and legislation largely answer the questions raised about the ability of CSR to create value and under what conditions. We have also seen how a paradigm shift in investment analysis is required to make shareholders interested, since the environment and the practices of financial markets do not encourage this. Finally, the type of investor that could be most receptive to this approach has been identified, as well as various CG proposals for their commitment. Is there a possible end to the short-termism?

Two factors can be seen as hindering the promotion of CSR in practice: the disaffection of shareholders with CG, with its consequent problems of agency, and the difficulty in measuring ESG objectives and outcomes, which can be intangible in the short-term or generated outside the company. Legislation has tried to remedy these shortcomings by promoting transparency and investment in the long term which is committed to the company. However, the problem is a complex one, with many inertias that are difficult to resolve, which are identified in the form of a "vicious circle" in Figure 1.

On the other hand, we also know that shareholders are primarily driven by financial motivations, CEOs by their incentives and financial analysts by the attempt to satisfy their customers (shareholders). Accordingly, if shareholders were able to discover financial advantages in CSR, they could be the true actors in change. This is a change that society is also demanding.

A clear path to change has not been found, but a path to creating value from CSR. The answer comes also in the shape of a loop - in this case a virtuous one - which would improve and feedback itself as it became more widely understood. It could help building a true competitive advantage, stable (and sustained) over time and difficult to replicate (Figure 2).

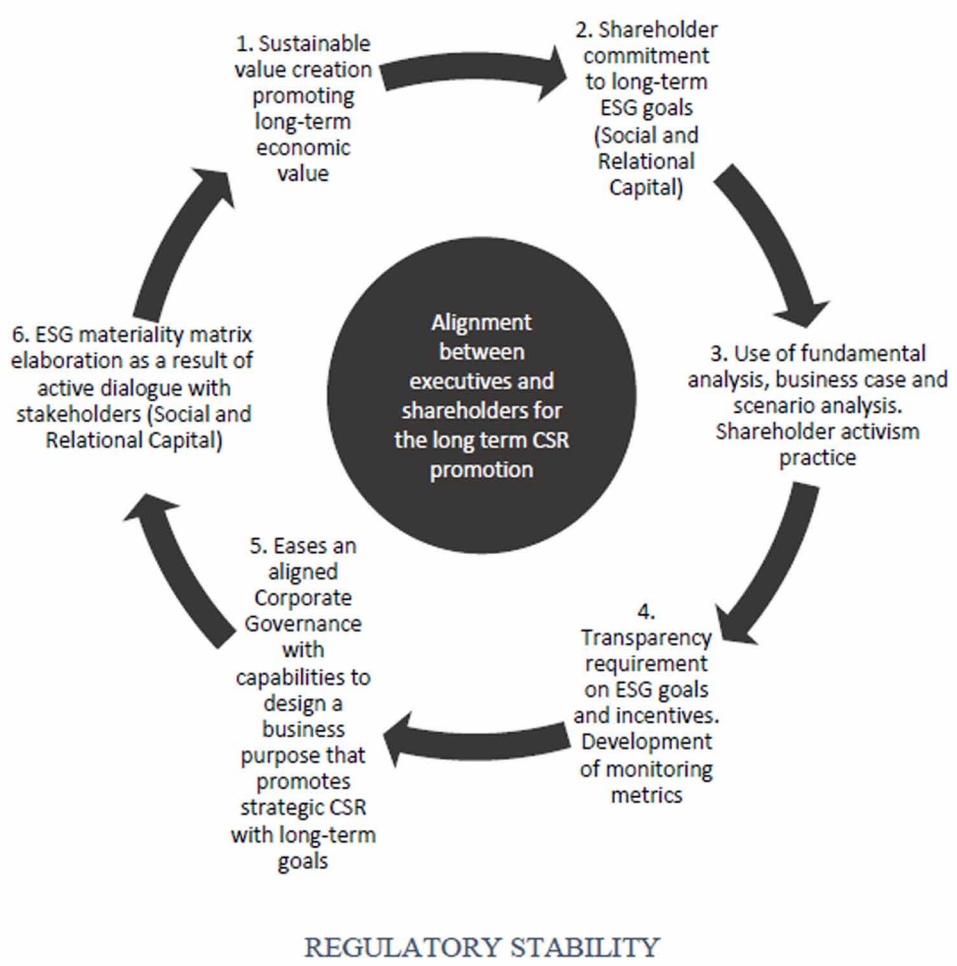
If CSR is to create value, it is necessary to select the right ESG objectives to which the company is going to allocate resources. We know that they must be aligned with the purpose, be relevant for both the company and the stakeholders, be the result of an active dialogue with all the stakeholders and innovative in the sense of redefining the value chain and its metrics. A materiality matrix considering these dimensions should be able to generate value.

All of the above implies that the company has to allocate resources to activate the relationship with the stakeholders first, and subsequently to achieve the new objectives, in anticipation of a return in the long term. In practice, this could not happen without an alignment between the CEO and shareholders in CG. In order to maintain their investment, shareholders would demand information on the progress of the ESG objectives and the monitoring thereof. This would be part of shareholder activism.

In addition to the above, as it is a long-term issue, some degree of legislative stability is necessary, which means that projects do not have to be modified on the fly as a result of possible tax penalties or legal impediments (Sulkowski et al., 2018).

Figure 2 summarizes the discussed proposals to break the vicious circle and get the commitment of shareholders, and also shows how an alignment between the objectives of the corporate executives and

Figure 2. A "virtuous circle" promoting Long-Termism
Source: Own elaboration, based on the reviewed literature



the objectives of the shareholders acting under a long term vision, can promote a virtuous circle based on sustainability and CSR. This "virtuous circle" can be seen as a model of corporate management that requires active dialogue and relationship management regarding all the company stakeholders – not only shareholders – but, in return, it generates shared value for all of them.

This model is based on the contributions of a wide range of authors, the most relevant of which are illustrated in the following three tables. Although a much broader body of academic, regulatory and technical literature has been reviewed, Tables 1, 2 and 3 collect the key works used to construct this "virtuous circle".

Table 2. Selected literature on the ability of CSR to create value in the LP and under what conditions

The main corporate responsibility is to **maximize profits** for its shareholders	Friedman (1970)
Stakeholder theory that considers all stakeholders to be relevant to the organization	Freeman (1984)
Creating a competitive advantage, this would be the result of **dialogue with stakeholders**, **aligned with business culture and values and based on ESG issues**	Porter & Kramer (2006)
A distinction is made between **direct profitability** (with a direct impact on financial profitability) and **indirect profitability** associated with CSR (with an indirect impact through **intangibles**)	Pivato et al. (2008)
The **interactions between the organization and its stakeholders are one of the keys** to obtaining this direct or indirect profitability	Carroll & Shabana (2010)
A **moral obligation to attend the companies responsibilities due to their negative ESG impacts**, even if legality does not oblige or do not generate an economic value	Argandoña (2010)
In order to extract the full potential for sustainable value creation with stakeholders, **they must be provoked (shaken) to establish an open and innovative dialogue**. This value would have the capacity to generate a positive impact on society in the long term	Sulkowski et al. (2018)
Consider the most vulnerable stakeholders, even if they have a reduced capacity to influence the organization	Schaltegger et al. (2019)

Source: own elaboration based on reviewed literature

Table 3. Selected European legislation and standards for international reporting

Global Reporting Initiative (GRI)	It proposes a concept of **materiality based on ESG impacts**
International Integrated Reporting Council (IIRC)	It considers that the **relationship with stakeholders** is within one of the six capitals of the company with **the capacity to create value**
Sustainability Accounting Standard Board (SASB)	It introduces a sectorial **selection of the material issues oriented to create a competitive advantage** (financial and shareholder-oriented)

Source: own elaboration based on reviewed literature

FUTURE RESEARCH DIRECTIONS

One of the six types of capital of the IR (IIRC, 2013) for the creation of value that has received the least attention is relevant throughout this process: social and relational capital. This includes relations with shareholders and stakeholders, and this aspect clearly requires further study.

Particularly, the relationship of companies with their stakeholders has been under-studied. It would be relevant to further analyse them, developing relationship models, as well as to measure if they provide added value to the company.

The factors highlighted throughout this chapter to break the circle of short-termism and to transform it into a virtuous circle, could form the basis for understanding the real limitations that companies are facing in their relationship with their stakeholders. These limitations would be hindering the ability of their social responsibility policies to also achieve better sustainable financial results in the long term. On this basis, we propose to develop a model that integrates all these elements and their interrelationships, which can be fed and applied to different business realities. It would be interesting to analyze potential long term differences regarding the financial performance of companies considering the elements of this model versus companies that do not.

Table 4. Selected literature on investor interest in CSR and empirical evidence on its financial benefits

For shareholders, it is important to obtain a financial return over other considerations such as sustainability	Sewchurran et al. (2019); Crifo et al. (2019); Amel & Serafeim (2017)
CSR would only affect investment decisions **when it is poorly managed**	Hsu et al. (2019)
Regarding the relationship between **obtaining financial return and managing CSR, the studies are not conclusive**	Amel-Zadeh (2018); Khan et al, (2016); Fernández, M. et al (2018) and Argandoña (2007)
Although studies **tend to show a positive correlation** between financial profitability and CSR management	meta study, Friede et al. (2015)
Studies that attempt to show **a cause-effect relationship between CSR and financial profitability have mixed results**. They are also based on questionable ESG information	Giese, G et al. (2019); Bennani, L et al. (2019)
Clark relate a **specific way of managing CSR with obtaining financial profitability**, find a higher operating performance with lower risk in **companies that integrate a sustainability well aligned with the culture and companies values and managed under criteria of materiality**	Clark et al. (2015)
For these authors the achievement of a higher financial return **depends on the selection of the ESG issues made by the company.** Khan and Betti work from the sectoral selection of ASG (materiality) issues made by SASB. **They find that companies using this materiality obtain a higher return for the shareholder in the long term**	Khan et al. (2016); Betti et al. (2018) and Schoenmaker & Schramade (2019)
Dunn, gives indications that **good CSR management leads to less risk for shareholders** (volatilities and betas)	Dunn et al. (2018)
Khan, on **investment in non-material aspects** (expenditure to cover possible negative ESG impacts) **would eventually generate a neutral financial return**	Khan et al, (2016)

Source: own elaboration based on reviewed literature

CONCLUSION

There are signs of a possible financial over-performance of companies that strategically create a shared value with stakeholders based on environmental, social and governance objectives (ESG), but a series of factors could be barrier, acting in the form of a vicious loop of shortterminisim. This chapter propose a model to consider a long-term approach creating sustainable value in organizations, detecting a possible sequence of requirements and key issues for their achievement Companies entering this dynamic could have interesting advantages, because in addition to attracting more stable investors interested in the long term, they would be working to create a new value based on CSR. In addition, in the long term they could improve aspects such as corporate culture, ethics, retention of talent, innovation and its defence through good risk management.

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KEY TERMS AND DEFINITIONS

Corporate Governance (GC): It can be seen as the whole system of rules, principles and procedures that regulate the structure and operation of the governing bodies of a company. Specifically, it establishes the relationships between the board of directors, the shareholders and the rest of the interested parties, and stipulates the rules that govern the decision-making process about the company for the generation of value.

Corporate Social Responsibility (CSR): Following the definition of the European Comission in 2011, it is understood as the responsibility of enterprises for their impact on society. Thus, companies should integrate social, environmental, ethical, consumer, and human rights concerns into their business strategy and operations to be considered as socially responsible.

ESG Objectives: Objectives related to intangible assets in the field of corporate sustainability, such as the impact on the environment (E), relations with employees or local communities (S), anti-corruption processes or the rights of shareholders (G).

Financial Markets: Physical or virtual places, through which financial assets are exchanged between economic agents, and where the prices of these assets are defined. In the context of this chapter, its role is important as the place where the value generated by a company is recognized by the investors.

Long-Term Value: Corporate benefits, based on competitiveness and differenciation, long-lasting and generated during a broad time scope. These benefits may also take some time to be perceived by the company, and not be immediate within the current fiscal year.

Stakeholders Management: Following the theory proposed by R. Edward Freeman in 1984, it refers to the way in which the agents or groups that influence or are influenced by a company are identified, the models of communication and relationship with them are stablished and, summarizing, their expectations are fulfilled.

Sustaitnability: Following the definition of the Brundtland Report (United Nations, 1987), we understand it as the achievement of a balance between economic, environmental and social goals, that allows meeting the needs of the present generation without compromising the ability of future generations to

meet their own needs. It requires a sustainable development of national economies, to be considered by any productive activity.

Value Creation: Generation of competitiveness and differentiation based on corporate assets.

ENDNOTES

[1] The acronym VUCA and its meaning can be found at: https://hbr.org/2014/01/what-vuca-really-means-for-you.

[2] The Global Reporting Initiative (GRI) was established in 1997 under the auspices of the CERES (Coalition for Environmentally Responsible Economies) and the UNEP (United Nations Environmental Program) in order to create a framework for reporting on the sustainability objectives of organizations.

[3] Taken from www.sasb.org

[4] This principle is set out in the Cadbury Report (1992) and has subsequently been included in the Olivencia Code (1998), the Aldama Report (2003) and the Good Governance Code of Listed Companies (2006 and 2015).

[5] Taken from: https://eur-lex.europa.eu/legal-content/ES/TXT/HTML/?uri=CELEX:52018PC0354&from=EN, 8-1-2020

[6] Taken from: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018DC0097&from=EN, 28-11-2020.

Chapter 11
ESG Materiality: Insights From the South African Investment Industry

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ABSTRACT

Sustainable finance proponents argue that integrating environmental, social, and governance (ESG) factors into investment decisions should have a positive long-term material impact on financial performance and ultimately benefit wider society as a whole. This chapter is based on interviews and an ESG materiality survey that was run among 20 prominent South African asset managers. The results demonstrate that if there is a growing awareness of ESG factors among the respondents, there are some perceived tensions around how to practically embed ESG factors within investment processes. In addition, the results show that the integration of ESG factors into financial valuation are not yet mainstream and that more needs to be done to demonstrate how the integration of ESG factors within investment processes materially impacts financial performance and meanwhile contributes to the sustainable development of economies.

INTRODUCTION

This chapter investigates the role of ESG factors and their materiality in sustainable finance by exploring how asset managers in a given emerging market context, South Africa, understand and integrate ESG factors in their investment processes. In this chapter, sustainable finance refers to any form of financial service integrating environmental, social and governance (ESG) criteria into the business or investment decisions for the lasting benefit of both clients and society at large. These last five years, sustainable finance has become a growing phenomena notably in Europe and the United States which mainstreamed and regulated appropriately could positively impact the long term sustainability of our globalized world that has been shaken to its core by the current pandemic. It is then of utmost importance to inquire fur-

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ther how sustainable finance is taking roots not only in developed economies but also in the the greater South including the African continent.

Carroll, Pawlicki and Schneider (2013: 2) provides a first definition of materiality: 'a matter is material if it is of such relevance and importance that it could substantively influence the assessments of providers of financial capital with regard to the organization's ability to create value over the short, medium and long term.' In this chapter, under the term ESG materiality, we are particulary interested by the the fact that different ESG factors can be considered more or less material by investors whose job is to assess whether organisations are creating financial value over the short, medium and long term. Some research has shown that companies that address their material sustainability issues outperform the market over time (Khan, Serafeim and Yoon, 2016). In addition, following a survey of 582 institutional investors and 750 retail investors, Eccles et al., (2017) found the results strongly supported the importance of materiality, which make them conclude that full ESG integration can lead to the creation of value for both investors and society as a whole. However, discussions and explorations are still ongoing between practitioners, policy makers and academics about how to define the financial materiality of integrating ESG factors versus its 'sustainability materiality' (Bansal & DesJardine, 2014; Flammer, Hong and Minor, 2019) also known as 'double materiality' (Responsible-investor.com, 2021).

Supported by interviews and an ESG materiality survey with 20 South African asset managers representing approximately over 67% of assets under management (AUM) in the country (see Appendix 1), the main goal of this chapter is to provide background empirical insights on what ESG materiality is and the shapes it takes within an emerging market investment industry such as South Africa. To contextualise our empirical insights, we discuss first some academic and practitioners considerations around ESG factors and their potential materiality. We end this chapter with a discussion of what the next steps are to see further convergence and integration between investment processes and ESG factors.

CONCEPTUAL BACKGROUND: MATERIALITY AND SUSTAINABLE FINANCE

Materiality and its Practitioner/Academic Success

Khan, Serafeim and Yoon's (2016) first academic evidence on the materiality of ESG factors was driven by guidance from the Sustainability Accounting Standard Board, (SASB), which used United States firms' Securities and Exchange Commission (SEC) and Form10-k filings to inform working groups of industry and issue-specific experts of known trends, events, and uncertainties that are reasonably likely to have material impacts on their financial condition or operating performance (Securities and Exchange Commission (SEC), 2003: 1). These working groups were responsible for providing feedback on SASB's draft sustainability accounting standards and ultimately creating the materiality heat-maps for 45 industries. 2,100 experts were represented on the working groups consisting of one third corporations, one third market participants, and one third other stakeholders. However, the starting point for determining materiality by the working groups was the "evidence of interest" based on the reporting firms' own SEC declarations. Following the development of the SASB (Sustainability Accounting Standards Board) materiality model, Khan, Serafeim and Yoon (2016: 1), found that firms with good performance on material ESG issues significantly outperform firms with poor performance on these issues.

Concomitant to the SASB initiative in the United States, a number of international role-players began to discuss the case for integrating non-financial information into company annual reports, the primary

reporting vehicle used by shareholders to hold public companies accountable for their actions. The movement towards the "one report" (Eccles & Krzus, 2010) underlined the shift in perspective on how materiality should be defined. By 2013, following broad consultation involving interested stakeholders to the process, the International Integrated Reporting Committee (IIRC) launched its International <IR> Framework.

Eccles and Serafeim (2013: 4), also endorsed the concept of a firm building a sustainable strategy by addressing the interests of all stakeholders. To do that, they argued, [the firm] has to increase shareholder value while at the same time improving the firm's performance on ESG dimensions. Eccles et al. (2017) found, in their survey of institutional and retail investors, that of the wide range of ESG issues of concern to a company's many stakeholders, not all are of interest to investors. They found that investors were interested in material issues as defined by the IIRC's <IR> Framework.

Following a survey of 582 institutional investors (evenly split between asset owners and asset managers) and 750 retail investors, Eccles et al., (2017) found the results strongly supported the importance of ESG materiality. Ninetie two percent of institutional investors wanted companies to identify what they considered to be the material ESG issues and to report on their performance on them. That is, investors wanted to be able to match their own view of materiality with the company's view, providing a basis for engagement. Eccles et al., (2017) further found that two thirds of institutional investors wanted the board to determine which issues are material, with less than one third citing the CEO. Eccles et al., (2017) concluded that full ESG integration could lead to the creation of value for both investors and society as a whole. And they recommended that if investors ask companies to provide integrated reports, they would be helping both companies and themselves.

Materiality Conceptual Complexity

Notwithstanding Khan, Serafeim and Yoon's (2016) findings of correlation between financial outperformance and performance on material ESG issues, it is unclear whether this implies causation. Other factors may be at play here, for example that companies that report in more detail, regardless of the materiality of the issues being reported on, might be more likely to manage their firms more responsibly than those with minimal reporting.

Accepting that some ESG factors are more material in providing for superior firm performance over others begs a number of questions: Which issues are more or less material than others? To whom? And, as posed by Carroll, Pawlicki, Schneider (2013), how do firms assess the impact and relevance of each issue to their business for reporting to stakeholders? In addition, Schramade, an investment practitioner (2016) makes the case that materiality is the main source of misunderstanding between investment analysts and sustainability analysts. Quite often, according to Schramade, the sustainability analyst "doesn't understand investment needs and he (or she) will bombard his investment counterpart with all available sustainability data on a firm. Most of that data will prove of little use to the investment analyst, who may unjustly become cynical about all sustainability data." Which begs also the question of how investors handle differently ESG information provided by companies and the assessment of their concomitant materiality for different type of investors.

In South Africa, Rea (2011) found that companies listed on the JSE responded to the GRI G3 guidelines, another voluntary international standard setters by attempting to report on as many of the GRI G3.1 indicators as possible, thus signalling compliance with the standard. By 2010, 32% of all 392 listed companies on the JSE were producing reports at Level C Compliance with the G3 standard. Perusal of

Rea's (2011) annual research into GRI compliance by companies listed on the JSE, found scant evidence that this increase in reporting on materiality (by the GRI's definition), showed any correlation with more responsible behaviour in terms of managing relationships and resources.

While the average G3 compliance score achieved by the companies surveyed in 2011 was 25%, several companies that achieved significantly above-average scores were on the cusp of destroying significant value for both shareholders and society. In South Africa, examples include: African Bank, with a score of 62%, cost 5,700 jobs and destroyed significant value due to reckless lending in 2014 (Myburgh, 2016) and while Lonmin achieved 93% compliance, its inability to resolve worker disputes resulted in the death of 42 mine workers and civilians in 2012 (Giamporcaro & Putter, 2018; Farlam, Hemraj, Tokota, 2015).

Such a decoupling between scoring and behaviour raises questions about the ability of different stakeholder to agree about what ESG materiality may be and the ability of these same stakeholders to detect that some companies may be engaging in misleading reporting behaviour. In surveying South African companies, Mungoni (2014) found that firms' interaction with stakeholders is less 'engagement' and more 'management' – a one-way interaction mainly for the purposes of gathering data for sustainability reporting. Lyon & Montgomery (2015) found increasing claims of environmental performance by companies was accompanied by an increasing tendency to mislead people into forming overly positive beliefs about an organisation's practices or products. This practice of greenwashing, according to Oreskes & Conway (2010), is being met with increasing scepticism by consumers, while employees seeking genuine career fulfilment are negatively affected by the practice.

These studies illustrate the competing and conflicting demands on reporting and how this could incentivise companies to be misleading in their reporting of these issues to their stakeholders which could blur further any attempt for investors to identify material ESG factors based largely on company reporting.

Materiality an Ever Contested and Evolving Target for Sustainable Finance

Some earlier sustainable investment proponents such as Lydenberg have criticized the rise of a strict definition of ESG materiality on the base that the the term "material," when used to qualify a requirement for the furnishing of information as to any subject, limits the information required to those matters about which an average prudent investor ought reasonably to be informed." (Lydenberg, 2012, p12). In Europe, the concept of 'double materiality' has been gaining attention as more and more practitioners and academics push for more onerous Sustainable Finance policy (European Commission, 2018). The concept of 'double materiality' refers to the consideration of the impact companies and investments have on the world in addition to the impact sustainability factors might have on the financial performance of a company or asset (Responsible-investor.com, 2021).

Grewal, Serafeim and Yoon (2016), scholars who have worked extensively on ESG factors and their financial materiality, found that ESG activism/engagement has not traditionally been founded on an assessment of the strict financial materiality of ESG factors. Rather, they found that responsible activist investors choose a topical issue, such as climate change or diversity, and then engage with a wide range of companies across industries based on criteria such as financial holdings, performance on the focal issue by the target companies, and/or the size of the target companies (Blackrock and Ceres, 2015). They cited the example where an investor might target many large companies with poor performance on diversity issues, as part of a diversity campaign. Some of the shareholder proposals based on such campaigns are likely to be less relevant for some companies than for others, considering that the issue's materiality would differ from one industry to another. They learned further that other reasons for inves-

tors submitting proposals on ESG issues include that the engagement team responsible was focused on objectives that did not include an overriding financial consideration. They cited, as an example, the CEO of a prominent responsible investing asset management firm that they interviewed. He discussed how the head of the engagement efforts, who had a human rights background, was placing emphasis on human rights issues in submitting shareholder proposals, without applying an investment lens on whether, how and under what conditions human rights could affect the financial performance of a company. This is a reminder that still today, a good portion of responsible investors are concerned first with making sure that their investment will influence companies to adopt behaviours that benefit society (Dyck et al. 2018, Gond et al. 2018)

CSR scholars such as Christensen (2017) also argue that sustainability is by its very nature open-ended, since problems, challenges, and issues change across time and context. Sustainability is necessarily a "moving target" (Guthey & Morsing, 2014) "in a state of continuing emergence" (Lockett, Moon, & Visser, 2006). Precisely because of its ambiguous nature, it allows for sense-making and participation from many different stakeholders with diverse interests and expectations (McWilliams, et al., 2006). Despite this open-ended nature, Christensen notes a trend towards the proliferation of voluntary ESG materiality standards which attempt to standardize what ESG materiality may be (so-called closed standards). Rasche (2010), criticizes such standards as being characterized by detailed and accurate specification of practices and behaviours, thus lacking sensitivity to local conditions. In such cases, compliance may be reduced to annual exercises of "ticking the boxes," thereby excluding necessary reflection on the standard's limitations and discussions about potentially better practices.

This conceptual background to the development and understanding of ESG materiality has highlighted and examined the development of materiality as a component of the current mainstreaming of ESG investing and sustainable finance as a whole. In addition, we have revealed how the materiality concept can be manipulated by companies, but is also a subject of debates between different type of stakeholders including professionals working in the emerging responsible investment industry. Take the case of a classical financial analyst and an ESG analyst working within the same investment company, but who cannot see eye to eye about ESG materiality (Shramade, 2016). Finally, we introduced some critical voices raising questions about the moral and pragmatic relevance to capture statically the financial materiality of ESG factors through the creation of voluntary standards. We also introduced the concept of double materiality that attempts to bring together the financial and sustainability materiality dimensions that ESG factors could provide if successfully integrated in investment decision making processes.

EMPIRICAL INSIGHTS

Now that we have discussed some central aspects of the materiality concept, let's turn to the empirical context we studied and how our empirical insights can inform the current debate on the concept of ESG, its materiality and how it is understood and practically implemented by local investors.

Empirical Context

To determine to which extent corporate and investor behaviour was changing to contribute to a more sustainable society, a decade ago, Eccles and Serafeim (2011) analysed data from over 2,000 companies in 23 countries. Two aspects were looked at: the extent to which companies were adopting a more inte-

grated approach to annual reporting, i.e. incorporating ESG issues as key influencers of their business strategies, and the number of times in two quarterly periods that investors accessed environmental and social performance metrics from the Bloomberg financial data information terminal. Countries were then indexed as high or low for both degree of integrated reporting and for investor interest in ESG, placing each country in one of four quadrants.

At the time, South Africa joined the likes of Brazil and Sweden in the quadrant where the perception was that there was a high degree of integrated reporting by companies, but little interest by investors in ESG performance metrics. However from 2011 onwards many regulatory and market developments occurred that changed drastically the landscape leading to more interest from local investors for ESG performance metrics (Giamporcaro and Viviers, 2014, Worthington-Smith, 2020).

One of the biggest asset owners in the world, the South African Government Employees Pension Fund signed (GEPF), signed the Principle for Responsible Investment Initiative (PRI) in 2007 (Giamporcaro, 2011) and it was followed progressively by large asset managers such as Old Mutual Investment Group, for example (Giamporcaro and Leslie, 2018). In 2011, the GEPF led the creation of a local responsible investment code called the CRISA code (IODSA, 2011). At the same time, the South African government also made radical changes in its pension funds industry reporting regulation, known as Regulation 28 (Department of National Treasury, 2011). The amendment that took the shape of a preamble to the regulation and stipulates that a fund has a fiduciary duty to:

Act in the best interest of its members whose benefits depend on the responsible management of fund assets. This duty supports the adoption of a responsible investment approach to deploying capital into markets that will earn adequate risk adjusted returns suitable for the fund's specific member profile, liquidity needs and liabilities. Prudent investing should give appropriate consideration to any factor which may materially affect the sustainable long-term performance of a fund's assets, including factors of an environmental, social and governance character. This concept applies across all assets and categories of assets and should promote the interests of a fund in a stable and transparent environment.

As displayed here, materiality was given central importance in the amendment to Regulation 28 to reassure institutional investors such as pension funds that integrating ESG investment decisions in their investment decision making would not be detrimental to their fiduciaries duties (Freshfield Brukhaus Deringer, 2005; UNEP-FI, 2009). These changes in the retirement regulation were reinforced in 2019 by giving further guidance to pension funds on how to report on ESG material factors (Giamporcaro, et al., 2020). This early voluntary policy move, which enshrined the idea that ESG factors that have a material impact on financial performance should be integrated into investment processes, made South Africa one of the pioneers of sustainable investing regulatory steering (Giamporcaro & Viviers, 2014, Giamporcaro, et al., 2020).

Today, South Africa is considered as one of the most dynamic markets for sustainable investing in Sub-Saharan Africa (Dhlamini, et al., 2017). *The African Investing for Impact Barometer* reported that at the end of 2017, US$360 billion AUM were subjected to ESG integration, compared with US$23 billion in East and West Africa combined.

ESG integration can be defined as the systematic integration of ESG factors into investment analysis, valuation and decision making based on appropriate research resources and metrics (Dhlamini, et al., 2017) and hence is centrally focused on the question of ESG materiality (Orsagh et al, 2018). In this analysis of ESG strategies, it was found that ESG integration was the strategy most favoured (as mea-

sured by assets under management within the country), compared to investor engagement, screening, sustainability themed investment and impact investment (Dhlamini, et al., 2017). However, it remains challenging to fully grasp the extent and the depth of the shape that ESG integration actually takes, since a majority of South African Investors (76,8%) are not fully able to disclose and report precisely what they mean by ESG integration, with the exception of a few leaders (Dhlamini, et al., 2017). The second most favoured strategy, 'investor engagement', is also known in other markets as corporate engagement, or shareholder action (GSIA, 2018). Investor engagement is about seeking to influence company behaviour by active ownership through proxy voting, board participation and/or engagement with companies on ESG matters (Sherwood & Pollard, 2018; Dyck et al., 2018; Gond et al. 2018).

Meanwhile these past few years, South Africa as has been the theatre of intense political and social upheaval, marked by events such as the tragic Marikana massacre at Lonmin (Giamporcaro and Putter, 2018), or the corporate governance debacles of African Bank (Giamporcaro & Marrian, 2018) and Steinhoff (Rossouw & Styan, 2019), which were detrimental to many stakeholders in the South African economy. In all these cases, local investors were largely not able to detect ESG red flags and integrate these into their investment decision making. Such an ability could undoubtedly have prevent them losing considerable amounts of money on behalf of their clients.

This chapter builds on the empirical insights drawn from interviews and a survey with a sample of asset managers in South Africa between February and March 2018. The field research was originally conducted in South Africa with South African asset managers due to the authors' connections within the industry and the interest in understanding the nuances of ESG views in an emerging markets context. These asset managers ranged in size of assets under management from significantly large to small and represented a variety of views on their approach to, and understanding of, ESG. Access to the local investment industry and to the most prominent asset managers was facilitated by the first author who is an ESG investment consultant. After 60-90 minute interviews about their general view on ESG factors and their materiality, the 20 asset managers representing approximately 67% of local asset under management, were asked to weight how material they thought the eight issue categories (Operational, Financial, Governance, Ethics, Labour, Society and Environment) were to 5 industries (Food producers, Healthcare, Mining, Retail and Telecommunications, Media and Technology). The selection of these five industries was based on practitioner knowledge of the diversity of ESG issues within each industry, the size of the companies within each industry being large and therefore on the radar of asset managers within the study and the importance of these industries to the South African economy. The interviews were coded using an inductive qualitative analysis approach (Thomas, 2006). We present first the results of the interview's inductive analysis, before presenting the results of the ESG materiality survey that complemented the interviews.

Interviews Empirical Insights

In analysing the interviews with local asset managers, three overarching dimensions emerged through the inductive analytical process: 1) *ESG factors awareness* 2) *Tensions about integrating ESG factors within investment processes* 3) *ESG strategies implementation diversity*.

The first dimension, '*ESG factors awareness*', refers to how asset managers described ESG factors, how they defined them, the relative importance of different components and their overall relevance to the industry. The analysis identified that there was no clear convergence on a standardized definition of ESG factors. However, most asset managers were open to their general relevance and importance

Table 1. Asset managers interviewed and surveyed

Name	Type	Size	Interview Date
All Weather Capital	Asset Manager	Small	28/02/2018
Allan Gray	Asset Manager	Large	04/04/2018
Aluwani Capital Partners	Asset Manager	Small	27/02/2018
Ashburton	Asset Manager	Small	27/02/2018
Balondolozi Investment Leadership	Asset Manager	Small	26/02/2018
Bateleur Capital	Asset Manager	Small	13/03/2018
Benguela	Asset Manager	Small	27/02/2018
Cadiz (now Warwick Wealth)	Asset Manager	Small	06/03/2018
Coronation Fund Managers	Asset Manager	Large	22/03/2018
Counter Point Asset Management	Asset Manager	Small	06/03/2018
Flagship Capital	Asset Manager	Small	14/03/2018
Futuregrowth Asset Management	Asset Manager	Large	08/03/2018
Makalani Management Company	Asset Manager	Small	28/02/2018
Matrix Fund Managers	Asset Manager	Small	06/03/2018
Momentum Wealth	Asset Manager	Large	26/02/2018
Old Mutual Investment Group	Asset Manager	Large	22/03/2018
Prudential Investment Management	Asset Manager	Large	06/03/2018
Sesfikile Capital	Asset Manager	Small	26/02/2018
Vunani Fund Managers	Asset Manager	Small	08/03/2018
Anonymous	Asset Manager	Large	28/02/2018

Sources: Large asset managers are holding above R100 billion of assets under management (AUM). Estimation of AUM for each companies was retrieved from the following sources Alexander Forbes; 2020 and 27four; 2020.

for doing their job properly. Some asset managers stressed that dramatic differences in the definition of ESG among their clients (usually large asset owners) and the companies they invest in, was rendering their own understanding of ESG materiality far more difficult.

When defining the materiality of ESG factors and whether it was a factor taken into account in the investment process, the majority of the asset managers who attempted to provide a definition for materiality only saw materiality at the level of governance, society and environment (sustainability materiality). No asset managers provided a definitive articulation of how ESG could be holistically integrated into the valuation of their investment porfolios, but rather expressed a dawning awareness to the concept of ESG and the growing importance of taking it into consideration when thinking about companies.

When analysing the interviews, it was clear that governance was particularly important in the asset managers' views, and they related governance to matters of ethics and integrity of leadership. One of the small size asset managers interviewed commented:

The G [Governance] I find so important because it can literally destroy a company. If you don't do the E [Environment] and the S [Society] it may speak to long term inefficiencies, but it doesn't necessarily destroy value like poor governance can.

Most of the asset managers interviewed also converged on the idea that governance and environmental issues were easier to understand and subsequently study, than societal issues. While they favoured Governance out of the three pillars of ESG, environmental issues followed as being the easiest to track and record with societal issues being the toughest to make an accurate account of. One fund manager summed up the "S" perceived complexity:

Society is the tougher one. Companies make donations, like buying food parcels for a community, but to what degree are they being responsible? … It is easy to over-spend on projects that don't succeed, raising doubt about when the input is sustainable and when enough. That causes corporates to pull back from investing in the social 'up-liftment' of the community.

With regard to environmental issues being easy to track and record, one large asset manager mentioned how the then incoming Carbon Tax (SARS, 2021), made effective in 2019, would allow for specific understanding of costs to be imposed on companies:

Sasol, for example, environmental emissions, will be subject to carbon budgets in 2021, to carbon tax, possibly from next year, that's integral to our investment decision making, so rather than outsourcing it to a separate function, rather let the analyst consider all those elements themselves, and where it can be brought into the valuation numerically, bring it in, otherwise, bring it into the report so that everyone has all the information, whether they are deciding whether to purchase those shares.

One of the other main subthemes that emerged in the '*ESG awareness*' dimension was the question of the relevance of ESG to business value creation. A reoccurring point was that the relevance of ESG lay in the ability to identify and mitigate risks - as echoed by this quote from a large asset manager:

A section 54 stoppage [a regulation in the mining industry that orders a mine shut down operations after a fatality on its premises] might seem like an operational issue, but actually it's a social issue.

Aligned to these tensions around the definition of ESG, the second dimension '*tensions about integrating ESG factors within investment'* revealed some concerns on how asset managers could integrate ESG information in their daily job of making investment decisions. A central tension that emerged among asset managers was about their views that if ESG integration was relevant in a long-term perspective this could possibly be at the expense of short-term financial performance, as encapsulated by some interviewee's reflections:

Investment management want to buy companies that are growing. So, it is unfortunate that we come a little bit more entrenched, and it is putting us on collision course with the principles of ESG.

Generally, clients are more focused on performance than anything else, until the crisis happens, and then they ask you difficult questions.

The tension between long-term demands of society versus the shorter-term demands of business, from the point of view of returns on investment, was commented on by every asset manager, most notably about executive remuneration that was increasingly rewarding short-term financial performance. In

general, despite recognising the link between long-term performance and ESG factors, eight managers noted increasing short-termism in the investment industry. A variety of reasons were cited for this increase in short-termism within the investment value chain, including pressure from clients, asset consultants, or professional business associations and investment rankings. These lead them to favour a short-term perspective, even though a long-term one would align more harmoniously with their views on certain ESG considerations.

ESG integration was identified as something rather demanding to achieve considering the intrinsic search within the investment industry for short-term financial performance. Another tension that was stressed by the interviewees related to the functioning of the investment value chain. To make investment decisions, asset managers use information about listed companies that are gathered by their internal analysts, also known as buy-side analysts. They also use the services of external analysts, known as sell-side analysts, who sits usually with brokerage firms. To get the most up-to-date and insider information, analysts may develop privileged relationships with some of these companies' top-level representatives. A large asset manager interviewed made an explicit reference to the conflict of interest that both buy-side and sell-side analysts may face in their quest to gather and communicate information on large and powerful local listed companies:

There is significant career risk if you highlight too many issues and lose your access to management.

One small asset manager commented on the fact that building long term relationships with top management could create some bias in their analysis:

If you've had a relationship with them [companies] for twenty years, you already in that trap where you're believing everything that they say.

Another conflict inherent for both the buy- and sell-side is the loss of independence for some asset managers because they have a brokerage or corporate finance arm within the same company. One asset manager provided an example of this, saying:

If an [asset manager] analyst would take on company X, company X management might go to the entity that owns the asset manager and say now listen, we're getting a bit of resistance from one of your guys, we're going to change our brokering or corporate finance accounts to another entity. And then the pressure will be on the analyst to let it go.

These various conflicts of interest were stressed by the local responsible investment code the CRISA Code launched in 2009 as risks that responsible investors willing to integrate ESG should be aware of:

An institutional investor should recognise the circumstances and relationships that hold a potential for conflicts of interest and should proactively manage these when they occur (IODSA, 2011: 3)

Another piece of local regulation was identified as a driver of the implementation of ESG within the investment industry:

I think for me the big push has come funnily enough from regulation, Regulation 28, which said that as part of your investment process you need to show how you've incorporated ESG into your thinking and then your evaluation. So, a lot of our clients are pension funds, and therefore Regulation 28 applies to them.

Although some asset managers recognized that regulation helped a faster integration of ESG factors in their companies, some also pointed out that the way the regulation was being dealt with was more to sign-off on a cut-and-paste paragraph of Regulation 28 on their new mandates. It was generally felt that younger practitioners were more likely to drive the integration of ESG factors within investment processes. In addition, one asset manager raised the point that large local institutional leaders wield a lot of influence, making them particularly influential to smaller players regarding taking ESG factors more seriously and accounting for them in their investment process.

Eventually, the third dimension that emerged from the inductive analysis of our interviews was "*ESG strategies implementation diversity"* within the local asset manager market. Two main roles for ESG factors emerged in the findings: a tool for investor engagement and as an input to financial valuation.

Investor engagement is the second most important sustainable finance strategies in South Africa (Dhlamini, et al., 2017). This was echoed during the interviews had with local asset managers. A main tension was stressed around investor engagement, which was that asset managers usually engage on behalf of their clients.

Half of the asset managers interviewed stressed that they recently witnessed an increase of interest from their clients for ESG issues concomitant to the corporate scandals that rocked the country, such as the Corporate Governance debacle at Steinhoff that unfolded in 2017 (Rossouw & Styan, 2019). In contrast, small asset managers pointed out a disinterest in their clients to ESG issues. Looking at what clients are demanding from asset managers in terms of their engagement, a nuance of pressures emerged. Some asset managers stressed that they were just asked by some clients to communicate on how they have started to apply their minds to ESG, others recalled that clients ask them to now report on their engagement and their ESG due diligence with companies, while others wanted the sale or reduction of their exposure to certain companies.

Eventually, to change company behaviour outside personal engagement with company management, respondents referred to proxy voting as being a primary source of company engagement. As a large asset manager put it:

And we actually engaged management on a lot of issues via proxies where we voted against issues. And obviously it goes back to majority/minority you know? According to the number of shares that you hold, you can make an impact.

While most respondents declared voting their proxies and using them as a positive source of engagement, a large asset manager was more nuanced about the importance of proxy voting in the whole spectrum of the investor engagement tools:

The proxy voting is not a good reflection of engagement because of this [engaging with companies before voting takes place]. Whether you voted for or against is not noticed. It is the engagement beforehand that is not disclosed that can translate into positive change to the policy change that you will now vote for.

One large asset manager did reference changes in company behaviours with the most advanced grasping that integrating ESG was beneficial to the financial health of their businesses:

Certain companies have taken a lead, they have gone from nowhere to being at the cutting edge of worldwide reporting practices. […] There is a spectrum of companies, some are poor on disclosure and practice, then there those who see it as OK, they see it for compliance with the requirements, then there are those that see it as a big part of their business strategy, "lets integrate". What we've been aiming to do is to push those companies at the bottom end to come up, some are just meeting the standard, and then there are those that are getting from good to great.

Given the growing recognition of ESG's role in financial valuation (Orsagh et al. 2018), each asset manager was probed for an indication of how far advanced they were in developing ESG models to serve as input to company valuation.

More than half admitted they had no formal model but considered ESG factors in their valuations. Four admitted that they are in the early stages of developing ESG financial materiality models. All the models are attempting to score ESG in some quantifiable form either as an ancillary to their financial models according to three large asset managers, or using ESG metrics to directly affect the discount rate used to value companies put forward by one smaller manager. Only one manager had fully integrated ESG into their investment process using ESG analysts and financial analysts to access companies and quantify ESG risks and opportunities using a matrix. The respondent admitted that this has not been used to impact financial valuations yet and that they would only attempt that once they have built up a large enough pool of ESG data.

A very marginal group had advanced qualitative ESG models. For these respondents they considered ESG information to be more of a qualitative nature and therefore not worth pursuing on a quantitative level (for now at least). An example of the qualitative process was put forward by one of the fund managers who said:

We have a template for each company, but with a lot of questions that help guide the analyst thinking about how to approach ESG factors. A list of questions, but by no means exhaustive. The idea is to get the analyst [financial] to think long and hard about some of the softer side of things before diving into the hard numbers and making a decision.

ESG Materiality Survey Methods and Results

After completing the interviews with the asset managers, the authors asked them each to complete a ESG materiality survey to understand what issues they specifically thought were most material in five different industries.

An analysis of the ESG materiality survey's methodological construction will be followed by its findings, drawing some comparative insights from the interviews conducted.

By and large, ESG factors are regarded as those that pose a threat to society as a consequence of business operations. However, to establish a universe of issues, it is necessary to list the broadest range of issues and refine the categories to which these issues belong to create a classification system that is neither clumsy in its breadth nor lacking in insight due to its simplicity.

Table 2. Average ESG materiality scores

Industries	Food		Healthcare		Mining		Retail		TMT	
Categories	**Sub-issues**	**Avg**	**Sub-issues**	**Avg**	**Sub-issues**	**Avg**	**Sub-issues**	**Avg**	**Sub-issues**	**Avg**
Operational	Manufacturing obsolescence; Business continuity	7,9	Patent & IP protection; Partnerships & brand relationships	8,0	Mergers & acquisitions; Business continuity	8,3	Distribution system integrity; Partnerships e.g. brand relationships	8,0	Access to spectrum; Patent & IP protection	9,1
Financial	Liquidity risk; Commodity price & currency volatility;	7,4	Liquidity & Funding risk; Macro-economic conditions	7,3	Capital allocation; Commodity price and currency volatility	8,8	Counterparty/credit risk; Liquidity & Funding risk	7,6	Liquidity & Funding risk; Counterparty/ credit risk	7,4
Governance	Board balance & effectiveness; Remuneration & incentives	8,3	Board balance & effectiveness; Leadership succession	8,5	Board balance & effectiveness; Remuneration & incentives	8,5	Leadership succession; Audit independence	8,4	Remuneration & incentives; Leadership succession	8,4
Ethics	Ethics & integrity; Anti-competitive behaviour	8,1	Ethics & integrity; Anti-competitive behaviour;	9,1	Ethics & integrity; Theft, fraud & corruption;	7,6	Conflicts of interest; Anti-competitive behaviour	8,2	Conflicts of interest; Anti-competitive behaviour	8,7
Labour	Fair labour issues (also in the supply chain); Health, safety & wellness	7,7	Health, safety & wellness; Skills shortages	7,5	Artisanal mining; Health & safety; Worker indebtedness	9,5	Fair labour issues (also in the supply chain); Health, safety & wellness	7,6	People skills & expertise; Health, safety & wellness	6,7
Society	Corporate social investment; Transformation towards B-BBEE	6,7	Political uncertainties; Condition of state infrastructure	7,2	Management of community expectations; Transformation towards B-BBEE	9,0	Corporate social investment; Transformation towards B-BBEE	7,0	Political uncertainties; Condition of state infrastructure	7,4
Customers	Food and product safety & health impacts (sugar tax); Ethical advertising	9,0	Access to products & services; Consumer ID protection	9,4	Product/Service health impacts; Customer experience	4,6	Product health impacts (sugar tax); Disclosure & labelling	9,1	Abuse of or harmful content; Access to products & service	9,1
Environment	Waste to landfill; Energy usage & carbon tax	7,5	Water usage; Electricity disruption	7,0	Water usage; Energy security; Uncontrolled discharges	9,4	Water usage; Waste, water & air pollution	5,8	Electricity disruption; Energy usage & carbon tax	5,2

Source: This table presents the average score achieved by the 8 categories/ per sector among the asset managers surveyed (Worthington-Smith; 2020)

The authors drew on two well-known ESG materiality mapping authorities: the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Authority (SASB). The former was initiated in Europe (with input from South African advisors), while the latter is a US standards body designed to become the de facto standard for the Securities and Exchange Commission (SEC). These two sources have been chosen as they have attempted to categorise ESG factors using working groups and advisors and as such represent a good foundation for the universe of issues. Comparing these two sources for similarities is the first step in identifying the universe of issues. In Appendix 1 is provided the issues put forward by the GRI and SASB. This table is useful for understanding how the two entities have similarly grouped and categorised issues, as well as where there have differed in categorising or including issues. Drawing on the work of these two standards authorities, the ESG materiality survey was drafted using the categories of Operations, Finance, Governance, Ethics, Labour, Society, Customers and Environment. Operation and Finance were included to ensure that the asset managers where not confined to making materiality decisions within ESG alone and could choose to place emphasis in other areas if they believed non-financial categories to be of little importance in an industry.

At the end of the interview process each asset manager was asked to weight the eight categories for each industry, one industry at a time. They could choose weightings between zero and ten where a zero would represent a category they thought was immaterial to the industry and ten would represent the most significant materiality. The interviewees were not limited to using a weighting once per industry and could theoretically weight all eight categories at a materiality of ten if they deemed them all to be equally material. For each category some sub-issues were provided for perspective, for example, 'Artisanal mining', "Health & safety' and 'Worker indebtedness' were provided as sub-issues to the Labour category for the Mining industry and 'Access to products & services' and 'Consumer IP protection' were provided as sub-issues to the Customer category for the Healthcare industry.

The final results or 'Avg.' column for each industry represents the addition of all weightings in that industry's category divided by the number of asset managers, with higher values indicating a category considered of higher materiality to the industry, and lower values indicating categories of less materiality on average.

Food Producers

In the Food producing industry, asset managers considered the Customers followed by Governance and Ethics categories to have the highest materiality, with the Societal category considered the least material.

Healthcare

In this sector, asset manager ranked the Customers category as the most material, closely followed by Ethics and then Governance. Environmental and Societal categories were considered the least material.

Mining

The Mining industry results looks quite a bit different to the other four with Labour, Environment and Societal categories considered the most material and Customers the least material in the industry. Interestingly the categories of Labour and Customers were considered the most and the least material of any categories across all the industries, respectively.

Retail

The Customer category comes through as the most material with Governance and Ethics the next highest. The Environment category was considered the least material by quite a margin.

TMT (Telecommunications, Media and Technology)

The Customers and Operational category came through as the most material issues with Governance and Ethics lagging behind. The categories of Environment and Labour were considered least material with Environment weighted particularly low.

When looking at all the industries together it is interesting to notice that the Customer category is the highest weighted category for all industries barring the Mining industry. What is most striking is that when interviewed prior to completing the ESG materiality survey, asset managers generally converged

on the idea that Governance (represented by Governance and Ethics categories) and Environmental issues (represented by the Environment category) were easier to understand and study. However, when the asset managers were presented with the survey and had to weigh the importance of different categories against one another, the Customer category (falling within the 'Society' pillar of ESG) came out as the single most material category in the Food, Healthcare, Retail and TMT industries. The Labour category (another issue in the 'Society' pillar of ESG) was only the highest in the Mining industry. That is not to say that Governance and Ethics were not weighted highly, since they were considered between the second and fourth most material categories in all industries other than Mining showing some convergence between the interviews and the ESG materiality survey.

What is clear though is that asset managers' declared focus on environmental issues during the interviews (articulated as such on account of a perceived availability of metrics and ease of study) did not necessary align with how material they consider the category, having the lowest materiality in Healthcare, Retail and TMT and the third from the bottom for Food Producers. Only in the Mining industry did the Environmental category scored a high materiality weighting – the second most material category behind Labour.

SOLUTIONS AND RECOMMENDATIONS

Our empirical insight, despite a growing but largely still nascent ESG awareness among the South African industry echoing what is going on worldwide (GSIA, 2018), demonstrates that there is still a need to see a more affirmed implementation of sustainable finance strategies such as ESG integration. This implementation is the only way to bring local asset managers to develop more sophisticated ESG performance metrics which in time will boost their grasp of what ESG materiality may entail both on the financial and sustainability side. This has become particularly relevant with the onset of the Covid-19 pandemic accelerating the importance of ESG considerations for asset managers to take into account and more asset managers seeking low risk ESG fund exposure (Ferriani & Natoli, 2020).

To do so, local asset managers have several paths to follow. According to their size, they can speed up the hiring of ESG analysts who will form the ranks of dedicated sustainability or ESG investment teams who can work in collaboration with financial analysts to develop in-house ESG research that will be used by fund managers for securities selection and portfolio construction. Local asset managers can make use of the wealth of training and guidance resources being generated by the Principles for Responsible Investment initiative (PRI) or the CFA Institute (Orsagh et al. 2018); become an active signatory of the Principle for Responsible Investment Initiative (Piani & Gond, 2013), or the local Responsible Investment Code (IODSA, 2011); and disclose transparently on their sustainable finance investment strategies to the African Investing for Impact Barometer (Dhlamini et al.).

All these resources and support systems for ESG disclosure can help local asset managers become familiar with the best local and global practices and help them refine their understanding of ESG materiality. Local asset managers, particularly smaller ones, which cannot rely on a large team of internal research resources, can use available training resources such as that provided by the Sustainability Accounting Standards Board (SASB), a program that is designed for asset managers, asset owners, companies, and service providers to learn about the financial impact of ESG issues. It allows members to explore best practices to integrate material sustainability information into existing processes. They can also use local ESG service providers such as FarSightFirms, whose research is dedicated to improving local ESG

awareness and promoting a more fine-grained understanding of ESG materiality in the South African and emerging market context.

They can also draw in training resources made available by the Task Force on Climate-related Financial Disclosures (TCFD) Knowledge Hub to get more familiar with climate reporting, different scopes of carbon emissions and the difference between physical and transitions risks (WWF, 2021). Asset managers can also allocate financial resources to purchase ESG information from established international ESG service providers such as Bloomberg, MSCI or Sustainalytics.

For investment in such research, education and training to achieve impact, it needs to be supported by the top management and the board of these investment organisations (Giamporcaro & Leslie, 2018), most notably those at the largest asset managers who have the power to influence their peers and the whole local investment industry to apply the principles of sustainable finance. In addition, local regulators and policy makers need to continue to push the local investment industry to refine their ability to implement and report on their ESG investment strategies. ESG integration should become mandatory for all institutional investors, particularly pension funds, using frameworks of ESG integration that are comparable (Giamporcaro, et al., 2020).

These actions would phase out the reactive, case-by-case driven approach to ESG from local asset managers and allow them to become pro-active, developing more holistic and sustainability driven approaches across the full ESG materiality spectrum.

FUTURE RESEARCH DIRECTIONS

Of particular interest in considering the future directions of research are the questions being asked of sustainable finance in emerging markets, particularly in the rest of Africa. Being able to expand on the lessons learned in developed markets and leverage the work on sustainable finance already performed, there is a significant opportunity for traditional financial systems to be leap-frogged and a more holistic approach to investing to be implemented. This will not only aide the stakeholders affected in these emerging markets, but could become more attractive to foreign investors looking to invest in sustainable finance opportunities outside the developed world.

The authors suggest four possible dimensions of further research to better understand the concept of materiality and its applications in an emerging market context. In order to best leverage the insights that materiality brings to the conversation of sustainable finance it is suggested that the study be expanded throughout the investment value chain to include asset owners, companies, analysts, other service providers, brokers and retail clients, to name but a few important stakeholders. By understanding how different actors within the value chain view materiality and the influence they have over investment decisions, ESG tools and resources can be refined to suit the needs of different stakeholders more holistically, as well as improve the quality of interaction between stakeholders, such that capital can be allocated more effectively towards sustainable finance outcomes.

Another dimension to pursue is that of the materiality exercise itself. By expanding the categories and the sub-issues, making them more specific to the country's context and developing the survey to feedback responses on what people considered material at sub-issue level, the ESG materiality survey can can identify specific issues of interest within the investment value chain. This insight could be used to develop a framework for reporting at industry level within countries and help regulators hone their policies.

Thirdly, expanding the research to other emerging markets, particularly the countries of the African continent, would provide further insight into the different perepectives of what is considered material in diverse regions (often coined under the umbrella term of 'emerging markets'). Pursuing this research direction would allow individuals across the investment value chain to tailor their ESG approaches to the specific context of the country they are in and better serve both business and society at large.

Finally, a research direction aimed at assisting practitioners specifically would be the development of a crowd-sourced materiality tool, leveraging the different views of asset managers and investors along the value chain to help individuals better understand the material issues for individual companies at a point in time. This will lead to better engagement with the most critical issues of our time, such as the implications of the Covid-19 pandemic on companies.

CONCLUSION

Since the launch of the Principles for Responsible Investment in 2006 (Gond & Piani, 2013), sustainable finance proponents are demonstrating that integrating environmental, social and governance (ESG) factors into investment decisions may have a positive long-term material impact on financial performance, and ultimately benefit wider society as a whole. The pandemic crisis has not slowed down this wave of enthusiasm and the ongoing development of sustainable finance policies (European Commission 2018; Raconteur, 2021, Responsible-investor.com, 2021). On the contrary, the pandemic crisis seems to have convinced more and more asset managers all around the world that they need to think in a more systemic and holistic manner about sustainability matters.

This chapter has focused on the issue of sustainable finance and ESG materiality, shining a spotlight on South African asset managers' awareness and implementation of ESG solutions within their investment processes. Building on both academic and practitioner work, the authors analysed the contested nature of ESG materiality within sustainable finance, as well as its conceptual complexity to better understand the role materiality has played over time.

Based on the interviews and an ESG materiality survey that was run among 20 prominent South African asset managers, the authors found that while there is a growing awareness of ESG factors among respondents there are some perceived tensions around how to practically embed these factors within investment processes. This nascent awareness of ESG materiality is evident in the variety of tools used by asset managers, ranging from quantitative to qualitative, and then further, varieties within those categories too. This diverse range of tools, definitions and metrics, creates tension for asset managers who also have to deal with conflicting demands of their clients. This can be confusing for many asset managers and little wonder that concepts like double materiality are far from their minds when they are not yet able to account for the impact companies have on the world and the impact sustainability factors might have on the financial performance of a company. We also found asset managers in our sample to have difficulty with the societal dimension of ESG in an emerging markets context, partly a result of inadequate definitions and measurement standards. Societal issues that need to be addressed include decent wages, infrastructure, indebtedness, education, racial equality, employment equity, poverty alleviation and access to healthcare, to name a few. We noted the trade-off between societal and environmental issues. Climate change is an environmental issue, but has a societal impact, such as reducing reliable access to water, food production, and living conditions.

In addition, our results show that the integration of ESG factors into financial valuation are not yet mainstream and that more needs to be done to demonstrate how the integration of ESG factors within investment processes can contribute significantly to both financial performance and to the sustainable development of our economies.

The authors discuss solutions and recommendations to these issues with specific reference to the role of the regulator to strengthen policies and move towards mandatory standards for companies and mandatory integration of ESG within investment decision making. In particular, institutional investors should apply ESG integration within a clear framework that allows industry-wide comparability. The development and implementation of the Carbon Tax effective in 2019 (SARS, 2021), Mining Charter (Department of Mineral Resources and Energy, 2018) and Regulation 28 are steps towards clarity for companies and investors in the South African market, but there is more to be done to create a more clear understanding of what is being asked of companies. This clarity and stability would allow for ESG matters to be taken more seriously in the long-term. Transparent reporting against clearly established ESG integration frameworks will allow for closer scrutiny and further strengthen compliance with responsible investing standards.

To further support the integration of ESG with investment processes asset managers need to build out their ESG teams and place a focus on up-skilling their analysts in ESG. Leveraging off the work of the PRI and CFA, analysts can strengthen their engagement with companies and drive the conversation on ESG materiality directly. Large asset managers with influence in the market should be leaders in this regard, paving the way for smaller asset managers to follow in their footsteps.

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KEY TERMS AND DEFINITIONS

Asset Managers: Term used in the financial sector to describe people and companies who manage investments on behalf of others. Those include, for example, investment managers that manage the assets of a pension fund.

Double Materiality: Double materiality refers to the inclusion of information about how an entity impacts social and environmental issues, as well as how such issues may impact financial performance.

ESG: Environment, social, and governance.

ESG Analyst: A specialised analyst also known sometimes as sustainability analyst focussed on analysing ESG risks and opportunities as they relate to investment activities.

ESG Integration: One of the most common investment strategy in Sustainable Finance. This refers to the systematic integration ESG factors into investment analysis, valuation, and decision making based on appropriate research ressources and metrics.

ESG Materiality: The active search by investors for understanding, calculating and reporting about the financial and potentially the sustainability impact of integrating ESG factors within their investment processes.

Financial Analyst: An investment professional also known sometimes as fundamental analyst focussed on assessing the financial condition of a business or asset to inform the investment decisions of an investor.

Financial Valuation: A quantitative process of determining the fair value of an asset or a firm.

Institutional Investor: A legal entity that has obligations in terms of investment analysis, activities, and returns to ultimate beneficiaries. Examples of institutional investors include pension funds, insurance companies, sovereign wealth funds and mutuals funds. Institutional investors are sometimes called asset owners.

Investor Engagement: Investor engagement is about seeking to influence company be behaviour by actice ownership through proxy voting, board participation, and/or engagement with companies on ESG matters.

Sustainability: Focuses on meeting the needs of the present without compromising the ability of future generations to meet theirs. The concept of sustainability is composed of three pillars: economic, environmental, and social, that stakeholders (including investors) should strive to make work in harmony and in the respect of the world's resources limitations.

Sustainable Finance: There are nowadays many slightly overlapping definitions of sustainable finance. In this chapter, we define sustainable finance as any form of financial service integrating environmental, social and governance (ESG) criteria into the business or investment decisions for the lasting benefit of both clients and society at large. Activities that fall under the heading of sustainable finance, to name just a few, include sustainable/ESG/SRI funds, green bonds, impact investing, microfinance, active ownership, credits for sustainable projects and development of the whole financial system in a more sustainable way.

Sustainable Investment: As a sub-category of sustainable finance, sustainable investment can be defined as an investment approach that "considers environmental, social and governance (ESG) factors in portfolio selection and management." Sustainable investment activities and strategies encompass negative or exclusionary screening, positive/best-in-class screening, norms-based screening, ESG integration, sustainability-themed investing, impact/community investing and corporate engagement and shareholder action. Sustainable investment can be also be called socially responsible investing, ESG or responsible investing.

APPENDIX 1

Table 3. Categories of material issues from the GRI and SASB

GRI category	GRI 'Topic specific standards'	SASB ESG categories	SASB category	SASB sub-issues
Economic	201: Economic Performance 202: Market Presence 203: Indirect Economic Impacts 204: Procurement Practices 205: Anti-corruption 206: Anti-competitive Behavior	Governance	Business Model & Innovation	Long-term viability of core business Competitive & ethical behaviour Research, development & innovation Accounting for externalities
			Leadership & Governance	Regulatory & legal challenges Policies, standards & codes of conduct Shareholder engagement Board structure & independence Executive compensation Lobbying & political contributions
Environmental	301: Materials 302: Energy 303: Water 304: Biodiversity 305: Emissions 306: Effluents and Waste 307: Environmental Compliance 308: Supplier Environmental Assessment	Environmental		Fuel management & transportation Water use & management Biodiversity impacts GHG emissions and air pollution Waste management & effluents Climate change & natural disaster risks Environmental accidents & remediation
Social	401: Employment 402: Labor/Management Relations 403: Occupational Health and Safety 404: Training and Education 405: Diversity and Equal Opportunity 406: Non-discrimination 407: Freedom of Association and Collective Bargaining 408: Child Labor 409: Forced or Compulsory Labor 410: Security Practices 411: Rights of Indigenous Peoples 412: Human Rights Assessment 413: Local Communities 414: Supplier Social Assessment 415: Public Policy 416: Customer Health Safety 417: Marketing and Labeling 418: Customer Privacy 419: Socioeconomic Compliance	Social	Employees	Recruitment & retention Employee health, safety & wellness Training & development Diversity & equal opportunity Labour relations & union practices Child & forced labour Compensation & benefits
			Community	Community development Communications & engagement Impact from facilities
			Supply Chain	Supply chain standards & selection Supply chain engagement & transparency Raw material demand
			Customers	Customer health & safety Disclosure & labelling Marketing & ethical advertisement Customer satisfaction
			Products & services	Product societal value Product life cycle use impact Packaging Product pricing & target materials Product quality & safety

Source: The information in this table was drawn from the websites of the Global Reporting Initiative (https://www.globalreporting.org/) and Sustainable Accounting Standards Board (https://www.sasb.org/about/).

Chapter 12
ESG Scores and Bank Performance During COVID-19

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ABSTRACT

This chapter examines the impact of ESG scores on bank stock returns as a response to the COVID-19 pandemic. The authors use a sample of 73 publicly listed banks from 15 developed European countries. They perform the analysis using two different periods that cover the pandemic: the first major wave period of COVID-19 (February-April 2020) and an extended period (February 2020-April 2021). The findings reveal the negative influence of the COVID-19 pandemic on bank stock returns during the first wave of the pandemic. They further find that, during the first wave, stock returns of banks with higher ESG scores were more resilient to the pandemic. However, when they use the extended time period (from February 2020-April 2021), the influence of both COVID-19 and ESG scores becomes insignificant. The chapter's findings have important policy implications during unprecedented crisis times such as COVID-19.

INTRODUCTION

Coronavirus pandemic (COVID-19) had unprecedented impacts on all corporations and financial institutions. Governments worldwide have been imposing several restrictions such as lockdowns, closure of businesses, closure of schools and borders, international flight bans, and social distancing measures to mitigate the severe impacts on the economies. These restrictions have unintentionally led to deteriorations in economic activities and sharp declines in stock markets, especially during the first wave of the pandemic, in the first quarter of 2020 (Baker et al., 2020; Çolak and Öztekin, 2021). In 2020 Q1, it produced a sharp global collapse in the stock markets (Zaremba et al., 2021). No previous infectious disease has caused such a high level of stock market volatility in the US (Baker et al., 2020) and the rest of the world (Engelhardt et al., 2021). Central banks and governments have responded with monetary and fiscal stimuli (Laeven and Valencia, 2020) to stabilize their economies and the markets. In addition, many countries have initiated loan guarantee programs or other types of credit supports and injected liquidity

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to the affected businesses (Alstadsæter et al., 2020; Bennedsen et al., 2020; Çolak and Öztekin, 2021). Topcu and Gulal (2020) have demonstrated that although the economic impacts are yet to be explored, global financial markets have responded to the pandemic, especially in 2020 Q1; and they further found that the negative effect has gradually decreased after mid-April 2020.

The question of whether shareholder or stakeholder value should be maximized has been an ongoing debate, and gained more interest after the COVID-19 pandemic (Bae et al., 2021). At the center of this debate, there lies the question of whether environmental, social, and governance (ESG) activities are value-enhancing, especially during crisis times such as the coronavirus pandemic (Lins et al., 2017). The coronavirus pandemic has led to an intensified attention to the ESG activities, and these activities were at the center of recovery plans in several countries. For example, the European Parliament re-announced its commitment to the European Green Deal during the pandemic, aiming to establish a climate-neutral Europe by 2050[1]. However, few prior empirical studies have found supporting evidence that corporate social responsibility (CSR) activities of non-financial firms are valued by the investors (Nguyen et al., 2020; Griffin et al., 2021; Boubakri et al., 2016; Servaes and Tamayo, 2013)[2]. These studies argue that if the CSR activities of firms are undertaken to meet the demand of stakeholders, then we might expect improved stock price performance in crisis periods (Bae et al., 2021). There is a burgeoning literature that explores the influence of ESG scores and CSR activities on non-financial firms during the COVID-19 pandemic. For example, Bae et al. (2021), using a sample of 1750 US firms during the first wave of the coronavirus pandemic (February and March, 2020) and post-pandemic (April and June, 2020) periods, investigate the link between CSR and stock returns. Their findings do not point out to a significant relationship between the CSR scores and stock market returns during or after the pandemic crisis period. In contrast, Ding et al. (2021) and Albuquerque et al. (2020) show that stocks with higher pre-pandemic CSR and ESG scores perform better. In this paper, this literature is extended by focusing on the banking industry and we investigate whether ESG activities of European banks have any mitigating influence on the negative stock price reaction to the COVID-19 pandemic.

At the beginning of the pandemic, banks were not at the epicenter of the crisis. This was mainly due to the inflow of money from the liquidity injection plans and due to their higher capital levels before the pandemic, helping to meet the demand in liquidity (Baldwin, and di Mauro, 2020; Li et al., 2020). However, later on, some banks underperformed compared to other non-financial institutions due to their higher sensitivity to crisis periods (Aldasoro et al., 2020; Demirgüç-Kunt et al., 2020; Goodell, 2020). COVID-19 shock would be expected to affect the banking sector in numerous ways. For instance, banks are tightening the lending standards globally due to a more uncertain outlook and reduction in risk tolerance. In addition, policymakers have softened the conduct of non-performing loans and have eased capital buffers to alleviate the negative consequences on the banking system's stability (Bitar and Tarazi, 2021). Such an easing of their conduct might jeopardize bank solvency. The pandemic-induced likelihood of an increase in non-performing loans, especially those to the firms in industries that suffer more from the pandemic, would severely impair the performance of banks (Goodell, 2020; Perotti, 2020). Furthermore, an increase in the number of credit line drawdowns during the pandemic might harm the stability of the banks, with potential spillovers to the real economy (Acharya and Steffen, 2020).

This paper uses a sample of 73 publicly listed banks from 15 developed European countries[3] and explores the influence of ESG scores on bank stock price reaction to the pandemic. We use two different time periods to cover the COVID-19 crisis: the first major wave (February-April 2020) and a more extended period, from February 2020 to April 2021. Our purpose for using such two different time horizons is to see whether ESG activities of banks are more helpful when the crisis at its highest level

of uncertainty, during the first wave of the pandemic, compared to an extended period when the severe impacts are more normalized. We use panel data estimation techniques with bank and time (week) fixed effects to discover the impact of ESG scores on bank stock returns during the COVID-19 pandemic. We control for various country-level factors and asset pricing indicators. In line with Ding et al. (2021) and Zaremba et al. (2021), we use the most recent year's data (2019) to capture the ESG scores and country-level variables, and other controls that are likely to influence stock price behavior during the pandemic. We use weekly data for the rest of the variables, such as stock returns and asset pricing factors such as market value, price to earnings ratio, and dividend yield.

We contribute to the literature in the following aspects. First, there is a rapidly developing literature on the impacts of COVID-19 on financial markets, such as the stock market behavior (Ashraf, 2020; Chen et al., 2020; Szczygielski et al., 2021; among many others), and the behavior of cryptocurrencies (Conlon and McGee, 2020). There are, however, a limited number of papers that consider its effect on the banking sector (Acharya and Steffen, 2020; Demirgüç-Kunt et al., 2020; Beck, 2020; Li et al., 2020; Çolak and Oztekin, 2021). We contribute to this strand of literature by documenting the significant negative impacts of the COVID-19 pandemic on banking stock returns during the first wave of the pandemic (February- April 2020). We further document that the negative impact on stock prices vanishes when an extended time period is used in the analysis (February 2020- April 2021). Our results are in line with Topcu and Gulal (2020) who have shown that global financial markets have mainly responded to the pandemic in 2020 Q1; and the negative effect has gradually decreased after April 2020. Second, to our knowledge, existing studies do not explicitly address the influence of ESG scores on the COVID-19 induced banking stock performance. We show that higher ESG scores are helpful for banks to mitigate the negative stock market reaction to the pandemic only during the first wave of the pandemic when the uncertainty is at its highest. This is in line with the literature that document stock prices of firms with higher pre-pandemic CSR and ESG scores perform better during the COVID-19 pandemic (Ding et al., 2021; Albuquerque et al., 2020). However, using an extended period of time to cover the COVID-19 crisis (February 2020 to April 2021), we observe no such mitigating effect.

The rest of the paper is structured as follows. Section 2 presents related literature, and Section 3 presents the data and methodology. Section 4 displays the results and discussions. The last section concludes the paper.

BACKGROUND AND RELATED LITERATURE

A very quickly building literature has investigated the impacts of the COVID-19 pandemic on financial markets; and these papers clearly illustrate the adverse effects. For example, Shanaev et al. (2020) and Ashraf (2020) document the negative influence on stock returns using cross-country datasets. Likewise, Al-Awadhi et al. (2020) show it for the case of China, and Wang & Enilov (2020) find a significant decrease in stock market returns in Canada, France, Germany, Italy, and the US. Another vein of the literature aims to explore the firm-level financial factors that might mitigate the severe negative impacts of the COVID-19. For instance, Ramelli and Wagner (2020) find that the stock returns of firms in the US with more exposure to China, and with higher debt and less liquidity are more severely affected by the coronavirus. Ding et al. (2020) observe that Chinese firms with higher Hubei exposure (where the outbreak has started) have lower stock returns; and firms with more foreign exposure have been affected less. Fahlenbrach et al. (2020) document financial flexibility as a mitigating factor that helps to

decrease the adverse stock price reaction to the pandemic. Heyden and Heyden (2021) detect that tangibility, liquidity, and institutional holdings can reduce the magnitude of the stock price reaction. Ding et al. (2021) document that the decrease in stock prices is considerably smaller for firms with a stronger pre-pandemic financial situation, such as higher profit levels, less leverage, higher liquidity, and more corporate social responsibility activities.

Few prior empirical studies have found supporting evidence that CSR activities of non-financial firms are valued by the stock market investors (Nguyen et al., 2020; Griffin et al., 2021; Boubakri et al., 2016; Servaes and Tamayo, 2013). The argument in these studies is that if the CSR activities of firms are believed as satisfying the demand from stakeholders, then a better stock price performance might be observed (Bae et al., 2021). There is a growing literature that focuses on the impact of ESG scores and CSR activities on non-financial firms during the COVID-19 pandemic. For instance, Bae et al. (2021), using a sample of 1750 US firms, do not observe a significant relationship between CSR scores and stock market returns during (February 18–March 20, 2020) or after the pandemic crisis period (March and June, 2020). In contrast, Lopatta et al. (2020) document that firms which specifically address the COVID-19 pandemic in their earlier reports during the pandemic have had better stock performance and lower risk. Takahashi and Yamada (2021) find that ESG activities of Japanese firms are not significantly associated with better returns during the pandemic. Albuquerque et al. (2020) document that the US firms with higher ESG ratings tend to have higher returns and lower volatilities. We extend this literature by focusing on the banking sector and explore whether ESG activities of banks headquartered in Europe have any influence on the negative stock market reaction to the COVID-19 pandemic.

DATA AND METHODOLOGY

Data

This section describes the sample, COVID-19 measures, and other variables used in the analysis and the data sources. The brief descriptions of the variables, frequencies, and data sources are presented in Table 1.

Covid-19 Variables

We obtain Covid-19 related data from the Oxford COVID-19 Government Response Tracker (OxCGRT) database[4]. The first COVID-19 case worldwide is documented in China in December 2019, and the first death was reported again in China on January 11, 2020. Our sample focuses on 15 developed European countries. The main reason to focus on the developed European countries is the ESG score data availability for banks (in the Thomson Reuters ASSET4 database). COVID-19 cases were observed later in Europe, and started to be reported in February 2020. We, therefore, extract the COVID-19 data for the period beginning with February 2, 2020, until April 29, 2021, which was the latest available data at the time of this study. We classify this period into two crisis periods: the first major wave of the pandemic, from February 03 to April 28, 2020, and an extended time period from February 03 to April 29, 2021. To capture the country's exposure to the Covid-19 pandemic, we use the growth of the weekly cumulative number of deaths (*COVID19*). Since we use weekly stock returns, we match the COVID-19 measure using the growth of the confirmed number of COVID-19 deaths from Fridays to Fridays. We calculate it for each country j and week t as follows:

$$COVID19 = \ln\left(1 + Confirmed\ Deaths_{jt}\right) - \ln\left(1 + Confirmed\ Deaths_{jt-1}\right).$$

We use an alternative COVID-19 country exposure measure for robustness: the weekly growth of the cumulative number of cases (*COVID19 V2*). We calculate it similarly as in Equation 1. Table 2 reports the summary statistics. We observe that the mean weekly growth rate of the cumulative number of deaths (*COVID19*) during the first wave of the pandemic (February-April, 2020) for Europe is 0.76. As expected, it is lower; i.e., 0.16, for the extended time period (February 2020 -April 2021). The mean weekly growth rate of the cumulative number of cases (*COVID19 V2*) is 0.90 during the first wave of the pandemic; and it is again lower; i.e., 0.21, for the extended period[5]. Table 3 presents the descriptive statistics at the country level for the main variables in the estimations. We observe that during the first wave of the pandemic, the highest average of *COVID19* was observed in Italy (0.924), followed by the United Kingdom (0.912), Spain (0.911), and France (0.910). During the entire period (February 2020-April 2021), the highest average of *COVID19* has been in the UK (0.187), followed by Italy (0.185) and France (0.183). Meanwhile, Finland, Norway, and Denmark rank at the bottom with the lowest averages during both the first wave of the pandemic and the extended time period.

Stock Prices

We extract bank stock price data from Thomson Reuters Datastream. We consider all publicly listed commercial banks headquartered in developed European countries with available data on ESG scores for 2019. The reason to focus on developed European countries is the data availability on ESG scores. In addition, we include stocks that actively trade in 2020 and 2021, following Ding et al. (2021) and Hanselaar et al. (2019). Table 3 shows the number of banks from each country[6]. Our sample includes 73 banks from 15 developed countries, with the highest number of banks from Italy (11) and the UK (11)[7].

We calculate weekly bank stock returns (*RETURN*) using the week's last trading day for the weeks between February 03, 2020 and April 29, 2021. We conduct our analysis separately for the first wave of the pandemic from February 03, 2020 to April 29, 2020, and the extended time period. We do this because stock prices are severely affected by the COVID-19 induced fear and uncertainty, especially during the first wave of the pandemic. Later on, there has been a normalization of the stock price behavior.

We observe in Table 2 that the average *RETURN* during the first wave of the pandemic is -4.84, and it is lower but still negative, -0.10, for the wider time period, clearly showing the severe effect on the stock returns. Table 3 presents that during the first wave of the pandemic, the lowest average *RETURN* was in Ireland (-8.219), followed by the Netherlands (-8.216). Meanwhile, Switzerland (-1.662) and Sweden (-2.245) have the lowest averages during the first wave of the pandemic. For the entire period, while Portugal and the Netherlands show the lowest average *RETURN,* Sweden and Norway have the highest.

Figure A1 in the Appendix shows the relationship between average weekly bank stock returns and the average COVID-19 exposure of the countries. The negative correlation is observed for the first wave of the pandemic (between February 2020 and April 2020, until week 13), which constitutes an initial sign of the negative impact of the COVID-19 pandemic on bank stock returns. However, the negative relationship seems to vanish for the post-first wave of the pandemic (after week 13).

Table 1. Variable descriptions

Variable	Definition	Frequency	Source
RETURN	The weekly logarithmic bank stock return of banks calculated by using the closing prices on the last trading day of the corresponding week.	Weekly	Thomson Reuters Datastream
COVID19	The growth rate of confirmed COVID-19 deaths. It is calculated as: Log (1+number of confirmed deaths in week t) – Log (1+ number of confirmed deaths in week t-1)	Weekly	Hale et al. (2020)
COVID19 V2	The growth rate of confirmed COVID-19 cases. It is calculated as: Log (1+number of confirmed cases in week t) – Log (1+ number of confirmed cases in week t-1)	Weekly	Hale et al. (2020)
ESG	ESG Combined Score is an overall company score based on the reported information in the environmental, social, and corporate governance pillars (ESG Score) with an ESG Controversies overlay.	2019	Thomson Reuters ASSET4
ENV	Environmental pillar score shows banks' reported environmental performance in three areas: resource use, emissions, and innovation.	2019	Thomson Reuters ASSET4
SOC	The social pillar score indicates banks' reported social information in four areas: workplace, human rights, community, and product responsibility.	2019	Thomson Reuters ASSET4
GOV	Governance pillar score is banks' reported governance information based on three dimensions: management, shareholders, and corporate social responsibility strategy.	2019	Thomson Reuters ASSET4
CSR	CSR Strategy index incorporates a company's practices to communicate that it integrates the economic, social, and environmental dimensions into its daily decision-making processes.	2019	Thomson Reuters ASSET4
MV	The natural logarithm of market value (Ln (Market value)). It indicates the aggregate market value of the corresponding stock in million US Dollars.	Weekly	Thomson Reuters Datastream
DIV YIELD	The dividend yield is the total dividend amount for the stock, expressed as a percentage of the total market value of the stock.	Weekly	Thomson Reuters Datastream
P/E	The Price-earnings ratio is the ratio of the total market value of the stock to the total earnings.	Weekly	Thomson Reuters Datastream
GDP GRW	GDP per capita growth	2019	World Bank World Development Indicators
INF	Inflation	2019	World Bank World Development Indicators
EQTA	Equity to total asset ratio	2019	Thomson Reuters Datastream
CREDIT	Domestic credit to the private sector (% of GDP)	2019	World Bank World Development Indicators
Note: This table displays the variables used in the regressions, their brief descriptions, data frequency, and sources.			

Environment, Social, and Governance (ESG) Scores

This paper examines whether ESG scores of banks influence the stock price reaction of the banks to the Covid-19 pandemic. For this purpose, we collect pre-pandemic ESG scores of banks from the Thomson Reuters ASSET4 database. Thomson Reuters ASSET4 database contains such information for publicly listed and large firms from various sources, including corporate annual reports and corporate social responsibility reports, stock exchange filings, and the news media. We collect the most recent year's data from the database, which is 2019.

Table 2. Descriptive statistics

Panel A: First wave (Feb 2020-Apr 2020)						
Variable	**N**	**Mean**	**Min**	**Max**	**p50**	**Stand. Dev.**
RETURN (%)	803	-4.84	-63.77	35.82	-2.99	11.84
COVID19	803	0.76	0.00	3.11	0.47	0.80
COVID19 V2	803	0.90	-0.14	4.17	0.61	0.92
MV	876	8.65	4.83	12.29	8.66	1.64
DIV YIELD (%)	876	4.36	0.00	12.01	4.22	3.57
P/E (%)	786	10.64	2.70	114.70	7.80	12.89
Panel B: Full period of time (Feb 2020- Apr 2021)						
Variable	**N**	**Mean**	**Min**	**Max**	**p50**	**Stand. Dev.**
RETURN (%)	4599	-0.10	-63.77	35.82	0.20	7.72
COVID19	4599	0.16	-0.05	3.11	0.02	0.43
COVID19 V2	4599	0.21	-0.14	4.17	0.05	0.50
MV	4672	8.68	4.83	12.29	8.79	1.65
DIV YIELD (%)	4672	2.64	0.00	12.01	1.36	3.13
P/E (%)	4092	14.83	2.70	114.70	10.80	15.82
Panel C: The variables for which 2019-end values are used						
Variable	**N**	**Mean**	**Min**	**Max**	**p50**	**Stand. Dev.**
ESG	876	59.30	1.36	92.86	62.41	21.47
ENV	876	56.85	0.00	96.56	71.41	33.33
GOV	876	56.16	1.86	94.69	57.67	23.66
SOC	876	62.32	1.05	95.96	69.55	23.01
CSR	876	57.94	0.00	96.91	69.09	30.18
GDP GRW	876	1.00	0.21	4.12	0.89	0.87
INF	876	1.25	-0.62	2.96	1.39	0.91
CREDIT	804	108.65	36.97	159.72	104.19	32.96
EQTA	852	8.44	1.28	86.58	6.80	9.82

Note: This table displays the descriptive statistics for the variables used in our regressions. Panel A presents the summary statistics for the sample that represents the first wave of the Covid-19 pandemic from February 2020 to April 2020. Panel B shows the descriptive statistics for the full period from February 2020 to April 2021. Finally, panel C shows the summary statistics of the variables for which the latest 2019 end-year values are used in our regressions.

We use the following five indicators to capture the banks' environmental, social, and corporate governance performance. First, we use ESG Combined Score (*ESG*), an overall company score. It is based on the reported information by the firms across three main categories (environmental, governance and social) based on publicly-reported data. The three main categories include ten different sub-categories such as resource use, emissions, management, workforce, human rights, etc. The index ranges from 0 and 100 and higher values indicate better ESG performance and transparency in publicly reporting material ESG data. Table 2 shows that it has an average of 59.30. Table 3 demonstrates that the highest average *ESG* is from France (78.1), and the lowest is from Switzerland (37.8). The second indicator is one of

Table 3. Descriptive statistics at the country level

Panel A: First wave (Feb 2020-Apr 2020)									
Country	**Number of banks**	*Return*	*COVID19*	*COVID19 V2*	*ESG*	*ENV*	*GOV*	*SOC*	*CSR*
AUSTRIA	3	-4.777	0.570	0.875	69.4	73.8	52.7	80.3	88.2
BELGIUM	2	-4.377	0.801	0.910	40.9	45.6	34.9	41.0	50.5
DENMARK	5	-4.025	0.546	0.819	42.9	53.1	39.7	42.2	50.7
FINLAND	2	-3.668	0.471	0.700	55.8	67.1	42.1	62.5	45.2
FRANCE	4	-6.877	0.910	0.912	78.1	93.3	66.6	84.2	76.4
GERMANY	4	-6.390	0.787	0.847	70.4	62.4	71.8	71.7	60.9
IRELAND	3	-8.219	0.629	0.892	54.9	42.4	51.8	60.7	48.0
ITALY	11	-4.510	0.924	0.980	60.6	58.6	50.2	68.7	51.5
THE NETHERLANDS	2	-8.216	0.760	0.955	70.6	87.5	65.8	69.2	85.3
NORWAY	7	-3.744	0.482	0.811	48.7	46.1	46.8	50.8	38.4
PORTUGAL	1	-6.576	0.614	0.912	75.5	62.6	61.0	89.8	82.1
SPAIN	7	-6.435	0.911	1.048	71.9	65.0	70.4	75.0	57.1
SWEDEN	5	-2.245	0.698	0.828	58.6	54.3	55.7	60.9	62.9
SWITZERLAND	6	-1.662	0.670	0.933	37.8	20.5	49.5	34.0	38.3
THE UNITED KINGDOM	11	-5.464	0.912	0.874	64.3	57.6	67.2	64.8	72.2
Total	**73**	**-4.842**	**0.757**	**0.899**	**59.3**	**56.9**	**56.2**	**62.3**	**57.9**
Panel B: Full period of time (Feb 2020-Apr 2021)									
Country	**Number of banks**	***Return***	***COVID19***	***COVID19 V2***	***ESG***	***ENV***	***GOV***	***SOC***	***CSR***
AUSTRIA	3	-0.20	0.146	0.211	69.42	73.81	52.71	80.26	88.18
BELGIUM	2	-0.34	0.160	0.207	40.91	45.59	34.88	41.00	50.53
DENMARK	5	0.11	0.124	0.197	42.85	53.07	39.65	42.20	50.68
FINLAND	2	0.03	0.108	0.169	55.80	67.13	42.07	62.47	45.24
FRANCE	4	-0.21	0.183	0.215	78.15	93.33	66.62	84.21	76.37
GERMANY	4	-0.35	0.179	0.196	70.39	62.36	71.78	71.71	60.87
IRELAND	3	0.06	0.135	0.197	54.86	42.39	51.83	60.69	48.01
ITALY	11	-0.06	0.185	0.219	60.59	58.60	50.25	68.67	51.50
THE NETHERLANDS	2	-0.43	0.155	0.225	70.58	87.47	65.75	69.17	85.30
NORWAY	7	0.20	0.105	0.184	48.68	46.09	46.84	50.77	38.44
PORTUGAL	1	-0.87	0.155	0.216	75.50	62.58	60.95	89.80	82.14
SPAIN	7	-0.36	0.179	0.228	71.90	65.00	70.39	74.99	57.05
SWEDEN	5	0.39	0.151	0.207	58.55	54.27	55.66	60.85	62.90
SWITZERLAND	6	0.04	0.147	0.212	37.80	20.50	49.53	33.95	38.33
THE UNITED KINGDOM	11	-0.30	0.187	0.206	64.35	57.62	67.17	64.81	72.24
Total	**73**	**-0.10**	**0.159**	**0.207**	**59.30**	**56.85**	**56.16**	**62.32**	**57.94**
Note: This table displays the descriptive statistics at the country level for the key variables.									

the components of *ESG*, the Environmental pillar score (*ENV*), which indicates reported environmental

performance in resource use, emissions, and innovation. *ENV* again ranges between 0 and 100. The average *ENV* in our sample is 56.85, and the highest average *ENV* is from France (93.3) and the lowest from Switzerland (20.5). Third, we use the Governance pillar score (*GOV*), the reported governance information based on the following three dimensions: management, shareholders, and corporate social responsibility strategy. The average *GOV* in our sample stands at 56.16, with the highest average *GOV* score from Spain (70.4), and the lowest from Belgium (34.9). The fourth indicator we use is the social pillar score (*SOC*) which reveals reported social information in the workplace, human rights, community, and product responsibility. Table 2 shows that the average *SOC* in our sample is 62.32, and from Table 3, we observe that the highest average *SOC* is from Portugal (89.8) and the lowest from Switzerland (34.0). The final indicator we use in the paper is the CSR Strategy index (*CSR*). It incorporates the reporting practices of firms regarding the daily decision-making processes in economic, social, and environmental dimensions. Tables 2 and 3 show that the average *CSR* is 57.94 in our sample, with the highest average from Austria (88.2) and the lowest from Switzerland (38.3).

Control Variables

We control for some asset pricing factors that are widely accepted determinants of stock market return, such as market value, price to earnings ratio, and dividend yield. By including them, we can better disentangle the differential influence of COVID19 on stock returns from other regular cross-sectional return patterns (Danisman et al., 2021; Ramelli and Wagner, 2020; Albuquerque et al., 2020). Their data is gathered from Datastream; and we use weekly data for the weeks between February 03, 2020, to April 29, 2021. Market value (*MV*) is calculated as the natural logarithm of the aggregate market value of the corresponding stock in million US Dollars. Dividend yield (*DIV YIELD*) is taken as the total dividend amount for the stock, as a share of the total market value. The Price-earnings ratio (*P/E*) is calculated as the ratio of the total market value of the stock to the total earnings. Table 2 shows that over the entire period (Panel B), banking stocks in our sample have an average *MV* of 8.68, an average *DIV YIELD* of 2.64%, and an average *P/E* of 14.83%.

We next control for some bank-specific and country-level conditions. As a bank-level indicator, we use capitalization ratio, equity to total assets (*EQTA*). We extract *EQTA* data from the Worldscope database of Thomson Reuters Eikon. We follow Ding et al. (2021) and extract the latest available years' data, which is 2019. This will help us capture the pre-2020 bank capitalization differences that might influence stock price behavior. Table 2 demonstrates that the average bank *EQTA* in our sample is 8.44%. As country-level controls, we focus on GDP growth (*GDP GRW*), inflation (*INF*), and the share of domestic credit to the private sector in GDP (*CREDIT).* We again consider the latest available data, 2019, for the country controls and extract their data from World Bank World Development Indicators. Table 2 shows that the average *GDP GRW* in the sample is 1% and ranges between 0.21% and 4.12%. The averages of *INF* and *CREDIT* for the sample countries are 1.25% and 108.65%, respectively.

Table 4 shows correlation coefficients between the variables and indicates no major collinearity problems.

Methodology

We conduct panel data estimation techniques to investigate the impact of ESG scores on bank stock returns as a response to the COVID-19 pandemic. We use bank and time fixed effects to consider the

heterogeneity between banks and through time and standard errors clustered at the bank level[8]. We follow Ding et al. (2021) and use the following model:

$$RETURN_{it} = \alpha + \beta_1 * COVID19_{jt} + \beta_2 * COVID19_{jt} * X_i + \beta_3 * Y_i + \beta_6 * COVID19_{jt} * Z_j + \theta_t + \varepsilon_{it}. \quad (1)$$

where i, j and t correspond to bank, country and time (week), respectively. X includes bank-level ESG scores, which are *ESG, ENV, GOV, SOC*, and *CSR*. The interaction term *COVID19**X in Equation 1 aims to investigate how ESG scores mitigate the relationship between COVID-19 and bank stock returns. Y stands for the asset pricing factors and bank-specific controls which are *MV, DIV YIELD, P/E* and *EQTA*. Z stands for the country controls to consider the heterogeneity between the countries, including *GDP GRW, INF,* and *CREDIT*. The definitions of the variables are explained in detail in the previous section. The variables included in X and Z and the bank-specific variable *EQTA* capture the pre-pandemic conditions, and the latest available data (2019) is implemented. We use weekly data for the rest of the variables, i.e., *RETURN, COVID19, MV, DIV YIELD,* and *P/E.*

As seen in Figure A1 in the Appendix, the negative correlation between average weekly bank stock returns and the average COVID-19 exposure (measured as the growth rate of confirmed COVID-19 deaths) of the countries is more apparent for the first wave of the pandemic (between February 2020 and April 2020, until week 13 in the figure). However, the negative correlation seems to disappear after week 13. We, therefore, estimate our regressions (as presented in Equation 1) separately for two different sample periods: (1) for the first wave of the pandemic February 03, 2020, to April 29, 2020, and (2) for an extended period between February 03, 2020, to April 29, 2021.

RESULTS

We first present the findings on the influence of ESG scores on bank stock price reaction during the first wave of the COVID-19. We then present the corresponding results for the extended time period.

Effect of ESG on Bank Stock Returns during the First Wave of the COVID-19 (February -April 2020)

Table 5 displays our findings regarding the influence of ESG scores on the stock price behavior during the first wave of the COVID-19 pandemic between February 2020 and April 2020. The dependent variable is the weekly stock returns (*RETURN*) in all columns. We use *COVID19* as a proxy for COVID-19 exposure of countries in all columns except for column 4, in which we use *COVID19 V2*. Regressions are estimated using panel data estimation techniques, including bank and time (week) fixed effects except for Column 3. Column 3 is estimated using pooled cross-sectional ordinary least squares (OLS) estimation techniques for robustness. Standard errors are clustered at the bank level and reported in parentheses. Column 1 presents univariate regressions and includes only the COVID19 term. Column 2 adds baseline controls, *MV, DIV YIELD, P/E, COVID19* GDP*, and *COVID19* INF*. We include interactions of *GDP* and *INF* with the *COVID19* variable. Since we use 2019-end values for *GDP* and *INF*, these variables are repeated and time-invariant for the banks in the corresponding country. They are dropped from the

Table 4. Correlation table

	RETURN	*COVID19*	*COVID19 V2*	*ESG*	*GOV*	*ENV*	*SOC*	*CSR*	*MV*	*DIV YIELD*	*P/E*	*GDP*	*INF*	*CREDIT*	*EQTA*
RETURN	1														
COVID19	-0.2940*	1													
COVID19 V2	-0.3856*	0.6140*	1												
ESG	-0.0191	0.0219	0.0064	1											
GOV	-0.0118	0.0194	0.0052	0.8205*	1										
ENV	-0.0179	0.0117	0.0034	0.8135*	0.4585*	1									
SOC	-0.0203	0.0225	0.0067	0.9368*	0.6014*	0.7869*	1								
CSR	-0.0187	0.0154	0.0046	0.7180*	0.5559*	0.6571*	0.6743*	1							
MV	0.0254	-0.0435*	-0.0124	0.4987*	0.3785*	0.5625*	0.4163*	0.4277*	1						
DIV YIELD	-0.1333*	0.2455*	0.2247*	0.1101*	0.1482*	0.1367*	0.0439*	0.0702*	0.1519*	1					
P/E	0.0604*	-0.0933*	-0.0814*	-0.0509*	0.0026	-0.0603*	-0.0749*	-0.0374*	-0.0658*	-0.0384*		1			
GDP GRW	-0.0029	-0.0132	-0.0026	0.0013	-0.0535*	0.0499*	0.0266	0.0301*	-0.0797*	-0.1267*	-0.0582*	1			
INF	-0.0118	0.0287	0.0068	0.2842*	0.2375*	0.2090*	0.2665*	0.3388*	0.0286	-0.1437*	0.0811*	0.0771*	1		
CREDIT	0.0099	-0.0247	-0.0102	-0.1551*	-0.0218	-0.0579*	-0.2514*	-0.0162	0.3630*	0.1295*	0.0373*	-0.1848*	-0.2125*	1	
EQTA	-0.0059	-0.0016	-0.0008	-0.3407*	-0.2105*	-0.2868*	-0.3920*	-0.2483*	-0.1611*	-0.0732*	0.0553*	0.0601*	-0.0058	-0.1226*	1
** denotes significance at the 5% level.*															

equation if we introduce them as solo variables in the regression without interacting with the *COVID19* variable. Column 4 uses an alternative COVID-19 exposure variable, *COVID19 V2*, the growth rate of the cumulative number of cases. Column 5 includes an additional control variable, CREDIT, and Column 6 adds an extra control EQTA.

The findings from Table 5 suggest that the coefficient of *COVID19* term during the first wave of the pandemic is negative and significant, even after controlling for various key asset pricing factors and other controls. This reveals the negative influence of the pandemic on bank stock returns. In terms of economic magnitude, considering Column 1, we see that if COVID-19 deaths grow at the average sample value of 0.76%, the bank stock returns will decrease by 2.76% (0.76%*-3.637) more per week. This finding is consistent with Ding et al. (2021), Al-Awadhi et al. (2020), Ashraf (2020), Danisman and Demir (2021), who document the adverse stock price reaction in response to the COVID-19 pandemic for various industries.

Columns 2-5 include our independent variable of interest, *ESG* score, and we observe that the coefficient of the interaction term between *COVID19* and *ESG* is positive and significant. This shows that the stock prices of banks with higher *ESG* scores are more resilient during the first wave of the pandemic for the developed European countries. This finding is consistent with the literature that reveal that stock prices of firms with higher pre-pandemic CSR and ESG scores perform better during the COVID-19 pandemic (Ding et al., 2021; Albuquerque et al., 2020).

Considering the control variables, we see that the coefficient of *MV* and *P/E* is positive and significant, showing the better performance of stocks with higher market value and higher price-to-earnings ratio. The interactions between *COVID19* and *GDP GRW* and *CREDIT* are negative and significant. They disclose that banks from countries with higher share domestic credit to the private sector and with higher GDP growth are more severely affected by the pandemic. This could be because, during the first wave of the pandemic, the major developed markets such as the UK, France, or Germany with higher economic growth rates were more unfavorably affected by the COVID-19.

Table 6 displays the findings regarding the impact of the components of ESG scores on bank stock returns during the first wave of the COVID-19. We aim to investigate which component is more helpful in reducing the severe impact of COVID-19 on bank stock returns. The dependent variable is the weekly stock returns (*RETURN*) in all specifications. *COVID19* is used as a proxy for COVID-19 exposure of

countries. We estimate the regressions in Table 6 using panel data estimation techniques, including bank and time (week) fixed effects. While Column 1 includes environment pillar score, *ENV,* in the regression, Column 2-4 include governance pillar score (*GOV),* social pillar score *(SOC),* and CSR strategy index *(CSR)*, respectively. We cluster the standard errors at the bank level. The findings indicate that it is the governance (GOV) and social pillar scores (SOC) that are more helpful in terms of reducing the negative stock price reaction during the first wave of the pandemic. Banks' stock returns with higher GOV and SOC scores are still affected negatively by the pandemic, but the negative effect is mitigated to some extent for these banks. However, we observe that the components regarding the environment and CSR strategy scores do not have a significant impact on bank stock returns during the COVID-19 pandemic.

Effect of ESG on Bank Stock Returns for the Extended Period of Time (February 2020-April 2021)

We observe in Section 3.1 that higher ESG scores of banks help to mitigate the negative impact of COVID-19 on bank stock returns during the first wave of the pandemic (February 2020-April 2020). We now investigate whether this relationship is observed for a wider time period (February 2020-April 2021). Table 7 presents our findings; and the dependent variable is the weekly stock returns (*RETURN*) in all columns. We use *COVID19* as a proxy for COVID-19 exposure of countries. We estimate the regressions using panel data estimation techniques with bank and time (week) fixed effects. While Column 1 includes *ESG* scores in the regression, Column 2-5 include the components: *ENV, GOV, SOC,* and *CSR*, respectively. In all these specifications, neither the COVID19 term is significant nor the interaction terms *COVID19*ESG* and the interaction terms of components of ESG with COVID19. Our previous findings for the first wave of the pandemic showed the negative influence of the pandemic on bank stock returns and we observed that banks with higher ESG scores were more resilient. However, when we consider an extended time period, such negative and significant influence disappears. Our results are in line with Topcu and Gulal (2020) that have shown that global financial markets have responded to the pandemic in 2020 Q1, and the negative effect has gradually decreased after April 2020. This shows that the negative impact of COVID19 on the markets has been normalized, and the bank stock prices do not respond negatively when we consider the full period. This is because the uncertainty that was brought by the pandemic has been diminished, and ESG scores do not have any influence on the relationship anymore.

Note: This table shows the regression results regarding the influence of ESG scores on bank stock price reactions during the first wave of the COVID-19 pandemic (February 2020-April 2020). The dependent variable is the weekly stock returns (*RETURN*) in all columns. We use *COVID19* as a proxy for COVID-19 exposure of countries in all columns except column 4, in which we use *COVID19 V2.* Regressions are estimated using panel data estimation techniques, including bank and time (week) fixed effects except for Column 3. Column 3 is estimated using pooled cross-sectional ordinary least squares (OLS) estimation techniques. Standard errors are clustered at the bank level and reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: This table shows the regression results regarding the influence of the components of ESG scores on bank stock price reactions during the first wave of the COVID-19 pandemic (February 2020-April 2020). The dependent variable is the weekly stock returns (*RETURN*) in all columns. We use *COVID19* as a proxy for COVID-19 exposure of countries. Regressions are estimated using panel data estimation techniques, including bank and time (week) fixed effects. While Column 1 includes *ENV* in the regres-

Table 5. Effect of ESG on bank stock returns during the first wave of the COVID-19

	(1) Univariate	**(2) Baseline Controls**	**(3) Pooled OLS**	**(4)** *COVID19 V2*	**(5) Baseline Controls +***CREDIT*	**(6) Baseline Controls +***CREDIT* **&** *EQTA*
COVID19	-3.637***	-3.209**	-2.904**	-2.347**	-0.833*	-0.891*
	(0.54)	(1.32)	(1.27)	(0.89)	(1.89)	(2.35)
COVID19 ESG*		0.036**	0.030*	0.024**	0.050***	0.051**
		(0.02)	(0.02)	(0.01)	(0.02)	(0.02)
ESG			-0.081***			
			(0.02)			
MV		25.422***	0.554***	25.899***	31.214***	31.010***
		(4.42)	(0.21)	(4.21)	(5.43)	(5.49)
DIV YIELD		-0.115	-0.134*	-0.086	-0.060	-0.060
		(0.16)	(0.08)	(0.14)	(0.17)	(0.17)
P/E		0.056***	0.041**	0.088***	0.047**	0.046**
		(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
COVID19 GDP*		-0.493**		-0.667**	0.674	0.667
		(0.56)		(0.26)	(0.49)	(0.49)
COVID19 INF*		-0.204		-0.063	-0.321	-0.332
		(0.43)		(0.30)	(0.45)	(0.46)
GDP			-0.967***			
			(0.32)			
INF			-0.113			
			(0.34)			
COVID19 CREDIT*					-0.033**	-0.033**
					(0.01)	(0.01)
COVID19 EQTA*						0.005
						(0.02)
CONSTANT	-2.089***	-2.315***	2.306	-2.246***	-2.205***	-2.989***
	(0.414)	(0.53)	(0.27)	(0.72)	(0.16)	(0.54)
R2	0.917	0.6501	0.5951	0.6508	0.6663	0.6616
Number of observations	803	720	720	720	654	632
Number of banks	73	67	67	67	61	59
Bank FE	YES	YES	NO	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES

sion, Column 2-4 include *GOV, SOC,* and *CSR*, respectively. Standard errors are clustered at the bank level and reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6. Effect of components of ESG scores on bank stock returns during the first wave of the COVID-19

	(1) *ENV*	**(2)** *GOV*	**(3)** *SOC*	**(4)** *CSR*
COVID19	-2.061**	-2.923**	-2.533**	-1.721
	(1.03)	(1.17)	(1.26)	(1.19)
*COVID19*ENV*	0.016			
	(0.01)			
COVID19 GOV*		0.032**		
		(0.01)		
COVID19 SOC*			0.025**	
			(0.01)	
COVID19 CSR*				0.010
				(0.01)
MV	25.407***	25.325***	25.438***	25.338***
	(4.40)	(4.46)	(4.42)	(4.41)
DIV YIELD	-0.120	-0.098	-0.122	-0.108
	(0.16)	(0.16)	(0.16)	(0.16)
P/E	0.062***	0.062***	0.054**	0.067***
	(0.02)	(0.02)	(0.02)	(0.02)
COVID19 GDP*	0.444	0.538	0.474	0.465
	(0.57)	(0.55)	(0.57)	(0.57)
COVID19 INF*	-0.071	-0.146	-0.130	-0.039
	(0.41)	(0.42)	(0.41)	(0.38)
CONSTANT	-232.251***	-231.585***	-232.401***	-231.746***
	(40.31)	(40.93)	(40.47)	(40.42)
R2	0.649	0.650	0.649	0.648
Number of observations	720	720	720	720
Number of banks	67	67	67	67
Bank FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES

CONCLUSION

This paper explores whether ESG scores have any influence on bank stock price reaction as a response to the COVID-19 pandemic. We perform the analysis using two different time periods: the first major wave period of the COVID-19: February 2020 to April 2020, and a broader period of time from February 2020 to April 2021. Using a sample of 73 publicly listed banks from 15 developed European countries, our findings show the negative banking stock market reaction to the COVID-19 pandemic on bank stock returns. We further show that during the first wave of the pandemic, the banking stocks with higher ESG scores are more resilient to the COVID-19 pandemic. In contrast, when an extended period is used (from February 2020- April 2021), the influence of both COVID-19 and ESG scores becomes insignificant.

Table 7. Effect of ESG on bank stock returns during the COVID-19- extended period of time

	(1) *ESG*	(2) *ENV*	(3) *GOV*	(4) *SOC*	(5) *CSR*
COVID19	0.554	0.572	-0.184	1.268	0.672
	(1.23)	(1.04)	(1.05)	(1.17)	(1.08)
*COVID19*ESG*	-0.004				
	(0.02)				
MV	7.359***	7.379***	7.358***	7.394***	7.400***
	(1.41)	(1.38)	(1.43)	(1.39)	(1.38)
DIV YIELD	-0.202***	-0.200***	-0.200***	-0.198***	-0.200***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
P/E	0.016	0.016	0.016	0.016	0.016
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
*COVID19*GDP*	-0.912***	-0.906***	-0.888***	-0.906***	-0.915**
	(0.34)	(0.33)	(0.33)	(0.33)	(0.35)
COVID19 INF*	-0.408	-0.398	-0.504	-0.327	-0.358
	(0.45)	(0.42)	(0.44)	(0.43)	(0.44)
COVID19 ENV*		-0.005			
		(0.01)			
COVID19 GOV*			0.009		
			(0.01)		
COVID19 SOC*				-0.016	
				(0.01)	
COVID19 CSR*					-0.007
					(0.01)
CONSTANT	-64.444***	-64.634***	-64.440***	-64.775***	-64.819***
	(12.76)	(12.50)	(12.96)	(12.55)	(12.48)
R2	0.6020	0.6010	0.6007	0.6026	0.6010
Number of observations	4026	4026	4026	4026	4026
Number of banks	72	72	72	72	72

Note: This table shows the regression results regarding the influence of ESG scores and their components on bank stock price reactions to the COVID-19 pandemic using the full period (February 2020-April 2021). The dependent variable is the weekly stock returns (*RETURN*) in all columns. We use *COVID19* as a proxy for COVID-19 exposure of countries. Regressions are estimated using panel data estimation techniques, including bank and time (week) fixed effects. While Column 1 includes *ESG* in the regression, Column 2-5 include *ENV, GOV, SOC,* and *CSR*, respectively. Standard errors are clustered at the bank level and reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Overall, our findings document that pre-crisis ESG scores are helpful for protecting shareholder wealth from the negative impacts of such a crisis only during the first wave of the COVID-19 pandemic when uncertainty is at its highest. When we consider an extended crisis period, however, such effectiveness vanishes, and ESG scores do not have any influence on bank stock returns. The paper's findings have important policy implications, showing the efficacy of ESG activities and implementations of such policies for the governments to protect the shareholder wealth and to stabilize the financial markets during extraordinary crisis times such as the COVID-19. Future studies could use an extended time period

with a higher frequency data and explore whether ESG scores have any influence on other performance indicators.

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ENDNOTES

1 European Green Deal was originally announced in December 2019.

2 The terms ESG and CSR are often used interchangeably. While ESG is a broader rating of a company's commitment to sustainability and to other values such as social and governance, CSR is an element of ESG score that shows internal commitment to strong corporate values.

3 Developed countries correspond to the IMF definition for ''high-income" countries.

4 Hale et al. (2020) presents detailed information on methodology and data collection.

5 The number of observations in Table 2 Panel A is lower than Panel B. This is because Panel A shows descriptive statistics for 73 banks for a period of three months, corresponding to 12 weeks. Meanwhile, Panel B covers descriptive statistics for a period of 64 weeks.

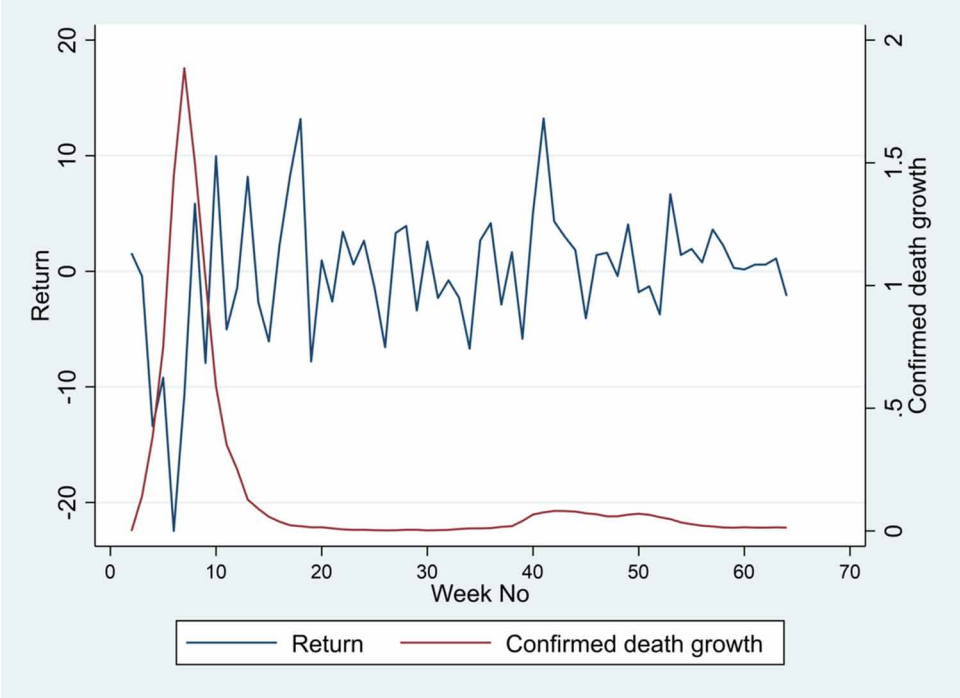
6 See Table 3 for the list of countries in the data set. Since there are more banks from Italy and the UK, the weighted average calculations put relatively more importance on them.

7 ESG scores data is not available for many banks in the database, leaving us with fewer number of banks. Initially, the sample includes 190 banks that are publicly listed in developed European countries.

8 We use Stata 16 as a statistical software package for analyzing the data.

APPENDIX

Figure 1. The behavior of weekly stock returns and COVID-19 death growth over time



Chapter 13
Sustainability Efficiency Assessment in the Turkish Manufacturing Sector: A DEA Approach

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ABSTRACT

This chapter intends to measure environmental, social, and economic sustainability efficiency levels of the manufacturing companies listed in Borsa Istanbul Sustainability Index by using data envelopment analysis (DEA) based on the target year of 2019. In this context, considering the relationship between inputs and outputs determined as a result of the comprehensive review of the related literature, efficiency assessment is made by considering environmental, social, and economic indicators, which are the main dimensions of corporate sustainability. The input-oriented Charnes, Cooper, and Rhodes (CCR) and Banker, Charnes, and Cooper (BCC) models have been used in the efficiency measurement. According to the obtained efficiency scores for the relatively inefficient companies in terms of environmental, economic, and social dimensions, several suggestions are offered depending on the potential improvement rates for them.

INTRODUCTION

In today's dynamic and global markets, companies strive to be at the forefront against tough competition. During this period, companies direct their resources to several fields such as innovation, cybersecurity, research & development (R&D), and customer-consumer satisfaction. Although all these focuses are important for the success of companies, sustainability factors are at least as important as them. Information on sustainability and non-financial data on environmental, social and corporate governance factors are increasingly used by investors and financial/credit circles to shape investment and financing decisions. Regardless of its scale, companies' understanding of sustainability, internalizing them and designing

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their future programs and goals in this direction also play an important role in building a more livable world. Companies that include environmental, social and corporate governance issues in their strategies take a key step in sustainable growth and value creation. On the other hand, companies that do not give the necessary importance to sustainability are seen as riskier by financing organizations and investors. This also increases the risks of organizations that fund these companies. Therefore, funding organizations pay more attention to which companies to finance and make more sensible choices. By integrating sustainability factors into their activities, companies gain various advantages in many areas such as ease of access to financial capital, increasing brand value, cost savings, effective risk management, creating new employment areas and providing a qualified workforce (Borsa Istanbul, 2020: 6-39).

For the business world, corporate sustainability means being able to understand the risks and opportunities brought by today's trends for companies and rearrange their operations, products and services, business models and all processes when necessary. Today, there is a business order in which corporate interests do not conflict with social interests, and social and environmental issues become the responsibility of companies as well as an economic and profit-oriented perspective. Accordingly, it is possible to state that corporate sustainability, which has environmental, social and economic dimensions, goes far beyond corporate social responsibility and has become an integral part of the strategies and operations of companies (PwC Turkey, 2011: 3-5).In addition to increasing the level of importance given in almost every sector, sustainability activities have reached quite high levels, especially throughout the manufacturing sector. Many sustainability factors such as resource use, waste treatment, carbon emissions, water pollution, and the well-being of employees occupy an important place in the agenda of producers. Failure to give the necessary attention to these factors may significantly damage the image of the company and therefore adversely affect the company's performance (Chen, 2015: 1).

Manufacturing companies have an important place in sustainable development and therefore in corporate sustainability with the environmental, social and economic impacts they create. Especially, the concept of sustainability comes to the fore when the impact of the sector in question on future generations is considered. Today, the industrial sector takes a large share of energy consumption. For this reason, production processes and products should become more efficient and socially friendly to protect the welfare of future generations. In addition to the aforementioned requirement, legal regulations also push industrial enterprises to focus on the sustainability factor, and now manufacturers become more responsible for the products they produce. Currently, governments, manufacturers and consumers try to direct their operations within the framework of this concept. They focus on consumer safety and general environmental health by taking into account the environmental, social and economic effects of the products and services (Spiegel et al., 2015: 3-6).

One of the main factors that encourage manufacturers in terms of sustainability is also its cost saving function provided by green production practices. Manufacturing companies may achieve significant cost savings by reducing waste treatment, disposal and raw material costs by preventing pollution with clean production. Internalizing green production practices, setting the zero waste targets enables manufacturers to increase their sales by decreasing production costs and thus high-performance success may be achieved. In this context, this chapter seeks to explore the environmental, social and economic sustainability efficiency levels of manufacturing companies included in the Borsa Istanbul Sustainability Index by Data Envelopment Analysis (DEA) for the year of 2019. For this purpose, DEA-Solver program with excel extension is performed, which enables the solution of data envelopment analysis models and suggests potential improvement rates for relatively ineffective decision units. While former studies generally focus on measuring sustainability performance for only one sustainability factor or general

situation across a limited sample, this chapter examines the efficiency of each corporate sustainability factor separately, including environmental, social and economic. At this point, this chapter is expected to guide for the relatively inefficient companies in improving their sustainability performance and on what aspects they should focus.

The rest of this chapter is designed as follows: Firstly, the theoretical matters such as concept, importance and internal aspects of corporate sustainability are outlined. This is followed by the relevant literature attempt to measure the corporate sustainability performance of numerous sectors. Next, the methodology, data set and findings are reported. Following, the findings are discussed and the limitations of the chapter are proposed. Finally, the chapter concludes on the results and some suggestions for future studies are presented.

CORPORATE SUSTAINABILITY: CONCEPT, IMPORTANCE AND SUB-DIMENSIONS

Contrary to what is known today, the principle of sustainability is originally based on the economic factors. However, as a result of excessive population growth, the problems of excessive use of natural resources and destruction of trees have come to the fore and this situation brought along economic and ecological crises. Upon these large-scale crises, some afforestation activities have been initiated in many countries, especially in Germany, to increase and use natural resources in a balanced way. These sustainable forestry activities have shown that sustainability is a basic economic principle and has become one of the key indicators for both countries and companies in ensuring long-term economic success. Later, besides the relevant environmental factors, economic and social factors have become a current issue and ranked among the main components of sustainable success (Zink et al., 2008: 3-4).

Hunger, poverty, human rights, illiteracy and many similar global social problems bring ecological problems in tow or ecological problems may induce social problems. The existence of such social and ecological problems leads to the emergence of a poor community that fells trees for fuel, causes erosion and water pollution, and limits agricultural production and income. At this point, companies make a great contribution to overcoming social and ecological problems. It is expected that companies giving importance to sustainability activities may come through global ecological problems such as climate change, as well as social problems that may trigger poverty such as antisocial behavior and terrorism. They also have a guiding function for the administrative segments of the countries and non-governmental organizations through the management skills and expertise with the appropriate technologies. In addition, it is possible to state that companies have an incentive function for more responsible consumption and have a critical importance in ensuring sustainability (Sharma and Starik, 2002: 15-16).

Currently, companies are obliged to adopt an attitude that attaches importance to transparency and has a high sense of responsibility in terms of sustaining their existence in the face of constantly changing consumer demands and external environmental conditions outside of their control. Rather than assigning a material value to social values, they have begun to realize that these values are closely related to intangible values such as social justice, social responsibility and environmental protection initiatives. The perspective gained in relation to these values has been very effective in the emergence of the term corporate sustainability by including social and environmental elements in the classical approach to business administration. Although the concept of corporate sustainability is generally used instead of corporate social responsibility and sustainable development concepts, it does not have the same meaning

Figure 1. The framework of corporate sustainability
Source: *Created by the author, based on (Wilson, 2003: 3).*

with these concepts. In business management, corporate sustainability requires considering social and environmental factors as well as economic factors, and it is a set of objectives that should be reached as well as maximizing profitability at the point of survival of a company. As for that, corporate social responsibility is a business practice in which these social and environmental elements are voluntarily included in management activities and only based on the perception of responsibility of the business manager. Both corporate sustainability and corporate social responsibility have emerged as a result of sustainable development that aims to meet the development needs of the next generation as well as the current generation (Siddique and Quaddus, 2011: 1-2). In addition to corporate social responsibility and sustainable development, stakeholder theory and corporate accountability theories are closely related to the term corporate sustainability. Stakeholder theory, based on strategic management, implies that companies provide business rationales that they should work not only for shareholder interests but for all stakeholders affected by their operations. Corporate accountability theory, which is the last approach utilized by corporate sustainability, emphasizes that the activities of an institution are affected by the external environment of the company and therefore it is necessary to be responsible for the effects of these activities (Wilson, 2003: 2-4):

Companies that focus on the term sustainability should prioritize financial, human, environmental and social capital elements and adopt an approach that takes into account the benefits and demands of not only shareholders but also other non-shareholders. Corporate sustainability is a final goal that strikes a balance between the components of the triple bottom line (TBL), and includes corporate social responsibility, which is an intermediate stage for businesses (Azali et al., 2011: 141). TBL consists of three basic components, namely social responsibility, environmental sustainability and bottom line (profit), and it serves a comprehensive purpose that is more than just profit, which companies should attach importance to in terms of their survival (Reimers-Hild, 2010: 1).

The term economic sustainability includes the factors related to improving market value and financial performance. These factors consist of the traditional financial performance measures such as cost reduction, as well as the benefits of external stakeholders (Martínez and Rodríguez del Bosque, 2014: 241). Economic sustainability is used to be handled only in terms of consumption; nowadays it has incorporated three basic elements: natural (untouched forests, clean air, etc.), social and humanitarian. The scarcity in the mentioned sources was effective in the emergence of this change and the valuation of intangible resources has become very important. Social sustainability encompasses several values such as cultural identity, variety, courtesy, latitude, connection, prudency, tenderness, etc. If the due importance is not given to this social capital, this damage will be the case, just like physical capital. Today, all investments made on human beings such as education, health and nutrition are seen as an integral part of economic development. Environmental sustainability refers to maintain global life support systems that contribute to human life both as a provider of sources such as food, water and energy and, as a sink for outputs and wastes. Environmental sustainability emphasizes that these sources should be protected rather than depleted and people have to learn living within restrictions of the environment. Environmental sustainability fulfills the requirements for providing social sustainability. Therefore, it is not possible to provide social sustainability without environmental sustainability (Goodland, 1995: 3-6).

When companies have to resolve on sustainability matters, they may encounter a number of difficulties. In particular, high-level interacting between sub-dimensions of sustainability may force companies to effectively implement corporate sustainability practices, which may negatively affect their sustainability performance (Azali et al., 2011: 141).In this sense, the sustainability performance of the companies discussed in this chapter is considered separately on the basis of three main dimensions of sustainability, and the analysis is conducted on the selected indicators and a number of recommendations are made (if necessary) on how to improve the sustainability performance.

LITERATURE REVIEW

This section aims to introduce the literature relative to the studies made for evaluating corporate sustainability performance and measuring financial performance listed in the sustainability index. The matter as regards sustainability performance has been discussed in the related literature to a great extent and has been analyzed both theoretically and empirically. Some of these studies are bank-specific, some focus their analysis on cross-country evidence, and while some consider real sector firms:

The first group of studies consists of Oztel et al. (2012), Goyal and Rahman (2014), Tanc and Gumrah (2015), Mehta et al. (2019), Vivas et al. (2019), Yalcin and Karakas (2019). These studies intended to measure the sustainability performance of real sector firms by applying different multiple criteria decision making (MCDM) methods. For example; Oztel et al. (2012) in a study evaluated the environmental and social corporate sustainability performance of Henkel Company by using an integrated Entropy-Compromise Programming (CP) method. After determining the weighted values of social and environmental indicators, the sustainability performance measurement of the relevant company was made from 2007 through 2011. The obtained results showed that the sustainability performance of Henkel Company continually improved positively. Concentrically, Goyal and Rahman (2014) set a model to evaluate the corporate sustainability performance of a company operating in oil and gas industry from 2009-2010 to 2011-2012. By considering 21 sustainability indicators, 11 of them were environmental, 6 of them were social and 4 of them were economic, Analytic Hierarchy Process (AHP) method was

applied for the assessment of sustainability performance. The results of the analysis showed a slight improvement in the sustainability performance of the analyzed firm over the years. Also, it was stated that the designed model will be beneficial in analyzing the sustainability performance effectively and gaining a competitive advantage. In another study conducted by Tanc and Gumrah (2015), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method was applied to measure the environmental sustainability performance of 9 listed Turkish manufacturing companies for 2013. They take into energy savings, emission reduction, hazardous and non-hazardous wastes disposed of and environmental protection expenditures within the scope of environmental sustainability performance indicators. The performance ranking of the analyzed companies was made in accordance with the scores obtained as a result of the TOPSIS method. By serving at the same purpose, Mehta et al. (2019) performed an integrated DEA-TOPSIS method to measure the relative efficiency and to rank 25 listed Indian companies contributing to the reduction of carbon emission and sustainable development to a large extent. In the application of DEA method, 4 inputs (fixed assets turnover, expense to total sales, debt to equity, interest coverage ratios) and 1 output (operating profit per share) were used. After determining the efficiency scores, relatively efficient decision-making units (DMUs) were ranked by applying TOPSIS method. The obtained results showed that companies with significant contributions to environmental and climate issues had no similar financial characteristics. Accordingly, Vivas et al. (2019) proposed a study measuring the corporate sustainability performance of a Brazilian oil and gas company over the period of 2009 and 2017. By applying the preference ranking organization method for enrichment evaluation (PROMETHEE), a total of 20 sustainability indicators are used, including five economic, eight social and seven environmental. As a result of the analysis, the years in which the relevant company has the best and the worst sustainability performance are presented. Using a different method, Yalcin and Karakas (2019) reviewed the environmental, social and economic sustainability performance of a listed energy company. CRITIC method is performed in weighting the sustainability indicators, and sustainability performance was measured by applying EDAS method for the period of 2010-2018. The results of the analysis show that the sustainability performance of the company in discussion displayed an unstable outlook over the years.

The second group of studies are bank-specific and include Ozcelik and Avci Ozturk (2014), Staňková (2015), Aras et al. (2018), Ecer (2019), Stauropoulou and Sardianou (2019). Such, Ozcelik and Avci Ozturk (2014) examined the corporate sustainability performance of 3 Turkish banks that published sustainability reports for the year of 2011. Economic, social and environmental sustainability scores are determined and ranked by performing Grey Relational Analysis. Additionally, they report banks' overall sustainability performance and make some improvement suggestions for the banks in line with the results obtained. In a similar study, Staňková (2015) assessed corporate social responsibility performance by using Analytic Hierarchy Process (AHP) method and compared the obtained findings with Analytic Network Process (ANP) method. Using a sample of 3 Czech banks, safety, transparent reporting and ethical codes were considered as economic indicators. As of environmental indicators; economic innovations, recycling, economic management and certifications were included in the analysis. Once and for all, employee welfare, corporate donations and employee volunteering were used as social indicators. The results obtained from both methods showed that the banks subject to the analysis had a similar ranking. Aras et al. (2018) in a study also aimed to generate a model for measuring corporate sustainability performance by considering five dimensions of corporate sustainability: environmental, social, economic, governance and financial. Using a sample of 4 Turkish deposit banks, Content analysis is performed in creating disclosure ratios and these ratios are weighted by Entropy method between 2012 and 2014.

Finally, corporate sustainability scores of the analyzed banks are determined and ranked by TOPSIS method in terms of both each dimension and overall sustainability performance. In the same vein, Ecer (2019) analyzed the corporate sustainability performance of 5 private Turkish banks by the integrated Entropy-ARAS method. Five economic indicators such as capital adequacy ratio, the share of equity to total assets, return on equity, return on assets and profit before tax to total assets are considered. The total number of branches, employee, customer, ATM, training time and employee turnover are included as social indicators. As for the environmental indicators; direct/indirect greenhouse gas emission and the consumption of electricity, water, paper and oil are used for the performance measurement. According to the findings obtained from the study, social indicators are seen to have prime importance in determining sustainability performance. Stauropoulou and Sardianou (2019) designed a sustainable performance index for the banking sector by considering three dimensions of sustainable development, such as environmental, economic and social. The AHP method was used in the study in which thirty-two indicators were taken into account, eight of which were economic, thirteen environmental and eleven social indicators. The findings obtained from AHP method showed that all three sustainability dimensions were given equal importance. Separately, Ozkan and Ozcan (2018) conceived a panel of countries and applied DEA method to evaluate the environmental sustainability performance of 34 selected OECD countries for the year of 2015. By considering Environmental Performance Index (EPI), 6 environmental inputs and 3 outputs were included in the analysis. According to the results of input and output-based CCR and BCC models, it was reported which country was relatively efficient and which were not. In addition, it was stated in the study which environmental factors were profound on the efficiency scores of the relatively inefficient countries.

As can be understood from the relevant literature, various studies have been carried out in many sectors, especially banks, manufacturing, oil and energy to measure corporate sustainability performance. MCDM techniques, which have different characteristics, such as AHP, ANP, TOPSIS, and DEA, have been used in the above-mentioned performance measurement by considering a large number of sustainability indicators.

DATA SET AND METHODOLOGY

Companies that internalize sustainability provide gains in many areas, such as favorable conditions for accessing financial resources, increased effectiveness in risk management, brand reputation, and an increase in market value. Regardless of its scale, companies ‘ understanding of sustainability and designing their programs and goals for the future in this direction also play an important role in building a more livable world. At this point, it is of great importance to measure the efficiency levels of sustainability practices and to identify deficiencies or weaknesses in achieving these goals. For this purpose, Data Envelopment Analysis (DEA) has been used in this study, because this method guides managers and decision makers to determine the relatively efficiency levels of sustainability practices of the companies evaluated and what needs to be done to improve the missing points (if any).

DEA is a linear programming based non-parametric efficiency measurement method that aims to measure the relative efficiency of decision-making units (DMUs) with similar structures. The concept of efficiency is of great importance for DEA and refers to the comparison between the inputs and outputs of observed and optimal values. Allocative efficiency is the use of inputs and/or outputs at the most appropriate rate in line with current prices. Technical efficiency is to achieve maximum output at a certain

input level with the output-based approach, or to use minimum input at a certain output level with the input-based approach. As stated by Thanassoulis (2001), DMUs whose relative efficiency measured in data envelopment analysis should have a homogeneous structure. DMUs should have the same output variables using the same input variables. Within the scope of DEA, which is used to measure the comparative efficiency of homogeneous units such as schools, hospitals, bank branches, restaurants or public service companies, existing inputs (resources, environmental factors, etc.) are converted into outputs and efficiency comparison between units is made. For example, bank branches have a homogeneous structure as they fulfill the same functions, but differ in terms of activities and resource structures at a relative and absolute level. (Thanassoulis, 2001: 1-22).

The emergence of dea began with edwardo rhodes' doctoral dissertation at carnegie mellon university. In the thesis conducted under the supervision of w. W. Cooper, rhodes evaluated an education program for disadvantaged students. The first study that announced dea method was the study published in 1978 by charnes, cooper and rhodes (ccr) in the european journal of operations research. Ccr developed farrell's (1957) measure of single input-output technical efficiency, using an optimization method of mathematical programming that allows analysis in multiple-input, multiple-output environments (charnes et al., 1994: 2-6). The results of dea are based on the set of input and output variables used in the analysis. Using different input and output variables may lead to completely different results. At the same time, dmus should be in sufficient number as well. There are various opinions on this issue. For instance, dyson et al. (2001) proposed that the number of dmus should be at least twice the number of inputs and outputs ($\mathbf{N} \geq 2\mathbf{x}\left(\mathbf{m}+\mathbf{s}\right)$). Another opinion is that the total number of input and output variables should not be more than 1/3 of the number of dmus included in the analysis. According to boussofiane et al. (1991), the fact that the number of inputs and outputs selected is less than the total number of dmus n≥(m+s+1) is of great importance in terms of making an effective discrepancy among dmus (boussofiane et al., 1991: 4). This study is based on the formula $n \geq 2 \times (m + s)$ proposed by dyson (2001), that is, the dmu number should be 10 and greater than 10 (14≥10). Table 1 presents the dmus analyzed in this study:

It is beneficial to increase the number of observations or sectors in the analysis, but unfortunately it is not easy to reach the sustainability reports of each of the companies included in the sustainability index. While some companies share their data on their environmental, social or economic sustainability performances at a very general level, some do not include the data needed for analysis in their reports. Therefore, this situation causes the number of decision-making units to be limited. The number of companies listed in the bist sustainability index is 61 as of 2020 (https://www.borsaistanbul.com/tr/sayfa/165/bist-surdurulebilirlik-endeksi). 18 of these are financial companies (banks, holdings, insurance and pension companies), therefore, excluded from the scope of analysis. A total of 14 manufacturing companies are included in the analysis because 29 of the remaining non-financial companies do not have enough information on their sustainability reports or official websites. In addition, since it is necessary for the reliability of dea method that there is no missing data regarding the dmus included in the analysis, the companies with access to all input and output information are considered in the analysis.

The high number of inputs and outputs makes it difficult to differentiate between efficient and inefficient DMUs in the analysis. In this case, regression and correlation analysis may be used to reduce the number of variables. One of the inputs (outputs) with a very strong correlation relationship may be excluded from the analysis by taking the opinion of the expert on the subject (Lewin et al., 1982: 405). Within the scope of this chapter, 14 manufacturing companies were evaluated for the year of 2019 and2

Table 1. Decision making units

No	Decision Making Unit (DMU)	Sector of Company	Abbreviation
1	Aksa Acrylic Chemistry Industry Corp.	Manufacturing / Chemicals, Petroleum Rubber and Plastic Products	AKSA
2	Anadolu Efes Brewery and Malt Industry Corp.	Manufacturing / Food, Beverage and Tobacco	AEFES
3	Arcelik Corp. (Turkey)	Manufacturing / Fabricated Metal Products Machinery Electrical Equipment and Transportation Vehicles	ARCLK
4	Aygaz Corp.	Manufacturing / Chemicals, Petroleum Rubber and Plastic Products	AYGAZ
5	Coca-Cola Beverage Corp. (Turkey)	Manufacturing / Food, Beverage and Tobacco	CCOLA
6	Ford Automotive Industry Corp.	Manufacturing / Fabricated Metal Products Machinery Electrical Equipment and Transportation Vehicles	FROTO
7	Kardemir Karabuk Iron and Steel Industry and Trade Corp.	Manufacturing / Basic Metal	KRDMD
8	Otokar Automotive and Defense Industry Corp.	Manufacturing / Fabricated Metal Products Machinery Electrical Equipment and Transportation Vehicles	OTKAR
9	Tofas Turk Automotive Industry Corp.	Manufacturing / Fabricated Metal Products Machinery Electrical Equipment and Transportation Vehicles	TOASO
10	Cimsa Cement Industry and Trade Corp.	Manufacturing / Non-Metallic Mineral Products	CIMSA
11	Tupras-Turkey Petroleum Refineries Corp.	Manufacturing / Chemicals, Petroleum Rubber and Plastic Products	TUPRS
12	Kerevitas Food Industry and Trade Corp.	Manufacturing / Food, Beverage and Tobacco	KERVT
13	Kordsa Technique Textile Corp. (Turkey)	Manufacturing / Textile, Wearing Apparel and Leather	KORDS
14	Ulker Biscuit Industry Corp.	Manufacturing / Food, Beverage and Tobacco	ULKER

inputs (m) and 3 outputs (s) were determined for environmental and economic sustainability dimension. For the social sustainability dimension, since the number of variables that can be reached for all DMUs is limited, only one single input and three output variables were included in the analysis. During the data collection period, each variable in a different unit of measure has been converted into a single unit of measure. The selected inputs and outputs are shown at Table 2:

In determining the inputs and outputs, all potential studies, especially Zhou et al. (2018), in the related literature have been considered. In measuring the environmental efficiency, greenhouse gas emissions and waste water are considered as the inputs expected to be minimized, while recycled water, energy savings and recycled non-hazardous waste are among the outputs expected to be maximized in DEA. Considering the social dimension, accident frequency rate is the variable that should be decreased, while number of females, males and hours of training should be increased. As for the economic dimension, general management expenses and marketing, selling and distribution expenses are included in the analysis as the variables that need to be decreased and net profit, operating profit and equity capital should be increased.

Table 2. Definition of inputs and outputs

DIMENSION	Input(s)		Outputs		
Environmental Sustainability	I_1: Greenhouse gas emissions (t CO_2e)	I_2: Waste water (m^3)	O_1: Recycled water (m^3)	O_2: Energy savings (MWh)	O_3: Recycled non-hazardous waste (tons)
Economic Sustainability	I_1: General management expenses (TL)	I_2: Marketing, selling and distribution expenses (TL)	O_1: Net profit (TL)	O_2: Operating profit (TL)	O_3: Total equity (TL)
Social Sustainability	I: Accident frequency rate		O_1: Number of female employees	O_2: Number of male employees	O_3: Total number of hours of training (employee* hour)

In case the correlation between an input variable and another input or inputs (another output or outputs) used in the efficiency analysis is too low or high, it is concluded that this input is not suitable for the model and it should be kept out (Yang, 2009). Additionally, the effects of inputs on output must also be in the same direction in DEA method. For instance, if there is a positive (negative) correlation between an input and any output, other inputs should have the same directional effect (Pidd, 2012: 295).

The key feature of DEA is the development of a reference criterion. Reference technology levels for each input and output are defined simultaneously with the linear component of each observed input and output. DEA does not require any assumptions about functional form or mold. The efficiency measurement of a DMU is a relative score since it is compared with the efficiency levels reached by all other DMUs. Therefore, all DMUs are either located on the efficient frontier or they are in an inefficient position. DEA includes two approaches for both obtaining the maximum output with fixed input (output-oriented) and obtaining the fixed output with the least input (input-oriented). One of these approaches, the input-oriented approach indicates how much the amount of input used in production may be reduced proportionally without decreasing the amount of output. The output-oriented approach investigates the maximum possible proportional increase in the production amount without changing the input amount. DEA method is used under both constant returns to scale and variable returns to scale assumptions. Therefore, input and output-oriented measurement methods may give the same results when constant returns to scale, but different results under the assumption of variable returns to scale (Kok & Deliktas, 2003: 221).

DEA is a model used to measure the relative efficiency of DMUs with a homogeneous structure. These relative efficiencies are calculated by proportioning the weighted sum of outputs to the weighted sum of inputs. Under the assumption that there are *n* DMUs, *m* inputs and *s* outputs, the relative efficiency score of each DMU is calculated by using the model developed by Charnes et al. (1978):

$$\max h_0 \frac{\sum_{r=1}^{s} u_r y_{r0}}{\sum_{i=1}^{m} v_i x_{i0}}$$

$$s.t. \qquad \frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}} \leq 1 \quad j = 1,\ldots,n,.$$

$$v_r, u_i \geq 0; \quad r = 1,\ldots,s; \quad i = 1,\ldots,m.. \tag{1}$$

Where;

y_{rj} And u_r .are the amount of the output r produced by dmu j and the weight given to output r, respectively. x_{ij} .is the amount of the input i utilized by dmu j and v_i .is weight given to input i, respectively. Input and output weights are determined to be maximum by each dmu. Dmus with an efficiency score of 1 are regarded as relatively efficient, while dmus with an efficiency score of less than 1 are considered to be inefficient (charnes et al., 1978: 430; talluri, 2000: 8).

There are four basic DEA models: Charnes, Cooper and Rhodes (CCR) ratio model (1978), Banker, Charnes and Cooper (BCC) model (1984), the Multiplicative models (Charnes et al., 1982, 1983) and the Additive model (Charnes et al., 1985) & Extended Additive model (Charnes et al., 1987). Although the focus of each of these models focuses on administrative or economic themes, their tendency differs from each other. Hence, these models may concentrate on increasing, decreasing or fixed returns to scale depending on the case of a large number of outputs. Models providing the same output level by making the inputs minimum are called input-oriented models. As for the output-oriented models, the aim is to obtain maximum output without exceeding the given resources. The model introduced by Charnes, Cooper and Rhodes in 1978 assumes constant returns to scale and was used for the first time to estimate the relative technical efficiency of public schools in the USA. In 1984, Banker, Charnes and Cooper evaluated the variable returns to scale in their study and presented the BCC formulation. Primal and dual linear programming models for the input and output orientation with CCR and BCC models are presented in Table 3 (Charnes et al., 1994: 23-40):

As can be seen from table 3; convexity constraint ($\vec{1}\lambda \geq 1$. And u_0 .are not included in ccr models. This difference may provide returns-to-scale evaluations (increasing, decreasing and constant). For this reason, bcc model is also named as variable returns-to-scale (vrs) model and differs with this feature from ccr model which is also referred as constant returns-to-scale (crs) model (cooper et al., 2011: 13-14).

FINDINGS

Efficiency analysis is carried out by using the input-oriented CCR-DEA and BCC-DEA models. There are many package programs for the solution of the so-called DEA models. The most used of these programs are DEA Solver, Frontier Analyst, DEAP, EMS and Warvick DEA. In this study, the DEA-Solver-LV software is utilized for solving the DEA models. Firstly, it is regarded not to have a very high or low level of correlation between the input and output variables included in the analysis. The correlation matrix for each sustainability dimension is shown at Table 4:

Table 3. Input and output orientation with primal and dual CCR and BCC models

Input-Oriented CCR Primal Model	**Input-Oriented CCR Dual Model**
$\min_{,,»,s^+,s^-} z_0 = , -\mu.\vec{1}s^+ - \mu.\vec{1}.s^-$ $s.t. \quad Y» - s^+ = Y_0$ $, X_0 - X» - s^- = 0$ $», s^+, s^- \geq 0$	$\max_{¼,v} w_0 = ¼^T Y_0$ $s.t. \quad v^T X_0 = 1$ $¼^T Y - v^T X \leq 0$ $-¼^T \leq -\mu.\vec{1}$ $-v^T \leq -\mu.\vec{1}$
Output-Oriented CCR Primal Model	**Output-Oriented CCR Dual Model**
$\max_{\phi,»,s^+,s^-} z_0 = \phi + \mu.\vec{1}s^+ + \mu.\vec{1}.s^-$ $s.t. \quad \phi Y_0 - Y» + s^+ = 0$ $X» + s^- = X_0$ $», s^+, s^- \geq 0$	$\min_{¼,v} q_0 = v^T X_0$ $s.t. \quad ¼^T Y_0 = 1$ $-¼^T Y + v^T X \geq 0$ $¼^T \geq \mu.\vec{1}$ $v^T \geq \mu.\vec{1}$
Input-Oriented BCC Primal Model	**Input-Oriented BCC Dual Model**
$\min_{,,»,s^+,s^-} z_0 = , -\mu.\vec{1}s^+ - \mu.\vec{1}s^-$ $s.t. \quad Y» - s^+ = Y_0$ $, X_0 - X» - s^- = 0$ $\vec{1}» \geq 1$ $», s^+, s^- \geq 0$	$\max_{¼,v} w_0 = ¼^T Y_0 + u_0$ $s.t. \quad v^T X_0 = 1$ $¼^T Y - v^T X + u^0\vec{1} \leq 0$ $-¼^T \leq -\mu.\vec{1}$ $-v^T \leq -\mu.\vec{1}$
Output-Oriented BCC Primal Model	**Output-Oriented BCC Dual Model**
$\max_{\phi,»,s^+,s^-} z_0 = \phi + \mu.\vec{1}s^+ - \mu.\vec{1}.s^-$ $s.t. \quad \phi Y_0 - Y» + s^+ = 0$ $X» + s^- = X_0$ $\vec{1}» \geq 1$ $», s^+, s^- \geq 0$	$\min_{¼,v,v_0} q_0 = v^T X_0 + v_0$ $s.t. \quad ¼^T Y_0 = 1$ $-¼^T Y + v^T X + v_0\vec{1} \geq 0$ $¼^T \geq \mu.\vec{1}$ $v^T \geq \mu.\vec{1}$

Source: Charnes et al., 1994: 31-40.

As can be seen from Table 4, which shows the correlation coefficients between the input and output variables selected for the analysis, there is a positive and significant relationship between some variables, while some variables have a negative and significant relationship. It is also concluded that there is no

Table 4. Correlation matrix between variables

ENVIRONMENTAL DIMENSION	**Waste water**	**Greenhouse gas emissions**	**Recycled water**	**Energy savings**	**Recycled non-hazardous waste**
Waste water	1	0.6221	0.5956	0.8016	0.1194
Greenhouse gas emissions	0.6221	1	0.9082	0.8943	0.1979
Recycled water	0.5956	0.9082	1	0.9099	-0.1271
Energy savings	0.8016	0.8943	0.9099	1	-0.0845
Recycled non-hazardous waste	0.1194	0.1979	-0.1271	-0.0845	1
ECONOMIC DIMENSION	**General management expenses**	**Marketing sales distribution expenses**	**Net profit**	**Operating profit**	**Equity capital**
General management expenses	1	0.6769	0.8896	0.8441	0.4143
Marketing sales distribution expenses	0.6769	1	0.8263	0.8409	0.5562
Net profit	0.8896	0.8263	1	0.9154	0.5107
Operating profit	0.8441	0.8409	0.9154	1	0.7963
Equity capital	0.4143	0.5562	0.5107	0.7963	1
SOCIAL DIMENSION	**Accident frequency rate**		**Number of female employees**	**Number of male employees**	**Total number of hours of training**
Accident frequency rate	1		-0.2109	-0.1186	-0.0519
Number of female employees	-0.2109		1	0.8202	0.5445
Number of male employees	-0.1186		0.8202	1	0.8419
Total number of hours of training	-0.0519		0.5445	0.8419	1

very high or low correlation between inputs and outputs and that the effects of inputs on outputs are in the same direction. Therefore, it is possible to state that the considered input-output combination has a suitable structure for the efficiency analysis.

Table 5 reports the relative efficiency scores for the environmental, economic and social sustainability by applying the input-oriented ccr model. The results obtained from the input-oriented ccr model show that 3 out of 14 dmus in terms of environmental and economic sustainability dimension and 2 of them in terms of social sustainability dimension are relatively efficient, while other dmus are relatively inefficient. Dmu, which has the lowest output-oriented ccr environmental, economic and social sustainability efficiency score, belongs to arclk with 0.18, aefes with 0.10 and aygaz with 0.01, respectively. Ccola has the highest efficiency score in terms of environmental and social sustainability with 0.96 and 0.78, respectively, while aksa has the highest economic sustainability efficiency score with 0.95.as a difference, it is concluded that aefes and kords are not relatively efficient in terms of environmental and economic sustainability, while relatively efficient in terms of social sustainability. Similarly, environmental and economic sustainability efficiency scores froto and toaso are equal to 1, while social sustainability ef-

Table 5. Efficiency scores and ranking for environmental, economic and social sustainability based on input-oriented CCR model

DMU	ENVIRONMENTAL	Relative Efficiency Score	Relative Efficiency Ranking	ECONOMIC	Relative Efficiency Score	Relative Efficiency Ranking	SOCIAL	Relative Efficiency Score	Relative Efficiency Ranking
AKSA		0.3459	11		0.9489	4		0.0671	11
AEFES		0.6889	10		0.1013	14		1	1
ARCLK		0.1829	14		0.1106	13		0.6822	5
AYGAZ		0.9304	5		0.2291	11		0.0048	14
CCOLA		0.9621	4		0.3492	9		0.7791	3
FROTO		1	1		1	1		0.0959	8
KRDMD		0.8321	8		1	1		0.0323	12
OTKAR		0.8535	7		0.5576	6		0.0995	7
TOASO		1	1		1	1		0.6903	4
CIMSA		1	1		0.1963	12		0.0221	13
TUPRS		0.8294	9		0.2482	10		0.0785	9
KERVT		0.2437	13		0.4429	7		0.0778	10
KORDS		0.8644	6		0.3789	8		1	1
ULKER		0.3327	12		0.7341	5		0.2055	6

ficiency scores are below 1 with 0.10 and 0.69, respectively. Another difference among sustainability efficiency scores belongs to krdmd and cimsa. Krdmd is relatively efficient only in terms of economic sustainability, cimsa only in terms of environmental sustainability.

According to the results of the input-oriented BCC model given in Table 6; a total of 8 DMUs such as AEFES, AYGAZ, FROTO, KRDMD, OTKAR, TOASO, CIMSA and TUPRS have been determined as relatively efficient in terms of environmental sustainability. 6 of DMUs such as AKSA, FROTO, KRDMD, TOASO and KERVT are included in the efficient DMUs in terms of economic sustainability. Additionally; AEFES, ARCLK, FROTO, TOASO and KORDS remain one of the efficient DMUs in terms of social sustainability. ARCLK has the lowest efficiency score with 0.19 in environmental terms, AEFES with 0.11 in economic terms and AYGAZ with 0.01 social terms. The highest efficiency score belongs to KORDS with 0.89 in environmental terms, ULKER with 0.75 in economic terms and CCOLA with 0.80 in social terms.

When considered the differences among sustainability dimensions, it is observed that relatively efficient DMUs in terms of only environmental sustainability are AYGAZ, OTKAR, CIMSA and TUPRS as can be understood from Table 6. Besides, FROTO and TOASO are determined as relatively efficient DMUs in terms of each sustainability dimension. KERVT and AKSA are included in the relatively efficient DMUs in terms of only economic sustainability, while ARCLK is determined as efficient in terms of only social sustainability. The remaining DMUs (AEFES, KORDS and KRDMD) are relatively inefficient in only one sustainability dimension (economic, environmental and social, respectively).

Depending on the results obtained in the efficiency measurement with DEA, a reference set may be determined for the relatively inefficient DMUs and how the DMUs that are not above the efficiency

Table 6. Efficiency scores and ranking for environmental, economic and social sustainability based on input-oriented BCC model

DMU	ENVIRONMENTAL	Relative Efficiency Score	Relative Efficiency Ranking	ECONOMIC	Relative Efficiency Score	Relative Efficiency Ranking	SOCIAL	Relative Efficiency Score	Relative Efficiency Ranking
AKSA		0.3648	11		1	1		0.0909	11
AEFES		1	1		0.1121	14		1	1
ARCLK		0.1853	14		0.1231	13		1	1
AYGAZ		1	1		0.2493	12		0.0052	14
CCOLA		0.8826	10		0.3567	10		0.8002	6
FROTO		1	1		1	1		1	1
KRDMD		1	1		1	1		0.0462	12
OTKAR		1	1		0.6105	8		0.1093	9
TOASO		1	1		1	1		1	1
CIMSA		1	1		0.5025	9		0.0262	13
TUPRS		1	1		0.2551	11		0.1139	8
KERVT		0.2879	13		1	1		0.0938	10
KORDS		0.8908	9		1	1		1	1
ULKER		0.3593	12		0.7518	7		0.2165	7

limit may reach the efficiency limit. Table 7 and 8 show the reference sets for each DMU according to the input-oriented CCR and BCC models:

As a result of the analysis, the efficient dmus in the ccr-i model are determined as froto, toaso and cimsa. Unlike the ccr-i model, aefes, aygaz, krdmd, otkar and tuprs are determined as relatively efficient in the bcc-i model as mentioned above. If any dmu is efficient, the relative efficiency score is equal to 1. In this case, there is no need to change the input and output values, and it has still its own reference set. On the other hand, it is necessary to simulate the weights and dmus included in the reference set to make inefficient dmus efficient.

Considering the density values and potential comparison partners for the inefficient DMUs in the CCR-I and BCC-I models, it is seen that the reference set of each DMU is different. For example, CCOLA is determined as the relatively inefficient DMU in terms of each sustainability dimension for both DEA models, since the efficiency score is not equal to 1. Thus, density values and potential comparison partners of CCOLA have been determined as a reference set. According to the CCR-I model, these values belong to FROTO with 0.11, and TOASO with 0.09 in environmental terms; AKSA with 0.58, FROTO with 0.43 and KRDMD with 0.01 in economic terms; AEFES with 0.15 and KORDS with 0.88 in social terms. In BCC-I model, it is seen that there are some differences in the reference sets for the mentioned unit. OTKAR with 0.09, and TOASO with 0.01 are included in the reference set of CCOLA in environmental terms. AKSA with 0.58, FROTO with 0.43 and KRDMD with 0.01 are shown as the reference units for CCOLA in terms of economic terms. Lastly, the density values belong to AEFES with 0.15 and KORDS with 0.88 in social terms. It is possible to evaluate other inefficient DMUs in a similar way.

Based on the referenced DMUs, how much an inefficient DMU should reduce its inputs and how much they should increase output levels may be obtained. Potential improvement percentages determined

Table 7. Reference sets (density values) for input-oriented CCR models

CCR-I Model			
DMU	**Environmental**	**Economic**	**Social**
AKSA	FROTO (0.04), TOASO (0.02), CIMSA (0.19)	FROTO (0.11), KRDMD (0.01), TOASO (0.04)	AEFES (0.09), KORDS (0.67)
AEFES	FROTO (1.59), CIMSA (0.18)	FROTO (0.52), KRDMD (0.01)	AEFES (1)
ARCLK	FROTO (0.16), TOASO (0.01), CIMSA (0.32)	FROTO (0.47), KRDMD (0.01)	AEFES (0.57), KORDS (6.52)
AYGAZ	FROTO (0.07), TOASO (0.02)	FROTO (0.09), KRDMD (0.05), TOASO (0.06)	AEFES (0.03), KORDS (0.53)
CCOLA	FROTO (0.11), TOASO (0.09)	FROTO (0.49), KRDMD (0.03)	AEFES (0.12), KORDS (0.82)
FROTO	FROTO (1)	FROTO (1)	AEFES (0.44), KORDS (4.21)
KRDMD	TOASO (8.97), CIMSA (5.39)	KRDMD (1)	KORDS (2.58)
OTKAR	FROTO (0.02), TOASO (0.04)	FROTO (0.17), KRDMD (0.01)	KORDS (1.16)
TOASO	TOASO (1)	TOASO (1)	AEFES (0.07), KORDS (3.67)
CIMSA	CIMSA (1)	KRDMD (0.64), TOASO (8.85)	KORDS (1.36)
TUPRS	FROTO (0.01), TOASO (0.33), CIMSA (2.72)	KRDMD (0.01), TOASO (0.35)	AEFES (0.02), KORDS (3.13)
KERVT	TOASO (0.07), CIMSA (0.51)	FROTO (0.73), KRDMD (0.57)	AEFES (0.18), KORDS (0.27)
KORDS	FROTO (0.02), TOASO (0.28), CIMSA (0.03)	KRDMD (0.94), TOASO (0.22)	KORDS (1)
ULKER	FROTO (0.05), TOASO (0.02), CIMSA (0.03)	FROTO (0.4619), KRDMD (0.07)	AEFES (0.38), KORDS (0.93)

according to CCR-I model for each sustainability dimension for 2019 are shown in Figures 2, 3 and 4, respectively:

According to the group mean of the potential improvement rates in Figure 2, relatively inefficient DMUs should reduce greenhouse gas emissions by 0.84 and waste water by 0.36. On the other hand, it is concluded that they should increase recycled water by 0.48, energy savings by 1.34, and recycled non-hazardous waste by 5.71.

Figure 3 shows the potential improvement rates of the relatively inefficient dmus for economic sustainability dimension. The mean values show that relatively inefficient dmus should decrease general management expenses by 0.71 and marketing sales distribution expenses by 0.64. In addition, they will provide relative efficiency if they increase net operating profit by 0.17, and equity capital by 0.97.

Finally, considering the input and output variables related to the social sustainability dimension; the mean values indicated in Figure 4 reports that the relatively inefficient DMUs should reduce accident frequency rate by 0.76, and increase number of females by 0.75, number of males by 1.56 and number of training time by 3.48 to provide relative efficiency. The results obtained from the BCC-I model also showed similar improvement rates for the relatively inefficient DMUs in terms of each sustainability dimension. The figures containing these improvement rates are given in Appendix A-1, 2 and 3.

Table 8. Reference sets (density values) for input-oriented BCC models

BCC-I Model			
DMU	**Environmental**	**Economic**	**Social**
AKSA	FROTO (0.02), OTKAR (0.76), TOASO (0.01), CIMSA (0.20)	AKSA (1)	KORDS (1)
AEFES	AEFES (1)	AKSA (0.55), FROTO (0.44), KRDMD (0.01)	AEFES (1)
ARCLK	FROTO (0.14), OTKAR (0.53), TOASO (0.001), CIMSA (0.32)	AKSA (0.61), FROTO (0.38), KRDMD (0.01)	ARCLK (1)
AYGAZ	AYGAZ (1)	AKSA (0.92), KRDMD (0.09), TOASO (0.01)	AEFES (0.01), KORDS (0.99)
CCOLA	OTKAR (0.09), TOASO (0.01)	AKSA (0.58), FROTO (0.43), KRDMD (0.01)	AEFES (0.15), KORDS (0.88)
FROTO	FROTO (1)	FROTO (1)	FROTO (1)
KRDMD	KRDMD (1)	KRDMD (1)	TOASO (0.53), KORDS (0.46)
OTKAR	OTKAR (1)	AKSA (0.95), FROTO (0.04)	TOASO (0.06), KORDS (0.94)
TOASO	TOASO (1)	TOASO (1)	TOASO (1)
CIMSA	CIMSA (1)	KRDMD (0.56), TOASO (0.39), KORDS (0.03)	TOASO (0.12), KORDS (0.87)
TUPRS	TUPRS (1)	KRDMD (0.68), TOASO (0.3172)	TOASO (0.75), KORDS (0.24)
KERVT	OTKAR (0.41), TOASO (0.07), CIMSA (0.51)	KERVT (1)	AEFES (0.16), KORDS (0.84)
KORDS	FROTO (0.01), OTKAR (0.97), TOASO (0.05), CIMSA (0.02)	KORDS (1)	KORDS (1)
ULKER	FROTO (0.02), OTKAR (0.93), CIMSA (0.03)	AKSA (0.62), FROTO (0.37), KRDMD (0.06)	AEFES (0.38), TOASO (0.13), KORDS (0.52)

Figure 2. Potential improvement rates for environmental sustainability (CCR-I model)
Source: *Created by the Author.*

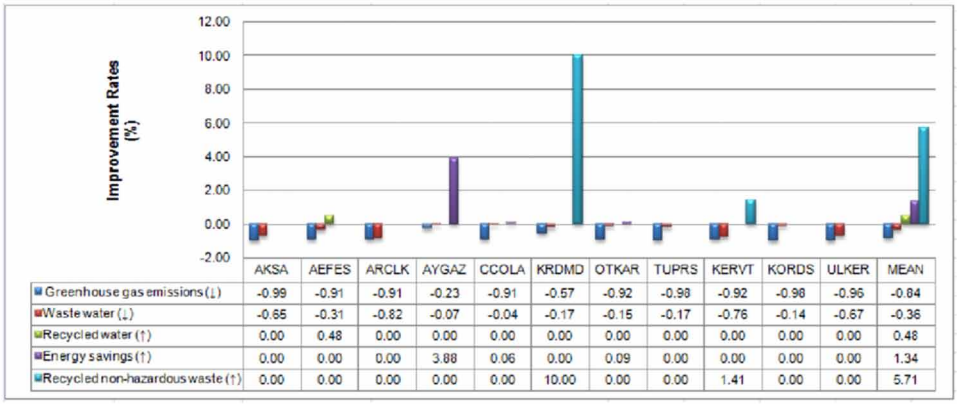
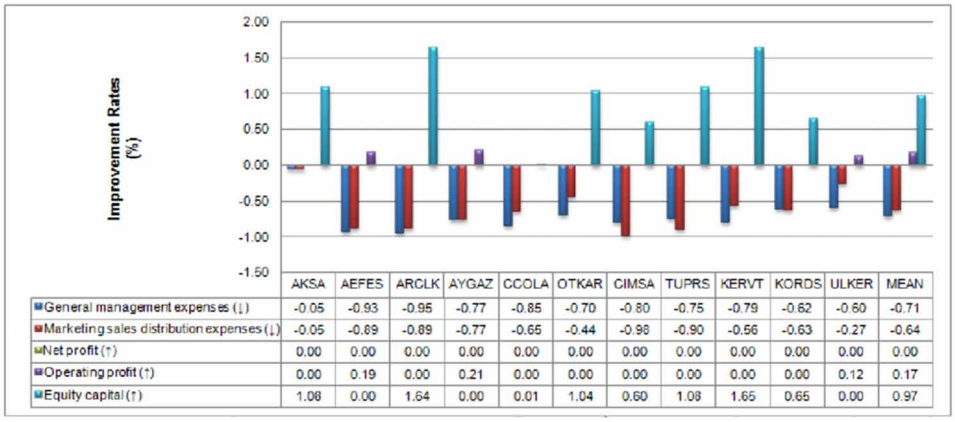


Figure 3. Potential improvement rates for economic sustainability (CCR-I model)
Source: *Created by the Author.*



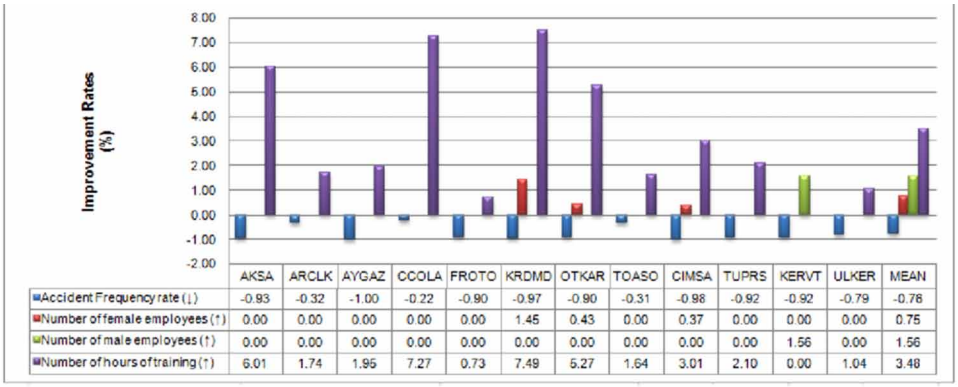
	AKSA	AEFES	ARCLK	AYGAZ	CCOLA	OTKAR	CIMSA	TUPRS	KERVT	KORDS	ULKER	MEAN
General management expenses (↓)	-0.05	-0.93	-0.95	-0.77	-0.85	-0.70	-0.80	-0.75	-0.79	-0.62	-0.60	-0.71
Marketing sales distribution expenses (↓)	-0.05	-0.89	-0.89	-0.77	-0.65	-0.44	-0.98	-0.90	-0.56	-0.63	-0.27	-0.64
Net profit (↑)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Operating profit (↑)	0.00	0.19	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.17
Equity capital (↑)	1.08	0.00	1.64	0.00	0.01	1.04	0.60	1.08	1.65	0.65	0.00	0.97

DISCUSSION

In this chapter, the importance of the concept of sustainability, including environmental, economic and social dimensions, is emphasized and it is tried to explain why businesses should focus their operations on this issue. As a result of the analysis, it is concluded that the number of efficient DMUs varies according to CCR-I and BCC-I models. In the CCR-I model, while 3 DMUs are efficient by taking an efficiency value of 1, the remaining 11 DMUs are not included in the efficiency limit in terms of environmental sustainability. In BCC-I model, the number of efficient values increased to 8. Similarly, the number of efficient DMUs, which are 3 in the CCR-I model, has increased to 6 in the BCC-I model in terms of economic sustainability. As for that social sustainability, while 2 DMUs are efficient in CCR-I model, 5 DMUs are determined as efficient in BCC-I model.

By comparison with CCR-I and BCC-I models, some differences are observed among efficiency scores of DMUs as well. For instance, according to both models, only FROTO, TOASO and CIMSA have been identified as environmentally efficient. It is also seen that only FROTO, KRDMD and TOASO

Figure 4. Potential improvement rates for social sustainability (CCR-I model)
Source: *Created by the Author.*



	AKSA	ARCLK	AYGAZ	CCOLA	FROTO	KRDMD	OTKAR	TOASO	CIMSA	TUPRS	KERVT	ULKER	MEAN
Accident Frequency rate (↓)	-0.93	-0.32	-1.00	-0.22	-0.90	-0.97	-0.90	-0.31	-0.98	-0.92	-0.92	-0.79	-0.78
Number of female employees (↑)	0.00	0.00	0.00	0.00	0.00	1.45	0.43	0.00	0.37	0.00	0.00	0.00	0.75
Number of male employees (↑)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.56	0.00	1.56
Number of hours of training (↑)	6.01	1.74	1.95	7.27	0.73	7.49	5.27	1.64	3.01	2.10	0.00	1.04	3.48

are efficient in terms of economic sustainability, and AEFES and KORDS in terms of social sustainability. At the same time, DMUs that are not efficient in the CCR-I model are considered efficient in the BCC-I model. The reason for this change is that the structure of the efficiency boundary differs for the two models. In the CCR model, the shape of the efficiency boundary for the case of single input and single output is a line passing through its origin, whereas it is segmented, linear and concave in the BCC model. BCC model measures the local technical efficiency, while the CCR model measures the overall technical efficiency. Therefore, the efficiency values in the BCC model are equal or greater than the CCR model (Pai et al., 2020: 30). As can be seen from Table 5 and 6; the number of DMUs determined as relatively efficient according to the BCC-O model and inefficient compared to the CCR-I model is 5 for environmental sustainability (AEFES, AYGAZ, KRDMD, OTKAR, TUPRS), and 3 for both economic (AKSA, KERVT, TOASO) and social sustainability (ARCLK, FROTO, TOASO). At this point, it may be concluded that these DMUs are efficient locally, but not generally.

The total reference values also show several differences between two models. According to the CCR-I model, in terms of environmental sustainability, TOASO has been selected as 10 times as the most reference (benchmark) unit. After TOASO, 9 times referenced FROTO and 8 times referenced CIMSA are listed among the reference units. In the BCC-I model, this ranking is OTKAR with 6 references, TOASO and CIMSA with 5 references, and FROTO with 4 references. In terms of economic sustainability, according to the CCR-I model; KRDMD is ranked first with 11 references. Afterwards, a ranking is made with 8 references of FROTO and 5 references of TOASO. In the BCC-I model, the ranking in question is determined as KRDMD with 7 references, AKSA with 6 references and FROTO with 5 references. Finally, when a comparison as to the reference sets is made in terms of social sustainability, it is seen that KORDS is referenced 2 times and AEFES is referenced 9 times according to the CCR-I model. This ranking belongs to KORDS with 8 references, TOASO with 5 references and AEFES with 4 references in the BCC-I model.

When considered the potential improvement rates for environmental sustainability dimension, it is concluded that the analyzed DMUs should try to reduce greenhouse gas emissions a vast scale. In particular, it is observed that AKSA, AEFES, ARCLK, CCOLA, OTKAR, TUPRS, KERVT, KORDS and ULKER may become efficient if they reduce greenhouse gas emissions by more than 0.90. On the other hand, AEFES should increase the rate of recycled water by 0.48. Also, AYGAZ, CCOLA and OTKAR should increase the level of energy savings by 3.88, 0.06 and 0.09, respectively. Lastly, it is required for KRDMD and KERVT to increase the rate of recycled non-hazardous waste at the rate of 10.0 and 1.41, respectively. Similar findings have been obtained in terms of economic and social sustainability dimensions as well. When evaluated in general, the results seem to suggest that it is essential for the relatively inefficient DMUs to develop strategies that will decrease the relevant input levels and increase their output levels by taking the required measurements as soon as possible.

As seen in the results of the quantitative analysis of the study, when the amount of inputs included in the model in terms of environmental, social and economic aspects increases, the efficiency scores of the decision-making units decrease. Hence, undesirable inputs should be reduced in order to increase the efficiency value of any firm. At this point, the study offers projections of the level at which these inputs should be reduced (See Figures 2, 3, and 4). If these projections are realized, it is thought that the companies identified as inefficient may reach the efficient limit quantitatively and these predictions may be a guide for decision makers.

CONCLUSION

The concept of sustainability is of great importance for the companies willing to gain success in the long term and to be permanent. At the point of achieving these goals, they should prioritize environmental, economic and social factors, identify opportunities and risks arising from these factors, and prepare growth plans accordingly. Businesses that internalize sustainability factors have a number of advantages in accessing financial resources, increasing their level of effectiveness in risk management and bringing market value to the desired level. Therefore, regardless of the scale, it is important for businesses to direct their operations in accordance with sustainability factors to have these advantages and to create a more responsive business environment. The covid-19 pandemic, the effects of which have been largely felt in almost every sector since the past year, is also a turning point in terms of questioning the sustainability of existing systems and adopting a more effective approach. The global health crisis in question is seen as an important opportunity for all businesses to adopt sustainability factors and implement the necessary practices. In this context, it is a great task to ensure a sustainable future for businesses.

It is possible to determine the adequacy of sustainability performance by continuously measurement and evaluation of the related indicators. In this context, it is of great significance for the businesses to determine where they are in terms of sustainability performance by using appropriate performance criteria through several MCDM methods. This study is conducted on 14 manufacturing companies listed on the BIST Sustainability index for the purpose of determining the relatively efficient units and what measures should be taken to enable the inefficient units to become efficient. Input-oriented CCR and BCC DEA models are used in evaluating the efficiency levels of these companies as of 2019. Research findings have shown some differences between both sustainability dimensions and models, in terms of efficiency scores and potential improvement rates. According to the findings of the CCR-I model, 21% of the relevant DMUs are found to operate efficiently in terms of environmental and economic sustainability dimensions. In terms of social sustainability, the efficient DMU rate is 14%. According to the findings of the BCC-I model, the rates of efficient DMUs are 57%, 43% and 36%, respectively, in terms of environmental, economic and social sustainability.

Using a non-parametric method (DEA), this chapter not only examines the sustainability efficiency levels but also make a number of recommendations by identifying the missing points for the relatively inefficient units. The current literature on measuring sustainability performance is extended by considering each sustainability sub-dimension individually. This contribution provides for businesses to take more accurate actions and to focus on more reasonable points in building a sustainable business environment. The limitation to this research arises from the fact that during the sample selection, a number of manufacturing companies listed on BIST Sustainability Index, have been eliminated from the sample because the required data could not be obtained from their sustainability reports. Additionally, due to the constraints of the method used, too many input and output variables could not be included in the analysis. Therefore, this has also been qualified as a limitation to the study. Further studies may promote this analysis by making comparisons among several countries and using different variables.

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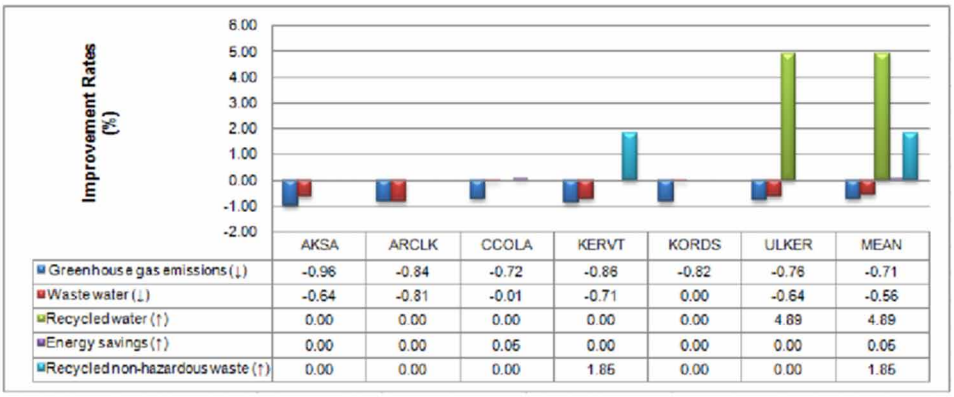
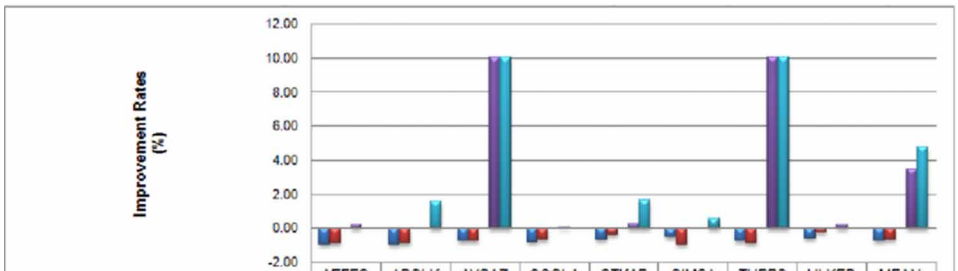
APPENDIX

Figure 5. Potential improvement rates for environmental sustainability (BCC-I model)



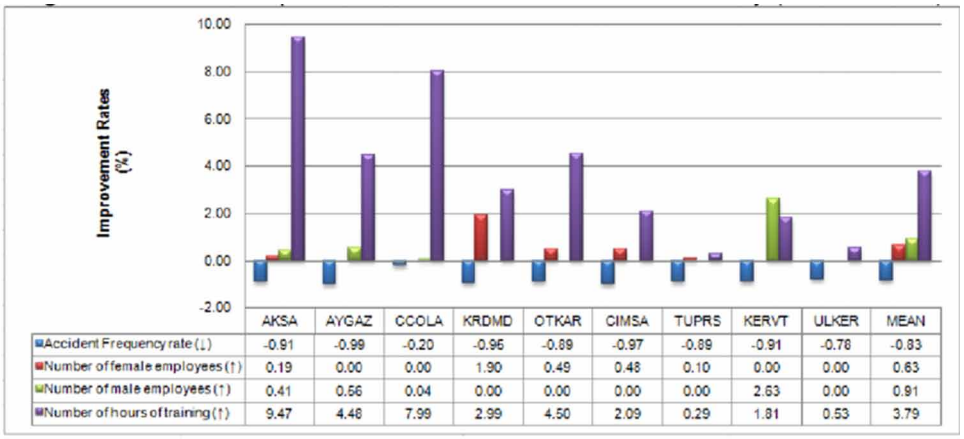
	AKSA	ARCLK	CCOLA	KERVT	KORDS	ULKER	MEAN
Greenhouse gas emissions (↓)	-0.96	-0.84	-0.72	-0.86	-0.82	-0.76	-0.71
Waste water (↓)	-0.64	-0.81	-0.01	-0.71	0.00	-0.64	-0.56
Recycled water (↑)	0.00	0.00	0.00	0.00	0.00	4.89	4.89
Energy savings (↑)	0.00	0.00	0.05	0.00	0.00	0.00	0.05
Recycled non-hazardous waste (↑)	0.00	0.00	0.00	1.86	0.00	0.00	1.86

Figure 6. Potential improvement rates for economic sustainability (BCC-I model)



	AEFES	ARCLK	AYGAZ	CCOLA	OTKAR	CIMSA	TUPRS	ULKER	MEAN
General management expenses (↓)	-0.93	-0.95	-0.75	-0.85	-0.70	-0.50	-0.74	-0.60	-0.75
Marketing sales distribution expenses (↓)	-0.89	-0.89	-0.75	-0.64	-0.39	-0.94	-0.87	-0.25	-0.70
Net profit (↑)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Operating profit (↑)	0.21	0.00	10.00	0.03	0.25	0.00	10.00	0.18	3.44
Equity capital (↑)	0.00	1.55	10.00	0.00	1.62	0.56	10.00	0.00	4.75

Figure 7. Potential improvement rates for social sustainability (BCC-I model)



	AKSA	AYGAZ	CCOLA	KRDMD	OTKAR	CIMSA	TUPRS	KERVT	ULKER	MEAN
Accident Frequency rate (↓)	-0.91	-0.99	-0.20	-0.96	-0.89	-0.97	-0.89	-0.91	-0.76	-0.83
Number of female employees (↑)	0.19	0.00	0.00	1.90	0.49	0.48	0.10	0.00	0.00	0.63
Number of male employees (↑)	0.41	0.56	0.04	0.00	0.00	0.00	0.00	2.63	0.00	0.91
Number of hours of training (↑)	9.47	4.48	7.99	2.99	4.50	2.09	0.29	1.81	0.53	3.79

Chapter 14
The Sustainable Finance Landscape in Germany

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ABSTRACT

This chapter discusses the current trend of mainstreaming sustainable finance in Germany. It provides an overview of contributions of different stakeholders to this trend and sheds light on the evolution of the sustainable finance landscape in Germany, including banks, the insurance sector, rating agencies, nonprofits, and academia. EU regulations are currently driving change and promoting sustainable finance in Germany. New policy initiatives and regulations are closely monitored and discussed by diverse stakeholders, including organisations with a long-standing expertise in promoting responsible and ethical investments. Advocacy-oriented nonprofits critically address greenwashing and engage in debates on qualitative aspects. The sustainable finance trend is expected to gain further traction in Germany.

INTRODUCTION

The purpose of this chapter is to provide an orientation in the increasingly complex field of stakeholders engaging in the sustainable finance trend in Germany. Until recently, critical analysis prevailed in assessing the contributions of Germany to shape the new trend of sustainable finance: "Germany is lagging behind other countries when it comes to developing a sustainable financial sector, despite the fact that major shifts – such as energy and transport reforms – are in the pipeline and need considerable capital" (Bassen & Zwick, 2018). However, the German government and regulatory authorities have recently stepped up their efforts to address sustainable finance in a more comprehensive way, driven by more ambitious climate policies and a series of regulatory initiatives at the level of the European Union, especially the EU Action Plan: Financing Sustainable Growth and the EU Taxonomy on Sustainable Finance as well as green lobbying and advocacy actions of various associations and nonprofits.

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The Covid-19 pandemic has tested Germany's ability to address a serious crisis. While Germany witnessed diverse manifestations of protest against Covid-19 related restrictions, the German government has by and large been credited to mount an adequate response to a crisis situation, in close consultation with scientists. The growing responsiveness of policymaking to recommendations of scientists in the Covid-19 pandemic might have prepared the ground for bolder actions on transformative policy-making, including on climate action and sustainability transitions. Germany exhibits strong analytical and planning expertise, including politically largely independent nonprofit institutes, to guide sustainability transitions, including sustainable finance policies. The 2030 Agenda for Sustainable Development and the Paris Agreement are powerful reference frameworks for a large number of state institutions, civil society institutions, and green business stakeholders. The latter carry a good deal of influence on political decision-making in Germany.

There is growing evidence that key factors supporting collaborative efforts for sustainability action are developing in a positive direction in Germany. Kuhn proposed five factors – the pentagon sustainability framework – to explain the promising developments of collaborative governance for sustainable development at country level: political leadership, discourses, in-country expertise, institutional density, and international cooperation (Kuhn, 2016). This chapter acknowledges the relevance of these factors and pays particular attention to the growing complexity of the institutional landscape and the acquired expertise by a variety of stakeholders. The analysis also provides evidence of the growing momentum in political discourses and the enhanced interest of the political leadership in promoting sustainable finance in a collaborative way and in close cooperation with other countries, especially in the context of EU sustainable finance initiatives.

The United Nations Environmental Programme (UNEP, 2015) recognized the relevance of the stakeholder theory in efforts to advance policy options to improve the financial system's effectiveness in mobilizing capital towards a green and inclusive economy. In their recommended study "Towards a Theory of Sustainable Finance", UNEP pays extensive reference to academic literature on stakeholder theory, including Joseph Stiglitz (2010) and important contributions to stakeholder theory of Freeman (1984), Freeman et al. (2010), Gioia (1999) and others (UNEP, 2015). It would go beyond the scope of this chapter to engage in a discussion on academic theories relevant to understanding motives and interests of stakeholder engagement and interactions.

In Germany, the sustainable finance trend and the landscape of institutions are currently developing in a dynamic way. Therefore, it is hardly possible to rate the level of influence of different stakeholders in policymaking processes in an accurate way at this moment. Many stakeholders and stakeholder groups have only recently started to engage more strongly in sustainable finance. Once some of the proposed new regulations or also informal regulation and more market-based initiatives are in place and the landscape of institutions is more consolidated, future research activities would be well advised to analyze the specific influence of stakeholders.

The analysis presented in this chapter is based on a review of policy and strategy documents of political and regulatory authorities and stakeholders at different levels. The authors focus on government and regulatory authorities, banks and asset managers, institutional investors: e.g. insurance sector, pension funds, churches and foundations, rating agencies and consulting firms, lobby and advocacy-oriented nonprofits and academics. Furthermore, the authors gained valuable insights from their engagement with other researchers and experts in the context of conferences, workshops, consulting work to governmental organizations (corresponding author) and their long-standing management experience in nonprofits and networking activities in the sector, including at political level (co-author).

BACKGROUND: PIONEERS OF SUSTAINABLE FINANCE IN GERMANY AND EU LEVEL INITIATIVES

There is wide-spread agreement among the German expert community that EU regulations are currently driving change and promoting sustainable finance in Germany. We witness a proliferation of policies and regulation at the level of EU which are currently driving change in Germany. However, we should also acknowledge the contributions of a wide range of stakeholders, including churches, nonprofits, and rating agencies, to the current process of change. In Germany, they have had a unique selling point in contribution and preparing the ground for the take-off of the sustainable finance trend.

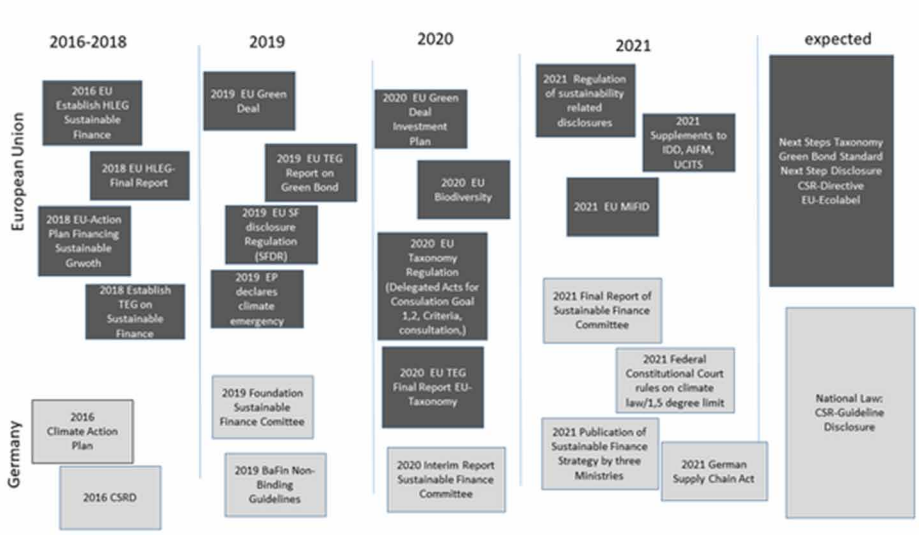
From the 1970s onwards, various nonprofits have promoted an approach that has challenged the conventional rational of investors by integrating ethical and sustainability issues into investment strategies. Such approaches were clearly off the mainstream and not taken serious by many key players of the financial sector. The Friedmann doctrine remained for a long time an important reference point for the rejections or at least reservations of mainstream asset managers on inclusion of sustainable aspects in decision-making on investments. The Friedmann doctrine holds that a firm's main responsibility is to its shareholders (Friedmann 1970). More recently, the focus on shareholders has given way to more holistic perspectives which pay greater attention to interest of and engagement with stakeholders. This plays much in favour of responsible investment and sustainable finance approaches.

Kuhn (2020) provided an overview of the landscape of nonprofits working in the field of ethical and sustainable finance and highlighted the role of some front-runner and specialised banks in promoting sustainable finance. Several associations played a critical role in promoting sustainable finance from the late 1990s onwards. In the early years of the sustainable finance movement, efforts focused on defining and goal setting. The mostly very small organizations grew slowly. With the upswing of the sustainable finance trend, they started to grow faster. Furthermore, new associations were founded that deal exclusively with sustainable finance and traditional environmental organization discovered the topic of sustainable finance. The following graphic shows a selection of policies, regulations, and launches of expert committees at European (dark grey) and German level (light grey) since 2016. The dynamic of regulation increased considerably after the establishment of the High-Level Expert Group (HLEG) on Sustainable Finance at the level of the EU in the year 2016) and the Climate Action Plan in Germany in the same year. The following table presents the milestones of sustainable finance policies and regulations and provides evidence how the trend gained traction in the past five years.

The EU Taxonomy Regulation on Sustainable Finance was published in the Official Journal of the European Union on 22 June 2020 and entered into force on 12 July 2020. It is seen as a major accomplishment by key stakeholders as it defines overarching conditions that an economic activity has to meet in order to qualify as environmentally sustainable (European Commission, 2020). The Taxonomy Regulation establishes six environmental objectives: climate change mitigation; climate change adaptation; the sustainable use and protection of water and marine resources; the transition to a circular economy; pollution prevention and control; the protection and restoration of biodiversity and ecosystems (European Commission, 2020a). A first delegated on sustainable activities for climate change adaptation and mitigation objectives was approved in principle on 21 April 2021, and formally adopted on 4 June 2021. A second delegated act for the remaining objectives will be published in 2022 (European Commission, 2021).

It would go beyond the scope of this chapter to engage in a detailed analysis of Germany's role within the EU and its influence on sustainable finance initiatives at the level of the EU Commission. According to most experts contacted in the context of this analysis, the German Government was not a front runner

Figure 1. Milestones of sustainable finance policies and regulations at the level of the EU and Germany
Source: Authors' elaboration



in pushing for an ambitious sustainable finance agenda at the level of the EU in the past years. More recently, however, it signaled strong commitment of ownership of EU action on sustainable finance by launching national level dialogue and policymaking initiatives.

Sustainability issues, especially climate action, have clearly gained more traction in Germany since 2021. A decision of Germany's Constitutional Court (Bundesverfassungsgericht, 2021) on Germany's climate law is considered to be a landmark decision and contributed to move the political leadership before the general elections in September 2021. Germany's Constitutional Court ruled on 29 April 2021 that the country's 2019 climate protection act is in part unconstitutional. "The regulations irreversibly postpone high emission reduction burdens until periods after 2030," the court said. It added that the law does not explain in enough detail how greenhouse gas emissions are to be reduced after 2031. The judges gave the legislature until the end of next year to draw up clearer reduction targets for greenhouse gas emissions for the period after 2030 (Deutsche Welle, 2021). The decision of the court might be challenged, but the political consequences of the decision are already taking shape ahead of the elections and in the context of the disastrous floods in the Western part of Germany which caused more than 180 deaths in July 2021.

The political administration has come under scrutiny from experts to present more far-reaching proposals on climate mitigation targets. Media attention has also grown. We have seen a growing engagement of diverse actors at national level. The most recent policy documents suggest that Germany wants to position itself as a leader in sustainable finance (see section on government & regulatory authorities). What has started as a relatively broad bottom-up movement is now developing into ambitious government policies. There are several push-and-pull factors. A key push factor is the pressure to meet its own emission reduction targets. Just before the pandemic broke out in early 2020, Germany was set to fail in meeting its own emission reduction targets. Pressure from the Green Party, civil society groups, and social movements, including Fridays for Future (FFF), has increased. A pull factor is Germany's international image to be at the forefront of environmental policies and climate policies and its forthcoming

G20 presidency in 2022. Another pull factor is the competition with other non-EU financial markets, especially the United Kingdom, in the post-Brexit era. German general elections in September 2021 also contribute to stimulate the debate, The Green Party has surged according to opinion pools and other parties, including the two other large parties, Christian Democratic Union (Christlich Demokratische Union Deutschland, CDU) and Social Democratic Party (Sozialdemokratische Partei Deutschlands, SPD), have stepped up efforts to also sharpen their green profile.

Political authorities across the political spectrum – with the exception of the far-right nationalist party Alternative for Germany (Alternative für Deutschland, AfD) – have engaged more strongly with climate policies. There is a growing momentum in political discourses to leverage the power of the financial sector as the title "Shifting the trillions" of the study of the German Sustainable Finance Committee suggests (Sustainable Finance Committee, 2021). The Government exercises growing influence on key institutions such as the German Federal Financial Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht, BaFin), and the German development bank (Kreditanstalt für Wiederaufbau, KfW), to align stronger with climate policies and to leverage their role in moving the financial and business community faster on the sustainability pathway. The new policies resound well with associations and nonprofits working in the field of sustainable finance. In turn, they provide valuable inputs to government-business-civil society dialogues on how to "shift the trillions" by advancing the sustainable finance architecture. The rise of stock markets, the growing number of green and sustainable investing funds, and the rising market capitalization of green companies have supported the sustainable finance trend. The rising stock market values have encouraged a growing number of Germans, especially the younger generation, to invest in the stock market. There are now a total of 12.4 million shareholders in Germany, 2.7 million more than in 2019. A total of 17.5 percent of the population over 14 years of age hold shares or funds which is the highest value since 2001. The increase is large due to the growing number of young people who invest in shares and access the stock market via mobile applications (Deutsches Aktieninstitut, 2020). Though their investments may be small and not always focus on sustainability issues, the growing number of stock market investors in Germany has contributed to a much greater coverage of finance, including sustainable finance issues, by media which in turn contributed to broadening and deepening debates and discourses.

GOVERNMENT AND REGULATORY AUTHORITIES

To assess the influence of political leadership in sustainable finance in Germany, we focus on governmental and regulatory authorities which have only recently – around 2019 – developed a serious interest in sustainable finance.

The Federal Ministry of Finance (Bundesfinanzministerium, BMF), the Federal Ministry of Environment (Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit, BMU), and the Federal Ministry of Economics (Bundesministerium für Wirtschaft und Energie, BMWi) (2021) jointly published the German Sustainable Finance Strategy in May 2021. The strategy document focuses on financial market policy and regulation and makes bold statement on Germany's future role in promoting sustainable finance. The three Ministries aim to make Germany a leader in sustainable finance and to promote sustainable finance at European and global level (goal 1 of the strategy). Next to the five goals, including a reference to better risk management and stability of the financial sector, it sets out 26 measures with

different time horizon (short-, mid-, and long-term perspective). Measure 1 relates to the promotion of sustainable finance in the context of Germany's presidency of the G20 group in 2022.

This strategy document follows on an earlier publication of the Sustainable Finance Committee appointed by the German Government which presented a report "Shifting the trillions. A sustainable financial system to facilitate the great transformation" with 31 recommendations pertaining to the policy framework, reporting, knowledge building, financial products, and consolidation. The recommendations include a reference to a classification system. The recommendations read: "establish a system for classifying the sustainability of all financial market products based on the logic of the EU Sustainable Finance Disclosure Regulation – (SFDR) and to task an independent project team consisting of various groups of stakeholders with the further refinement of the system by creating such a system, Germany would set an example for Europe which could set a precedent. The classification system should transparently present sustainability opportunities and risks to customers on a simple scale of 1 to 5 (Sustainable Finance Committee, 2021). These new initiatives follow on a series of other initiatives that sustain the argument that we witness a mainstreaming of sustainable finance in Germany in the context of its commitments to being almost climate-neutral by 2050.

Regarding the Sustainable Finance Committee, it is worth noting that the traditional representatives of the financial industry –not known to be promoters of sustainable finance until recently – were only allowed to act as observers in the committee. They criticized their limited influence and argued that a transformation could not succeed without close consultations with the financial industry associations. However, the political leadership showed determination to push the sustainable finance agenda forward. Political developments at the level of the EU and in France, a close political ally of Germany in the context of the EU, encouraged the German Ministries to intensify their engagement in sustainable finance.

Back in November 2016, the German Federal Government adopted the Climate Action Plan 2050, making Germany one of the first to submit a long-term greenhouse gas emission strategy to the UN, as required under the Paris Agreement (BMUB, 2016). The ESG (Environmental, Social, Governance) Country Rating of Germany has the Status Prime, a good rating B, and relatively high performance. In a resolution adopted in February 2019, the State Secretaries' Committee for Sustainable Development recognizes that sustainable finance can help the German government to achieve its objectives in the areas of financial market stability, energy, climate and development, along with other sustainability-related objectives. The German government created a Sustainable Finance Committee in June 2019 (Federal Ministry of Finance, 2019) which released the above-mentioned final report (in German) in February 2021. The 31 recommendations addressed to the government split into five categories: (1) reliable policy framework, (2) future-oriented and integrated reporting, (3) systematic build-up of expertise, (4) sustainability-effective financial products and (5) institutional steadiness. The report has been extensively discussed in the SF community in Germany and is prove of the mainstreaming of SF. German government has set itself the aim of making Germany a leading sustainable finance center and instituted new divisions dealing with sustainable finance at the level of the Ministry of Finance and the Ministry of Environment.

Germany issued Green German federal securities for the first time in 2020. It published a framework for Green German Federal Securities and announced that it will issue green federal bonds every year from 2020 onwards. This initiative aims to attract new investors and issuers to the green bond market and thus act as a catalyst, channeling more investments into a greener economy (Federal Ministry of Finance, 2020). The issuance volume of the first 10-year Green Federal bond was 6,5 billion Euro. The

volume of the first 5-year Green Federal bond amounted to 5 billion Euro. In May 2021, Germany issued its first 30-year Green Federal bond (Deutsche Finanzagentur, 2021).

The chief regulatory authority, the Federal Financial Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht, BaFin) is more active within sustainable finance since 2019. In 2019 they published a Guidance Notice on dealing with sustainability risks to give the supervised entities a compendium of non-binding procedures for the risk management (BaFin, 2019). This is remarkable because in the time before, sustainability risks have been seen, as not an aim of the BaFin. As it becomes more and more significant to integrate sustainability risks in the risk management systems, BaFin redefined some of its mandates and tasks. Within the German Sustainability Finance Strategy, the Federal Ministry of Finance is still working on a concept of how BaFin could be supported, and the BaFin itself is working on a report how federal government agencies such as the Federal Environment Agency (Umweltbundesamt, UBA) and the Federal Office of Economic Affairs and Export Control (Bundesamt für Wirtschaft und Ausfuhrkontrolle, BAFA) can cooperate in order to use more sustainability expertise.

The Bundesbank, the German Central Bank, increasingly engages within sustainable finance and plays a leading role in the Network for Greening the Financial System (NGFS) which was established in 2017. It comprises central banks and supervisory authorities (NGFS, 2021). Next to its work on macroeconomic and financial stability, it addresses monetary policies and aims to integrate sustainable and responsible investment principles in investment approaches (NGFS, 2021). A dashboard of Green Finance was established in 2021. It provides an overview of Green Finance in Germany. The financial indicators show the volumes of green bonds issued, as well as the national expenditure on environmental protection, environmental tax revenues as well as general economic indicators related to greenhouse gas emissions and energy consumption. Furthermore climate-related indicators of greenhouse gas concentration, temperature, hot and heavy rain days are listed (Deutsche Bundesbank, 2021).

The German Council for Sustainable Development (Rat für Nachhaltige Entwicklung, RNE), a high-level advisory body to the Government, is another key driver. It was founded in 2017 with a mandate to promote an open stakeholder dialogue. It created the "Hub for Sustainable Finance" until the Sustainable Finance Committee took over most of this work in 2019. In 2021, RNE published an analysis of the status quo of sustainable economic development in Germany (RNE, 2021). Within the chapter financial markets, RNE this publication highlights that sustainable finance is a central instrument to reach the goals of the Paris Agreement as well as the 2030 Agenda with its 17 SDG's (Sustainable Development Goals). It acknowledges that systematic ESG screening is not yet established in Germany. The recommendations focus on the systematic integration of ESG risks, analysis of value chains, and on ´transparency issues in the process of reforming the German and European financial systems. With its recommendation for the election for the German Bundestag, the German Council for Sustainable Development recommends to give incentives for private investments (German Council for Sustainable Development, 2021).

In the context of the 2021 general elections, the Green Party (Bündnis 90/Die Grünen, 2021), the Social Democratic Party (SPD, 2021) and the Christian Democratic Union (CDU, 2021)) mentioned sustainable finance in their election manifestos.

BANKS AND ASSET MANAGERS

Expertise and action on sustainable finance needs to be deeply grounded in the financial sector in order to gain traction. Thus, the financial sector, especially the role of banks and asset managers, deserve attention.

Germany's banking system is structured along three pillars: private commercial banks, mutual cooperative banks and public law banks (saving banks and state banks). Compared to other countries, the German banking system is more diversified and less concentrated on a few big players. This is particularly evident in banking sector. Deutsche Bank is the largest privately owned commercial bank with assets of about 1300 billion EUR. It was only the 8th largest Bank in Europe in February 2021 (Business Insider, 2021), smaller than HSBC, BNP Paribas, Crédit Agricole and four other banks. In Germany, DZ Bank and Commerzbank follow second and third with assets around 500 billion EUR. The largest bank under public law is the KfW with assets close to the level of those of DZ Bank and Commerzbank.

There are also a number of other, more specialized private banks and regionally focused credit cooperatives. The banks with government involvement are the large, mostly nationally active federal states banks / Landesbanken, the banks of the 16 Länder (states), and the smaller, regionally focused savings banks (Kuhn, 2020) Cooperative banks are organized within the National Association of German Cooperative Banks (Bundesverband der Deutschen Volksbanken und Raiffeisenbanken, BVR). The cooperative financial network comprises 814 local cooperative banks and specialized institution. The BVR has therefore signed in 2021 a stakeholder endorsement committing it to the principles of the United Nations (UN) for responsible banking (BVR, 2021). The Association of German Banks (Bankenverband) has 170 members, ranging from small specialist banks to global universal banks. It also counts among its members other companies, including fintechs. The Association pays reference to the 2030 Agenda for Sustainable Development and the 17 SDGs and emphasized that it intends to sensitize all its member banks to sustainability and especially climate protection. The website explains EU policy initiatives to its members, e.g. the Non-Financial Reporting Directive (Bankenverband, 2021).

There are a number of smaller banks with a specific focus on ethical investment. Most of them have an affiliation to one of the two leading churches, the Protestant or the Catholic Church. The German consumer association (Verbraucherzentrale) refers to the following banks with a specific mandate on ethical, social, or environmental issues: Bank für Kirche und Caritas EG, DKM Darlehnskasse Münster eG (both only for employees of churchly and charitable institutions), Bank für Kirche und Diakonie eG – KD-Bank, Bank für Orden und Mission eG, Bank im Bistum Essen eG, EthikBank eG, Evangelische Bank, Evenord-Bank eG-KG, GLS Gemeinschaftsbank eG, Pax-Bank eG, proCredit Bank AG, Steyler Bank AG, Triodos Bank N.V. Deutschland, Umweltbank AG and Bank für Sozialwirtschaft. Triodos Bank N.V. is an exception, it is a public limited company under Dutch law with headquarters in the Netherlands. It includes branches and representative offices in six European countries, including Germany. Almost all of them offer classic banking products such as: current account, credit cards, saving books, credits and deposit of securities. It is noteworthy that nine banks have a Christian background (Verbraucherzentrale, 2021).

The banks affiliated to the protestant and catholic church have a long-standing commitment to ethical investments. They are also well-networked within the Sustainable Finance community and contributed to promote good practices at different levels, e.g. by participation in working groups. They focus on specific customer groups rather than showing interest in strong growth. GLS and Triodos Bank consider themselves as banks specialized in ethical and sustainable investment. Their market share has grown. Another bank is "Tomorrow". This start-up bank was founded in Hamburg in 2018 and aims to promote digital sustainable banking and meeting customer requirements for mobile banking (Tomorrow, 2021). The combination of sustainability and online banking is a novelty. It targets younger customers by providing them with easy access to banking in line with sustainability criteria. According to the FNG market report, the total amount of the customer deposits of these specialist banks is about 43 billion euros (FNG,

2021). Depending on their ownership, the individual banks set their priorities according to Protestant and Catholic teaching or environmental orientation. In comparison to the other banks, the specialized banks in Germany are front-runners for ethical and sustainable investing, they have implemented sustainability in their core business strategy and not only in single products. With their engagement, e.g. working groups, common guidelines, member of different non-governmental organizations, they play a strong pushing role of sustainable finance in Germany. But - also precisely because of the restrictions for customer groups - the overall market share is still small. The growth rates of GLS and Triodos bank, for example, are also high, although here, too, customer deposits only achieve a very low market share. A study of the Steinbeis University, Centre for Financial Services examined the sustainability of asset management in Germany in terms of urgency of the need for action, the extent of the risk from the perspective of the company and the importance of sustainable investment. It concluded that churches invest 100 percent of their assets in line with sustainability criteria while insurance companies reach 62 percent and banks 44 percent (Steinbeis, 2018).

There are six leading asset management companies in Germany which together manage 67 percent of all assets. These are the Allianz Asset Management (Allianz AM is comprised of two separate investment management companies: Allianz Global Investors and PIMCO), Universal Investment, DWS, Union Investment, Deka and HSBC Trinkaus & Burkard. The managed assets of the German asset management industry cover more than 3 trillion Euro (BVI, 2021). Allianz Global Investors (AGI) follow ESG criteria in their investment strategies and show 206 billion in sustainability-related assets. In total they are managing 598 billion EUR (Allianz Global Investors, 2021). Union Investment is the asset management company for all cooperative banks in Germany. It is one of the longstanding players in the field of sustainable finance. It joined the Sustainable Finance Committee and is an active member in various working organizations and groups such as the Green and Sustainable Finance Cluster and the German Sustainable Investment Forum (Union Investment, 2021). Deka, the asset management company of the Sparkassen, the municipal savings banks, offers a number of sustainability products. According to its own public relation documents, sustainability strategies are anchored at the Deka Group since about 2015 (DEKA, 2021). Among the major asset management companies, Union Investment is often seen as most committed to sustainable finance issues, followed by Deka and DWS. The German Investment Fund Association (Bundesverband Investment and Asset Management e.V., BVI) has more than 110 members and covers 95 percent of the German market. BVI members voluntarily agreed on "Guidelines on Responsible Investing" in 2012, which are now part of the Code of Conduct of the BVI (BVI, 2021 a). Until around 2010, the BVI was very hesitant dealing with sustainable finance issues, but has now become pro-active. It publishes quarterly statistics on the German sustainable fund market since 2020, called "Snapshot Sustainability" (BVI, 2021b).

Since 2005, the German Sustainable Investment Forum (Forum Nachhaltige Geldanlagen, FNG) publishes annually its market report for Germany, Austria, and Switzerland. In the last edition of the market report, the total volume of sustainable investments (ESG criteria are set at product level) in Germany amounted to 335.3 billion euros. The total includes sustainable funds and mandates as well as sustainably managed account deposits and own deposits. The growth rate compared to the previous year was 25 percent. In 2020, sustainable investment funds were the big drivers with 69 percent growth. The growth factors are largely due to the inflows into existing funds. Despite such growth, the market share for sustainable funds and mandates is only 6.4 percent. In terms of responsible investment (ESG criteria are set at the institutional level) the total volume 1.935 billion Euro and shows a growth of 18 percent (Dittrich et al., 2021). The figures for Germany look relatively low if compared to other EU

countries (EUROSIF, 2016). This is partly due to the different criteria and methodologies used in different countries. In Germany and Austria, the surveying institute FNG differentiates between sustainable investments and responsible investment. In sustainable investment, ESG criteria are anchored at the product level. In responsible investment, ESG criteria are anchored at institutional level. Furthermore, the Green and Sustainable Finance Cluster Germany was founded 2018. It is an initiative that emerged from the merger of the Accelerating Sustainable Finance Initiative (Deutsche Börse) and the Green Finance Cluster Frankfurt (owner is Ministry of Economics of the State of Hessen). It aims at bundling activities in the field of sustainable finance to achieve greater use of financial market expertise in the area of sustainability (GSFCG, 2021).

INSTITUTIONAL INVESTORS: INSURANCE SECTOR, PENSION FUNDS, CHURCHES AND FOUNDATION

Institutional investors are other key players in the financial sector and are worth looking it when analyzing in-country-expertise and action on sustainable finance in a given country. In the following, we analyze the market relevance of insurances, pension providers, churches, and foundations. Institutional investors are specialized financial intermediaries which collect and manage funds on behalf of small investors toward specific objectives in terms of risk, return and maturity. The major types of institutional investors in Germany are insurance companies and investment funds, followed by public institutions, foundations, companies, churches (Maurer, 2003). Institutional investors basically have two basic motivations for considering sustainability and ESG criteria in their investment strategy: One motive is the inclusion of one's own values in the investment. This is particularly the case with church organizations, charities, and foundations. The second motive, the more return- and risk-oriented investors are convinced that the additional criteria for an issuer's ESG-related performance help to assess the opportunities and risks of an issuer and better understand its securities and thus improve the risk / return ratio of investments (Häßler, Tober & Wilhelm, 2019).

According to the FNG market report (FNG, 2021) the largest group of sustainable investors in terms of volume are still churches and welfare organizations (29,4%), followed by insurance companies (17,1%), public sector (16%), foundations, public and corporate pensions funds are just under 10 percent. One of the major groups of institutional investors is the insurance sector which are targeted by sustainable investment advocacy groups. German Insurance Association, (Gesamtverband der Deutschen Versicherungswirtschaft e.V., GDV) is the branch organization and represents 1.700 billion Euro. In the past GDV was cautious or even critical on sustainable finance and recommended market-based processes and voluntary commitment (Wiener & Ockenga, 2019). In 2015, GDV published "Non-binding guidelines for the integration of sustainable criteria" (GDV, 2015). This has been a small but still important step towards more sustainability. GDV formulated new sustainability goals in February 2021. It recognises that climate change is one of the most pressing challenges and now aims to have a climate-neutral investment portfolio by 2050 (GDV, 2021).

The *private insurance business* in Germany has its origins in three different lines: mutuals, public, and commercial insurance companies (Maurer and Somova, 2007). The largest insurance company in Germany is by far the Allianz Group with more than 140 billion EUR in gross written premiums, followed by Munich Re with 50 billion EUR and Talanx with around 35 billion EUR (Statista, 2021).

Allianz pledged to stop selling insurance to coal companies. In addition, Europe's biggest insurer said it would stop investing in companies that do not cut their greenhouse gas emissions (Allianz, 2021; Deutsche Welle, 2018).

Churches and their associated institutions have a long tradition in applying criteria of ethical finance. Both the Protestant and the Catholic Church hold a high volume of assets in Germany. The estimated assets of the Catholic Church amount to 100 billion EUR. The ethical values of the churches guide their investments according to their publications. The Catholic Church published an orientation guide for ethical investments (Deutsche Bischofskonferenz, 2015). The protestant church established the Arbeitskreis kirchlicher Investoren (AKI), a working group of the churches on value driven investments in 2008. It publishes guidelines and engages in networking activities with like-minded investors (EKD, 2019).

In other countries *pensions funds* are playing a relevant role for promoting sustainable finance. In Germany this is not the case – partly because of its pension system. In Germany, the most dominant form of pension provision is the statutory PAYG (Pay-As-You-Go) scheme, called the 'gesetzliche Rente'. This is a system in which state retirement benefits are financed by contribution levied from current workers, corresponding to a certain percentage of their income.

Germany has no state funds for pensions. This implies that no major sovereign wealth funds exist that could promote sustainability criteria under government objectives. In Germany, there is still a company pension scheme as the second pillar of pension insurance, and private old-age provision as a third pillar. In the German corporate pension sector, 35 corporate pension funds and 133 corporate pension institution companies (Pensionskassen) operate and are regulated by the Federal Financial Supervisory Authority (BaFin). The umbrella organization for the various types of occupational pensions is the working group for company pension scheme (Arbeitsgemeinschaft für betriebliche Altersversorgung e.V., ABA) with currently about 1500 members. For the public sector's occupational pension scheme, the Pension Institution of the Federal and State Governments (Versorgungsanstalt des Bundes und der Länder, VBL) – has provided pensions for already 80 years. It is the largest provider of supplementary pensions in Germany. Some 5400 participating employers and about 4.3 million insured employees use VBL's services. VBL manages more than 12 billion EUR of employee and employer contributions. Its investment policy is currently subject of a campaign by Finanzwende.de, a nonprofit organization mentioned in section 3.1. The ten biggest pensions funds in Germany manage approx. 92 billion Euro. Compared to countries with a state-owned sovereign wealth fund, such as Norway, this is low. The Norwegian state pension fund manages approx. 865 billion US $.). Only few of the German pension funds started to engage more deeply in sustainable finance. e.g. the Metal Industry Pension Fund (Metallrente), and the Bavarian Pension Fund (Bayrische Versorgungskammer BVK). In a study "German pension funds – ready for sustainable investment" of the year 2020, the investment guidelines of 18 of the largest German pensions funds were evaluated. Only 7 pensions funds applied specific exclusion criteria, especially banning companies that produce controversial weapons such as landmines. The EU Directive 2016/2341 on the activities and supervision of institutions for company retirement provision (IORP-II-RL) obliges pension funds to integrate ESG criteria into their risk management and to actively inform beneficiaries about appropriate measures. The law for the implementation of the second shareholder rights directive (ARUG II) obliges institutional investors to publish a so-called participation policy every year, in which they explain how they deal with "important matters" care of the companies whose stocks they hold. ESG issues such as climate change are also important issues in many industries.

German *foundations* play a non-negligible role in promoting sustainable and responsible investments though the foundation sector is quite diverse. There are currently 23.876 private foundations with their

own legal identity in Germany (BDS, 2021a). The known assets are worth around 110 billion EUR (only from around 12.000 foundations) (BDS, 2021b). It is worth mentioning that there are a number of foundations started by Germans with legal identity in Luxemburg which are not covered by the statistics of the BDS. The investment policies of private foundations are usually conservative as prudent financial management is mandatory in the context of state supervision. The German apex body for the foundations, the Association of German Foundations (Bundesverband Deutscher Stiftungen, BDS) provides analysis and guidance for its member foundations and has taken a supportive stance on the 2030 Agenda (BDS, 2017).

Foundations are encouraged by various stakeholders to align their asset management with their purpose and apply criteria of ethical investment. Their investment strategies are divers, more than half invest in funds and fixed-term deposits, followed by investments in real estate, shares and corporate bonds (BDS, 2021a). In Germany, most foundations focus on social purposes, e.g. by working for and with children, youth and elderly people). Such purposes account for more than 50 percent of the purpose of foundations, Other important purposes of foundations include the promotion of education, art, and culture (more than 30 percent). The number of environmental foundations has been growing significantly and has reached about 20 percent. There are no official guidelines for German foundations how to invest their assets. This is contrary to the neighbour country Switzerland. Swiss Foundations are supposed to follow sustainability guidelines. Sustainability is referenced in the in the Swiss Foundation Code since 2015. The Code addresses mission investments and sustainable investments under the focus, that foundations have to be interested how they earn their money (Sprecher, Egger & von Schnurbein, 2016). The engagement of German foundations with sustainable finance issues is quite diverse. While there is still ignorance among some foundations, other foundations are very pro-active. One of the pioneers in terms of sustainability orientation of asset management is the Bewegungsstiftung, founded in 2002. They have been working on political issues, set up an investment advisory committee and have invest along relatively strict sustainability criteria since 2004. Another active foundation is EVZ-Foundation "remembrance, responsibility and the future" (Stiftung EVZ, 2021a). In accordance to their foundation target, within the ethical investment strategies e.g. human rights violation, modern form of compulsory labour (Stiftung EVZ, 2021b). The German Federal Environmental Foundation (Deutsche Bundesstiftung Umwelt, DBU) is one of the largest foundations in Europe, with the aim of environmental protection. ESG criteria are part of their investment guidelines since 2005. In 2012, the DBU was the first nonprofit organization in Germany to sign the "UN Principles for Responsible Investment" (PRI). In 2019, the DBU invested 80 million Euros in green bonds and bonds for sustainable projects and 60 million in renewables. DBU decided not to make any new investments in the coal sector already at the end of 2015 and to divest from coal. Most divestments were done in the year 2016 (Dittrich et al. 2021). With the increasing regulation from the European side, a stronger commitment is also expected here. Institutional investors, including foundations, are expected to further promote the sustainable finance trends in the next years.

Institutional investors are drivers of the sustainable finance trend in Germany. Except for churches and a few foundations, however, most of the institutional investors have just started to pay more attention to sustainability criteria. There is ample scope for institutional investors to further strengthen commitment and action on sustainability criteria.

RATING AGENCIES AND CONSULTING FIRMS

Rating agencies and consulting firms play an important role in providing ESG related data and supporting the development of responsible investment. In Germany there are classical credit rating agencies, ESG rating agencies and consulting firms providing broader advisory services on sustainable finance related issues. The ESG rating agencies offer customised ESG research services for clients and help asset managers to develop and design innovative and sustainable investment products like ESG funds. Sustainalytics, ISS-ESG, MSCI, IMUG are amongst the leading players in Germany (Busch et.al, 2018; Kuhn, 2020). There are also other companies which offer ESG data related information services e.g. Thomson Reuters and Bloomberg.

Unlike some other EU countries, Germany has a number of home-grown ESG rating agencies. However, the landscape of German ESG rating agencies has recently witnessed changes through a series of acquisitions: large international rating agencies took over smaller home-grown German and European rating agencies: ISS-ESG (US) bought Scandinavian Ethix SRI Advisor and German oekom research. The German Stock Exchange (Deutsche Börse) holds 80% of ISS ESG. Sustainalytics was for a long time the largest European provider with up to eight independent companies. In 2020 it was bought by Morning Star. Vigeo Eiris – the partner of the German rating agency IMUG – was taken over by Moody in 2019. This trend has led to more oligopolist structures (Häßler, 2020). Häßler and some of our dialogue partners of the sustainable finance community are not very positive about this trend.

Häßler (2020) pointed out that the growth and increasing attractiveness of the sustainable finance market, raised the interest of US agencies and tends to lead to oligopolization and US Americanisation of the market. The German Insurance Association (GDV) has also voiced concerns that the dominant position of the new players could cause damage to investors and markets. The EU-Action Plan: Financing Sustainable Growth recommends that credit rating agencies be made more transparent with regard to whether and how sustainability factors are taken into account, also promote solutions that ensure that credit rating agencies fully integrate sustainability and long-term risks (European Union, 2018).

In the beginning of 2021, the European Securities and Markets Authority (ESMA) became more active in addressing risks of "greenwashing, capital misallocation and product misspelling". This may facilitate further proliferation of ESG rating, The ESG rating market is very diverse: 40 ESG ratings, 150 ESG rankings, and 450 ESG indices, not including the large number of investment banks, governmental organizations, and research institutions, who conduct their own ESG related research that can be used to produce ratings. The development from a niche to a mainstream prepared the ground for business opportunities for ESG rating agencies and ESG data provider. We observe that large companies buy their way into the market. (Berg et al., 2020) point to the problem of missing binding definitions and low comparability between providers of ESG ratings. The different methodologies lead to confusion (Berg et al., 2020). In addition to the specialized providers, KPMG, PwC, Ernst & Young (EY) and Deloitte – known as the Big Four auditing and strategy consulting firms, have stepped up their efforts to be on top of the sustainable investment agenda.

LOBBY AND ADVOCACY-ORIENTED NONPROFITS

Until about five years ago, the driving force behind sustainable finance were actions of nonprofits which started and promoted sustainable finance discourses based on their strong expertise and passionate en-

gagement. The Association for Environmental Management and Sustainability in Finance Institutions (Verein für Umweltmanagement und Nachhaltigkeit in Finanzinstitutionen, VFU), founded in 1995, was one of the pioneers working on sustainable finance in Germany (VFU, 2021). It is a network of more than 50 sustainable finance professionals. They integrated sustainable finance in units of major banks and asset management groups. Their efforts were motivated by demand from clients, by reputational gains and by an interest to broadening their portfolio. The VFU was instrumental in gradually integrating sustainability aspects in the decision-making process of banks and asset management groups.

In 2001 the German Sustainable Investment Forum (FNG - Forum Nachhaltige Geldanlagen) was created to promote sustainability through investment strategies. FNG publishes a widely referenced annual market report which provides basic statistics and outlines major trends (FNG, 2021). FNG introduced a certificate, the FNG Seal, in 2015 (FNG, 2021). The FNG seal is a comprehensive quality standard for sustainable investment funds in German-speaking countries. The certification has to be renewed annually. It is audited by the University of Hamburg (Qualitätssicherungsgesellschaft Nachhaltiger Geldanlagen, 2020). FNG is well networked at the level of the EU. It is founding member and one of eight members of EUROSIF, the European association for the promotion of sustainable and responsible investment across Europe (EUROSIF, 2021). FNG is considered an active organization. However, it has recently experienced frequent changes of Managing Directors which could weaken the organization (Tagesspiegel, 2021).

The Corporate Responsible Interface Center (CRIC), the nonprofit association for the promotion of ethical and sustainable investment, was founded in 2001. It is another relevant player in German speaking countries. It regards itself as both an information platform and a center of competence. It engages in dialogue with representatives from the business community, politics and society. CRIC is representing numerous church actors and prioritises ethical and social issues within the context of sustainable finance (CRIC, 2021).

Ecological Finance 21 (Ökofinanz-21), founded in 2003, is a network of financial advisors promoting social and ecological goals with financial products. As an established actor in the market for many years, ökofinanz-21 is convinced that acting responsible is necessary and brings financial benefits. Their guideline is to ask where the money comes from, for what purpose and where it is going. As pioneer in the branch, they have a high reputation in the dark green area of sustainable finance (Ökofinanz-21, 2021).

Finance Watch Germany (Finanzwende.de) was started in 2018 as a nonprofit organization by Gerhard Schick, a former Member of Parliament for the Green Party who gave up his political mandate to engage in campaign and lobbying work to promote the interests of small retail investors and sustainable finance discourses from a grassroots perspective. Finanzwende aims to act as a counter-vailing force for the lobby of financial industry. One of their most recent campaigns targets the Federal Government and State Government Pension Fund (In German: Versorgungsanstalt des Bundes und der Länder, VBL) in an effort to promote sustainable investment by pension funds. VBL is one of the biggest institutional capital investors in Germany. Other recent themes are the role of Blackrock as consultant for sustainable finance for the EU Commission, the role of the German Sparkasse and the light green bond (Finanzwende, 2021).

Two organizations with a long tradition in environmental action have also been active in the field of sustainable finance. The nonprofit Urgewald, founded in 1992, is a grassroots environment and human rights action-oriented nonprofit organization which adopts a critical approach on big asset management groups. They act as critical shareholders in general assemblies and exercise voting rights from an advocacy perspective. Urgewald organized a money for future festival in 2020 and published a widely reference critical report on BlackRock's asset management which points to BlackRock's continued investments in fossil fuel companies (Urgewald, 2021). Südwind, founded in 1991, is a nonprofit with Christian roots

that focuses on fair trade in North-South relations. Südwind has been working on sustainable investments for over 20 years. It critically analyzes different approaches to making investments effective in terms of ecological and social sustainability. It produced reports on topics such as best-in-class approach, impact investment, shareholder engagement, raw material investments and investments in land. is also working on the consequences of the financial market crisis for developing and emerging countries (Schneeweiß, Seitz & Straub, 2020).

Another advocacy organization is Facing Finance, founded in 2013. They critically monitor investments from banks, insurance companies, pension funds. Facing Finance publishes rankings of banks and insurance companies. Their campaigns focus on different themes each year. The theme of the year 2021 was the fight against global plastic pollution (Küchenmeister et al., 2021).

In Germany, consumer associations, such as the leading association German Consumer Center (in German: Verbraucherzentrale) are active in helping private consumers in all matters of their life. Since about 2016, such organizations started to pay more attention to financial products. The leading consumer association Verbraucherzentrale is widely known in Germany. Thus, its screening of various financial products received significant attention and contributed to raise the awareness of retail investors on sustainable finance issues. With GeldmitSinn (founded in 2010) and VenGa (founded in 2017) two other private consumer-oriented NGO raise awareness on issues related to sustainable finance and provide specific information on financial products available to small retail investors.

Fridays for Future (FFF), the global climate strike movement started by Greta Thunberg from Sweden, is another noteworthy player in Germany. This social movement has a strong base in Germany. FFF has extended its climate action agenda and also addresses sustainable finance issues with a focus on divestment from fossil fuel assets (FFF, 2021). Greenpeace is also engaging stronger with sustainable finance. Its Luxemburg office published a critical report on the climate impact of the 100 largest Luxembourgish investment funds which revealed that these 100 funds on average invest in a way conducive to a 4°C increase in global temperature by 2050 – or even 6°C and more in some cases (Greenpeace, 2021).

The German office of World Wildlife Fund for Nature (WWF), one of the largest international environmental nonprofit organizations, has published a ranking of banks according to sustainability criteria. In cooperation with the NKI, the Institute for Sustainable Capital Investments, it analyzed investment policies and practices of the fourteen largest banks. The study focused on how the banks integrated sustainability issues, including ESG, in strategies, processes and products. The study concluded that sustainability strategies are defined at management level in many banks. However, such definitions and proclaimed commitments tend to be lofty and are not well integrated in the core business and in the design of financial products. The study also revealed that there are significant differences between some of the banks, including those belonging to the same holding, e.g. the Sparkassen Finanzgruppe, the Savings Banks Finance Group (WWF, 2020).

Furthermore, a growing number of nonprofits working in the field of environmental and climate action, e.g. Greenpeace, have recently joined sustainable finance initiatives at different levels. It is expected that more nonprofits will recruit staff with expertise in sustainable finance to capacitate themselves and to complement their environmental action agenda. This applies also to city governments which are under political pressure to shift funds to more sustainable investments, sometimes with mixed results (Kuhn, 2020).

ACADEMIA

In German Universities, expertise on sustainable finance is still limited but has grown in recent years. Some of the leading researchers provide advisory services to high-level networks and expert committees. The study of Friede, Busch & Bassen (2015) on "ESG and Financial Performance: Aggregated Evidence from more than 2000 Empirical Studies" is among the most widely referenced studies. Some academics are active members of networks and committees though the Sustainable Finance Committee of the Federal German Government mainly consists of experts of the financial industry and the nonprofit sector (Sustainable Finance Beirat, 2021).

The University of Hamburg, official international name: Universität Hamburg, established a renowned academic hub on sustainable finance and its members influenced policy development on sustainable finance in Germany. The Sustainable Finance Research Group of the Universität Hamburg is comprised of professors in the area of Finance, Accounting and Strategy as well as senior fellows from the financial sector. Alexander Bassen and Timo Busch are among the most widely published members. The aim of this group of researchers is to highlight the role of financial markets and investments for sustainability in business practice (Sustainable Finance Research Group, 2021).

The German Institute for Economic Research (Deutsches Institut für Wirtschaftsforschung, DIW) hosts the Sustainable Finance Research Platform since 2020. It is a network of five German research institutions that have been conducting intensive research on sustainable finance for many years. Founding members include the University of Augsburg (Universität Augsburg), Frankfurt School of Finance and Management, Universität Hamburg, and University of Kassel (Universität Kassel). The platform plays an advisory role in the political and public discourse and provides inputs and feedback to the Sustainable Finance Advisory Board of the German Federal Government (DIW, 2021).

Free University of Berlin (Freie Universität Berlin, FU Berlin) organizes annual transdisciplinary sustainability conferences which attract participants from around the world. The 2020 Conference of the University Alliance of Sustainability focused on the topic of sustainable finance in one workshops (Freie Universität Berlin, 2021). Researchers from Freie Universität Berlin, Universität Hamburg, University of British Columbia, Hebrew University, and the Swiss Federal Institute of Technology Zurich (Eidgenössisch-Technische-Hochschule Zürich, ETH Zurich) met with practitioners, including executives from FNG Germany, the Chinese Green Belt and Road Initiative Center. Publications appeared in the Journal for Sustainable Finance and Investment (JSFI).

The Frankfurt School of Finance & Management is another key academic player in the field of sustainable finance and investment. It organizes an annual flagship conference on sustainable finance since 2007, involving the Association of German Foundations and other stakeholders. The Chair of Sustainable Finance at the Universität Kassel specializes in researching topics on sustainable finance. Professor Christian Klein and his team focus on the behaviour of sustainable investors, the characteristics of sustainable investments, and the effects of sustainability on the capital market (University of Kassel, 2021).

There are a few university chair holders who work on sustainable finance. Rüdiger Hahn holds the Henkel-Endowed Chair of Sustainability Management at the Heinrich-Heine-University Düsseldorf (Heinrich-Heine Universität Düsseldorf, HHU) since 2018 and is also involved in research on sustainable finance. Andreas Oehler who holds the Chair of Finance at Bamberg University (Universität Bamberg) works on ESG and sustainable finance issues. The EBS Business School offers a Master of Business with a specialization on sustainable finance (EBS 2021). The Sustainable Business Institute (SBI), Dr. Paschen von Flotow, are also researching on sustainable finance issues (Sustainable Business Institute, 2021).

CONCLUSION

Multiple factors are shaping the sustainable finance trend in Germany. The pentagon sustainability framework (Kuhn, 2016) with focus on political leadership, discourses, in-country expertise, institutional density, and international cooperation provides a useful perspective on how and by whom the trend is shaped in Germany. We analyzed the role and contributions of diverse stakeholders in Germany. Most of them, including policymakers, regulatory authorities, and major banks and asset managers, have jumped on the trend only recently. We have long observed parallel developments. The major banks and the mainstream of the investment community have shown little interest in ethical and sustainable investment and opposed the idea of more regulations of financial markets for many decades. German regulatory authorities have not taken much initiative either. At the level of nonprofit associations and churches, however, Germany witnessed a relatively strong ethical finance movement which was able to accumulate significant expertise and to extend its network, especially after the last financial crisis of 2008/2009. The two major churches, some foundations, and a relatively large number of advocacy-oriented nonprofits were pioneers of ethical and sustainable investments in Germany and promoted discourses on how to focus more on the ethical and sustainability dimensions of investments.

Critical reflection on the role of the financial sector slowly gained traction among business and nonprofit networks. Already in 2008, members of the Green Party discovered the political relevance of the sustainable finance trend. The financial crisis of 2008-2009 negatively impacted on the reputation of the banking and investment community, led to a series of new regulations, and prepared the ground for alternative visions for the role of the financial sector. This change of perception on the role of the financial sector fell on futile ground in Germany because the two major churches, various advocacy-oriented nonprofits, and a few specialised banks had accumulated expertise on sustainable finance over many years which could quickly made available to policymakers. The protestant and catholic church both played a non negligeable role in promoting sustainable finance through their good practice examples. They hold significant assets and were pioneers of ethical investment. As early as the 1990 and 2000 years, sustainability and ethical banks were founded, some with Christian background. The expertise and networking of the FNG and its sister organization CRIC – first from asset manager side and second from investor side – contributed to raise awareness and muster growing support from the financial sector after the year 2000.

The process of mainstreaming gained further momentum in the context of Germany's strong commitment to the implementation of the 2030 Agenda for Sustainable Development and the Paris Agenda from 2015 onwards. This shows that international agreements and international cooperation matter to move the political leadership. Academic papers made also widely quoted contributions by providing evidence of good financial performance of ESG and sustainability-oriented funds, especially the paper of Friede, Bassen & Busch (2015).

The establishment of the EU Action Plan: Financing Sustainable Growth in 2018 was an important milestone and strongly impacted on new policies and regulations in Germany. Without the agreements at the level of the EU, national efforts would have been much smaller. The regulation of the EU's Action Plan eventually led to activities at all levels of the financial industry, including asset management companies, insurance companies, financial advisors, and rating agencies. Today, the main drivers of sustainable finance in Germany are institutional investors though private investors are also making growing contributions to this trend. According to the FNG Market Report 2021 (FNG, 2021), the growth of funds that meet the criteria of FNG for sustainable investments amounted to 69 percent due to a substantial

increase of inflows in 2020. Private investments in sustainable investments witnessed a growth of 117 percent. Sustainable investment funds represent 6,4 percent of total funds in 2020. 71 percent of FNG survey participants believe that investment in sustainable funds will further grow in 2021.

Which issues will be on the sustainable finance agenda in Germany in the coming years? Measuring of impact will be of key importance according to 82 percent of respondents to a FNG Survey (FNG, 2021). Limited availability of data and challenges to measure sustainability criteria, deficits in regulatory clarity, and limited investment opportunities are regarded as major obstacles (FNG, 2021). Digitalization is another trend in the finance sector as availability and processing of data will remain a challenge. It is also expected that we shall see further mergers and acquisitions in the field of specialized institutions, such as ESG Data provider, and rating agencies.

Key players in the financial sector are worried about a loss of reputation if they do not take sustainability issues and climate issues into account. German NGOs are expected to voice more concerns on greenwashing and will engage in naming and shaming activities by scrutinizing the investment activities of large asset management groups and critically monitoring regulations at the level of the EU. Environmental and consumer organizations pulled out of an EU expert group in protest of the European Commission's decision to classify some forestry practices and highly-emitting types of biomass as sustainable investments (Bannon, 2021).

In view of the dynamic developments at the level of the EU and the pressing need for more ambitious climate action, it is expected that the process of mainstreaming of sustainable finance will continue. The sustainable finance trend is expected to gain even more traction in the next decade. The new ruling coalition government in Germany will continue to take actions in the field of sustainable finance. The Green Party has demonstrated the most pronounced interest in promoting the topic among the political parties represented in the German Parliament. With the role and claim of Germany within the framework of the European Union and in international bodies, it can be expected that the institutional and regulatory involvement with sustainable finance will growth further.

In the financial and banking sector, more laggards will jump on the sustainable finance trend due to new policies and regulations, intensified international competition and loss of reputation with non-consideration of sustainability factors. Many efforts are now aimed at acquiring relevant knowledge and expertise on sustainable finance topics. Campaigns of nonprofits such as Finanzwende, Urgewald, WWF, and Facing Finance might play a role in moving some institutional investors, including pension funds and city governments, move faster and comply with sustainability criteria in wealth management. Experts largely agree that the young generation in Germany has more knowledge on finance, is more active on financial markets, and is more sensitive to sustainability issues. The sustainable finance trend in Germany will be shaped by multiple factors and drivers. It is expected that the trend will gain further traction among policymakers, the investment community, and a series of other stakeholders, including cities, and many nonprofits. Emerging debates will more strongly focus on quality issues, including definitions of ESG and sustainability criteria, avoiding greenwashing, impact of sustainable finance, digitalization, transparency issues, monitoring, and evaluation of green investments.

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APPENDIX

ABA Arbeitsgemeinschaft für betriebliche Altersvorsorge – working group for company pension scheme
AFD Alternative für Deutschland - Alternative for Germany
AGI Allianz Global Investors
AIFMD Alternative Investment Fund Manager Directive
AKI Arbeitskreis kirchlicher Investoren – Working group of church investors
ARUG Gesetz zur Umsetzung der Aktionärsrechterichtlinie
BAFA Bundesamt für Wirtschaft und Ausfuhrkontrolle - Federal Office of Economic Affairs and Export Control
BaFin Bundesanstalt für Finanzdienstleistungsaufsicht – German Federal Financial Supervisory Authority
BDS Bundesverband Deutscher Stiftungen – Association of German Foundations
BMF Bundesfinanzministerium – Federal Ministry of Finance
BMU Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit - Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
BMWi Bundesministerium für Wirtschaft und Energie – Federal Ministry of Economic Affairs and Energy
BVI Bundesverband Investment und Asset Management e. V. – The German Investment Fund Association
BVK Bayrische Versorgungskammer
BVR Bundesverband der Deutschen Volksbanken und Raiffeisenbanken – national association of German cooperative Banks
CDU Christlich Demokratische Union Deutschland - Christian Democratic Union
CFIN Research Center for Financial Services an der Steinbeis-Hochschule Berlin GmbH
CRIC Corporate Responsibility Interface Center
CSR Corporate Social Responsibility
CSRD Corporate Sustainability Reporting Directive Proposal
DBU Deutsche Bundestiftung Umwelt – German Federal Environmental Foundation
DIW Deutsches Institut für Wirtschaftsforschung - German Institute for Economic Research
DKM Darlehnskasse Münster
EBA European Banking Authority
EBS European Business School
EIOPA European Insurance and Occupational Pensions Authority
EKD Evangelische Kirche Deutschlands – protestant church Germany
ESG Environmental, Social, Governance
ESMA European Securities and Markets Authority
EP European Parliament
ETH Eidgenössische Technische Hochschule
EU European Union
Eurosif European Sustainable Investment Forum
EVZ Erinnerung, Verantwortung Zukunft – Remembrance, responsibility and the future
EY Ernest & Young
FNG Forum Nachhaltige Geldanlagen e.V. – German Sustainable Investment Forum

FFF Fridays for Future
FU Freie Universität – Free University
G20 The Group of Twenty
GDV Gesamtverband der Deutschen Versicherungswirtschaft - German Insurance Association
GSFCG Green and Sustainable Finance Cluster Germany
HHU Heinrich Heine University Düsseldorf
HLEG High Level Expert Group
IDD Insurance Distribution Directive
IMUG Institut für Markt-Umwelt-Gesellschaft e.V.
IORP Institution for occupational retirement provision
ISS Institutional Shareholder Services
JSFI Journal for Sustainable Finance and Investment
KfW Kreditanstalt für Wiederaufbau (German Development Bank)
MIFID Markets in Financial Instruments Directive
MSCI Morgan Stanley Capital International
NGFS Network for Greening the Financial System
NGO Non-Governmental Organizations
PAYG Pay-as-you-go
PRI Principles of Responsible Investment
RNE Rat für Nachhaltige Entwicklung – German Council for Sustainable Development
SBI Sustainable Business Institute
SDG Sustainable Development Goals
SF Sustainable Finance
SFDR Sustainable Finance Disclosure Regulation
SFRG Sustainable Finance Research Group
SPD Sozialdemokratische Partei Deutschland
TEG Technical Working Group
UBA Umweltbundesamt - Federal Environment Agency
UCITS Undertakings for Collective Investments in Transferable Securities
UN United Nations
UNEP United Nations Environmental Programme
PRI Principles of Responsible Investment
VBL Versorgungsanstalt des Bundes und der Länder – Pension Institution of the Federal and State Government
VenGa Verein zur Förderung ethisch-nachhaltiger Geldanlagen e.V.
VFU Verein für Umweltmanagement und Nachhaltigkeit in Finanzinstitutionen
WWF World Wide Fund for Nature

Chapter 15
Rethinking the Prospects of Sustainable Finance and Challenges of Agribusiness Transformation in Nigeria:
Implications of the Nexus for Entrepreneurship Development

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ABSTRACT

The chapter explicates the need to rethink the prospects of sustainable finance (SF) for agribusiness transformation in spite of the challenges facing the sector in Nigeria. It extends to highlighting the implications of the nexus on entrepreneurship development. After a triangular data analysis using the world development indicators (2000-2016) and scholarly articles, the authors found that the prospects of SF are enormous: (1) Nigeria has a modest agricultural growth performance in the crop, food, livestock, and cereal production that could support SF; and (2) SF options such as green loans, green bonds, green credit, green investment funds, green mortgage scheme, and other green financial support instruments could be suitable for agribusiness transformation in the country. Also, the content analysis revealed there are 13 challenges facing agribusiness transformation in the country, and these have harmed the vegetation, farmland, and ocean leading to low productivity. The authors contribute to the literature by identifying SF options as a game-changer for agribusiness transformation.

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INTRODUCTION

Insights from decades-old literature revealed that agricultural financing for the purchase of seed, fertilizers, machinery and other farming needs has been a raging issue (Ihimodu, 1983). The old literature also explicated that private sector financing for agriculture is very minimal because agricultural financing does not give attractive returns compared to other sectors of the economy (Ihimodu, 1983), hence the bulk of the financing for agriculture has come from the government, which is grossly inadequate because the demand for agricultural financing outweighs the supply (Olomola, 1991; Adegbite et al., 2008). Amazingly, the situation in the agricultural sector has not really changed, as the challenge of financing persists. According to Lawal & Abdullahi (2011), the challenge of agricultural financing has not abated as a large percentage of the rural farmers do not have access to financial resources because of the stringent conditions imposed by the formal financial and credit institutions. To survive, however, the farmers resort to financing from three informal financing schemes namely: (i) periodic savings; (ii) money lending; and (iii) rotating savings.

After the official launching of the sustainable development goals (SDGs) by the United Nations, a renewed determination to transform agribusiness was initiated by the policymakers in Africa (Nigeria inclusive) because one of the thematic issues that the SDGs intend to address is food sustainability through an inclusive agricultural strategy (Babu, Mavrotas & Prasai, 2018; Panel, 2018; Ali, Agyekum & Adadi, 2021). To actualise the targets of SDGs, there is a need to rethink agribusiness transformation in Nigeria through sustainable finance (SF, henceforth) because both development-oriented nuances have the capacity to boost food production, increase the GDPs, and could directly strengthen the actualization of SDG 1, SDG 2, SDG 3, SDG 8, SDG 9, SDG 10, SDG 11, SDG 12, SDG 14, SDG 15, SDG 17, and indirectly impact other SDGs (Dhahri & Omri, 2020; Raimi, Che & Mutiu, 2021). Nigeria is the context of focus in the chapter because of its strategic status in the Sub-Saharan Africa. Nigeria's agribusiness flourished for several decades, but successive leaders neglected the agricultural sector, and oil became the most viable resource that drives economic development (Matemilola, 2017).

To transform agribusiness in Nigeria, the sector requires sustainable financing. Agribusiness transformation is believed to have the capacity to increase the earnings of the poor and boosts the productive capacity of farmers in three stages as explained in the literature. In the first stage, agricultural transformation triggers realignment in the labour market by pushing surplus labour out of the agriculture sector, thereby increasing farmers' real wages. In the second stage, surplus pushed out from the agriculture sector are absorbed or pulled into other sectors that use agricultural products as inputs such as manufacturing, retailing and services. In the third stage, agricultural transformation increases the supply of affordable food in the economy and create a win-win situation for all (Alvarez-Cuadrado and Poschke, 2011; Otchia, 2014]).

Agricultural transformation for optimal productivity has been used productively across the world, but the outcomes have been slowed down by challenges such as overuse and mismanagement of land resources through unsustainable and extractive farming practices (Mainguet, 2012; Lal, 2020). In North-East India, the mismanagement of land resources through the use of toxic chemicals and pesticides have altered the quantity and quality of water resources (Sharma, 2003). In South-East Asia and the Pacific, humans through mismanagement of the forest reserves have triggered a number of forest fires through carelessness, negligence or misuse of the land resources leading to depletion of land resources and environmental degradation (Dahlan & Puat, 2000). Worse still, in several parts of the world, the use of ozone-depleting chemicals, toxic pollutants and pesticides have negatively affected the vegetation and

the farmland altering the chemistry of the ocean and increased the concentration of atmospheric greenhouse gases – a situation which scholars explained portends grave danger and existential threat to lives of humans, flora and fauna (Kolbert, Wilson & Lovejoy, 2017).

To redress the challenges facing agribusiness, the academic and policymakers emphasized that agribusiness and its financing have to be built on inclusive business models in the context of the sustainable development goals (SDGs) and the promotion of the circular economy (Oostendorp et al., 2019). But, Schmidt-Traub & Shah (2015) argued that for the actualization of the targets of SDGs, incremental investment is needed by the low- and lower-middle-income countries from both private commercial financing and public financing. The World Bank (2021) remarked that Africa's agribusiness market valued at US$313 billion has a greater prospect of being tripled by 2030, when massively funded by private investments because of scarce public resources in order to actualize the SDGs. Furthermore, agribusiness requires sustainable finance because it is an inclusive finance that has the prospect of creating a climate-smart agricultural production that is supportive of sustainable development, green economy, low carbon economy and adaptation to and mitigation of climate change, while maintaining agribusiness productivity and profitability (Musvoto et al., 2015; Ryszawska 2016). Most previous studies discussed finance for funding short-term input purchases but ignore the climate-smart agriculture that would help transform the agribusiness value –chain in a manner that is operationally, economically, socially and environmentally sustainable (Oostendorp et al., 2019).

For bridging the research gap on SF for agribusiness transformation in the developing country context, this chapter explicates the need to rethinks the prospects of sustainable finance against the challenges facing agribusiness transformation in Nigeria. It extends to examining the implications of the nexus of sustainable finance for agribusiness transformation on entrepreneurship development in the country. In specific terms, the study provides answers to the following research questions: (a) What are the prospects of SF for agribusiness transformation in Nigeria? (b) What are the challenges facing agribusiness transformation in Nigeria as a low-income economy? (c) What are the implications of nexus of SF and agribusiness transformation on Entrepreneurship Development in Nigeria? Nigeria is chosen for this discourse because of its strategic position in Sub-Saharan Africa (SSA). Restrictions on movement through lockdowns and suspension of imports had devastating consequences on the countries that heavily depend on imported agricultural products and migrant farmworkers who are particularly vulnerable to COVID19 (Altieri & Nicholls, 2020). The pandemic has therefore underscored the importance of agribusiness for food security, food availability and food sustainability for citizens (Pulighe & Lupia, 2020). The three arguments above justify the need to strengthen agribusiness with SF options.

METHODS AND APPROACH

This is a qualitative research that provides a deeper insight into agribusiness and SF. In order to achieve the objectives of the study, we sourced the required data from scholarly articles, texts, World Bank data (2000-2016), national policy documents, working papers, national development plan reports, and other online resources on agribusiness and SF. We combined and integrated non-numeric and numeric data using content analysis. Content analysis is a logical procedure for quantifying the contents of texts, writings, interviews, picture speeches, books, correspondences, and other verbal data (Denscombe, 2017). It allows the texts, words, and other visual and verbal data to be compressed, classified, summarized, and tabulated into fewer content categories for meaningful and useful interpretation in research (Saun-

ders et al., 2016). For more clarity, our mixed-method approach follows a three-stage process explained further below.

i. **Stage 1: Data sourcing** - This stage focuses on sourcing the required numeric and non-numeric secondary data to address the formulated research questions. For data sourcing, we explored Science Direct, Google Scholar, and ProQuest for articles from which over 80 relevant articles were selected through the purposive sampling technique. The articles selected through the purposive sampling technique followed the selection criteria below:
   - Selected articles discuss agricultural practices and financing challenges from the Nigerian context;
   - Selected articles provide insights on sustainable finance and principles of sustainable finance in relations to the SDGs; and
   - The articles chosen focus on agribusiness transformation in Nigeria

ii. **Stage 2: Data development and conversion** – This relates to compiling the secondary data and previewing for suitability in readiness for analysis data. Specifically, secondary data on the agricultural productivity of Nigeria were critically reviewed and contextualised to address the research questions that the chapter sets out to answer.

iii. **Stage 3: Data analysis** – The data gathered from mixed sources were appraised and analysed using a combination of content analysis and descriptive statistics to provide answers to the four research questions that the study set out to answer. This methodological approach is supported by Jepson, (2009), and Williams & Shepherd (2017).

BACKGROUND

The concepts of agribusiness and sustainable finance that underpin this chapter are sequentially discussed along with the evolution of SF principles and the theoretical foundation.

Agribusiness Defined

Agribusiness refers to the entire agricultural value chain starting with growing, nurturing, harvesting, transporting, processing, and distributing agricultural products (food and cash crops) throughout a country (Mukundi, 2019; Barnard, Foltz, & Yeager, 2020). But, Chait (2020) describes agribusiness as agricultural entities spanning small, large, corporate, and independent companies that understand the business of food production, processing, and distribution. Moreover, Cains and Henshel (2019) describe agribusiness as a large-scale agric-oriented business that encompasses all aspects of agricultural production, processing, and distribution of products and the assembly of farm machinery and supplies. From the various definitions above, agribusiness covers diverse segments of commercial agriculture including marketing and distribution, retailing, and wholesaling. Perception about agriculture has radically changed from its description by Arthur Lewis as a backward unproductive subsistence sector (Christiaensen, Demery & Kuhl, 2011). The contemporary view depicts agriculture as a productive sector that contributes to the growth in other sectors such as manufacturing, food processing, construction, hospitality, services, and retailing. The low agricultural productivity of the past is linked to poor agricultural policy, low investments in commercial agriculture, and delayed transformation of agricultural activities (Christiaensen et

al., 2011). The relevance of agribusiness to economic development is strongly supported by the historical experiences of Europe and America. In England, surplus earnings from agriculture supported the technical and social transformations in Great Britain (Magdoff, Foster & Buttel, 2000). In the United States, agriculture provided a regular source of food for consumption, and raw materials for the factories and food processing plants were made available by suppliers/vendors in the agribusiness, and more importantly, agriculture provided employment opportunities for the growing American population and by extension contributed to poverty reduction (Bresciani & Valdés, 2007).

Sustainable Finance

The definition of SF draws from several sustainability principles such as the Triple themes of sustainable development (economic, environmental, and social dimensions), the environmental, social, and governance (ESG) criteria, the 17 sustainable development goals (SDGs), the Equator Principles (EPs) among others. Specifically, sustainable development (SD) refers to a development strategy that addresses the socio-economic and environmental needs of the present generation without compromising the needs of the upcoming generation (Nagesha and Subrahmanya, 2006; Adebakin and Raimi, 2012). This presupposes that humans and corporations should utilize natural resources ethically without stressing the Earth system.

The SF is defined as the integration of three sustainability aspects in the decision-making processes of financial market actors, financial market policy, and related institutional and market arrangements in order to contribute to the achievement of strong, sustainable, balanced, and inclusive growth (Sommer, 2020). Whereas, the European Commission (2020) defines SF as the process of taking due account of environmental, social, and governance (ESG) considerations when making investment decisions in the financial sector, which ultimately leads to increased longer-term investments into sustainable economic activities and projects.

Sustainable Finance (SF) considers how finance (investing and lending) interacts with economic, social, and environmental issues (Dirk Schoenmaker, 2017). Having become part of the lexicon in recent times, sustainable finance has been described as 'the provision of finance to investments taking into account environmental, social and governance considerations. It requires a deep transformation of our socio-economic behaviour, structures, and norms in order to ensure the stability and resilience of our livelihood. SF is highly important because several studies alarmed that achieving the SDGs requires a substantial investment annually to deliver the SDGs by 2030 (Franks et al., 2018; Sachs et al., 2019). Also, reaction to sustainability issues is escalating, as governments, business organizations, investors, customers, investors, banks, and other financial institutions are now integrating sustainability factors into their operations, management models, and governance frameworks (Calabrese et al, 2019: Rogers & Serafeim, 2019).

SF for agribusiness transformation became expedient because of the widespread discontent and escalating public pressure on agribusiness firms to embrace more sustainable management practices in the way agricultural production and food processing are being industrialised and commercialised (Jansen & Vellema, 2004; Friedrich, Heyder & Theuvsen, 2012). Consequently, a number of SF options (SFOs) have been developed in response to the pressure on agribusiness firms and financial institutions to adopt more sustainable finance. Some of the SF options include green bonds, green credit, green investment funds, green insurance, impact bonds, blue bonds, and other green financing investments (Jeucken, 2010; Beschloss & Mashayekhi, 2019). Short explanations on SF options are provided in Table 1 below.

Table 1. Explanations of the different sustainable finance options

SN	SF Options	Explanations
1.	Green Bond	This is a fixed-income instrument designed specifically to support climate-related or environmental projects.
2.	Green Credit	This is a financing scheme provided by the banks to support sustainable commercial projects that strengthen sustainable development.
3.	Green investment fund	This is an investible fund given to productive sectors and commercial activities that benefit the environment, and which comply with specific investment criteria, strategies and processes.
4	Green insurance	This is an eco-friendly insurance that covers people and businesses, while contributing to protecting the environment. A fraction of its premium is donated/or invested in planting trees, conservation of rainforests and climate smart agriculture.
5.	Impact bond	Impact bond is a form of results-based financing, whereby an investor provides upfront capital for public projects that deliver social and environmental outcomes. If the projects succeed, the investor is re-paid with interest by government, or by a donor organization or a foundation.
6.	Blue bond	This is an innovative financing instrument for supporting projects and infrastructural facilities on the island and coastal nations with a view to creating long-term sustainable financing for marine protections, sustainable economic development and climate change.
Source: Insights from reviewed literature		

The various SF options explicated above could be suitable for agribusiness transformation in any country (developed or developing) when properly linked with relevant segments of the agribusiness that support investments and projects that directly and positively impact the climate and the environment (Calder, Kolodzie & Selot, 2017; Sojisirikul & Touray, 2019). The development of green financing instruments has been applauded by the Global Sustainable Investment Alliance which stated that for 2018 an estimated $30.7 trillion in institutional assets had been invested in sustainable green products in six major markets, namely: Australia, Canada, Europe, Japan, New Zealand, and the United States (Beschloss & Mashayekhi, 2019). The prospect of FinTech green technologies driving agribusiness transformation has also be expounded because the FinTech green technologies could accelerate the achievement of SDG 12 (responsible production) by promoting synergies between environmental SDG 1 and social SDG 15, which helps increase agribusiness profitability without additional use of natural resources (Hinson, Lensink & Mueller, 2019). To curb recklessness and ensure regard for the environmental and social governance (ESG) considerations of SF based on transparency, comparability, and accessibility, a number of principles have emerged. These principles are discussed in the next section.

Evolution of SF Principles

The SF principles evolved from several concepts, but the most influential is the triple themes of sustainable development recognised in Rio 1992, which include integrating economic and social development with environmental protection (Mohammad, 2010; Savitz, 2013). The three themes of Rio 1992 were framed under five fundamental themes, namely: (1) satisfaction of basic human needs, (2) achieving equity and social justice, (3) social self-determination and cultural diversity, (4) maintaining ecological integrity and biodiversity, (5) integrating environmental and economic considerations (Mohammad, 2010). From the

Islamic finance perspective, the Eight Principles of sustainable development that underpin a balanced socio-economic development in Ibn Khaldun's Economic Thought include (i) collective entity (state), (ii) rules and regulations, (iii) law enforcement institutions, (iv) people, (v) wealth or economic empowerment, (vi) development, (vii) justice, and (viii) moral legitimacy (Chapra, 2006; Mohammad, 2010).

Gladwin, Kennelly and Krause (1995) however identified five principles of sustainable development to include comprehensiveness, connectivity, equity, prudence, and security. The principle of comprehensiveness presumes that sustainable development is holistic in terms of space, time, and its component parts; connectivity explicates that sustainable development demands an understanding of the world's challenges as systemically interconnected and interdependent; equity advocates the need for a fair distribution of resources and property rights among the citizens; prudence emphasizes keeping life-supporting ecosystems and interrelated socio-economic systems resilient, avoiding irreversible actions, and keeping the scale and impact of human activities within regenerative and carrying capacities; and security explains that sustainable development ensures a safe, healthy, high quality of life for current and future generations.

Besides, the International Capital Markets Association (ICMA) provides guidance for the emerging Eurobond market through a set of green loan principles developed in 2014 that guide the mass of issuers and investors in green bonds and other green investments (Beschloss & Mashayekhi, 2019).

Later, the global coalition of financial institutions developed the Equator Principles (EPs) to support the SF. The EPs represent a baseline risk management framework developed by a coalition of 116 financial institutions across 37 countries for determining, assessing, and managing environmental and social risks inherent in projects financing (Equator Principles, 2020). In other words, it is a voluntary code developed by the environmentally-responsible commercial and investment banks to promote harmonised standards for green lending and investing in project financing (Richardsoni, 2005). Whereas, Lawrence (2009) describes the EPs as a voluntary code of conduct endorsed by a coalition of global financial institutions with a commitment to comply with the stipulated requirements in financing projects. The underlying principles of the code serve as a benchmark for these financial institutions to manage social and environmental issues encountered in project financing. The Equator Principles Financial Institutions (EPFIs) that signed up to abided by the 10 EPs cut across Asia, Africa, Middle-East, North America, Latin America and Oceania (Equator Principles, 2020). Structurally, the EPs are to be applied to five financial products of financial institutions when supporting new projects and investment portfolios with a total capital cost of $10 million or more (Equator Principles, 2020; Panait, et al., 2021). The products on which EPs are to be applied include Project Finance Advisory Service, Project Finance, Project-Related Corporate Loans, Bridge Loans, and Project-Related Refinance, and Project-Related Acquisition Finance.

Theoretical Foundation

The inclusive business model innovation (IBMI) provides the required theoretical underpinning for this study. The inclusive business model innovation (IBMI) is a broad-based business model that mainstreams the small farm holders and petty traders into the competitive agricultural value chains through the public sector intervention that provides an enabling environment for reinventing the underlying business principles and tools in a manner that is mutually beneficial to the competitive business community (Kelly, Vergara & Bammann, 2015; Méda, & Atewamba, 2020). Besides, the IBMI unlike the traditional business model embeds inclusive finance as a synergetic component of business development including the recognition of the crucial role of the private sector players (Oostendorp et al., 2019). The IBMI emerged

Table 2. Ten equator principles

SN	Principles & Themes	Explanations and Applications
1.	Principle 1: Review and Categorisation	This principle stipulates that before project financing, the EPFIs as part of their internal environmental and social due diligence should categorise their proposed projects into A, B and C based on the magnitude of potential environmental and social risks and impacts, including those related to Human Rights, climate change, and biodiversity. Category A contains a list of projects with potentially significant adverse social and environmental impacts that are diverse, irreversible, or unprecedented. Category B represents projects with potentially limited adverse social or environmental impacts while Category C represents projects with minimal social or environmental impacts.
2.	Principle 2: Environmental and Social Assessment	This principle requires the clients/beneficiaries to conduct an appropriate assessment process to the satisfaction of EFPIs to address, mitigate and minimize observed environmental and social risks and scale of impacts inherent in the proposed project to be financed.
3.	Principle 3: Applicable Environmental and Social Standards	This requires the EFPIs (as corporate citizens) to comply with the laws, regulations, standards, and terms of permits approved for them in their respective host countries/ markets that pertain to environmental and social issues.
4.	Principle 4: Environmental and Social Management System and Equator Principles Action Plan	This principle obligates the EFPIs to request their clients to develop and/or maintain a robust Environmental and Social Management System (ESMS), as well as requesting the project's host to comply with the applicable standards.
5.	Principle 5: Stakeholder Engagement	This principle emphasizes the need for a consultation process and engagement with the relevant stakeholders such as affected communities, workers among others in structured and culturally appropriate manner.
6.	Principle 6: Grievance Mechanism	The principle explicates the need for clients to establish effective grievance mechanisms for the purpose of receiving and facilitating the prompt resolution of concerns and grievances of the stakeholders arising from the project's environmental and social performance.
7.	Principle 7: Independent Review	The principle stipulates that an Independent Environmental and Social consultants carry out an independent review of the assessment process for all Category A and Category B Projects, which will assist the EPFIs in reporting on due diligence and compliance with the EPs
8.	Principle 8: Covenants	The EPFIs are to incorporate EPs as covenants that clients must comply with during the construction and operation of the projects. In the case of defaults in meeting environmental and social covenants of the projects, the EPFIs are empowered to exercise remedies, including bringing the project back into compliance with an agreed period of respite.
9.	Principle 9: Independent Monitoring and Reporting	This principle requires EPIFs' Independent Environmental and Social Consultants to report on project compliance with the EPs after financial close and over the life of the loan. The clients are also allowed to retain qualified and experienced external experts carry out the monitoring and reporting of the projects.
10.	Principle 10: Reporting and Transparency	The principle requires that EPFIs and clients report voluntarily and transparently their EPs implementation and compliance for all Category A and, as appropriate, Category B Projects on an annual basis.

Source: Equator Principles (2020: 1-8).

as a frontrunner issue in recent times because of the need to transform agribusiness through the expertise of the private sector players that have been identified as the activators of economic transformation and catalysts for actualization of sustainable development goals (SDG2) and food and nutrition security (FNS) in the developing and emerging markets (Mawdsley, 2015; Mawdsley et al., 2018; Oostendorp et al., 2019). From another perspective, the IBMI is an approach that reinvents agribusiness value chains

to become climate-smart by providing the farming population with easy access to inclusive financing, technical support services, and other climate-friendly benefits (Oostendorp et al., 2019). The IBMI supports the agenda to drive agribusiness transformation through SF because there have emerged in the agribusiness value-chain the green activists, responsible investors, green policymakers, and socially responsible investors (SRI) who passionately support the ideals of inclusive agriculture, inclusive green agriculture and other variants of sustainable agriculture with high prospects of boosting food security, improving revenue earning, and accelerating the actualization of the SDGs (Teng & Oliveros, 2016; Wangu et al, 2020).

MAIN FOCUS OF THE CHAPTER

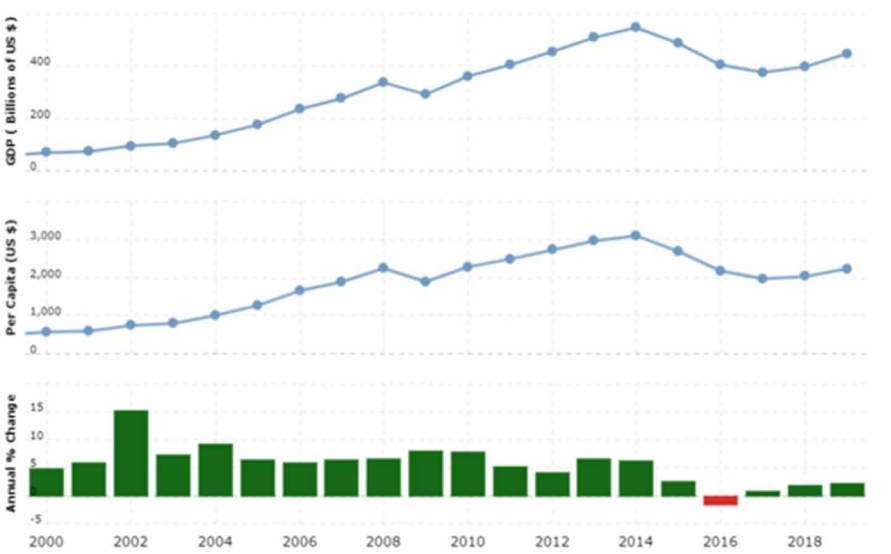
Issues, Controversies, and Problems in Agricultural Financing

To situate this chapter within the body of existing knowledge, let us explore the literature in Nigeria on the prospects of inclusive agricultural financing in Nigeria. In the quest to diversify the Nigerian economy away from oil to non-oil productive sectors, the policymakers adopted the inclusive agribusiness transformation as the foundation for long-term structural change necessary to stimulate inclusive growth, reduce poverty and create jobs, increase competitiveness in the value chains and improve nutrition outcomes (Mghenyi et al., 2021). Some of the previous agribusiness financing schemes implemented in Nigeria include Agricultural Transformation Agenda (ATA), Anchor Borrowers, Commercial Agriculture Credit Scheme (CACS), and Agricultural Credit Guarantee Scheme Fund (ACGSF) among others (Osabohien et al., 2019, Gershon et al., 2020; Romanus & Ngozi, 2020). Unfortunately, these financing schemes were counterproductive and failed to impact positively on food production because of poor agro-financing and implementation deficiencies.

The positive impact of inclusive financing on agribusiness productivity was affirmed in previous studies. Government agricultural financing such as the Fadama Development Project Phase II, Commercial Bank Credit to Agricultural sector (CBCA), and Agricultural Credit Guarantee Scheme Fund Loan were found to be helpful to poor farmers in Nigeria. The Fadama Development Project Phase II in Nigeria was found to have provided the beneficiaries access to acquisition farming facilities and capacity-building through training opportunities. These benefits impact minimally on agricultural sector output (Adegbite et al., 2008). Another study found that Commercial Bank Credit to Agricultural sector (CBCA) and Agricultural Credit Guarantee Scheme Fund Loan significantly impact on agricultural sector output percentage to gross domestic product (Egwu, 2016).

Gershon et al., (2020) found that farmers in Nigeria with unhindered access to agricultural credit and agricultural production generated agricultural yields that are thrice those of their counterparts without access to credit facilities. Similarly, Osabohien et al., (2019) found that farmers with access to credit facilities tripled their agricultural outputs after the harvests. Another study by Romanus & Ngozi (2020) found that inclusive agro-financing when properly channeled would support the realization of SDG2 that aims to "end hunger, achieve food security, improve nutrition and promote sustainable agriculture. An earlier study by Osabohien et al. (2018) found that access to credit facilities by farmers in Nigeria had dual impacts; it impacts positively on agricultural production and also enhances food security in the country. Besides, Ayeomoni and Aladejana (2016) found that there exist both short-run and long-run relationships between the provision of agricultural credit and economic growth, and an indication that

Figure 1. Nigeria GDP 1960-2019
Source: Macrotrends (2021a).



the agricultural sector is very important for sustainable economic development. Overall, agribusiness transformation in the developing country context requires enabling environments, deliberate policy reforms in the areas of seed regulations, fertilizers quality control, warehouse receipts, and redesigning of the business model in agricultural trade. These afore-mentioned reforms increase competitiveness in the agribusiness value chains and snowball into the creation of jobs, reduction of poverty scourge, and improved nutrition outcomes (Mghenyi et al., 2021).

Prospects and Challenges of Agribusiness in Nigeria

Nigeria is an oil-dependent economy, although with appreciable contributions from the agricultural, industrial, and service sectors. Currently, it has a population of over 200 million citizens (Ibrahim & Olasinde, 2020; Kalu, 2020) that are distributed across 36 states and a Federal capital. According to FAO (2021), Nigeria has a country area of 92377 (1000 ha), a land area of 91077 (1000 ha), an agricultural area of 68796.8521 (1000 ha), and a forest area of 22280.1479 (1000 ha), which places it at a vantage position to transform agribusiness in the SSA through sustainable finance. The trends in its GDPs from 2000-2019 as shown in Figure 1 have been steady and positive, except for a drop in 2017, which improved in 2017. The steady growth in Nigeria's GDPs over the years is a good indication that the economy is on the path to sustainable development.

Nigeria has a nominal GDP of $375.77 billion and per capita income of $5680 (World Development Indicators database (2018). With regards to the status of agribusiness, the official report indicated that apart from oil revenue, the bulk of the GDP comes from agriculture, and it provides the country with employment opportunities and foreign exchange earnings (Ayodele, Obafemi and Ebong, 2013; Omorogiuwa, Zivkovic & Ademoh, 2014).

Table 3. Agriculture output and productivity in Nigeria

Countries	Crop production index		Food production index	
	2004-2006 = 100		2004-2006 = 100	
	2000	2016	2000	2016
Nigeria	80.5	118.9	81.8	124.6
World	87.8	128.1	88.5	125.6
South Africa	102.7	104.8	95.5	116.7
Sub-Saharan Africa	83.2	135.4	83.6	132.2
Low income	82.6	128.6	83.3	120.3
Lower middle income	86.3	137.9	86.8	138.1
Upper middle income	83.7	132.4	83.7	130.2
High income	98.0	109.3	97.7	109.8
Source: World Development Indicators, The World Bank (2017)				

The agribusiness sector in Nigeria is divided into four broad areas, namely: crop production, fishing, livestock, and forestry (Omorogiuwa et al., 2014). With respect to the performance of each of the four areas, Oyaniyan (2020) reported that crop production accounts for about 87.6% while livestock, fishing, and forestry at 8.1%, 3.2%, and 1.1% respectively. He noted further that despite the leading role of oil, the nation's agribusiness remains the largest sector in Nigeria that contributed an average of 24% to the nation's GDP and ranked as the highest employer of labour, absorbing more than 36% of the labour force. However, with a population of over 200 million people (Ibrahim & Olasinde, 2020; Kalu, 2020), the current agribusiness productivity is grossly insufficient to meet the food demand of a growing population thus increasing the demand and supply gap in Nigeria (Muhammad-Lawal & Atte, 2016).

In the past years, the country experienced very low yields per hectare of arable land due to small farm holdings, primitive farming methods, climate change the effect, drought, pest attacks, desertification, shortages in the supply of inputs, inadequate irrigation, poor harvesting systems, low rainfall, oil spillages, government acquisition of farmland among others (Odetola & Etumnu, 2013; Ahmadu & Egbodion, 2013; Tagliarino et al., 2018). With desertification and water depletion in the northern part of the country, herdsmen shifted towards the south in search of grazing fields and water for their animals, but this has led to violent conflict with farmers and communities in southern Nigeria. And generally, increased violence in the food-producing states in the North and South has caused the decline in Nigeria's food production output. Nigeria's agriculture output and productivity statistics from 2000-2016 in Table 3 below showed a crop production index of 80.5 (2000) and 118.9 (2016); food production index of 81.8 (2000) and 124.6 (2016). The crop and food production of Nigeria indices are lower when compared with the indices for the World average, South Africa, Sub-Saharan Africa, Low income and Lower middle income for the same periods.

For Table 4 however, Nigeria has a livestock production index of 86.3 (2000) and 118.9 (2016); and Cereal yield of 1,172kph (2000) and 1414kph (2016). The livestock and cereal indices fall below the figures for World average and South Africa, but higher than figures for Sub-Saharan Africa, Low income and Lower middle income. From the statistics, it is evident that Nigeria has a lower crop, food, livestock and cereal production.

Table 4. Agriculture output and productivity in Nigeria

Country	Livestock production index		Cereal yield	
	2004-2006 = 100		kilograms per hectare	
	2000	2016	2000	2016
Nigeria	86.3	118.9	1,172	1,444
World	90	118.9	3,089	3,967
South Africa	87.9	131.1	2,766	3,819
Sub-Saharan Africa	85.9	112.7	1,182	1,400
Low income	83.9	99.7	977	1,329
Lower middle income	84.8	137.0	2,287	3,034
Upper middle income	85.1	126.4	3,165	4,366
High income	97.7	105.1	4,597	5,975
Source: World Development Indicators, The World Bank (2017)				

For Table 5, the agriculture value-added per worker (a measure of agricultural productivity) showed that the agricultural productivity of Nigeria was 1,649.4 (2000) and 5,852.1 (2016). The agricultural productivity index falls below the figures for World average, South Africa, Sub-Saharan Africa, Upper middle income, High income countries, but higher than the figures for Low income and Lower middle income countries.

SOLUTIONS AND RECOMMENDATIONS

Findings and Discussions of Thematic Issues

Research question 1: What are the prospects of SF for agribusiness transformation in Nigeria?

Our finding revealed that the prospects of SF are enormous: (a) Nigeria has a modest agricultural growth performance in the crop, food, livestock, and cereal production that could support SF. Specifically, Nigeria had a crop production index of 80.5 (2000) and 118.9 (2016); food production index of 81.8 (2000) and 124.6 (2016); livestock production index of 86.3 (2000) and 118.9 (2016); and Cereal yield for 1,172kph (2000) and 1414kph (2016); and agricultural productivity of 1,649.4 (2000) and 5,852.1 (2016). Also, the various SF options such as green loans, green bonds, green credit, green investment funds, green mortgage scheme, and other green financial support instruments would be suitable for agribusiness transformation when properly-linked with relevant segments of the agribusiness in the country. The SF options are also unique and ideal for agribusiness because the EPFIs, green banks and other eco-financial institutions are guided by Ten EPs that give prominence to environmental, social, and governance (ESG) considerations when making investment decisions on projects that have a direct impact on humans, flora, and fauna.

Research question 2: What are the challenges facing agribusiness in Nigeria, a low-income economy?

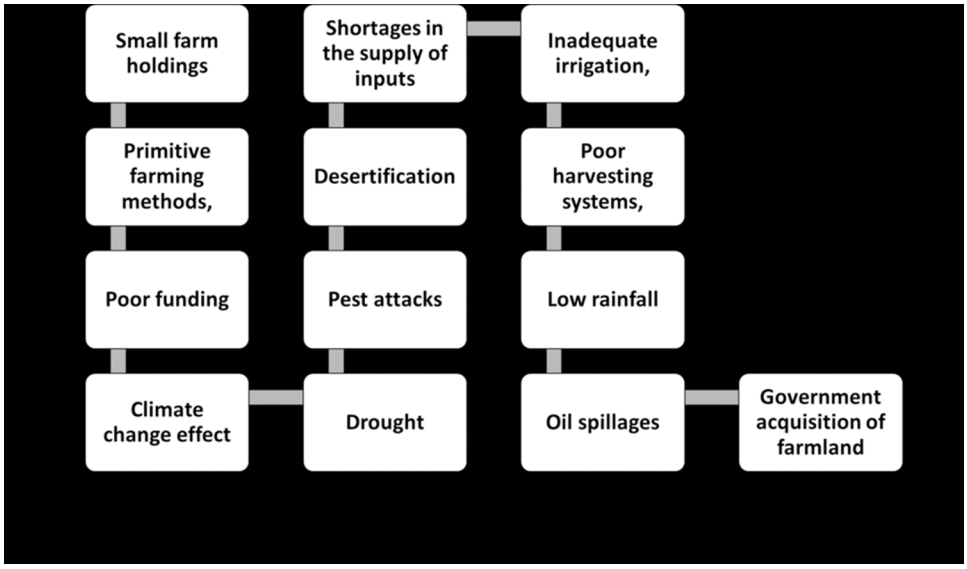
Several themes emerged from the content analysis on the challenges facing agribusiness in Nigeria, a low-income economy. In Nigeria, the thirteen (13) challenges facing agribusiness depicted in Figure

Table 5. Agriculture output and productivity in Nigeria

	Agricultural productivity	
	Agriculture value added per worker	
	2010 $	
	2000	**2016**
Nigeria	1,649.4	5,852.1
World	1,924.00	3,542.10
South Africa	6,393.6	9,716.5
Sub-Saharan Africa	846.1	1,430.8
Low income	601.4	794.5
Lower middle income	1,041.9	1,922.2
Upper middle income	1,754.3	4,394.1
High income	20,690.2	34,171.3
Source: World Development Indicators, The World Bank (2017). http://wdi.worldbank.org/table/3.3#		

2 below include small farm holdings, primitive farming methods, climate change effect, drought, pest attacks, desertification, shortages in the supply of inputs, inadequate irrigation, poor harvesting systems, low rainfall, oil spillages, government acquisition of farmland among others.

Figure 2. Thirteen key challenges facing agribusiness in Nigeria (Omitoyin and Tosan, 2012; Odetola & Etumnu, 2013; Ahmadu & Egbodion, 2013; Tagliarino et al., 2018)



Research question 3: What are the implications of nexus of SF and agribusiness transformation on Entrepreneurship Development in Nigeria?

From the discourse, the nexus of SF and agribusiness transformation has far-reaching implications on entrepreneurship development in Nigeria. The first implication is that agribusiness transformation through SFs would bring about a structural change from the current subsistence agricultural practices to large-scale agribusiness supported by the agricultural information systems (AGRIS), precision agriculture, and disruptive agricultural technologies. Flowing from the first implication, the nexus between agribusiness and SFs will systematically improve agricultural productivity in the areas of crop production, fishing, livestock, and forestry in both countries. Thirdly, an improved agribusiness would boost food production and food availability, thereby mitigating the rising trends in food insecurity, food inflation, food poverty, and ultimately will help actualize the SDG 1(No poverty), SDG 2 (Zero Hunger), and SDG 3 (Good Health and Wellbeing).

Another implication is that agribusiness transformation has the propensity to create a strong eco-friendly value-chain, as well as stimulates massive employment opportunities for the growing population of unemployed people (male and female). The potential employment opportunities to be created would ultimately reduce poverty and income inequality, leading to the attainment of the SDG 1(No poverty), SDG 2 (Zero Hunger) and SDG 3 (Good Health and Wellbeing), SDG 4 (Quality Education), SDG 5 (Gender Equality), SDG 8 (Decent Work and Economic Growth) and SDG 12 (Responsible Production and Consumption).

Furthermore, well-funded agribusiness has the propensity to generate surplus agricultural products that would increase the gross domestic products (GDPs), expand agricultural exports to international markets, increase foreign exchange earnings, and attract foreign direct investment (FDIs) that would collectively trigger economic growth and sustainable development. Finally, the entrepreneurs seeking SF options for agribusiness in Nigeria have to comply with the EPs guidelines. Principle 2 stipulates that agribusiness entrepreneurs must conduct an appropriate assessment process on their agricultural projects to the satisfaction of the EFPIs. Such assessment must address, mitigate and minimize observed environmental and social risks and scale of impacts inherent in their proposed agribusiness projects. Principle 4 explicates that agribusiness entrepreneurs are expected to develop and maintain a robust Environmental and Social Management System (ESMS), as well, as complying with the applicable standards in their host countries. Principle 5 explains that before launching the agribusiness projects, the entrepreneurs should initiate a consultation/engagement process of buy-in with relevant stakeholders such as host communities, workers among others for the purpose of briefing them of the benefits in a structured and culturally appropriate manner. Principle 6 mandates that agribusiness entrepreneurs are to establish effective grievance mechanisms for the purpose of receiving and facilitating the prompt resolution of concerns and grievances of the stakeholders arising from the agricultural project's environmental and social performance. Principle 8 emphasizes that entrepreneurs are to comply with all environmental and social covenants contained in the EPs as well as local norms and national laws during the construction and operation of agribusiness projects. Principle 9 explains that agribusiness entrepreneurs are required to appoint qualified and experienced external experts to carry out oversight monitoring and reporting on the environmental, social, and governance (ESG) dimensions of the agribusiness projects. And Principle 10 wants entrepreneurs to report voluntarily and transparently their EPs implementation and compliance to their bankers, in this case, the EPFIs.

CONCLUSION

We explicate the need to rethinks the prospects of sustainable finance against the challenges facing agribusiness transformation in Nigeria including examining the implications for entrepreneurship development. At the end of the analysis, we found that the prospects of the SF options for agribusiness transformation are enormous. We contribute to the literature on SF and agribusiness in emerging economies by identifying SF options as a game-changer for agribusiness transformation.

FUTURE RESEARCH DIRECTIONS

The findings are based on descriptive statistics. However, future research should consider using rigorous econometric tests such as the Co-Integration Test, Test of Causality, and Inferential Statistics that would enhance stronger generalization and prediction.

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KEY TERMS AND DEFINITIONS

Agribusiness: This refers to the entire agricultural value-chain, which starts with cultivating, nurturing, harvesting, transporting, processing, and distributing agricultural products throughout a country in an effective and efficient way.

Agribusiness Transformation: This refers to a fundamental shift from the traditional subsistence-oriented farming approach to a more commercialized, productive, and off-farm centered approach.

Entrepreneurship Development: This refers to the process of establishing new businesses and growing new businesses in the economy.

Equator Principles: This is a framework with ten (10) developed coalition of financial institutions for providing a minimum standard for due diligence and monitoring to support responsible risk decision-making in the financing of sustainable projects.

Inclusive Agribusiness Model: This refers to an approach of improving the livelihoods of small farm holders by integrating them in commercial agribusiness value chains in a viable manner that gives more access to markets, inputs, and services, finance, and training.

Sustainable Finance: This refers to a finance system that gives priority to environmental, social, and governance (ESG) considerations when making investment decisions on sustainable economic activities and projects.

Chapter 16
The Impact of Investment on Sustainable Competitiveness Aspects:
Is There a Difference Between the Old and New EU Member States?

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ABSTRACT

The European Union (EU) consists of 27 economies characterized by different economic structures, living standards, demographic dynamics, technology development, and other factors shaping their sustainable development patterns. This chapter aims to examine the impact of total investments and R&D investments on the sustainable development of EU economies and determine how these financial investments impact sustainable competitiveness in the global market. The assessment of the sustainable development performances was performed for the period from 2008 to 2019 using the linear regression model. The key findings pointed out that total investments and R&D investments had different impacts on sustainable competitiveness aspects in old member states (OMS) and new member states (NMS). The results could help policymakers understand, adjust, and optimize sustainable competitiveness to secure economic growth in all regions and reduce the differences between OMS and NMS.

INTRODUCTION

The process of globalization is an evident factor influencing structural change in EU economies (Fedajev et al., 2019). Moreover, the intensified globalization has significantly empowered both newly and early

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industrialized countries and posed substantial global challenges on economic, environmental, and social stability (Jovane et al., 2017). In the last decade, national and international institutions, policymakers, and companies have paid more attention to sustainable competitiveness because this represents a more comprehensive concept than sustainable development. The main idea of this concept is to improve the competitiveness of the national economy by balancing economic, environmental, and social issues. Under current business conditions, competitiveness is not measured only by financial performances but also by environmental and social performances. Therefore, the synergy among mentioned three aspects of performances creates sustainable competitiveness (Herciu & Ogrean, 2014).

The sustainable competitiveness concept was defined by the World Economic Forum (WEF) as "the set of institutions, policies, and factors that make a nation remain productive over the longer term while ensuring social and environmental sustainability" and it "implies achieving competitiveness gains today without compromising future competitiveness" (Schwab et al., 2013). The representatives of the WEF developed the Sustainable Competitiveness Index (SCI) by adjusting the Global Competitiveness Index (GCI) through increased importance of social sustainability and environmental sustainability pillars (Herciu & Ogrean, 2014). The SCI is considered the most accurate basis for comparing national economies, considering that conventional comparisons are based only on economic and/or financial indicators. These indicators present current economic progress without explaining what makes this progress possible and how it shapes future potential or decline. Also, the conventional comparisons do not consider the fact that economic activities have negative side-effects on the environment and society reflected primarily in rising inequality and poverty, pollution, natural resources depletion, climate change, health impacts, and alike. Neglecting these facts can diminish the basis of current economic growth and development measured by conventional indicators (SolAbility, 2020). Namely, there are situations where the high competitiveness of the economy is accompanied by negative externalities, like pollution, overconsumption, and resource deprivation, resulting in a low level of prosperity and well-being. On the other hand, there are countries with lower competitiveness and also fewer external effects. Therefore, these countries can improve their competitiveness more inclusively and sustainably (Huggins & Thompson, 2012).

In the modern world, sustainability is promoted by the development of innovations and new technologies (Thore & Tarverdyan, 2016), so investments, especially those in research and development (R&D), represent significant factors of sustainable competitiveness. Furthermore, EU cohesion policy promotes and financially supports sustainable competitiveness, particularly in less-developed regions. In that sense, Europe 2020 strategy emphasizes the need for smart, sustainable, and inclusive development (Fedajev et al., 2020). However, there are still EU regions less developed, characterized by a low level of competitiveness. Such a situation poses challenges to the EU and requires adopting a new competitiveness approach that should be more sustainable and inclusive (Dziembala, 2020). Therefore, the author's main motive is to analyse the situation in the EU countries after the 2008 global economic crisis and, particularly, identify differences in this respect between Old Member States (OMS) and New Member States (NMS).

In that sense, this chapter aims to assess the impact of total investments and R&D investments in the EU on mentioned aspects of sustainable competitiveness, using a linear regression model. Furthermore, taking into account that there are differences between New Member States (NMS) and Old Member States (OMS) in the achieved level of sustainable competitiveness, as well as in the level of total investments and R&D investments, special attention is paid to the analysis of those differences. Therefore, the chapter is organized as follows: Section 2 is devoted to presenting previous studies of sustainable competitiveness and investments in the EU; the methodological steps toward investigating the impact of

investments (total and R&D) on sustainable competitiveness and differences between NMS and OMS are presented in Section 3; the obtained results are elaborated in Section 4; and Section 5 focuses on the research's main conclusions.

BACKGROUND

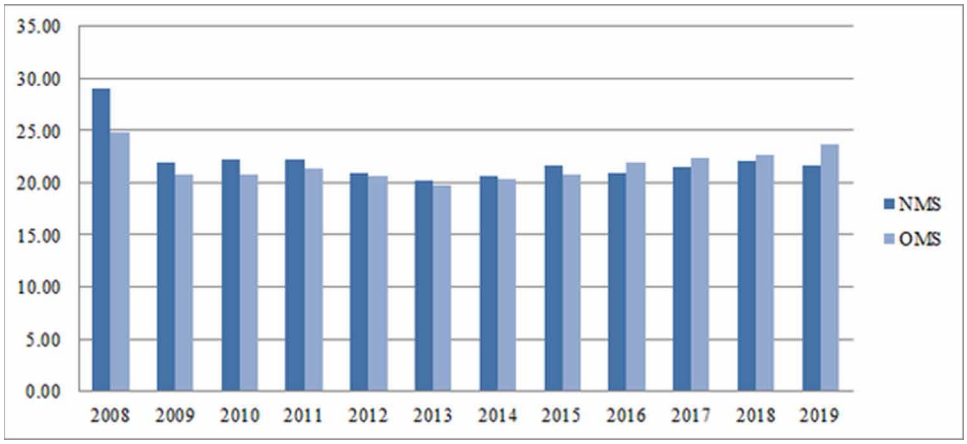
The ability of national economies to use foreign products, services, and capital and preserve foreign economic relations is becoming the more important direction of sustainable development (Širá et al., 2020; Djordjevic et al., 2020). The European Council and European commission realized the importance of improving the competitiveness while ensuring the sustainable development of the EU economy and launched a new strategy for smart sustainable and inclusive growth called "Europe 2020". This strategy is a continuation of the Lisbon strategy. It aimed to create jobs and enable faster recovery from the global economic crisis that escalated in 2008 while achieving a satisfactory social and ecological stability level. Launching the strategy led to the evolvement of a new concept of competitiveness and a deeper relationship between sustainable development and competitiveness (Balkyte & Tvaronavičiene, 2010). Namely, it transferred the focus of policymakers in the EU from economic to sustainable competitiveness. This change in competitiveness paradigm motivated researchers to investigate different aspects of sustainable competitiveness.

However, it should be borne in mind that achieving sustainable competitiveness, as a complex goal, requires the engagement of all available resources of the economy. Therefore, investments are an important issue of achieving sustainable competitiveness. Amount of funds that individual economies invest impacts their sustainable growth and position in the market. Considering this fact, the European Commission allocated a significant amount of investments from structural funds across EU economies to achieve sustainable competitiveness. Special attention was put to NMS, where a substantial amount of funds was allocated to narrow the gap in development in comparison to OMS (Pîrvu et al., 2019) and to neutralize the consequences of the less developed regions' integration in the EU (Gross & Debus, 2018). In addition to differences in development level and amount of total investments, NMS and OMS also differ in the structure of investments. Namely, compared to other forms of international capital movements in EU countries, foreign direct investments (FDI) are most prevalent in financing the national economies of NMS, and most of them are developing economies (Stojadinović & Jovanović, 2013). Moreover, the large share of these investments in NMS is resource-driven investments, meaning that investors are mainly focused on achieving economic goals rather than social and environmental ones (Ambroziak, 2016). This is why some of NMS were lagging behind the OMS in achieving sustainable competitiveness.

The R&D investment increases the possibility of achieving a higher standard of technology in companies. This issue allows companies to produce new superior products and services. Also, the R&D investments foster innovation development, leading to an improved competitive position in the market (Stojanović et al., 2020; Stojanović et al., 2021). Furthermore, the higher level of R&D investment results in more sophisticated production and greater involvement in Global Value Chains (Taglioni & Winkler, 2016; Hernandez & Pedersen, 2017), which improve the country's competitiveness. The average total investments and R&D investments (as % of GDP) in the 2008-2019 period are shown in Figure 1 and Figure 2 to notice differences between NMS and OMS investment activities.

Analysing the total investments in OMS and NMS in the considered period (Figure 1), it can be seen that the differences between mentioned groups of countries are not so pronounced in the recovery period

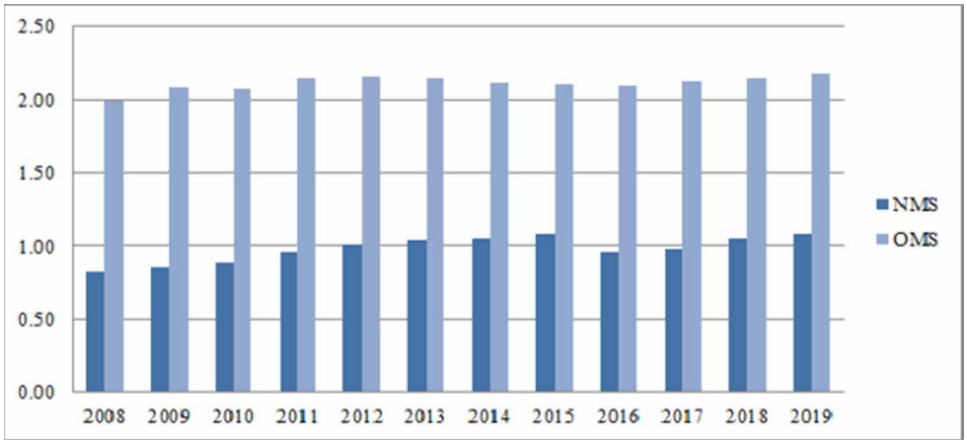
Figure 1. Total investment in eu countries in period 2008-2019
Source: World bank.



(from 2009). During the crisis in 2008, this difference was the largest; the OMS allocated 24.76 of their GDP in the economy while this share in the NMS amounted to 29.03% of GDP. From 2009 to 2015, generally, NMS allocated a little more funds for total investments, while from 2016-2019, that situation changed in favour of OMS. In 2019, OMS gave 23.70% for total investments, while the NMS invested a little less 21.64%. On the other hand, the gap in R&D investments is relatively wider. Namely, during the entire observed period, OMS allocated more financial resources for R&D than NMS. In 2008, OMS invest an average of 1.99% of GDP, while NMS allocated only 0.82% of their GDP in R&D activities. In later years, these EU countries began to allocate slightly more funds for R&D, so the R&D budget was raised. In 2019 this amount reached 1.08% in NMS and 2.18% of GDP in OMS. However, the amount of R&D investments in NMS is still twice more than the funds allocated for the same purpose by OMS.

Based on the theoretical framework, it can be concluded that there is a research gap regarding the differences between OMS and NMS concerning the effects of investments on the aspects of sustainable

Figure 2. R&d investment in eu countries in period 2008-2019
Source: World Bank.



competitiveness. Most research has focused on examining the impact between the dimensions themselves or ranking countries, while differences between OMS and NMS have been ignored. Accordingly, to make a breakthrough in existing scientific research and determine the differences between OMS and NMS according to the aspects of sustainable competitiveness, the following hypotheses were defined:

H1 - There is a statistically significant difference in social aspects of sustainable competitiveness between OMS and NMS.
H2 - There is a statistically significant difference in ecological aspects of sustainable competitiveness between OMS and NMS.
H3 - There is a statistically significant difference in economic aspects of sustainable competitiveness between OMS and NMS.
H4 - There is a difference in the impact of the total investment on sustainable competitiveness between OMS and NMS.
H5 - There is a difference in the R&D investment's impact on sustainable competitiveness between OMS and NMS.

DATA AND METHODOLOGY

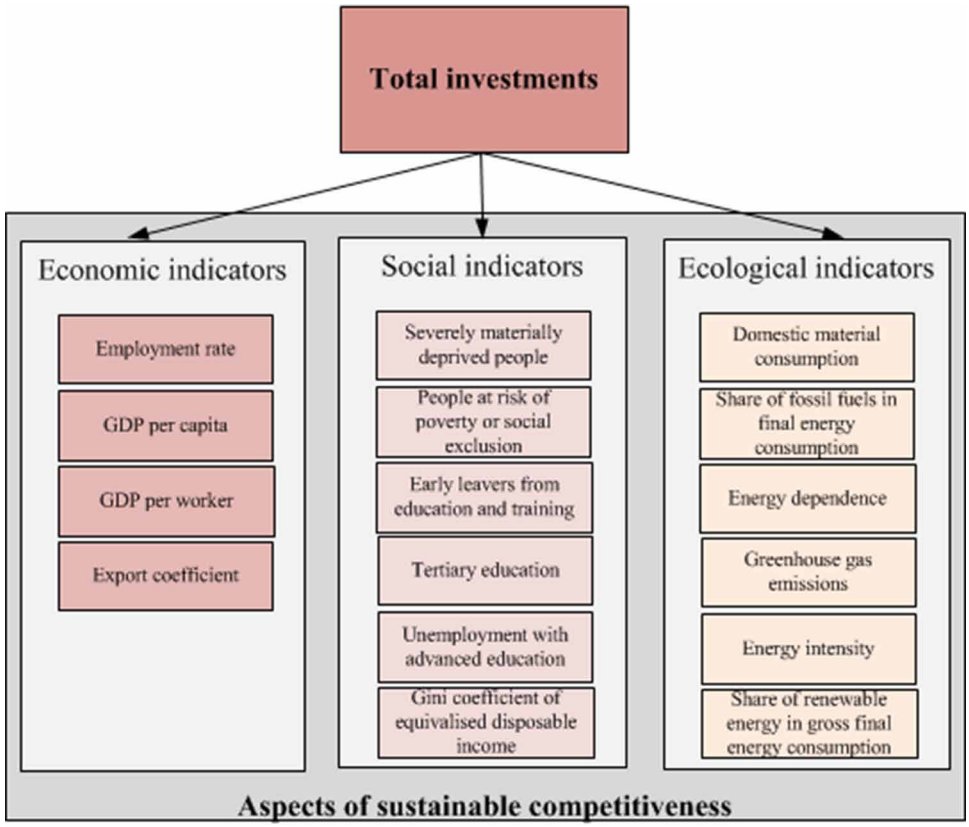
To examine the defined goals of this research, the conceptual framework, which consisted of two research models, was created. Within the framework of Model 1, the impact of the total investment on aspects of sustainable competitiveness (social, economic and ecologic) in EU countries is depicted in Figure 3.

The impact of R&D investment on aspects of sustainable competitiveness was examined in Model 2 (Figure 4). Considering that there are differences between the OMS and NMS in the achieved level of sustainable competitiveness, these differences were separately analysed. Hence, details of the collecting data and characteristics of the sample were presented first, and after that, the statistical analyses were applied.

Collecting Data and Sampling

When it comes to the selected period, the idea was to analyse the impact of total investment (TI) and investment in R&D (RD) on indicators of sustainable development after the 2008 Global Economic Crisis, therefore, research in this chapter was focused on the 27 economies of the European Union for the period from 2008 to 2019 based on the data collected within the World Bank's Enterprise Surveys (WBES). Taking into account that the level and effects of total investments and R&D investments differed considerably between economies, all EU countries were divided into two groups: Old Member States (Belgium, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Italy, Netherlands, Austria, Portugal, Finland, and Sweden) and New Member States (Bulgaria, Czech Republic, Croatia, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, Poland, Romania, Slovenia, and Slovakia). According to the defined research framework (Model 1 and Model 2), social, economic, and ecological indicators of sustainability in the EU economies were analysed (Despotovic et al., 2015; Salimova et al., 2018; Despotovic et al., 2019). The indicators for examining the social aspects of sustainable competitiveness of countries are (Schwab et al., 2011; Ostry & Berg, 2011; Despotovic et al., 2019; Kwilinski et al., 2020): severely materially deprived people (SMDP), people at risk of poverty or social exclusion (PRSE),

Figure 3. Research model 1 – Impact of the total investment on aspects of sustainable competitiveness
Source: Author's

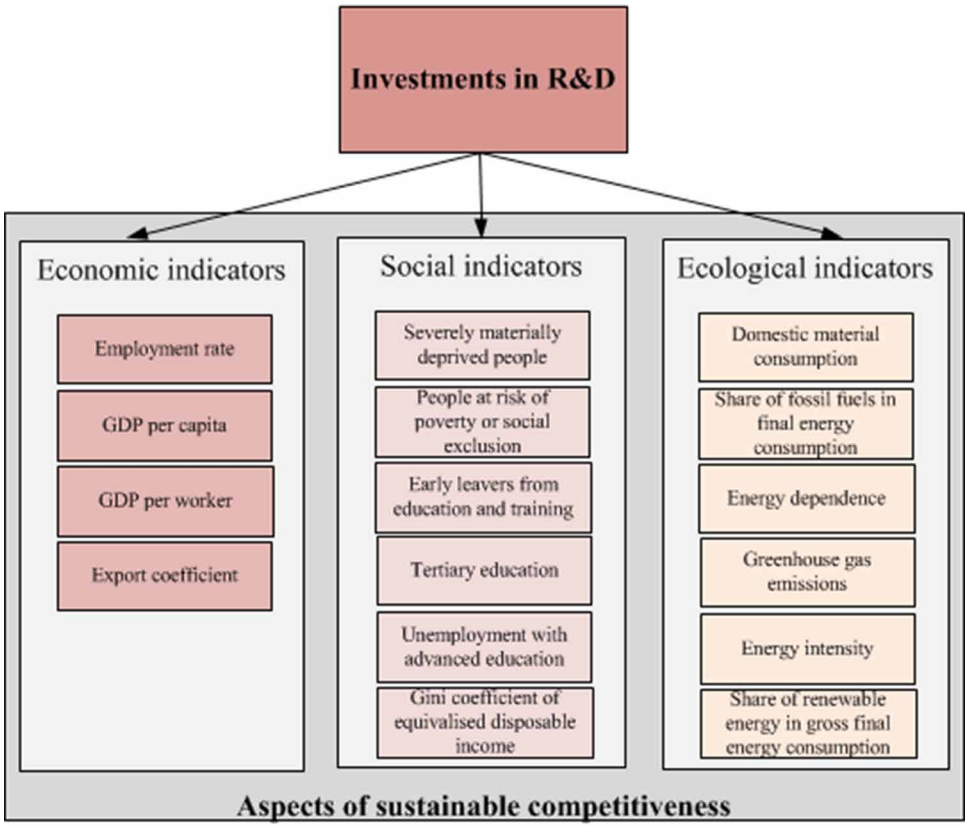


early leavers from education and training (ELE), unemployment with advanced education (UAE), Gini coefficient of equivalised disposable income (GINI), and tertiary education (TE). The ecological aspect of sustainable competitiveness consists of the following indicators (Cvetanovic et al., 2014; Marikina, 2018; Martins et al., 2018; Möbius & Althammer, 2019; Ritchie & Roser, 2020): domestic material consumption (DMC), the share of fossil fuels in final energy consumption (FF), energy dependence (ED), greenhouse gas emissions (GHG), energy intensity (EI), the share of renewable energy in gross final and energy consumption (SREC). The economic aspect of sustainable competitiveness consists of the following indicators (Chocholatá & Furková, 2018; Pietrzykowski, 2019; Möbius & Althammer, 2019; Širá et al., 2020): employment rate (ER), GDP per capita (GDPC), GDP per worker (GDPW), and export coefficient (EC).

Methodology

One of the commonly used types of predictive analysis in social science is the linear regression analysis method. Linear regression is usually used to explain the relationship between one dependent variable and one or more independent variables (Su et al., 2012; Waqar, 2015; Despotovic et al., 2015; Schmidt & Finan, 2018; Möbius & Althammer, 2019; Dorofyeyev et al., 2020). Hence, in this study, simple linear

Figure 4. Research model 2 – Impact of the R&D investment on aspects of sustainable competitiveness
Source: Author's



regression was used to estimate the influence of the independent variable (total investments - Model 1 and R&D investments - Model 2) on dependent variables (sustainable competitiveness indicators). The relationship was analysed separately for each dependent variable in the conceptual model, and the obtained results are presented below.

RESULTS

Differences between OMS and NMS Regarding the Aspects of Sustainable Competitiveness

The first step in analysis is the identification of differences in values of considered sustainable competitiveness indicators and investments (total and R&D). To choose an appropriate statistical methodology for the identification of those differences, the test of normality was conducted. The results of Kolmogorov-Smirnov and Shapiro-Wilk tests are presented in Table 1.

The results of both tests presented in Table 1 suggest that most of the variables do not follow the normal distribution. Therefore, considering that the differences between two independent samples should

Table 1. Tests of normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
DMC	.141	52	.012	.890	52	.000
FF	.301	52	.000	.598	52	.000
ED	.084	52	.200*	.956	52	.051
GHG	.144	52	.009	.956	52	.050
EI	.192	52	.000	.874	52	.000
SREC	.153	52	.004	.887	52	.000
SMDP	.279	52	.000	.747	52	.000
PRSE	.183	52	.000	.871	52	.000
ELE	.142	52	.010	.842	52	.000
UAE	.258	52	.000	.644	52	.000
GINI	.113	52	.093	.955	52	.050
TE	.124	52	.045	.949	52	.028
ER	.099	52	.200*	.966	52	.137
GDPC	.203	52	.000	.786	52	.000
GDPW	.235	52	.000	.752	52	.000
EC	.223	52	.000	.776	52	.000
TI	.102	52	.200*	.977	52	.399
RD	.142	52	.011	.923	52	.003
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						
Source: Authors' calculations.						

be identified in the research, the Mann-Whitney test is applied. The results of this test are presented in Table 2.

The results presented in Table 2 indicate differences in the median are not statistically significant for the following indicators: PRSE, ELE, GINI, and SREC. Such results point out that the difference in the social aspect of sustainable competitiveness is not so pronounced. However, except for SREC, the differences in the median for the remaining ecological indicators are statistically significant. On the other hand, there are statistically significant differences in the median for all indicators representing the economic aspect of sustainable competitiveness.

The Impact of Total Investments and R&D Investments on Aspects of Sustainable Competitiveness

Considering that the total investment in one economy has significant effects on achieving economic, social, and ecologic performances reflecting sustainable competitiveness, this causality is analysed in this chapter, using linear regression. Before conducting the linear regression analysis, the correlation among considered variables should be analysed in order to avoid multicollinearity problems. A high

Table 2. The Mann-Whitney test results

Indicators					Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Median	
									OMS	NMS
SMDP	10356.0	20509.0	-2.922	.003	589.00		427.50			
PRSE	223.5	818.5	-1.849	.064	20.00		23.00			
ELE	11917.0	22357.0	-1.245	.213	9.40		9.75			
UAE	11019.5	21459.5	-2.316	.021	4.50		4.21			
GINI	10945.5	26876.5	-1.664	.096	29.00		30.00			
TE	8473.5	18913.5	-5.355	.000	42.70		33.05			
DMC	10997.0	21437.0	-2.343	.019	16.91		14.46			
ED	10692.0	21132.0	-2.707	.007	64.45		50.52			
FF	9222.0	25512.0	-4.462	.000	1.14		1.99			
GHG	4847.0	21137.0	-9.683	.000	89.45		99.60			
EI	1530.5	17820.5	-13.641	.000	128.45		232.40			
SREC	11911.5	28201.5	-1.251	.211	14.90		18.83			
ER	11008.0	21448.0	-2.330	.020	71.20		69.40			
GDPC	2674.0	13114.0	-12.277	.000	48305.55		29287.95			
GDPW	1617.0	12057.0	-13.538	.000	105114.00		63839.45			
EC	7572.5	23862.5	-6.431	.000	45.00		70.91			
TI	9797.5	26087.5	-3.786	.000	21.00		22.00			
RD	4212.5	14652.5	-10.441	.000	1.97		0.83			

Source: Authors' calculations.

correlation between individual variables may indicate the presence of multicollinearity (Saunders et al., 2003; Anderson et al., 2007). Multicollinearity can be a problem if the correlation between the variables exceeds 0.80 (Field, 2005). In Table 3, it can be seen that there is both a positive and a negative correlation between the considered independent variables at the statistical level of significance of 0.01 (**) and 0.05 (*).

According to results presented in Table 3, it can be concluded that there is no problem of multicolinearity and that all variables should be considered in further analysis.

Impact of Total Investments

In today's turbulent world influenced by globalisation, sustainable competitiveness is becoming an essential issue for policymakers in all economies worldwide. The European Commission pays special attention to achieving sustainable competitiveness in the global market since competitive pressures have become more pronounced after the global economic crisis. Therefore, regression analysis was conducted at the EU, OMS, and NMS levels to take a deeper insight into the analysed problem. The results of linear regression at the EU level are presented in Table 4.

The obtained results of regression analysis for social indicators in Table 4 pointed out the impact of total investments on PRSE, UAE, and GINI of equalised disposable income was statistically significant

Table 3. The correlations of independent variables

	SMDP	PRSE	ELE	UAE	GINI	TE	DMC	FFC	ED	GHG	EI	SREC	ER	GDP per cap	GDP per work
SMDP	1														
PRSE	0.471**	1													
ELE	0.283**	0.415**	1												
UAE	0.188**	0.461**	0.046	1											
GINI	0.388**	0.785**	0.398**	0.362**	1										
TE	-0.489**	-0.323	-0.342**	0.063	-0.87	1									
DMC	-0.382**	-0.126	-0.081	-0.226**	-0.058	0.327**	1								
FFC	0.298**	0.289*	-0.343**	-0.177**	0.073	-0.148**	0.208**	1							
ED	-0.118*	0.222	0.201**	0.158**	0.113*	0.101	-0.253**	-0.244**	1						
GHG	-0.124*	0.088	0.018	-0.321**	0.169**	-0.118*	0.237**	0.353**	-0.157**	1					
EI	0.048	0.301*	0.026	-0.187**	0.103	-0.366**	-0.093	0.338**	-0.304**	0.625**	1				
SREC	-0.52	0.130	-0.111*	0.150**	0.157**	-0.05	0.246**	-0.079	-0.462**	-0.133**	0.001	1			
ER	-0.377**	-0.673*	-0.087	-0.246**	-0.427**	0.507**	0.264**	-0.333**	0.248**	-0.370**	-0.787**	-0.174**	1		
GDP per cap	-0.191**	-0.488**	-0.046	-0.111*	-0.370**	0.374**	0.071	-0.311**	0.295**	-0-509**	-0.791**	-0.181**	0.711**	1	
GDP per work	-0.568**	-0.361**	-0.258	-0.418**	-0.376**	0.268**	0.068	0.161**	0.189**	0.204	0.204**	-0.414**	0.165**	0.071	1

Source: Authors' calculations.

Table 4. Linear regression results for impact of total investments on sustainable competitiveness in EU

Total investment					
Indicator	**R Square**	**Unstandardized coefficients**	**Standardized coefficients**	**t**	**Sig.**
Social aspects					
SMDP	0.060	-32.415	-0.076	-1.372	0.171
PRSE	0.021	-0.265	-0.144	-2.618	0.009
ELE	0.003	-0.066	-0.050	-0.903	0.367
TE	-0.011	-0.260	-0.106	-1.914	0.057
UAE	0.275	-0.412	-0.524	-11.048	0.000
GINI	0.053	-0.246	-0.230	-4.246	0.000
Ecological aspects					
DMC	0.109	0.503	0.330	6.271	0.000
FF	0.016	0.109	0.128	2.315	0.021
ED	0.092	-0.826	-0.303	-5.697	0.000
GHG	0.001	0.035	0.037	0.642	0.522
EI	0.048	4.603	0.220	4.044	0.000
SREC	0.020	0.389	0.141	2.554	0.011
Economic aspects					
ER	0.132	0.522	0.364	7.005	0.000
GDPC	0.000	-21.039	-0.005	-0.088	0.930
GDPW	0.004	-565.075	-0.061	-1.102	0.271
EC	0.000	0.084	0.009	0.165	0.869

Source: Author's calculations.

at the level $p<0.05$. The standardised coefficients for these variables were negative, indicating that an increase in total investments decreased mentioned indicators. So, increased investment activities improve the social dimension of sustainable competitiveness by reducing poverty, unemployment of highly educated population and inequality. This positive effect was highest in UAE, where the highest standardised coefficient was provided (-0.524). In contrast, the lowest standardised coefficient was recorded for PRSE (-0.144). It should also be emphasised that the standardised coefficient for TE was statistically significant at $p<0.1$. Considering that a negative coefficient was obtained (-0.106), the share of TE people in the total population decreased with the increase in investment. Radulescu et al. (2018) found that the tertiary level of education was the most important factor of economic performance and competitiveness, but it is important to take into account the structure of investments. The large share of investments in the observed period is FDI investments. The significant increase in total investments results from a rise in vertical FDI, especially in developing countries (as a result of removing the trade barriers and relaxing the financial controls). Multinational corporations took advantage of the abundant low-cost and low-skilled labour force available in developing countries. The greater availability of jobs and increased wages motivated people to delay or give up education and join the labour market.

Table 5. Linear regression results for impact of total investments on sustainable competitiveness in NMS

Total investment					
Indicator	**R Square**	**Unstandardized coefficients**	**Standardized coefficients**	**t**	**Sig.**
Social aspects					
SMDP	0.042	91.006	0.216	2.833	0.005
PRSE	0.000	0.002	0.001	0.009	0.993
ELE	0.021	0.184	0.145	1.893	0.060
TE	0.207	-1.224	-0.455	-6.592	0.000
UAE	0.142	-2.226	-0.377	-5.245	0.000
GINI	0.015	-0.168	-0.124	-1.616	0.108
Ecological aspects					
DMC	0.072	0.374	0.268	3.589	0.000
FF	0.008	0.098	0.088	1.136	0.258
ED	0.222	-3.149	-0.471	-6.877	0.000
GHG	0.002	-0.057	-0.049	-0.605	0.546
EI	0.109	6.916	0.330	4.505	0.000
SREC	0.039	0.456	0.199	2.612	0.010
Economic aspects					
ER	0.055	0.296	0.235	3.113	0.002
GDPC	0.069	-1398.059	-0.263	-3.512	0.001
GDPW	0.072	-3086.604	-0268	-3.589	0.000
EC	0.093	-3.220	-0.305	-4.119	0.000

Source: Author's calculations.

If the ecological aspect was considered, it can be concluded that standardised coefficients for all indicators, except for GHG emissions, were statistically significant at the level $p<0.05$. The only negative coefficient was for ED, indicating that increased investments resulted in reduced ED and an increase in DMC, FF, EI and SREC. It should be noted that the highest coefficient was obtained for DMC, while the lowest one was obtained for FF.

Finally, if the economic indicators were considered, it can be noted that only the standardized coefficient for ER was statistically significant at the level $p<0.05$. The coefficient was positive, meaning that an increase in investments could lead to an increase in employment.

In order to explain such results at the EU level, the regression coefficients were calculated partially for NMS and OMS. The results for NMS are presented in Table 5.

As shown in Table 5, the results for NMS were somewhat different compared to the EU results. In the group of social indicators, only standardized coefficients for PRSE and the GINI were not statistically significant. On the other hand, the standardized coefficient for ELE was statistically significant at the $p<0.1$, while all other coefficients were statistically significant at the level $p<0.05$. Therefore, according to values of standardized coefficients, it can be concluded that an increase of investments in NMS increased SMDP and ELE, as well as a decreasing share of people with TE in total population and UAE.

Table 6. Linear regression results for impact of total investments on sustainable competitiveness in OMS

Total investment					
Indicator	**R Square**	**Unstandardized coefficients**	**Standardized coefficients**	**t**	**Sig.**
Social aspects					
SMDP	0.109	-0.001	-0.331	-4.347	0.000
PRSE	0.290	-0.439	-0.239	-7.932	0.000
ELE	0.037	-0.143	-0.191	-2.419	0.017
TE	0.138	0.173	0.372	4.970	0.000
UAE	0.384	-0.675	-0.619	-9.789	0.000
GINI	0.232	-0.664	-0.482	-6.820	0.000
Ecological aspects					
DMC	0.162	0.242	0.403	5.459	0.000
FF	0.058	1.295	0.242	3.092	0.002
ED	0.008	-0.016	-0.089	-1.109	0.269
GHG	0.080	0.490	0.282	3.495	0.001
EI	0.025	-0.021	-0.158	-1.982	0.049
SREC	0.020	0.045	0.142	1.784	0.076
Economic aspects					
ER	0.260	0.321	0.510	7.361	0.000
GDPC	0.539	0.000	0.734	13.423	0.000
GDPW	0.415	0.000	0.644	10.457	0.000
EC	0.185	0.075	0.430	5.907	0.000

Source: Author's calculations.

The impact of investments on the ecological aspect of sustainable competitiveness in NMS was slightly different in the EU. In NMS, the standardized coefficients for FF and GHG emissions were not statistically significant. However, all remaining coefficients were positive except for ED, indicating that an increase in total investment could lead to growth of DMC, EI, SREC and decreased ED.

The greatest difference in comparison to EU results was recorded for the economic aspect of sustainable competitiveness. Namely, all standardized coefficients were statistically significant. The interesting fact was that only the coefficient for ER was positive, meaning that an increase in investments could lead to reduced GDPC, GDPW, and EC.

The same analysis was performed for OMS, and obtained results are presented in Table 6.

The first insight in Table 6 indicates that only the standardized coefficient for ED was not statistically significant. However, regarding the social indicators, it can be concluded that all standardized coefficients were statistically significant at the level of $p<0.05$. Therefore, the only causality between total investments and TE was negative, meaning that an increase in investments could lead to increased number of people with TE in the total population.

In the group of ecological indicators, the standardized coefficients for DMC, FF, and EI were statistically significant at the level of $p<0.05$, while coefficient for SREC was statistically significant at the

Table 7. Linear regression results for the impact of R&D investments on sustainable competitiveness in EU

R&D investments					
Indicator	**R Square**	**Unstandardized coefficients**	**Standardized coefficients**	**t**	**Sig.**
Social aspects					
SMDP	0.041	-400.904	-0.203	-3.706	0.000
PRSE	0.349	-5.088	-0.591	-13.139	0.000
ELE	0.048	-1.345	-0.219	-4.022	0.000
TE	0.082	3.296	0.286	5.362	0.000
UAE	0.062	-0.920	-0.249	-4.615	0.000
GINI	0.174	-2.104	-0.417	-8.242	0.000
Ecological aspects					
DMC	0.110	2.371	0.332	6.309	0.000
FF	0.056	-0.943	-0.236	-4.367	0.000
ED	0.068	-7.361	-0.260	-4.830	0.000
GHG	0.031	0.748	0.177	3.093	0.002
EI	0.204	-44.380	-0.452	-9.085	0.000
SREC	0.163	5.226	0.404	7.916	0.000
Economic aspects					
ER	0.295	3.659	0.543	11.605	0.000
GDPC	0.159	8034.693	0.399	7.815	0.000
GDPW	0.123	15151.158	0.350	6.713	0.000
EC	0.027	-7.019	-0.164	-2.984	0.003

Source: Author's calculations.

level $p<0.01$. Opposite to NMS, all standardized coefficients were positive, indicating that investments could lead to employment growth, economic activity, productivity, and export growth.

Impact of R&D Investment

As the R&D investments are a vital part of investments in achieving sustainable competitiveness, the same analysis was conducted for these investments. The obtained results for the EU as a whole are presented in Table 7.

The results presented in Table 7 suggest that all standardized coefficients were statistically significant at the level $p<0.05$. Furthermore, the standardized coefficients for social variables were negative except for TE, indicating that an increase in R&D investments could decrease all indicators except this related to TE.

The values of standardized coefficients for indicators representing the ecological aspect of sustainable competitiveness suggested that increased R&D investments at the EU level resulted in increased DMC and GHG, and SREC, as well as a decreased FF, ED, and EI.

Table 8. Linear regression results for impact of R&D investments on sustainable competitiveness in NMS

R&D investments					
Indicator	**R Square**	**Unstandardized coefficients**	**Standardized coefficients**	**t**	**Sig.**
Social aspects					
SMDP	0.118	-1123.858	-0.343	-4.674	0.000
PRSE	0.282	-9.271	-0.531	-8.078	0.000
ELE	0.176	-4.189	-0.420	-5.954	0.000
TE	0.035	3.983	0.188	2.464	0.015
UAE	0.032	-0.844	-0.179	-2.339	0.021
GINI	0.153	-4.161	-0.391	-5.472	0.000
Ecological aspects					
DMC	0.012	1.182	0.108	1.393	0.165
FF	0.002	-0.388	-0.044	-0.566	0.572
ED	0.048	-11.506	-0.218	-2.878	0.005
GHG	0.089	2.751	0.298	3.847	0.000
EI	0.020	-23.595	-0.143	-1.857	0.065
SREC	0.001	0.537	0.030	0.382	0.703
Economic aspects					
ER	0.098	3.116	0.313	4.253	0.000
GDPC	0.071	11160.914	0.266	3.556	0.000
GDPW	0.075	24782.826	0.273	3.656	0.000
EC	0.045	17.651	0.211	2.788	0.006

Source: Author's calculations.

If the economic indicators were considered, it can be concluded that only the standardized coefficient for the EC was negative, meaning that an increase in R&D investments could lead to a decrease in exports, but also an increase in economic activity, productivity, and employment.

For deeper insight into results at the EU level, the regression coefficients are calculated separately for NMS and OMS. The results for NMS are presented in Table 8.

The results for NMS presented in Table 8 suggest that standardized coefficients for all indicators in the group of social indicators were statistically significant at the level $p<0.05$. As for the EU level data, negative standardized coefficients were obtained for all observed indicators, except for TE. The values of standardized coefficients for ecological indicators suggested that the impact of R&D investments on the ecological aspect of sustainable competitiveness in NMS was slightly different from the EU. In NMS, the standardized coefficients for DMC and FF and SREC were not statistically significant. However, the standardized coefficients for ED and GHG were statistically significant at the level $p<0.05$, while the coefficient for EI was statistically significant at the level $p<0.1$. Thus, the increase of R&D investments resulted in increased GHG, and decreased ED and EI.

The standard coefficients for all indicators representing the economic aspect of sustainable competitiveness were positive and statistically significant at the level $p<0.05$. According to that, it can be

Table 9. Linear regression results for impact of R&D investments on sustainable competitiveness in OMS

R&D investments					
Indicator	**R Square**	**Unstandardized coefficients**	**Standardized coefficients**	**t**	**Sig.**
Social aspects					
SMDP	0.134	0.000	-0.366	-4.878	0.000
PRSE	0.608	-0.125	-0.780	-15.450	0.000
ELE	0.211	-0.068	-0.460	-6.424	0.000
TE	0.077	0.025	0.278	3.592	0.000
UAE	0.415	-0.138	-0.644	-10.449	0.000
GINI	0.602	-0.211	-0.776	-15.271	0.000
Ecological aspects					
DMC	0.287	0.064	0.536	7.873	0.000
FF	0.002	0.048	0.045	0.562	0.575
ED	0.313	-0.020	-0.560	-8.385	0.000
GHG	0.027	0.062	0.163	1.961	0.052
EI	0.010	0.003	0.098	1.227	0.222
SREC	0.328	0.036	0.573	8.675	0.000
Economic aspects					
ER	0.565	0.093	0.751	14.134	0.000
GDPC	0.159	3.398E-005	0.399	5.397	0.000
GDPW	0.010	4.624E-006	0.101	1.259	0.210
EC	0.001	0.001	0.034	0.418	0.677

Source: Author's calculations.

concluded that increased R&D investments could contribute to the improvement of all observed economic performances in NMS.

The same analysis was performed for OMS, and obtained results are presented in Table 9.

Considering the results for social indicators presented in Table 9, it can be noted that all standardized coefficients were statistically significant at the level of $p<0.05$. The only causality between R&D and TE was negative, meaning that an increase in R&D investments could result in an increase in the share of people with TE in the total population. All other aspects of the social dimension can be improved by increased investments in R&D.

The results for ecological indicators pointed out that the standardized coefficients for a FF and EI were insignificant. In contrast, all remaining coefficients were statistically significant at the level of $p<0.05$, except the coefficient for GHG, which was statistically significant at the level of $p<0.1$. Moreover, among statistically significant coefficients, only the coefficient obtained for ED was negative, indicating that R&D investments could contribute to lowering the ED of OMS. On the other hand, increased investment in R&D could lead to DMC and SREC.

In the group of economic indicators, only standardized coefficients for ER and GDPC were statistically significant at the $p<0.05$ level. Both of them were positive, suggesting that the growth of R&D investments could lead to increased employment and economic activity in OMS.

CONCLUSION

During the last two decades, the concept of competitiveness has got a much broader application. It is not just an economic concept measured by financial performance but encompasses companies' ecological and social aspirations to increase profitability under intense competition in the global market. Therefore, ecological and social performances become an essential part of national competitiveness strategies. In that sense, sustainable competitiveness became the top priority of policymakers in all economies worldwide. The EU leaders have taken many actions to achieve sustainable competitiveness since the future position of the EU economy in the global market significantly depends on investments dedicated to improving the economic, social, and ecological aspects of competitiveness. Considering that the OMS has more capacity to meet the challenges of this idea than NMS, the motive for writing this paper was to investigate differences in the effect of total investments and R&D investments on key sustainable competitiveness pillars.

The results of the Mann-Whitney test suggested that differences in most social indicators are not statistically significant, while differences in all economic indicators are statistically significant. Regarding the ecological indicators, the differences in all indicators except the SREC are statistically significant. According to that, it can be concluded that differences among NMS and OMS related to economic and ecological aspects of sustainable competitiveness are still relatively high.

The obtained regression analysis results pointed out that total investments and R&D investments had different impacts on sustainable competitiveness in NMS and OMS to a great extent. If the social dimension of sustainable competitiveness is considered, the results suggested that both total and R&D investment could cause a decrease in poverty at OMS and EU levels. In contrast, in NMS, only R&D investments reduced poverty (Cincera et al., 2015). One important conclusion, certainly to some extent connected with these results, was that increase in total investments at the EU level and NMS level could lead to a decrease in the share of TE, as a result of high specialization in low value-added manufacturing goods and efficiency-driven investments, and, consequently, low demand for a skilled workforce and insufficient motivation for engagement in TE. However, in both NMS and OMS, and consequently at the EU level, an increase in total and R&D investments could cause a decrease in UAE and a decrease in the GINI coefficient. This can be explained by increased investment activity absorbing a skilled workforce and reducing poverty to lower inequality.

The total and R&D investments had diverse effects on the ecological dimension of sustainable competitiveness regarding the observed indicators. The results indicated that the growth of both total and R&D investments can increase DMC and GHG due to still high presentence of resource-seeking investments and low usage of clean technologies in production. On the other hand, the total investments had the opposite impact on NMS in comparison to OMS. Namely, increased total investments could cause increased ED and lower EI in NMS and opposite effects in OMS. These results suggested that increased demand for energy in OMS was met by increased production of energy. At the same time, higher investments in NMS were characterized by lower usage of energy, but they were still highly dependent on energy imports. On the other hand, R&D investments contributed to decreasing EI and

dependency in NMS, leading to better performances in this respect in the EU. Furthermore, both total and R&D investments contributed to an increased usage of renewable energy sources due to the higher consumption of such energy in OMS.

Finally, the impact of total and R&D investments differed across the analysed economic indicators. The obtained results suggested that both total and R&D investments increased employment in NMS, OMS, and the EU as a whole (Chocholatá & Furková, 2018). However, the impact on labour productivity was different. In NMS, increased employment due to increased total investments was not followed by an appropriate increase in economic activity (as is the case in OMS), leading to a reduction in productivity. On the other hand, the growth of R&D investments led to increased productivity at the EU level, mainly due to increased productivity in NMS (Cincera & Veugelers, 2013). The effects of total investments were also different if GDPC and the EC were considered. Namely, increased total investments led to decreased GDPC and export in NMS and opposite results in OMS. This is why the results at the EU level were diverse. The higher R&D investments contributed to increased economic activity and export in NMS, taking into account that most of them follow an export-led growth model.

The study had some limitations. From the viewpoint of the future orientation of scientific tasks, the research could encompass other sustainable competitiveness indicators that may affect sustainability competitiveness. Also, it might be helpful to begin new research on the indicators considered here in a broader group of countries or the other continents. By enlarging the sample size and expanding the analysis with new countries, new conclusions and interactions between the research areas may emerge. Another suggestion for future studies is to further the research, using multi-criteria decision-making methods to rank the EU economies. This way, more detailed insight into the level of development of individual economies at the OMS and NMS levels would be gained. Additionally, this study focused on the period of 2008-2019. Still, the situation on the global market has significantly changed due to COVID-19. Accordingly, the consideration of investments in aspects of sustainable competitiveness has changed. To overcome this limitation, the research model could be analysed for the period 2019-2022 and a comparative analysis could be provided.

Due to its universal character, the scientific community can apply this conceptual view to understand the impact of the total investment and R&D investments on sustainable competitiveness aspects in the other environments. The study also provides valuable references for policymakers to understand the importance of investments to ensure the country's sustainable competitiveness, secure even economic growth in all regions, and reduce the differences between OMS and NMS.

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Chapter 17
Paradigm Change in Financing Sources:
Transition From Traditional Finance to Platform-Based Finance to Ensure Financial Sustainability

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ABSTRACT

Paradigm changes also change the sources of corporate finance. The goal of this chapter is to demonstrate how the sociological changes that will be created by technological developments transform the sources of finance within the framework of "sustainability" and "financial inclusion." At this point, the basic elements of the financial system in the transition from traditional financing to alternative financing and to platform-based financing, albeit a new one, are examined. For this purpose, first of all, traditional financing sources and alternative financing sources are briefly mentioned, and then platform-ecosystem-based financing sources, which are the main subject of the study, are shed light on. The sources of financing provided through FinTechs are examined within the framework of digital finance-digital inclusion and online finance models (especially crowdfunding). The changes that the COVID-19 process may create in financial resources and the digital technologies it may bring are also assessed.

INTRODUCTION

The effectiveness of the financial system is measured by increased productive investment, which increases economic growth and improves sustainable living standards. Fundamental elements of the financial

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system are providers of funds, users of funds, financial markets (intermediaries and instruments) and regulatory-supervisory institutions. In this sense, in order to interpret the effectiveness of the financial system, a broad and social perspective that affects all these factors together can be useful. In this chapter, the major changes that have occurred in the structure and functioning of financial markets and the provision of financial services in the last 100 years are examined, because the changes in the social relations system are a reflection of the changes in the financial system (Kurt-Cihangir, 2019). The main contribution of the study is to reveal how the financing sources and financing composition used by a firm at various stages of its life cycle changes and develops. Therefore, the study provides a bird's-eye view of the last 100 years of the international financial system. It is expected that the determination of the paradigm shifts in the financial system and their consequences will contribute to both those who are interested in the subject and policymakers in their evaluations.

Until the 1970s, value-creating fields such as industry, agriculture, and mining were largely financed by loans, and the productivity of labor had to increase in order to repay these loans. With the collapse of the Bretton Woods System in 1971, the excess money created was loaned to developing countries and/or used to buy assets instead of directing it to production. The value of these assets has been determined according to the income stream or scarcity situation it will provide in the future. On the one hand, excess money commodities real estate, land, etc. when transferring to assets; on the other hand, futures markets are created to manage/distribute emerging systematic risks (Harvey, 2015). Liberalizing interest rates of countries and the flow of international capital as part of financial liberalization have relaxed financial markets' rules. In addition, the significant increase in the innovation capability of the system with the computerization of finance has led to financialization. Financialization is the increasing role of financial instruments, financial actors, financial markets and financial institutions in national and international economies (Epstein, 2005; Palley, 2009). On the other hand, there is growing evidence in recent years that private finance has withdrawn from financing long-term productive investments in the "real economy", as the combination of financial innovations with regulation makes it easier to profit from speculative investments in financial assets (Wray, 2011; Kay, 2012). Therefore, it can be said that financialization, with its increasing profitability and short-term perspective, distanced companies from their main fields of activity and intermediaries from their basic operational activities.

Platform-based financing continues to affect traditional forms of financing, posing a new competitive risk, especially for commercial banks, due to its functions such as cost reduction, disintermediation and elimination of information asymmetry. Platform-based financing models, based on the use of special online platforms or ecosystems, provide various advantages such as speed, simplicity and accessibility compared to financing through banks or capital markets (Rubanov & Marcantonio, 2017). The emergence of these technology-based modern financing methods in terms of corporate finance allows small investors to invest without the need for financial intermediaries (Vismara, 2016). The negative aspects of platform-based financing methods can be listed as the formation of a kind of shadow financial system, which may be caused by the exclusion of online financial institutions from the regulatory framework, the inability to control credit quality, the relative difficulty of investor protection, and the existence of risks related to digital data security.

In this chapter, the paradigm shifts in the financial system and the transformations in the sources of finance are presented with a 100-years background within the scope of sustainability. This chapter, in which evaluations are made on the functioning of digital finance and platform-based financing methods that have developed with the digital transformation, focuses mainly on the crowdfunding system. Considering the increasing interest in platform-based financing methods, it is thought that this review

paper will achieve the aim of being a principal resource in terms of finance literature and will provide a 100-years in-depth perspective on the transformation in financing sources.

BACKGROUND

The literature on the development of financing sources dates back to the birth of business science. The main element that ensures the start and continuity of a project is its access to financial resources. In this section, the reasons for the transition of these financing sources from traditional to platform-based ones and the changes created by this transition are emphasized and major, irreversible paradigm shifts such as technological developments and crises are shown and in particular, different solutions have been proposed for entrepreneurs who find it difficult to apply to traditional financing methods and to find a place for themselves in the systems supported by these methods. At this point, one of the platform-based financing models, which are thought to serve as a bridge in reaching sustainable finance, should be emphasized. Crowdfunding is an important step towards achieving sustainable development goals by providing access to individuals with limited access to financial resources and increasing "financial inclusion".

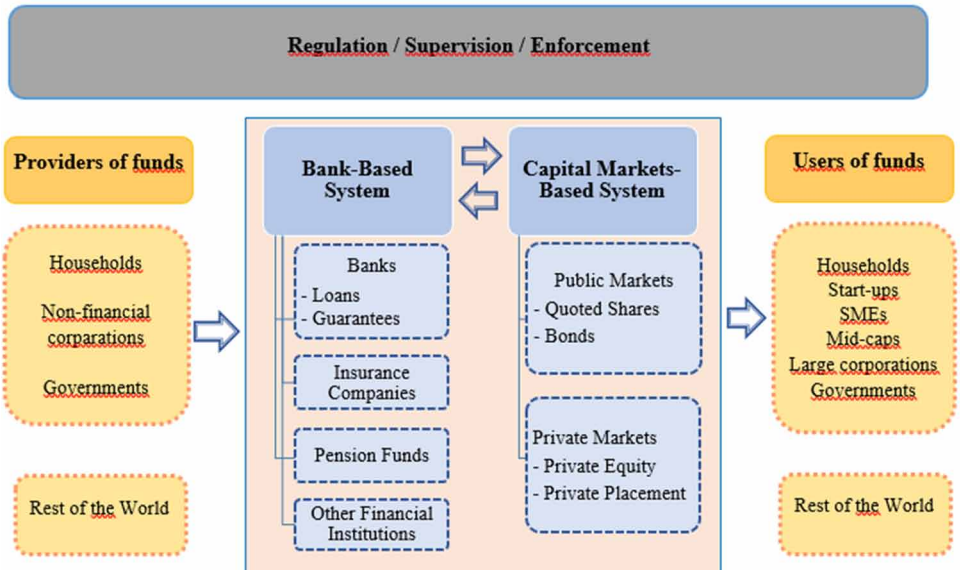
Like all changes, the mentioned paradigm shifts have positive and negative sides. However, considering the impossibility of escaping the economic extensions of technological changes in today's conditions, it is more logical to choose to manage these changes. Therefore, the reflection of technology to financial life has been evaluated by focusing on the new financing models created by FinTech applications. The study will contribute in this regard and become an important guide in ensuring sustainability in accordance with the new financial understanding brought by the Covid-19 pandemic. Since many of the constructs commonly encountered in platform-based finance to ensure financial sustainability may be new to the reader, the authors have provided a glossary that contains the key terms related to the subject.

Traditional Financing Sources & Alternative Financing Sources

The financial systems of countries are divided into bank-based and market-based. This distinction affects all elements of the financial system, especially financing sources, and macroeconomic indicators. Figure 1 shows the functioning of the financial systems formed as a result of this separation.

Since the financial system and the social structure are closely interrelated, changing sociological structures also change financial systems. After the industrial revolution, the technological revolution that shaped the social structure of the society, led to the biggest transformation. Paradigm changes in financing sources and their causes in the last 100 years are given in Figure 2. Keynes (1930) divided the elements of the monetary system into industrial circulation dependent on production and financial circulation dependent on financial transactions. Accordingly, the relationship between industrial circulation and financial circulation emerges in two ways (Kurt-Cihangir, 2020): The first is that the entrepreneur (investor), who has capital and wants to invest and/or expand his current status, can reach more total capital by requesting a loan. The second is that money goes into financial circulation through a direct financial intermediary. In the first one, the return appears as a dividend and in the second one as an interest and/or capital gain. The Bretton Woods System (1944) was established to eliminate the negative effects on the international financial system of the Great Depression in 1929 and the Second World War. This system, which minimized the risks arising from the international monetary system, collapsed in 1971 and thus a paradigm shift occurred. The industrial cycle, which had been valid until this time, left

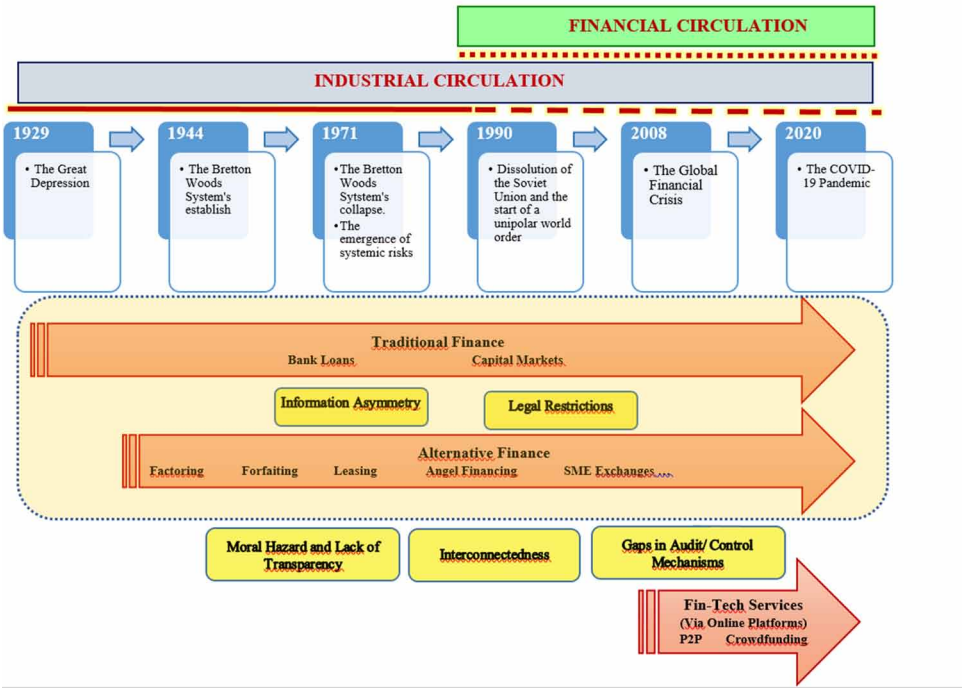
Figure 1. Key elements of financial systems
Source: (EC, 2015)



its place to the monetary cycle with the emerging systemic risks (exchange rate, interest rate, political, etc.). This process, which was slow in the past, accelerated in the early 90s with the dissolution of the Soviet Union and the increase in the use of technology in the field of information and communication (Kurt-Cihangir, 2019).

Companies needed more capital to increase technological investments for new production techniques, to invest in new countries where cheaper raw materials and cheaper labor opportunities were available, and/or to avoid emerging risk factors. This situation made it important to determine the appropriate financing source. In the traditional sense, the need for financial resources outside the company basically arises in two ways: The first is the working capital need that arises from short-term funding needs in the business cycle. The second is the need for investment financing for companies' long-lasting investments such as investment in production facilities, goods and service production vehicles, machinery and equipment purchase. In both cases, depending on whether the financial system is bank or market-dominated, the alternatives for the source of financing vary. Traditionally, external funds can be used in two ways: bank loans and / or issuing securities in the capital markets. Bank-based funds source capital through financial intermediation (Vashishtha, 2014; Boot, 2000). The general acceptance here is that every company in need of financing can benefit from the financing alternatives offered. However, this is not really the case, because factors such as asymmetric information in a bank-based financial system and legal restrictions in a market-based financial system directly affect firms' access to finance. Therefore, alternative sources of financing to traditional financing have been developed. Alternative financing can be defined as providing financing from sources other than traditional sources such as the banking system and capital markets in general (Allen et al., 2013; Rubanov & Marcantonio, 2017). These options can be listed as Factoring, Forfaiting, Leasing, Angel Financing, SME Exchanges, Project Exchanges, etc. Those who prefer these types of financing are mostly the companies excluded from traditional financing and the new companies in the market. Companies using alternative financing methods reduce their dependence

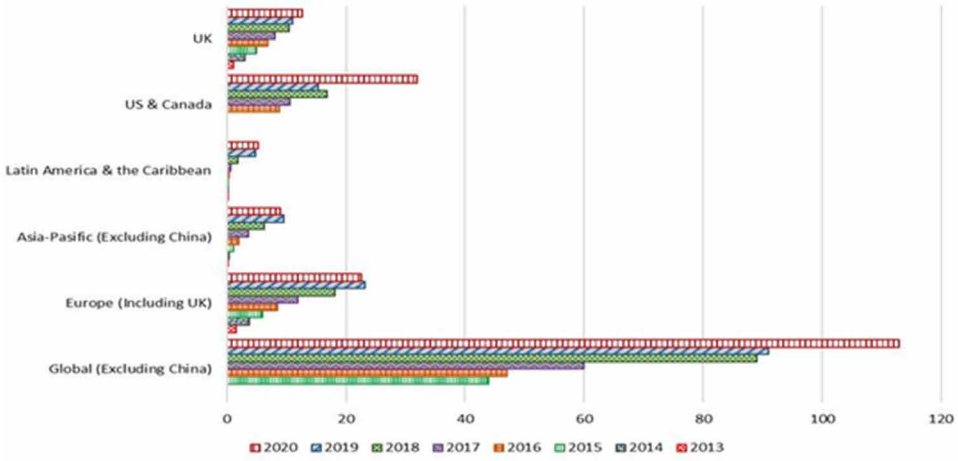
Figure 2. Paradigm changes in the financing sources and their causes in the last 100 years
Source: Authors.



on the classical banking system and their systematic risks with financial diversity. It is necessary to build a system based on the legal framework and an atmosphere of trust without information asymmetry in alternative financing methods, as in traditional financing methods. Financial crises arise due to the flaws in the implementation of these systems and completely change the construction of the financial system.

Generally, the increasing frequency of financial crises since the 1990s shows that Galbraith's (1994) term "brevity of financial memory" is valid for the financial sector and its regulators. The fact that the regulations which were passed after each financial crisis form the basis of a new financial crisis reveals the power and impact of the financial sector, in other words, its status quo. Global integration as a result of liberalization movements in national markets, has led to increase the interconnectedness between institutions and markets. For example, with the transformation of a large number of local and/or regional banks into a universal banking model, almost all financial services are provided by a single institution. This situation which was also one of the main reasons of the 2008 Global Financial Crisis, was led to the concentration of the banking sector which was "too big to fail", or, in the case of the European Union, "too big to bail" (Blyth, 2013). In retrospect, it was during the same period that certain aspects of financial markets began to be unregulated by the state and the erosion of discipline in the industry gradually increased (Coffee, 2009). Furthermore, failures in market discipline began to become apparent long before the 2008 Global Financial Crisis, probably in the mid-1980s, along with the Savings and Loans (S&L) Crisis in the United States (Barth, 1991), in the aftermath, the collapse of Long Term Capital Management in 1998 (Bookstaber, 2007). In the EU Commission papers it is generally admitted that much of the growth in debt capital markets activities in pre-crisis years was effectively not aimed at supporting any real economy activities and instead was resulted in profits being kept within the financial

Figure 3. Alternative finance volume, billions USD
Source: CCAF, 2020a; CCAF, 2021, Ziegler et al., 2017.



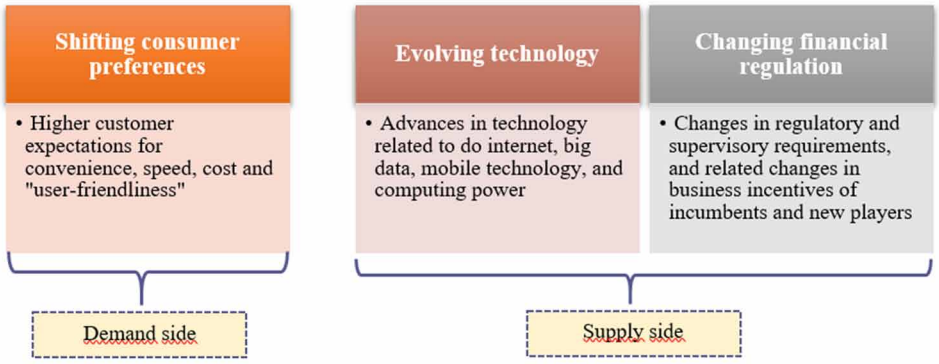
system (EC, 2015). As a result, this system based on the financial cycle, has started a paradigm shift by causing the meltdown of international financial markets and a Global Financial Crisis.

Platform-Ecosystem Based Financing Sources within The Framework of Financial Sustainability

The paradigm shift that emerged with the 2008 Global Financial Crisis has also caused a great change in financing resources. Undoubtedly, the intertwined structure of financial systems and financial institutions and the deficiencies in supervision/control mechanisms have a major role in the effectiveness and severity of this crisis. After the crisis, the reluctance of banks and intermediary institutions in the capital markets to provide funds as a result of an effective supervision/control process led to the development of new alternative financing sources. Although the development of alternative financing sources with the paradigm shift is observed, the evaluation of this process becomes difficult due to the inadequacies in data collection. Therefore, the 2020-2021 reports of the Cambridge Centre for Alternative Finance (CCAF) and the European Alternative Finance Industry Reports, which are the most comprehensive evaluations made, are discussed in the study. These reports prove the rise in the volume of alternative finance with data because of the increasing interest all over the world over the years. In Figure 3, the alternative finance volume change, both globally and regionally, that occurred with the paradigm shifts is shown.

The increase in the use of technology in financial markets (FinTech applications) has also been effective in this paradigm shift (Kirby & Worner, 2014). Financial units which supply and demand funds are experiencing sociological changes due to technological developments, and this situation also changes their expectations and requirements from the financial system. An increase in FinTech applications has been observed to meet this requirement (FSB, 2017). In Figure 4, the driving forces of financial innovations experienced with digitalization are discussed with regard to all financial units. Along with these changes, platform-based financing models have been developed under the name of reward-based, donation-based, debt-based (P2P) and equity-based crowdfunding, which enable the masses to integrate into the financial system without intermediaries.

Figure 4. Drivers of financial innovation
Source: (FSB, 2017)

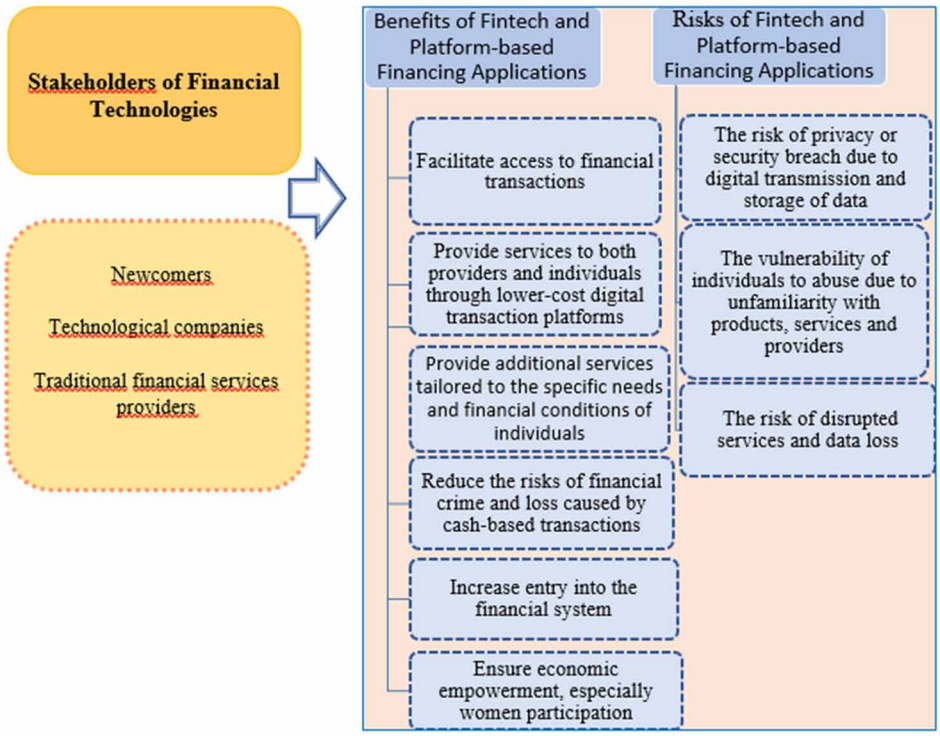


Platform-based financing models, with the intensive use of FinTech applications, enable financial units to access financing resources more easily, to distribute resources more evenly among units, and thus to have a positive effect on reaching resource efficiency. With the closure of digital gaps, it is thought that there will be improvements in ensuring equality in accessing digital financial services, benefiting from financial resources and using these resources effectively. This so-called digital financial inclusion involves the use of cost-saving digital tools to access a range of official financial services offered to financially excluded and underserved people at a reasonable cost (sustainable cost for providers) (CGAP, 2015). It is expected that financial inclusion and sustainability will be ensured with digitalization, which radically changes the use of financial services and their access channels. Financial inclusion is considered to be an important step towards achieving the United Nations' Sustainable Development Goals (SDGs) of combating poverty, hunger, gender discrimination, and inequality or promoting economic growth, innovation, industrial development and health care (UNCDF).

According to the data of the World Bank, only 2.5 billion people can make cash transactions due to lack of access to financial services. The widespread use of FinTech applications developed and used by three different stakeholders, will bring significant benefits for those who are excluded financially and receive insufficient financial services (WB, 2014). These benefits, which are also shown as the benefits of platform-based financing applications, are given in Figure 5. In addition to these benefits, there are also some risks. By paying attention to these risks, FinTech applications that can create opportunities for low-income households and small businesses without financial access should be well understood for the regulation and supervision.

When CCAF's 2021 report is examined to support the mentioned benefits with data (see Figure 6), it is seen that alternative financing models facilitate individuals and companies who cannot reach traditional financing models to enter the financial system. Accordingly, it is understood that 72% of the participants in the crowd-led microfinance system have no access to traditional financial systems, while 27% can only access simple and basic financial services. In the report, although the rate of those who cannot benefit from the banking system is not as high as the microfinance system in other alternative financing methods, the rate of those who only benefit from basic banking services should also be evaluated for a healthy evaluation. The proportion of individuals who cannot access all financial services is, on average,

Figure 5. Benefits and risks of fintech and platform-based financing applications
Source: Carmona, et al., 2018; CGAP, 2015.



30%. It is thought that financial inclusion will be ensured by providing access to platform-based financing systems for this large crowd of people, whose access to traditional financing methods is limited.

There is no consensus on the classification of FinTech applications. For example, the Financial Stability Board (2017) classifies FinTech applications under 5 financial services groups: (i) payment and clearing (ii) deposit, lending and fundraising (iii) insurance (iv) investment management and (v) market support services; crypto assets were included as a separate financial service category in the BIS (2020) report (see Figure 7).

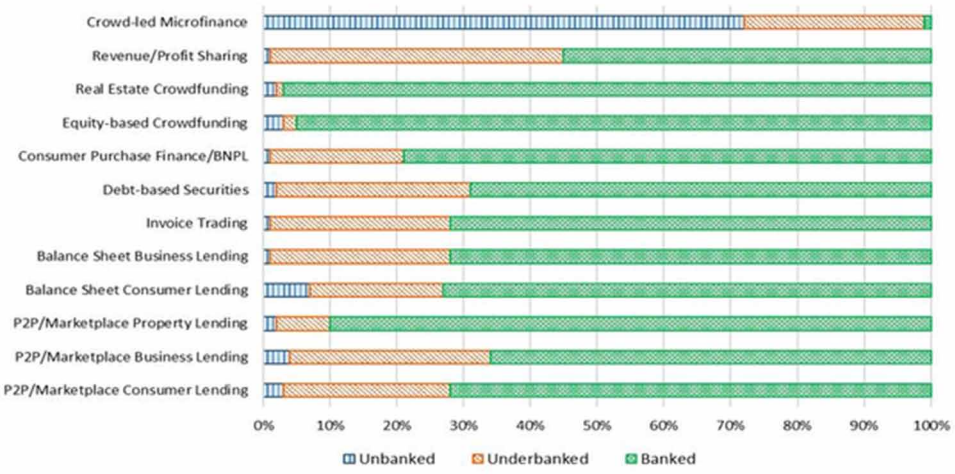
In this study, crowdfunding will be discussed under the title of deposits, lending and capital raising practices.

CROWDFUNDING

The Concept of Crowdfunding

Crowdfunding aims to create an investment environment in which small amount of capital is provided by individual contributors in a large crowd. In this new type of financing, "crowd" is used as a broad concept to get ideas, feedback and collaborative solutions. In crowdfunding, the amount required for investment is tried to be collected by using social networks (Belleflamme, et al. 2010). The crowd in question consists of a large number of people and their assets, resources, knowledge and expertise. The

Figure 6. Banking status by model
Source: CCAF, 2021.

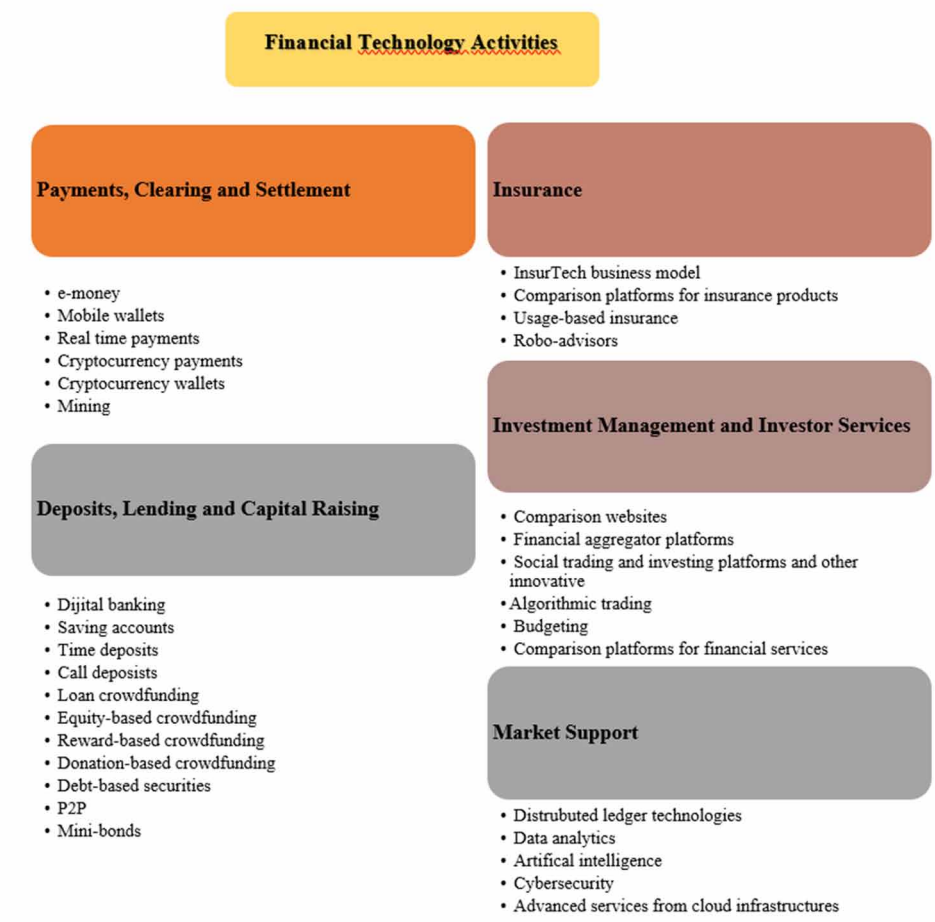


term crowdfunding is derived from the concept of crowdsourcing (Hemer, 2011). This system, which aims to bring an alternative solution in terms of the use of financial resources, is seen as an important financial revolution for entrepreneurs who have difficulty in finding resources.

This new financing system is an important step for entrepreneurs who have difficulty in finding funds from traditional financing sources due to lack of collateral, insufficient cash flow and significant information asymmetry with investors. At this point, the essence of this system, which replaces angel investors, banks and venture capital funds, is the idea of "receiving help from the crowd" (Schwienbacher & Larralde, 2010). In order for the system to work, the fund needs to change hands in the most cost-effective and fast way between individuals who have the source of finance and the entrepreneur who needs finance. This requirement causes the system to operate via the internet. Crowdfunding definitions made within this framework also emphasized this point.

Klemann et al. (2008) defined crowdfunding as "an open call, via the Internet, to provide financial resources, either in the form of donations or in exchange for a prize and/or voting rights, to support initiatives for specific causes". In the study, it was emphasized that crowdfunding gained momentum with the emergence of "Web 2.0", a short term used for internet applications that facilitate two-way communication. Thus, in this system, which aims at the participation of the crowd, who are also consumers, in the value creation process, consumers are now called "working consumers" (Klemann et al., 2008). Ordanini et al. (2011) also focused on this feature of crowdfunding and it was stated that the development of consumer technologies, especially the "Web 2.0" technology, are used commonly in crowdfunding by creating and changing content and communicating with other consumers with the help of social networks. In addition, with the evolution of consumers towards entrepreneurship, the changing consumer roles have been examined, In addition, with the evolution of consumers towards entrepreneurship, the changing consumer roles have been examined, and it has been emphasized that consumers have transitioned from merely purchasing to the point of deciding to pay for the production and promotion of the product and taking the risk associated with this decision (Ordanini et al., 2011). This system, which is applied to convert the small investments of the masses into large investments by combining them via the internet, has emerged as an alternative to traditional financing methods.

Figure 7. FinTech services classification
Source: (Iclaves, 2018; FSB, 2017)



While crowdfunding makes significant use of technological developments, it can also be the cause of these. Crowdfunding makes it easier for entrepreneurs with innovative ideas to find funding. According to a definition emphasizing this aspect, crowdfunding is expressed as a new financing technique that enables entrepreneurs with innovative ideas to meet their financing needs through websites and social media tools at the stage of implementing their ideas or presenting prototypes (İzmirli Ata, 2018). Due to its unique characteristics, innovation has become more compatible with this technique than with traditional financing methods. Generally, small innovative companies and start-ups have difficulty in accessing bank financing and in the repayment of this financing. The features such as the high risk of implementation of innovative ideas and the fact that they can only be used in the company where they were developed because of the difficulty of transfer (Herve & Scwienbacher, 2018) have enabled entrepreneurs with these ideas to turn to alternative financing techniques.

Paradigm Shifts that are Effective in the Development of Crowdfunding

The concept of crowdfunding is derived from the concepts of microfinance and crowdsourcing. A similar aspect of these systems is the role of the masses in the continuation of small projects that provide social development. Crowdsourcing is defined as obtaining the necessary data, information resources, goods or services from the masses rather than professional experts or consultants. Howe (2006) who first addressed this concept, stated in his paper that ordinary people participate in this system to produce content, solve problems and participate in R&D studies, and companies prefer this method for cheap labor (Howe, 2006). However, the difference of this concept from crowdfunding is that what is expected from the masses is information, innovative ideas and the products that these ideas reveal, instead of funds. Likewise, in terms of mass support, it is similar to microfinance. However, microfinance applications mostly cover the provision of funds to low-income people in developing countries to alleviate poverty. Since it is aimed at donors and non-economic benefits, it is far from explaining the risk perception and risk-return expectations of stakeholders in crowdfunding (Ordanini et al., 2011; Bruton et al., 2015). Although similar to these concepts, the concept of crowdfunding differs from them with its unique features.

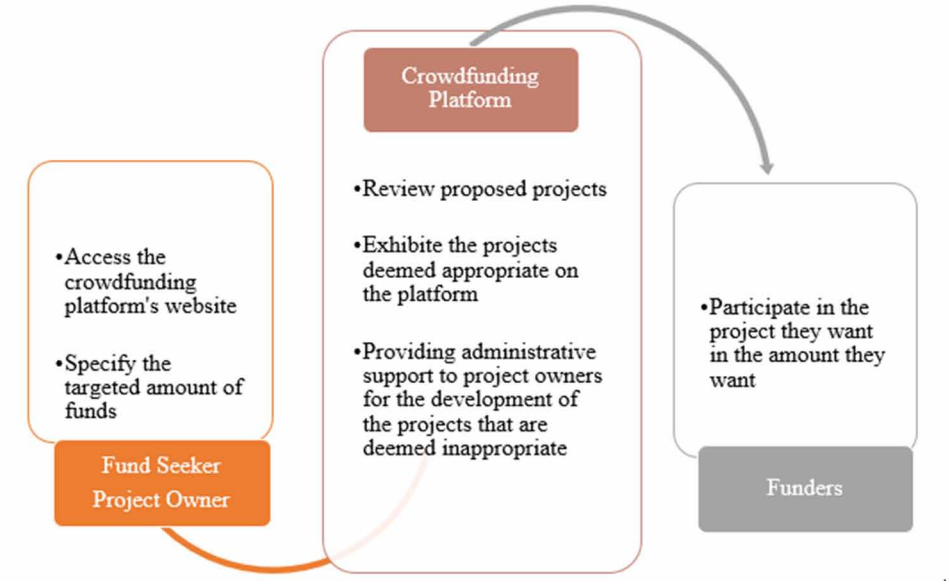
The emergence of the concept of crowdfunding is not new. Even if it is not called by this name, financing methods with similar transactions have been seen in practice. It is known that Mozart and Beethoven's concerts and publication of new music manuscripts were financed through pre-subscriptions by individuals, or the Statue of Liberty in New York was funded by small donations from American and French citizens (Hemer, 2011).

Crowdfunding has become widespread as an alternative financing source for small-scale and early stage companies that have difficulty in finding funds after the Global Financial Crisis that caused a paradigm shift. During the crisis, crowdfunding has become widespread because banks see small businesses as risky and do not want to give loans, the cost of these businesses to find funds is high, many people are willing to help and the internet facilitates access to large communities (Onur & Değirmenci, 2015). The Global Financial Crisis has greatly reduced the debt financing of small businesses and the decrease in venture capital has reached 82% (Beaulieu et al., 2015). At this point, the idea that the funds needed to get out of the crisis could be met by the masses came to the fore. The belief that it would be easier for large masses to overcome the consumption-investment and employment losses experienced with the economic crisis triggered by the financial crisis has become widespread.

Crowdfunding Process and Types

The parties in crowdfunding are fund seekers, funders and intermediaries, similar to traditional financing techniques. Fund seekers, also called project owners, are people who try to obtain the funds they need for their projects by making an open call to large audiences via crowdfunding platforms (Atsan & Oruç Erdoğan, 2015). In addition to finding financial resources for their ideas, project owners also apply to crowdfunding for reasons such as promoting their products to consumers and conducting market research (Ekici, et al., 2019). Investors or donors who financially support the projects they want to invest are called funders. As a side of crowdfunding, financial supporters resort to this method to support their social circles, buy cheap products, support innovative projects, and provide high returns (Vural & Doğan, 2019; Ekici, et al, 2019). Apart from donation-based crowdfunding, funders earn dividends if they become partners by investing in promising projects and interest if they lend (Anbar, 2020). Platform owners, who earn a certain percentage of commission income from the project owners, are defined as

Figure 8. Crowdfunding process
Source: Authors.

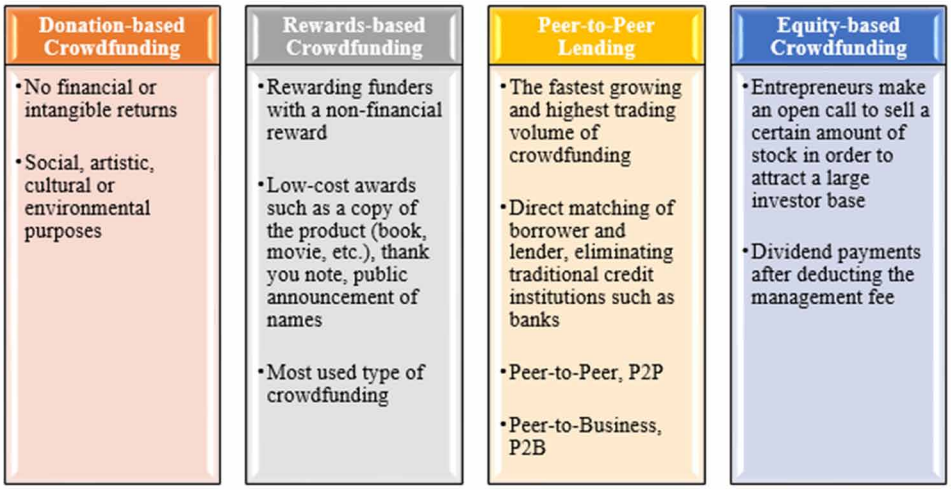


internet-based websites that bring together fund seekers and funders. Platform owners, who are a-key stakeholders, have to create, manage and control the crowdfunding process, oversee legal requirements and ensure that it runs smoothly (Beaulieu et al., 2015; Vural & Doğan, 2019).

In crowdfunding, the process starts with the project owner becoming a member of the crowdfunding platform and introducing his idea or prototype. At this stage, the targeted amount of funds should also be specified. Determining an optimal fund amount affects the credibility of the project owner and provides a realistic evaluation of the project. In order to bring the project from the idea stage to a realistic product or service stage, it is important to analyze all the costs and risks in the process and for pricing that takes into account the market conditions (Kurt Cihangir, 2018; Anbar, 2020; İzmirli Ata, 2018). The process continues with the crowdfunding platform reviewing the proposed projects, and the projects that are found appropriate are allowed to be submitted on the platform. Investors fund these projects via the internet. At the end of the specified period, some of the crowdfunding platforms determine the collection of all the targeted funds as a success criterion, while some do not determine a success criterion. Platforms that do not set success criteria, on the other hand, transfer the collected fund amount to the project owner after the commission deduction, even if it is less than the targeted amount. If the targeted amount is met, the project owner may give the participants, depending on the type of crowdfunding, gifts with high moral value rather than economic value such as awards, gift products or services, thank you letters, announcing the names of the participants, or returns with high economic value such as interest or dividend income (Kurt Cihangir, 2018; İşler, 2014). The operation of the crowdfunding process is shown in Figure 8.

Although the crowdfunding system is generally considered as meeting the funding needs of entrepreneurs by the masses, it is divided into types that differ from each other according to the characteristics of the system. The most common distinction of the system is made based on whether it brings financial returns to the participants or not. Accordingly, the crowdfunding system is divided into four groups as

Figure 9. The different types of crowdfunding
Source:(Zhao & Sun, 2019; Ahlers et al., 2015; Schwienbacher, 2019; Can, 2017)



reward, donation, borrowing and equity-based crowdfunding. The different features of crowdfunding types are shown in the Figure 9.

Donation-based crowdfunding is a type of funding that does not provide any material and/or intangible return to the investors in return of the funds. In this system, it is possible for the participants to benefit from tax deductions depending on the type of project, even if their purpose is not to earn benefits (Sakızlı, 2018:11; Zhao & Sun, 2019:3). At this point, this method is the most appropriate solution for enterprises that cannot benefit from traditional financial resources and aim for social development.

Reward-based crowdfunding involves rewarding the funders with a non-financial reward for their support without expecting any economic return. Rewards are generally low-cost gestures (Fettahoğlu & Khusayan, 2017; Karaarslan & Altuntaş, 2015). The positive aspects of this model are the possibility to avoid new partnerships and to monitor the demand for large quantities of pre-production products or services. If the project and the award are not handled in the predetermined ways, the uncertainty of those responsible and the difficulty of obtaining the necessary financing amount are the negative aspects of this model (Atsan & Erdoğan, 2015; Onur & Değirmenci, 2015).

Equity-based crowdfunding is based on the issuance of shares or a similar security by businesses whose stocks are not traded on the stock exchange or in an organized market, with a call by entrepreneurs on an online platform to attract a large investor base (Ahlers et al., 2015; Can, 2017). In this system, platforms often request a review report from businesses in need of funding before the project is submitted and to publish it online. Through the platform, contracts for the acquisition of shares must be signed, and the amounts deposited in exchange for the shares held in an escrow account in a bank must be transferred with instructions at the end of the transaction. It is also possible to indirectly acquire a share by investing in a financial instrument that collects all the financial accumulation of the population with surplus funds. This indirect investment is called an "investment pool" and is managed by professionals (Schwienbacher, 2019; Atsan & Erdoğan, 2015).

Although the equity-based crowdfunding method is similar to the reward-based crowdfunding method, higher amount on average is collected, a higher campaign target is set, and the target of the participants

is determined as to obtain a positive financial return from their investments (Vulkan et al., 2016; Hornuff & Schmitt, 2016; Can, 2017).

Debt-based crowdfunding model (Peer-to-peer lending) allows investors to obtain principal amount and interest by providing unsecured loans via an online platform without an intermediary institution at the end of a specified maturity (Onur & Değirmenci, 2015). With the advantage of unsecured loans, entrepreneurs can reach the source of finance more easily than traditional methods. Unlike traditional financing methods such as bank loans, both the entrepreneur and the investor know which project is being financed and choose to be a party in this system with their belief in the project. In the debt-based crowdfunding model, there are two alternatives: person-to-person (peer-to-peer, P2P) or person-to-business (peer-to-business, P2B) lending. In crowdfunding based on person-to-person borrowing, called P2P, small amounts are accumulated from the masses to provide the financing needed by a personal need or an entrepreneur. In crowdfunding based on person-to-business borrowing, which is another alternative and called P2B, the financial support needed by SMEs and micro-scale enterprises is provided by the masses (Can, 2017; Sakızlı, 2018). Generally, when debt-based crowdfunding is mentioned, interpersonal (interparty) lending, expressed as P2P, comes to mind.

This system is seen as one of the platform-based financing methods, as it directly matches the borrower and the lender, eliminating traditional credit institutions such as banks. As in other crowdfunding models, in the P2P model, the stakeholders are divided into three groups which are; borrowers, lenders and lending platforms. The task of the platforms is not only the transfer of money between the borrower and the lender but also they perform many different tasks such as evaluating the applicants for borrowing and determining the credit rating by after the risk assessment; monitoring the interest and principal payments to the lenders; providing the debtors with the opportunity to call the debt before the due date; giving the lenders the opportunity to close the loans they have purchased before the due date (Omarini, 2018). Usually, the stakeholders pay a fee to take advantage of these additional services provided by the platform.

Debt-based crowdfunding system is known as the fastest growing and highest transaction volume model of crowdfunding. Equity-based crowdfunding has spread more slowly than debt-based crowdfunding. Although countries have changed their laws to accommodate crowdfunding, the possibility of fraud in this financing system and the need to protect investors remains a matter of debate (Bruton et al., 2015; Anbar, 2020).

Strengths and Weaknesses of Crowdfunding for Sustainable Finance

Crowdfunding is a combination of social change and financial sustainability. This combination offers an innovative solution for entrepreneurs to reach the source of finance (Battilana & Lee, 2014). It is known that crowdfunding serves purposes other than the main purpose of providing funds. Grün and Brunner (2002) divided these purposes into four. Companies benefiting from this funding system can save costs, increase their efficiency with the effective use of resources, experience an increase in the sales of the products, thus operating income and turnover rates, due to the cheaper products, and improve product quality with the inclusion of consumers in the production and value appreciation process.

Crowdfunding has positive aspects not only for companies that prefer this system, but also for individuals and governments. Individuals using this system have the opportunity to use their insufficient savings in the projects they want in order to venture alone. Crowdfunding not only provides ease of access to financial resources for those in need of funds, but also helps to include the masses that have surplus

funds and cannot be included in the financial system. This system gives individuals the opportunity to invest by increasing their financial participation and also provides individuals both material gain and moral value. At this point, the fact that crowdfunding reveals consumer demands and consumer opinions about the product before the product is released to the market should also be addressed. Thus, it is ensured that investments in areas where consumers think that production is not beneficial are prevented from the very beginning and these ineffective investment ideas are abandoned. With the provision of resource efficiency, the level of social welfare will be increased by investing in productive ideas.

States also benefit from the strengths of this financing method. Entrepreneurship with small and idle funds increases resource efficiency and enables scarce resources to be used in more efficient areas. At this point, the fact that crowdfunding reveals consumer demands and consumer opinions about the product before the product is released to the market should also be addressed. Thus, it is ensured that investments in areas with bad feedback from consumers are prevented from the very beginning and these ineffective investment ideas are abandoned. It is thought that with the investments made in productive ideas, resource efficiency will be achieved and the level of social welfare will be increased.

Countries also take advantage of possible increases in employment levels. Creating new job opportunities and increasing employment in this way is one of the advantages of this financing system. (Valanciene & Jegeleviciute, 2014). In addition, it is expected that economic growth will be positively affected as a result of the increase in investment (Zengin et al., 2017). The positive effect on economic growth can also be considered in terms of innovation-oriented investments, where crowdfunding is generally used. Accordingly, crowdfunding has the potential to promote innovation by offering new sources of capital to innovation-oriented firms, thereby reducing the funding gap for innovative ventures.

The situation mentioned for innovation-oriented investments is also experienced in investments with more social benefits. It is known that it is difficult to support investment ideas with social, cultural, environmental and artistic purposes and to allocate scarce resources to these areas. However, it is a necessity to make these investments in order to ensure social development. In this framework, with the crowdfunding system, social, cultural, artistic and environmental improvements are experienced and the concern of raising fund for these investments is reduced.

Although crowdfunding has many advantages, it also has its own risks. These risks need to be managed for the positive aspects to be more visible. These risks are generally handled by investors in crowdfunding (Robock, 2014; Kirby et al., 2014; Valenciene & Jegeleviciute, 2013):

- Default risk (repayment risk): It is known that individuals/institutions who cannot borrow from traditional financing sources and who may have difficulties in debt repayment generally prefer alternative methods. Therefore, difficulties in debt repayment are among the possible risks.
- Liquidity risk: The difficulties that the investor will face in the process of getting back their invested funds are within the scope of this risk.
- Fraud risk: Due to the lack of some regulations found in traditional financing methods and the low public disclosure requirements, some businesses may hide their true financial status. Even, businesses started and closed immediately based on fraudulent purpose after receiving funds were witnessed in this process.
- The risk of platform shutdown or bankruptcy: Since there is no such strict control mechanism as in traditional financial institutions, such a problem may occur.
- Cyber-attack risk: Considering that all the transactions of this system are done online, the magnitude of this risk cannot be underestimated.

- Legal risk: Legislation regulating crowdfunding is still under development. In particular, there are risks arising from legal loopholes as the legal basis of the equity-based crowdfunding system has just been laid.

Apart from these risks, there are some risks faced by entrepreneurs. These risks are the difficulties experienced in management and accounting, difficulties in getting professional help in the crowdfunding process due to its internet-based nature, the very rapid theft of ideas and business models, deficiencies in regulation and therefore frauds (Valanciene & Jegeleviciute, 2013) These risks should be carefully analyzed and reduced as much as possible. However, in this way, the barriers to financial participation will be reduced and financial sustainability will be ensured.

Latest Paradigm Shift in terms of Financial Sustainability: Covid-19

The crises experienced in the last century have brought innovative solutions to the market by moving investors and entrepreneurs away from the traditional financial system. Accordingly, a new understanding of finance, which is open to everyone's use, is not dependent on any central authority, is providing transparent transactions and is operating in peer-to-peer networks (P2P), has been reached. In the finance literature, this concept is called DEFI or "decentralized finance" (Yavuz & Suyadal, 2020) and is more adaptable to today's conditions than traditional ones. This financing method, which brings entrepreneurs and investors together in a digital environment, has the effect of closing the shortcomings of traditional finance methods and focusing on their strengths.

The Covid-19 pandemic, as one of the biggest paradigm changer, has caused irreversible changes in the financial field. Financial technology, which is seen as a way out of an economic crisis, is also wanted to be used in the exit from the crisis environment created by the pandemic. The problems that can be overcame with digitalization such as social distance and quarantine have made the transactions of companies using financial technology (FinTech) more intensely. According to the report prepared by the World Bank and Cambridge University, FinTech companies responded immediately to the pandemic by changing their products, services and policies. It was determined that two-thirds of the companies participating in the survey made changes in their products and services, and 60% of them put forward new products or services. In the same report, it was emphasized that 36% of the digital payment companies participating in the survey applied fee or commission discounts, 53% of the digital lending companies changed their qualifications or onboarding criteria, and 49% of them brought payment easements. Due to the adaptation to pandemic conditions, FinTech companies' transaction volumes and market values have grown in this period. According to this report, while digital asset exchanges, digital payments, digital savings have achieved an annual growth of more than 20% in transaction volumes, digital banking and digital identity have provided more modest increases (CCAF, World Bank, World Economic Forum, 2020b).

Financial technology, which is seen as an important step to exit the crisis constituted by the Covid-19 pandemic, is also considered to be a prerequisite for achieving sustainable development goals. In the United Nations' 2020 report, which emphasizes the necessity of digital finance for a sustainable future, technological advances are seen as an opportunity to reshape finance. The transformation that created by FinTech's bringing financial services to mass markets, ensuring efficiency in financing and eliminating inequalities by supporting disadvantaged groups has been addressed within this framework (UNDP, 2020).

FUTURE RESEARCH DIRECTIONS

In this chapter, the developments in the financing resources caused by the changes experienced in FinTech applications until today are analyzed. With the spread of the Internet and other mass media, not only individuals but also entrepreneurs seeking financing sources were affected by this change and developed platform-based financing resources in order to get rid of the difficulties of traditional financing methods. Web 2.0, which was emphasized in the definitions of the years when crowdfunding emerged, covers the years 2000-2010. However, it is known that today we have entered the Web 4.0 era. FinTech applications are developing day by day and evolving to meet new requirements. Accordingly, the crowdfunding system discussed in the chapter is expected to differentiate with the acceleration of globalization and instant information and money exchange. It is thought that crowdfunding will be applied more and gain an international dimension in this new order, where the masses that entrepreneurs apply to find funds for their investments do not have to be located within geographical boundaries. Therefore, in future studies, it is recommended to examine the changes that the crowdfunding system will experience and how the sustainable finance process is affected by these changes.

CONCLUSION

Platform-based financing models are used for targeted investments in high-risk R&D, innovative start-ups, and long-term innovations, in areas where private equity has proven too short-term and risk-averse to venture (Schapiro, 2012; Hochstetler & Montero, 2013). Inclusive and sustainable growth efforts based on innovation can be achieved by creating an ideal ecosystem. Major social challenges, such as combating climate change, improving public health and well-being, and adapting to demographic changes, and a financial system to fund them, should be the primary goal of societies. Only in this way, environmental, cultural, and social sustainability can be achieved with the help of a sustainable financial system.

It is thought that crowdfunding models, one of the platform-based financing methods, will result in democratization and less discrimination. In the debt-based crowdfunding model, individuals have the freedom to decide on how much they will lend and to whom they will lend. In addition, individuals have the opportunity to take an unsecured loan, instead of having to take a loan by mortgaging with real estate as in traditional lending. By removing the obligation of individuals to have a guarantee in order to be an entrepreneur, an entrepreneurial environment where only ideas compete is created and thus equality of opportunity is ensured. In the equity-based crowdfunding model, individuals can choose to be a partner in the project they want, not the project chosen by an intermediary (Herzenstein et al., 2008). Crowdfunding provides freedom in this area by exempting people from the conditions set for accessing traditional sources of finance, such as age, work experience, ownership, or having a fixed income. With this situation called the democratization of access to capital, individuals and companies that cannot get loans from financial institutions and cannot be integrated into the financial system are included in the system.

As a result of the efficient distribution of resources and the use of financial resources in efficient projects, crowdfunding promotes economic growth just like the other platform-based financing methods. This model; which facilitates investment in social, environmental and cultural projects and which enables the evaluation of intellectual outputs, makes a significant contribution to the social, environmental and artistic development of countries. It is thought that this chapter, which focuses on the effects of 100-year paradigm shifts on financing resources with a holistic perspective, will make significant contributions

to the finance literature. It is expected that the change in financing resources, which are evaluated from a bird's eye view, will continue, transform towards financing systems without geographical boundaries, and financing resources will gain a new dimension with technological advances. Considering that this change will attract the attention of national and international organizations over time (even if it is insufficient today), and the data will be evaluated more healthily, it is recommended that future studies focus on data analysis.

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KEY TERMS AND DEFINITIONS

Crowdfunding: It is a concept based on the transfer of small amounts of funds owned by a large audience to financial units in need of financing.

Decentralized Finance (DEFI): It is an innovative technology-based system that operates without a central authority or intermediary, unlike the centralized and traditional financial system.

Digital Finance: It is a concept that expresses the effects of new technologies in the field of finance that provide ease of use, speed, and low cost in accessing financial services.

Digital Financial Inclusion: It is a term of that covers the use of cost-saving digital tools in providing access to financial services.

Financial Inclusion: It is the process of ensuring that all segments of society have access to basic financial services in the formal financial system.

Financial Technology (FinTech): They are systems that enable traditional financial transactions to be carried out through technological hardware and software.

Online-Based Finance: It is a term that includes new technology-based sources of finance and financial institutions working with online networks.

Platform-Ecosystem-Based Finance: It is an innovative system in which financial services, decisions, investments, and especially financing resources are based on financial technologies, unlike the traditional financial system.

Sustainable Finance: It is a concept that covers financial services aiming at sustainable development in terms of environmental, social and governance.

Traditional Finance: They are the sources of financing obtained from the banking system and/or capital markets (such as bank loans, bond issuance, stock issuance).

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