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Bank Management, Finance and Sustainability

Edited by
David Aristei and Manuela Gallo

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Contents

About the Editors

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David Aristei is an Associate Professor of Economic Statistics at the Department of Economics of the University of Perugia (Italy). He obtained his Ph.D. in *Economics and Finance* from the University of Verona in 2007. His main research interests include applied microeconometrics, income inequality, household portfolio choice, and firm financing. His publications comprise numerous articles in international academic journals as well as in edited books.

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Preface to ”Bank Management, Finance and Sustainability”

Sustainable banking incorporates environmental, social and governance (ESG) criteria into traditional banking activities and makes ESG benefits a key objective of the new banking business models. Banks'managerial and investment choices are made taking into account not only the aspects of risk and return, but also their social and environmental impacts.

Sustainability represents an opportunity for banks as it contributes to improvements in trust in the banking system. However, sustainable business models must be financially viable so that they can have a positive impact on banks'profitability, stimulating the long-term growth and resilience of the banking industry and overall financial stability.

Banks are widely acknowledged as playing a crucial role in achieving the Sustainable Development Goals (SDGs), as they can promote responsible investments and integrate environmental and social criteria into lending and investment strategies. Financial intermediaries can support projects and activities that create a measurable positive economic, social and environmental impact by providing easier access to capital. Furthermore, they can have an active role in improving the financial awareness, inclusion and resilience of the most vulnerable individuals in society.

The present volume collects the contributions selected for publication in the Special Issue entitled *Bank Management, Finance and Sustainability* of the journal *Sustainability*, for which we served as guest editors. This collection includes both empirical and theoretical studies, covering a wide range of themes related to sustainable banking and finance.

David Aristei, Manuela Gallo
Editors

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Article

Using Environmental, Social, Governance (ESG) and Financial Indicators to Measure Bank Cost Efficiency in Asia

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Abstract: Environmental, social, and governance (ESG) practices have been used as non-financial indicators to measure bank performance worldwide in the last decade. The United Nations (UN) has specified 17 Sustainable Development Goals (SDGs) for the implementation of these ESG concepts. However, it remains unclear whether the costs of ESG have exceeded the benefits. The purpose of this study is to examine the impact of ESG on the cost efficiency of developed and developing Asian banks using a two-step approach comprising stochastic frontier analysis (SFA) and stochastic metafrontier analysis (SMF). The data sample from 2015 to 2018 is separated into two groups: 60 Asian developed economies and 85 developing economies. The results show that banks in the developed Asian economies become more cost-efficient through environmentally friendly activities. The banks in the developing Asian economies increase their cost efficiency by socially responsible activities and improved governance. Moreover, banks in the developed Asian economies outperformed those in the developing Asian economies in terms of technology gap ratio (TGR) and metafrontier cost efficiency (MCE). The results of this study benefit not only investors and bank managers but also the entire banking sector and the world economy.

Keywords: ESG; sustainable development goals (SDGs); bank efficiency; bank cost; stochastic frontier analysis; stochastic metafrontier analysis

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1. Introduction

Financial institutions play an important role in national and international trade, and in the process of globalization. Banks serve as intermediary institutions for intermediation, channeling funds from savers to borrowers to enable business developments and investments [1]. Financial institutions are also crucial in the international markets because banks support companies in conducting international trade in which foreign exchange and letters of credit are often needed. Furthermore, banks facilitate the globalization process. Banks provide their customers with convenient and low-cost ways, such as an internet banking system, to pay and track funds [2]. In addition, banks assist multinational firms in achieving foreign direct investments and listing their stocks in overseas countries, thus helping these corporations to expand globally.

Karray and Chichti [3] claimed that banks must achieve optimal performance to support regional development and strengthen their function as intermediary institutions. Efficiency is an important indicator of bank performance which is measured mostly by financial data. Battese and Coelli [4] began to use bank efficiency to measure bank performance, followed by other researchers [5–7]. Efficiency is measured by comparing inputs such as cost of borrowed funds, cost of tangible assets and labor, against outputs such as loans, income-generating assets, and deposits. It is essential to measure bank efficiency because the failure of the bank or inadequate cash due to loan collection problems jeopardizes the economic lives of millions of individuals [8]. Miralles-Quiros et al. [9] expected banks to play a dual role concerning the sustainability of the financial sector with one involving

financial performance and the other corporate governance and social responsibilities at a strategic level [10,11]. Banks must not only focus on profitability but also on corporate governance [12,13].

In 2005, the United Nations (UN) proposed the Principles for Responsible Investment (PRI) which highlighted environmental, social, and governance (ESG) issues [14]. In 2015, the UN further announced the 17 Sustainable Development Goals (SDGs) of the 2030 agenda for sustainable development [15]. As intermediary institutions, banks primarily use the funds from their depositors to conduct banking business; therefore, banks must monitor the cost-benefit effect more prudently in order to safeguard their depositors' money. Banks' efficiency in using such funds is a crucial indicator of bank sustainability in the long run. Although it is important for banks to execute ESG practices, the literature examining whether banks generate more revenue as a result of implementing ESG programs to cover the associated expenditures is scant. Consequently, it remains unclear whether the implementation and disclosure of ESG activities increased or decreased bank cost efficiency. Moreover, prior research using regression models to analyze bank financial performance also mostly focused on the performance of banks in the developed countries, such as the U.S. and Europe. Few studies discussed the efficiency of the rapidly growing banking industry in Asia. This study fills such a research gap.

The purpose of this study is to examine the impact of ESG on the cost efficiency of developed and developing Asian banks using a two-step approach comprising stochastic frontier analysis (SFA) developed by Battese and Coelli [4] and stochastic metafrontier analysis (SMF) proposed by Huang et al. [6]. We divided the Asian banks into two groups based on the International Monetary Fund (IMF) definitions. One group included 60 banks in five developed Asian economies. The other group included 85 banks in 13 developing Asian economies. In the first step, we investigated the impact of ESG and bank-specific indicators on the efficiency of the two groups of banks. In the second step, we studied the impact of macroeconomic factors on bank efficiency and compared the technology gap ratio (TGR) and metafrontier cost efficiency (MCE) of the two groups of banks.

The results indicate that environment variables significantly increased bank cost efficiency in the developed economies, but not in the developing economies. The social and governance variables increased bank cost efficiency in the developing economies, but not in the developed economies. In addition, banks in the developed economies exhibited higher cost efficiency than their counterparts in the developing economies in Asia.

The study contributes to the literature in three ways. First, to the best of our knowledge, this is the first study to incorporate the 17 SDGs to examine bank cost efficiency. Second, this study compared the cost efficiency of banks in developed and developing economies in the fast-growing Asian region, which was rare in the literature. Third, this is the first study to apply SFA and SMF to analyze the impact of ESG on Asian bank cost efficiency. The results of this study benefit not only the bank managers and investors but also the entire banking sector.

2. Literature Review

Dahl et al. [16] elucidated that the western countries led the development of the modern banking industry around the world in terms of size, growth, business models, and innovation. However, in the last decade, Asian banks have expanded quickly and developed innovative products designed to satisfy the needs of a larger group of customers. This change reflects not only the increasingly important role of Asian banks in global trade and economic growth but also Asia's leadership in delivering new technologies and business models. From 2016 to 2021, the top five largest banks by asset size (Industrial & Commercial Bank of China, China Construction Bank, Agricultural Bank of China, Bank of China, Japanese Mitsubishi Bank) were in Asia [17].

In addition, more than 40 of the world's 100 largest banks based on asset size are Asian, accounting for approximately 50% of global market capitalization [16]. Moreover, Asia was the largest regional banking market in the world for the last decade. On the

whole, the Asian banks generated pretax profits exceeding $700 billion, which accounted for 37% of the global banking profit. With the rise of the income level of the middle-class group in Asia, Dahl et al. [16] expected the financial assets held by households in Asia to reach $69 trillion by 2025, representing approximately 75% of the global amount.

Despite the growth of the financial sector, banks are affected by systemic risks, which arise when a set of adverse events in the markets threatens to disrupt the bank functions of intermediation [2]. The systemic risk in the economy, such as a decline in the gross domestic product (GDP) and high unemployment rate, could lead to the instability of the banking system. For instance, a high unemployment rate is likely to aggravate the default rate of bank loans, which impedes further bank lending and tightens bank credit policy, leading to a recession and widespread failure of loan payment. Such results hamper the bank's role in facilitating economic growth.

2.1. ESG

The PRI announced by the UN in 2005 highlighted the influence of ESG issues on the performance of investment portfolios. Subsequently, guidelines for environmental stewardship, social responsibility, and corporate governance gradually directed the evaluation of the firms. Environmental stewardship refers to the firm's actions concerning the natural environment with a focus on the reduction in waste and pollution, greenhouse gas emissions, and climate change [14]. Social responsibility is similar to the concept of corporate social responsibility (CSR). Social responsibility means fair and beneficial business practices for labor, respect for human rights, the establishment of a safe environment, and service to the community [14]. Governance refers to the proper management of the company in addition to economic prosperity. Firms should formulate appropriate policies, especially related to business ethics, disclosure of information, and board composition to govern their business operations [18].

In 2015, the UN announced the 17 SDGs which can be divided into five categories: people (no poverty, zero hunger, good health and well-being, quality education, gender equality), planet (clean water and sanitation, affordable and clean energy, climate action, life below water, life on land), prosperity (decent work and economic growth, industry, innovation, and infrastructure, responsible consumption and production), peace (reduced inequality, sustainable cities and communities, peace, justice, and strong institutions), and partnership (entering into partnerships to reach the goals) [15].

In 2018, the UN released a report entitled "Integrating the SDGs into Corporate Reporting: A Practical Guide", to help corporations to set objectives and disclose their ESG activities. In 2018, approximately 40% of the world's 250 largest companies reported SDGs and included the global goals in their annual reports [19]. The achievements of the SDGs by all nations would create new opportunities and an increase in efficiency for an estimated $12 trillion in four economic systems: food and agriculture, cities, energy and materials, and health and well-being [19].

In 2018, the UN established a special task force to analyze the relationship between ESG investing and returns. The UN also recommended aligning financial systems with sustainable development. Prior researchers began to examine the impact of the disclosure of ESG activities on bank performance.

2.2. Environmental

The stakeholder theory explains the dynamics of ESG and shareholder value [20]. Shareholders are the primary stakeholders in a firm; hence companies should perform business activities to maximize shareholder interests. Therefore, negative consumer attitudes toward a firm's products and services or non-compliance with government regulations and environmental practices may decrease shareholder value [21].

However, ESG may increase bank expenditures due to the additional investment requirements in environmental activities, such as reduction in carbon emissions, use of renewable energy, prevention of air and water pollution, planting trees, etc. Many banks

implemented environmental activities as a result of government requirements that need to be considered when evaluating the performance of listed firms [18]. The question of whether over-investment in environmental activities leads to a favorable financial position remains unanswered in the literature [22].

Prior studies indicated that the impact of environmental activities on bank performance varied. Some researchers found that environmentally friendly activities improved a bank's financial performance. In other words, banks that disclosed efforts of minimizing carbon emissions generated greater profits. Such disclosure also increased the bank's market value [14]. Buallay [23] studied the performance of 235 banks from 2007 to 2016 and ascertained that environmental disclosure positively affected the banks' return of assets (ROA) and market value as measured by Tobin's Q. Similarly, Miralles-Quirós et al. [24] studied 51 banks in the U.S. and Europe from 2002 to 2015. These authors claimed that environmental endeavors positively influenced the banks' market value and earnings per share (EPS). Crespi et al. [18] examined ESG activities and financial performance using data for 727 financial firms from 22 developed countries from 2006 to 2017. The results revealed that a higher environmental score led to increased profitability.

In contrast, other studies found that the disclosure of environmental activities had a negative impact on banks. For example, Forgione et al. [5] used a one-step SFA method to examine ESG and bank efficiency in primarily developed economies from 2013 to 2017. They found the disclosure of environmental activities reduced bank efficiency. Similarly, Dell'Atti et al. [25] investigated the impact of the banking industry during the 2008 subprime mortgage crisis by studying the correlation between bank reputation and economic performance. The results suggested that environmental activities had a negative but insignificant effect on reputation and bank performance. In a study by Di Tommaso and Thornton [26], the European banks that received high ESG scores by engaging in more carbon-emission-reduction activities became less willing to take a risk, thus diminishing bank value for the shareholders.

Following the practices of banks in the U.S. and Europe, banks in Asia also invested in environment-friendly activities. These environment-friendly policies may produce a positive influence on bank performance in the medium to long run.

Therefore, we developed the first hypothesis:

Hypothesis 1 (H1). *Environmental variables have a positive impact on bank cost efficiency.*

2.3. Social

CSR can be explained by the stakeholder theory [27]. The theory states that firms should service a multitude of stakeholders, including shareholders, customers, and employees, rather than shareholders only, so that firms may boost the popularity of products and financial performance [20].

These CSR activities include the production of high-quality products and services for customers, payment of fair salaries to employees, provision of health care and educational programs to the community, in addition to profit maximization for shareholders. However, previous studies found the relationship between social activities and firm performance to be mixed.

Some studies of developed countries such as the U.S., Canada, and other European countries revealed a negative relationship between the disclosure of social activities and bank performance in terms of earnings and ROA because the large costs of social welfare exceeded the benefits [9,11,23,26].

However, CSR may produce a positive influence on bank performance due to a better perception of the stakeholders of the firm's attitude toward social responsibility. Shakil et al. [22] argued that because stakeholders were more interested in the firms' disclosure of social activities, and the implementation of CSR programs may lead to an overall improvement of the firm performance. Dell'Atti et al. [25] studied the correlation between firm reputation and economic performance using 75 large international banks

during the 2008 subprime mortgage crisis. The results suggested that social welfare was positively correlated with firm reputation with some possibility of improving the firms' economic performance. Similarly, Forgione et al. [5] found that the disclosure of CSR activities had a positive impact on bank efficiency only in common law countries, such as the U.S., Australia, and countries with stakeholder protection. These studies confirmed the stakeholder theory that activities benefiting stakeholders increase their contributions to the firms and led to improved financial results.

Therefore, we assumed that CSR activities have a positive relationship with the performance of Asian banks. Thus, we developed the second hypothesis:

Hypothesis 2 (H2). *Social variables have a positive impact on bank cost efficiency.*

2.4. Governance

Corporate governance refers to the proper management of a company. For instance, firms should follow good business ethics, as well as disclosure and accountability practices [22]. Sustainable business policies cover the areas such as disclosure of financial and operational information to increase stakeholders' confidence in the company, gender equality, board diversity to allow various opinions on the firm operations, and so on [28].

The agency theory explains the reasons for the increasing importance of good corporate governance over the last decade. According to agency theory, a conflict between shareholders and managers occurs when management interests are not aligned with those of the shareholders [29]. Good corporate governance aims to align the interests of shareholders and managers so that the two groups of people cooperate to strengthen firm performance [5]. Hence, companies with strong corporate governance may reduce the conflict between shareholders and managers [30]. Companies with poor corporate governance are likely to face high agency problems and lower profitability [24].

Prior studies reported mixed results regarding the impact of corporate governance on bank performance [9,11,12,23,31,32]. Birindelli et al. [32] used a fixed-effects panel regression model to analyze the relationship between the composition of the board of directors and the ESG performance among 108 listed banks in the U.S. and Europe from 2011 to 2016. They used female directors, the board size, CSR committee as the governance variables. The empirical results presented an inverted U-shaped relationship between the female directors and firm performance. The evidence suggested that only a gender-balanced board had a positive impact on the bank's overall ESG performance. In addition, ESG programs produced a positive impact on the board size and the existence of the CSR committee. Miralles-Quirós et al. [9] investigated the relationship between ESG and bank performance using 51 banks in the U.S. and Europe from 2002 to 2015. The results indicated that governance had a positive influence on market value and EPS. In addition, Miralles-Quirós et al. [11] scrutinized ESG and bank financial performance in Europe and found that the governance factor produced a positive effect on bank market value.

However, other researchers found governance negatively affected bank performance in emerging countries and some European countries [12,23,31]. Azmi et al. [12] examined the relationship between the disclosure of ESG activities and bank value based on 251 banks from 2011 to 2017 from 40 emerging economies. The results revealed that governance had a negative impact on bank market value. El Khoury et al. [31] investigated the financial performance of 46 banks in the Middle East, North Africa, and Turkey (MENAT region) from 2007 to 2019. The empirical evidence showed that in the long run, bank costs exceeded the benefits of social and governance programs. Similarly, Buallay [23] found that governance disclosure negatively impacted the financial performance of European banks.

Based on the assumption that governance benefits bank performance, we developed the third hypothesis:

Hypothesis 3 (H3). *Governance has a positive impact on bank cost efficiency.*

2.5. Financial Variable

Prior studies used bank-specific (loan, deposits, interest, etc.) and macroeconomic indicators (unemployment rate, GDP, etc.) of the countries in which banks were headquartered to examine bank performance [2,7,10,23,31]. The combination of bank-specific and macroeconomic indicators provided for a comprehensive analysis of the banks and revealed the factors that contributed the most to bank performance.

2.6. SFA and SMF

Battese and Coelli [4] proposed SFA to examine the cost inefficiency of the panel data of firms. Subsequently, Huang et al. [6] proposed SMF to compare the efficiencies of different decision-making units (DMU) by computing their TGR and MCE. Banks in various countries used different knowledge and technologies to develop their products and services. The difference in technology, measured by TGR, contributed to the variations in bank performance [6,33].

Based on the literature review, this paper uses a two-step stochastic frontier analysis process composed of SFA and SMF to estimate the cost inefficiency of two groups of banks adopting distinct technologies [34]. In the first step of the analysis, the within-group variation in the firms' technical efficiencies, which is frequently associated with firm-specific exogenous variables, is calculated [4]. In the second step, the between-group variation in the technology gap ratios which commonly stems from group-specific environmental differences is computed [6]. The two-step stochastic frontier analysis is more powerful than the conventional regression models because the two-step analysis not only identifies the significant variables affecting bank cost efficiency but also compares the cost efficiency of two groups of banks.

3. Method

3.1. Data Collection

This study collected data for 145 banks located in Asian economies from 2015 to 2018, from the BankFocus database. The data were separated into two groups for a comparison of the bank's efficiency based on the bank classification by the IMF [35]. The IMF classifies countries/regions into advanced (known as "the developed economies") and emerging and developing economies (referred to as "the developing economies") by three main criteria: GDP per capita, export diversification (a country/region must export a wide array of commodities, not just a few commodities to be considered "developed economy"), and integration into the global financial system (including both an economy's volume of international trade and its adoption of and participation in international financial institutions). The IMF uses either the sums of the weighted average of data for individual countries/regions. This study adopts the IMF bank classification that is readily available but moves China to the developed economy group considering China has become the second-largest economy in the world by GDP since 2010 and has occupied nearly 20% of the top 100 banks in the world since 2015.

As the result of the bank division, one group of this study contained the data for 60 banks from five developed economies (China, Hong Kong, Japan, Korea, and Taiwan) with 240 observations. The other group included the data for 85 banks from 13 developing economies such as India and Pakistan, with 340 observations. Table 1 lists the banks in the two groups of developed and developing economies.

Table 1. Division of banks into the developed and developing economies.

Year	2015	2016	2017	2018	Total
			Developed Economy		
China	18	18	18	18	72
Hongkong	10	10	10	10	40
Japan	13	13	13	13	52
Korea(S)	9	9	9	9	36
Taiwan	10	10	10	10	40
Total	60	60	60	60	240
			Developing Economy		
Afghanistan	1	1	1	1	4
Banglandesh	7	7	7	7	28
India	34	34	34	34	136
Kazakhstan	7	7	7	7	28
Kyrgyzstan	1	1	1	1	4
Malaysia	5	5	5	5	20
Mongolia	1	1	1	1	4
Nepal	6	6	6	6	24
Pakistan	10	10	10	10	40
Philippines	3	3	3	3	12
Srilanka	5	5	5	5	20
Thailand	4	4	4	4	16
Vietnam	1	1	1	1	4
Total	85	85	85	85	340

3.2. Variables and Definitions

The intermediation approach proposed by Sealey and Lindley [36] defines the relationship of input and output used in the efficiency measurement. This approach focuses on bank activities performing the function of intermediation to distribute savers' deposits to borrowers in the form of loans [3,37]. In other words, the efficiency of the bank is measured by its ability to convert resources into income-generating financial assets.

Based on the literature review [7,8,36], the inputs of this study are deposits, labor, and fixed assets. However, we found the data on the number of employees either missing or unavailable for many Asian banks in the sample; we therefore used total assets to indicate labor based on the literature by Altunbas et al. [38], Altunbas et al. [39], Gaganis and Pasioura [40], Weill [41], Fries and Taci [42], Huang et al. [43]. In the previous studies, the price of labor was defined as the ratio of personnel expenses to total assets. Hence, the price of labor is significantly correlated with total assets. Therefore, this study used total assets as the proxy for labor input [38–43]. The outputs are loans, investment, and fee income. Table 2 lists the inputs, outputs, definitions, and descriptive statistics.

The outputs are loans, investment, and fee income. We obtained the means of input and output variables of the two bank groups from the T-test, which shows a significant difference between the two bank groups. Table 2 lists the inputs, outputs, definitions, and descriptive statistics.

Both non-financial and financial variables are used to measure bank efficiency in this study based on the literature. This study adopts both non-financial and financial variables to measure bank efficiency [7,8]. The non-financial variables are the 17 SDGs by the UN and its divisions into the three dimensions of ESG [14]. The UN provided the ESG score indicated by a color scheme for each economy. The green color indicates "good SDG achievement" with a score of 3. The yellow and orange colors (orange colors only available from 2017) mean "challenges remained" and "significant challenges" with a score of 2. The red color means "a major challenge" with a score of 1. The UN gave a higher score for better ESG performance of an economy.

Table 2. Definitions of Variables and Descriptive Statistics.

Variables	Definition	Developed Economy	Developing Economy	t Value
		Mean	Mean	
Total Cost (TC) (million USD)	Labor cost + Capital cost + Funding cost	6,499,063 (14,914,637)	677,066 (1,019,084)	7.177 ***
Output				
Loans (Y1) (million USD)	Loans	165,285,597 (383,233,910)	8,622,639 (13,732,876)	7.534 ***
Investments (Y2) (million USD)	Investments	97,147,466 (214,135,742)	3,763,981 (5,918,764)	7.036 ***
Noninterest income (Y3) (million USD)	Non-interest income	1,378,710 (3,519,554)	107,359 (212,930)	6.646 ***
Input				
Funding (X1) (million USD)	Deposits + Borrowing	237,796,753 (574,427,451)	11,118,874 (16,804,436)	7.275 ***
Labor (X2) (million USD)	Total assets	301,638,981 (695,877,521)	14,281,769 (22,166,301)	7.612 ***
Capital (X3)	Net fixed assets	2,507,191 (6,209,124)	178,012 (292,881)	6.909 ***
Price of funding (P1)	Interest payments/(Deposits + Borrowing)	0.015 (0.015)	0.049 (0.020)	−22.692 ***
Price of labor (P2)	Employee salaries/Total employees	0.005 (0.002)	0.012 (0.006)	−17.829 ***
Price of capital (P3)	Operating expenses/Net fixed assets	0.311 (0.498)	0.536 (0.566)	−4.945 ***

Notes: 1. Standard deviations are expressed in parentheses. 2. All the data were deflated using the consumer price index from the IMF with the year 2010 as the base year. 3. *** indicates significance levels of 1%.

The financial variables are divided into bank-specific variables and macroeconomic variables for the economies in which the banks were headquartered [2,10,23,31]. The literature used the bank-specific financial indicators as variables to show the distinct characteristics of banks [43–46]. Pasiouras and Kosmidou [44] used cost-to-income ratio, liquidity ratio, equity ratio, and asset size. Liang, Chang, and Lin [45] adopted non-performing loans (NPL), loan-loss-reserve ratio, and non-interest expense ratio. The rationale for using the cost-to-income ratio is that it indicates the efficiency of cost management, measuring the degree to which banks generate revenues relative to expenses. Higher cost-to-income ratios imply less efficient cost/profitability management [44]. The major element of bank cost is employee salaries and benefits.

The macroeconomic variables include unemployment rate, gross domestic product (GDP) per capita, and GDP growth rate. Table 3 shows the inefficiency variables and their definitions.

Table 3. Definitions of Inefficiency Variables.

ESG Variables	Definitions
Environmental (E)	Seven SDGs: clean water and sanitation, affordable and clean energy, sustainable cities and communities, responsible consumption and production, climate action, life below water, life on land. Each variable is assigned a value between 1 and 3 by UN with a higher value meaning higher achievement in this area.
Social (S)	Six SDGs: no poverty, zero hunger, good health and well-being, quality education, decent work, and economic growth, reduction in inequality. Each variable is assigned a value between 1 and 3 by UN with a higher value meaning higher achievement in this area.

Table 3. *Cont.*

ESG Variables	Definitions
Governance (G)	Four SDGs: innovation, gender equality, peace, partnership for the goals. Each variable is assigned a value between 1 and 3 by UN with a higher value meaning higher achievement in this area.
Bank Financial Variables and Macroeconomic Variables	
SFA	Bank-specific variables
NPL ratio	Calculated as non-performing loan/total outstanding loan amount
BIS ratio	BIS Capital Adequacy Ratio calculated as the amount of capital/risk-weighted assets
Cost-to-income ratio	Operating expenses/operating income of the bank
Loan loss reserve ratio	Loan loss reserve amount/outstanding loan amount
Liquidity ratio	Current assets/total deposits plus short-term funds (Note 1)
Non-interest expense ratio	Non-interest expenses/assets (Note 2)
SMF	Bank-specific and macroeconomic variables
Asset size	The natural logarithm of total bank assets
Unemployment rate	Number of unemployment/labor force
GDP per capita	GDP/population

Note: 1. The Hong Kong Monetary Authority (HKMA) defines the net stable fund ratio as available stable funds divided by expected stable funds. However, this study computes the liquidity ratio by taking liquid assets divided by total deposits plus short-term funding, due to a lack of data on the net stable fund ratio. 2. non-interest expense refers to an operating expense separated from interest expense and loan loss reserves. Non-interest items include payroll, rent, utilities, information technology costs, etc.

3.3. SFA

In the first step of the analysis, we applied SFA as proposed by Battese and Coelli [5]. The stochastic cost frontier function is set as translog, based on Christensen et al. [47], which is homogeneous at the first degree [42,48–50]. In order to eliminate the heteroskedasticity problem, we also used the price of labor (P_{2it}) to normalize total costs and input prices proposed by Allen and Rai [51], Berger and Mester [52], Kraft et al. [50]. The cost function is set as Equation (1):

$$\begin{aligned}\ln(\tfrac{TC_{it}}{P_{2it}}) = \;& \alpha_0 + \alpha_1 \ln Y_{1it} + \alpha_2 \ln Y_{2it} + \alpha_3 \ln Y_{3it} + \beta_1 \ln\left(\tfrac{P_{1it}}{P_{2it}}\right) + \beta_2 \ln\left(\tfrac{P_{3it}}{P_{2it}}\right) + \tfrac{1}{2}\delta_{11}(\ln Y_{1it})^2 + \tfrac{1}{2}\delta_{22}(\ln Y_{2it})^2 \\ & + \tfrac{1}{2}\delta_{33}(\ln Y_{3it})^2 + \delta_{12} \ln Y_{1it} \ln Y_{2it} + \delta_{13} \ln Y_{1it} \ln Y_{3it} + \delta_{23} \ln Y_{2it} \ln Y_{3it} + \tfrac{1}{2}\gamma_{11}\left[\ln(\tfrac{P_{1it}}{P_{2it}})\right]^2 \\ & + \tfrac{1}{2}\gamma_{33}\left[\ln(\tfrac{P_{3it}}{P_{2it}})\right]^2 + \gamma_{13} \ln\left(\tfrac{P_{1it}}{P_{2it}}\right) \ln\left(\tfrac{P_{3it}}{P_{2it}}\right) + \rho_{11} \ln Y_{1it} \ln\left(\tfrac{P_{1it}}{P_{2it}}\right) + \rho_{13} \ln Y_{1it} \ln\left(\tfrac{P_{3it}}{P_{2it}}\right) \\ & + \rho_{21} \ln Y_{2it} \ln\left(\tfrac{P_{1it}}{P_{2it}}\right) + \rho_{23} \ln Y_{2it} \ln\left(\tfrac{P_{3it}}{P_{2it}}\right) + \rho_{31} \ln Y_{3it} \ln\left(\tfrac{P_{1it}}{P_{2it}}\right) + \rho_{33} \ln Y_{3it} \ln\left(\tfrac{P_{3it}}{P_{2it}}\right) \\ & + \tau_1 t \ln Y_{1it} + \tau_2 t \ln Y_{2it} + \tau_3 t \ln Y_{3it} + \lambda_1 t \ln\left(\tfrac{P_{1it}}{P_{2it}}\right) + \lambda_2 t \ln\left(\tfrac{P_{3it}}{P_{2it}}\right) + \omega_1 t + \omega_2 t^2 + u_{it} + v_{it}\end{aligned} \quad (1)$$

where i denotes the *i-th* bank; t denotes the time period; TC_{it} is the total cost of the i-th bank during period t; Y_{1it} is the total loan amount of the *i-th* bank during period t; Y_{2it} is the *i-th* bank's total investment during period t; Y_{3it} is the total fee income of the *i-th* bank during period t; P_{1it} is the funding price (interest) of the *i-th* bank during period t; P_{2it} denotes the labor price of the *i-th* bank during period t; P_{3it} denotes the capital price of the *i-th* bank during period t; u_{it} denotes random error, $v_{it} \sim N(0, \sigma_v^2)$ means statistical noise. Non-negative random errors u_{it} represent cost inefficiency, which follows the truncated-normal distribution as $u_{it} \sim N^+(m_{it} = \delta' Z_{it}, \sigma_u^2)$. u_{it} and v_{it} are independent of each other.

The inefficiency model used in this study is expressed in Equation (2):

$$m_{it} = \theta_0 + \theta_1 Z_{1it} + \theta_2 Z_{2it} + \theta_3 Z_{3it} + \theta_4 Z_{4it} + \theta_5 Z_{5it} + \theta_6 Z_{6it} + \theta_7 Z_{7it} + \theta_8 Z_{8it} + \theta_9 Z_{9it} \quad (2)$$

where θ denotes the estimated parameter; and Z_{it} the inefficiency parameter. The inefficiency variables include ESG (environmental (Z_{1it}), social (Z_{2it}), governance (Z_{3it}) with

a score of 1 to 3 assigned by the UN, NPL ratio (Z_{4it}), BIS ratio (Z_{5it}), cost-to-income ratio (Z_{6it}), liquidity ratio (Z_{7it}), loan loss reserve ratio (Z_{8it}), and non-interest expense ratio (Z_{9it}).

3.4. SMF

The second step of this analysis uses SMF as proposed by Huang et al. [7] to estimate the metafrontier cost function, and then measure the inefficiency of different DMUs. The SMF approach not only includes statistical inferences to replace the mathematical programming technique when estimating group frontiers but also considers error terms and group heterogeneity.

Prior literature discussed heterogeneous market structures and measured systemic risk based on the capital flows between groups of banks [53] or based on banks' market returns which are aggregated in bank groups [54].

We first applied SFA to estimate the group-specific frontier cost, then used SMF to estimate the metafrontier cost. Moreover, the SMF approach can directly estimate the technology gaps which are represented by the one-sided term. The technology gaps can be further specified as a function of bank-specific variables beyond the control of banks. The metafrontier cost is based on the concept that all DMUs in the various cost groups have potential access to an array of production technologies, but each may choose a particular technology depending on specific circumstances, such as regulation, the environments, risk (systemic risk or non-systemic risk).

The method used in this study is based on the two-step stochastic frontier approach for estimating the metafrontier proposed by Huang et al. [6]. In the first step, prior researchers [6] used the stochastic frontier regression method to estimate the group-specific frontier. In the second step, these researchers applied the stochastic metafrontier regression method to estimate the metafrontier that specifically takes into consideration the estimation error of $\widehat{f}_t^{\,w}(X_{wit})$ in estimating $f_t^w(X_{wit})$.

The SMA regression method is used to obtain the frontier of cost efficiency (CE) of each bank group. Equation (3) explains that the cost efficiency of the i^{th} DMU in group w^{th} at $t^{\text{-th}}$ period is accounted for by the group-specific exogenous variables Z_{wit}. The CE calculated using $CE_{it} = e^{u_{it}}$ has a value between one and infinity ($1 < CE_{it} < \infty$). A lower group's CE_{it} value means lower cost inefficiency (higher cost efficiency). On the contrary, a higher group's CE_{kt} value means higher cost inefficiency (lower cost efficiency).

Thus, Cost Efficiency (CE) is expressed in Equation (3):

$$CE_{it}^{w} = \frac{C_{wit}}{f_t^w(X_{wit})e^{V_{wit}}} = e^{U_{wit}} \tag{3}$$

where w denotes a group.

The common underlying metafrontier cost function for all bank groups in the *t-th* period is defined as $(f_t^M(X_{wit}))$ [6]. The metafrontier $(f_t^M(X_{wit}))$ envelops all individual groups' frontiers $(f_t^w(X_{wit}))$, which is expressed in Equation (4):

$$f_t^w(X_{wit}) = f_t^M(X_{wit})e^{U_{wit}^M},\ w = 1,\ 2,\ \ldots,\ W;\ i = 1,\ 2,\ \ldots,\ N_j;\ t = 1,\ 2,\ \ldots,\ T \tag{4}$$

Because $U_{wit}^M \geq 1$, the metafrontier cost for all groups must be smaller than or equal to the estimated group cost frontier $f_t^M(X_{wit}) \leq f_t^w(X_{wit})$. TGR is the distance from the cost frontier of the w group to the metafrontier cost due to differences in the economic or non-economic factors. A higher TGR indicates a greater distance between the cost frontier of one particular group and the metafrontier cost. TGR is calculated using Equation (5).

$$TGR_{it}^{w} = \frac{f_t^w(X_{wit})}{f_t^M(X_{wit})} = e^{U_{wit}^M} \geq 1 \tag{5}$$

The inefficiency of DMU_i under X_{wit} produces random interference for output C_{wit} with the group inefficiency captured by V_{wit} and U_{wit}. Non-negative U^M_{wit} reflects the TGR between the group cost frontier and metafrontier cost. The result indicates that although DMU_i has reached the highest cost efficiency within the group, it still has room for improvement when compared to the metafrontier cost.

Based on technology gap ratio expressed as $TGR^w_{it} = \frac{f^w_t(X_{wit})}{f^M_t(X_{wit})}$, DMU cost efficiency expressed as $CE^w_{it} = \frac{f^w_t(X_{wit})e^{U_{wit}}}{f^w_t(X_{wit})} = e^{U_{wit}}$; random errors expressed as $\frac{C_{wit}}{f^w_t(X_{wit})e^{U_{wit}}} = e^{V_{wit}}$, we can obtain Equation (6):

$$\frac{C_{wit}}{f^M_t(X_{wit})} = TGR^w_{it} \times CE^w_{it} \times e^{V_{wit}} \tag{6}$$

The MCE (MCE_{jit}) for the bank groups can be expressed using Equation (7):

$$MCE_{wit} = \frac{C_{wit}}{f^M_t(X_{wit})e^{V_{wit}}} = TGR^w_{it} \times CE^w_{it} \tag{7}$$

4. Results

4.1. Descriptive Statistics

Table 4 exhibits the descriptive statistics for the inefficiency variables for the two groups of banks. Overall, the banks in the developed economies all had higher ESG means than the ones in the developing economies. We further examined each of the ESG variables. Regarding the environmental variable, the means of the banks in the developed and developing economies were 1.64 and 1.56, respectively. Regarding the social variable, the means of the banks in the developed and developing economies were 2.01 and 1.61, respectively. Regarding the governance variable, the means of the banks in the developed economies and developing economies were 1.78 and 1.38, respectively. Moreover, we tested for multicollinearity between the two groups of banks. The results showed the correlation coefficient of each variable between the developed and developing economies to be less than 0.6; therefore, the problem of collinearity did not exist. Table 4 provides the descriptive statistics of inefficiency variables.

Table 4. Descriptive Statistics of Inefficiency Variables.

Variables	Developed Economy				Developing Economy			
	Mean	**Std. Dev.**	**Max**	**Min**	**Mean**	**Std. Dev.**	**Max**	**Min**
E	1.64	0.14	1.86	1.29	1.55	0.26	2.00	1.00
S	1.99	0.17	2.33	1.67	1.53	0.24	2.17	1.00
G	1.81	0.16	2.00	1.50	1.27	0.23	2.00	1.00
NPL ratio	1.56	1.34	8.96	0.04	6.22	7.02	39.29	0.26
BIS ratio	13.91	2.87	23.10	8.10	16.67	6.44	86.73	7.72
Cost to income ratio	51.45	18.10	100.60	6.82	52.63	13.38	117.51	23.07
Loan loss reserve ratio	143.99	134.36	1086.86	6.17	101.68	124.04	2008.67	7.74
Liquidity ratio	7.50	2.07	14.59	3.97	18.62	13.96	125.94	2.93
Non-interest expense ratio	1.38	0.99	10.12	0.14	3.58	1.74	13.80	0.72

4.2. SFA

In the first step of the analysis, we applied SFA. Before estimating the stochastic frontier cost functions for the two groups of banks, we performed the likelihood ratio (LR) test to verify whether the proposed inefficiency model was well developed, with Equation (8):

$$LR = -2\{\ln[L(H_0)] - \ln[L(H_1)]\} \tag{8}$$

where $\ln[L(H_0)]$ is the log likelihood of the translog cost function without the inefficiency variables. $\ln[L(H_1)]$ is the log likelihood of the translog cost function with inefficiency variables.

The null hypothesis (H_0) means that no difference existed between the two groups of banks. The opposite hypothesis (H_1) assumes the existence of a significant difference between the two groups of banks. The results show that the LR statistic for the banks in the developed Asian countries was 64.5084 and that for developing Asian countries was 87.2316. The statistics of both bank groups are above the Chi-square $X^2_{0.01,9} = 21.6660$, thus significantly rejecting H_0. The results indicate that the inefficiency variables should be included in the SFA method. Thus, the proposed inefficiency model was suitable for this research. Table 5 presents the estimation of stochastic frontier cost functions for the two groups of Asian banks.

Table 5. Stochastic Frontier Cost Functions of Two Groups of Asian Banks.

Variables	Developed Economy		Developing Economy	
	Estimated Coefficients	**t Values**	**Estimated Coefficients**	**t Values**
Constant	7.1454 ***	3.3275	3.1049 ***	3.1889
lnY1	−0.5344	−1.3695	0.0147	0.0625
lnY2	0.8950 ***	3.2612	0.7511 ***	5.7416
lnY3	0.1272	0.4463	0.0354	0.3018
ln(P1/P2)	1.3582 ***	6.7846	0.7174 ***	4.8893
ln(P3/P2)	−0.5449 **	−2.1368	−0.2176 **	−1.9674
$1/2 \times (\ln Y1)^2$	0.2348 ***	3.3777	0.2083 ***	7.0339
$1/2 \times (\ln Y2)^2$	0.0982	1.4855	0.1301 ***	5.5271
$1/2 \times (\ln Y3)^2$	0.0137	0.6027	−0.0146	−1.2515
lnY1 × lnY2	−0.1486 **	−2.5162	−0.1690 ***	−9.2538
lnY1 × lnY3	−0.0337	−1.1547	−0.0091	−0.5532
lnY2 × lnY3	0.0202	0.7848	0.0203	1.4088
$1/2 \times [\ln(P1/P2)]^2$	0.1241 ***	6.4329	0.1871***	9.1967
$1/2 \times [\ln(P3/P2)]^2$	0.0276	1.4265	0.0197 **	2.1619
ln(P1/P2) × ln(P3/P2)	−0.0464 ***	−3.3171	−0.0532 ***	−5.0083
lnY1 × ln(P1/P2)	−0.0553 *	−1.8949	−0.0106	−0.6431
lnY1 × ln(P3/P2)	0.0087	0.2971	0.0176	1.0977
lnY2 × ln(P1/P2)	−0.0163	−0.5230	0.0135	0.8274
lnY2 × ln(P3/P2)	0.0322	1.5277	−0.0053	−0.5042
lnY3 × ln(P1/P2)	0.0254**	2.0051	−0.0229	−1.3842
lnY3 × ln(P3/P2)	−0.0070	−0.3823	0.0042	0.3945
t × lnY1	0.0175	1.0586	−0.0106	−0.9197
t × lnY2	−0.0275*	−1.8599	0.0091	0.9478
t × lnY3	0.0034	0.3316	−0.0014	−0.1788
t × ln(P1/P2)	−0.0039	−0.4800	0.0074	0.6864
t × ln(P3/P2)	−0.0007	−0.0753	0.0083	1.4061
T	0.0082	0.0577	0.1327	1.4760
t^2	0.0203	1.5936	−0.0197 **	−2.1555
σ^2_μ	0.0226 ***	5.5345	0.0139 ***	11.9827
γ	0.9144 ***	4.9264	0.1272 **	2.0110
Log likelihood function	180.3048		191.6664	
LR test	64.5084		87.2316	

Note: *** denotes 1% significance level; ** denotes 5% significance level; * denotes 10% significance level.

The study used the inefficiency model of the banks in the developed and developing economies in Asia to identify the impact of the ESG and financial variables on the cost inefficiency of the banks. Table 6 presents the empirical results for the two groups of Asian banks based on the cost inefficiency model.

Table 6. Results of Cost Inefficiency Model.

Variables	Developed Economy		Developing Economy	
	Coefficients	**t Values**	**Coefficients**	**t Values**
Constant	0.6364	1.3258	0.8446 ***	7.7130
E	−0.4687 **	−2.3741	−0.0160	−0.2328
S	0.4608 ***	2.7570	−0.1685 ***	−3.5102
G	0.4132 ***	3.0017	−0.1043 ***	−2.3322
NPL ratio	0.0511 **	2.4063	0.0042 ***	2.7383
BIS ratio	−0.0304 ***	−3.4008	−0.0085 ***	−5.0861
Cost to income ratio	−0.0202 ***	−5.6154	0.0020 ***	2.9572
Loan loss reserve ratio	0.0003 *	1.8508	−0.0001	−1.1099
Liquidity ratio	−0.0011	−0.6728	−0.0008	−1.2930
Non-interest expense ratio	−0.0211	−1.2653	−0.0004	−0.1476

Note: *** denotes 1% significance level; ** denotes 5% significance level; * denotes 10% significance level.

4.3. ESG

4.3.1. Environmental (E)

The results in Table 6 show that in the developed Asian economies, the environmental variables are negatively related to bank cost inefficiency at the 5% significance level. However, in the developing Asian economies, the environmental variables are negatively correlated with bank cost inefficiency but insignificantly.

The outcome suggests that in developed Asian economies, environmentally friendly activities such as reducing water pollution, eliminating carbon dioxide emissions, and using renewable energy, not increased the intangible values of the banks, but also tangible values. The environmental activities disclosed in the banks' annual reports enhanced bank reputation and simultaneously diminished bank cost inefficiency. These results are consistent with previous studies that found that bank investments in environmentally friendly practices were able to save energy and fuel costs for banks considerably due to the bank-wide inclusion of the relatively larger scale of the energy-saving plans [12,18,23,26]. However, in the developing Asian economies, banks are unable to recover the costs incurred for implementing environmentally friendly activities. These findings correspond to the literature in that although banks spend money reducing environmental harm, these banks suffer from poor environmental regulations and government incentives. Therefore, banks in the developing economies increased expenditure on the necessary equipment and facilities to improve their environments but failed to reduce costs in the long run.

Therefore, H1 is accepted for developed Asian economies but rejected for developing Asian economies.

4.3.2. Social (S)

The results in Table 6 indicate that in the developed Asian economies, social variables have a positive relationship with bank cost inefficiency at the 1% significance level. In the developed Asian economies, banks that implement social welfare programs for stakeholders such as fair employee salaries, safe work environment, and community services increased costs that cannot be compensated for by higher revenue. This outcome is consistent with the literature in that the large banks in the developed economies are expected to show altruistic behavior by caring for employees and serving the communities, hence these social activities did not create more business for these banks [9,11,23,26].

However, in the developing Asian economies, social variables have a negative relationship with bank cost inefficiency at the 1% significance level. This result suggests that socially responsible activities are considered strategic behavior for the banks in developing economies. Such a finding is consistent with the literature that care for employees and neighbors enhances bank reputation and consumer confidence, thus attracting more customers to interact with socially responsible banks. Consumers could even be willing to pay a higher price to purchase financial products and services from banks that frequently

announced new social programs. Furthermore, the higher revenue generated by these banks enables them to hire more qualified workers to enhance their cost efficiency [43].

Therefore, H2 is rejected for developed Asian economies but accepted for developing Asian economies.

4.3.3. Governance (E)

The results in Table 6 reveal that in the developed economies, the governance variables have a positive relationship with bank cost inefficiency at the 1% significant level. In the developed economies, the design of innovative products and services, gender equality, and peace-building activities resulted in higher costs than profits. Such a phenomenon is consistent with prior studies [12,23,31] and occurs because the implementation of corporate governance is internal. The additional costs for such internal improvements cannot be directly turned into more business and higher revenue for banks. This outcome suggests that because the banks in the developed economies tend to be more globalized, they are anticipated to align with the UN guidelines and managed according to international standards. These banks are expected to invest in corporate governance to maintain their reputation and service quality. However, these efforts simply meet the customers' expectations and do not attract more customers. These efforts can be regarded as altruistic behavior [5].

In contrast, in the developing economies, the governance variables have a negative relationship with bank cost inefficiency at the 1% significance level. This outcome implies that these banks can attract more customers or increase customer willingness to purchase more financial products or services as a result of bank investments in governance activities. Such acts are considered strategic behavior for banks because their improvement in bank management is likely to change customer perception and differentiate themselves from the banks that do not pay attention to governance. Hence, banks in developing economies can attract customers and generate higher revenue due to improved governance which can be announced publicly.

Therefore, H3 is rejected for developed Asian economies but accepted for developing Asian economies.

4.4. Bank Financial Ratios

Regarding bank financial indicators, three variables are worth noting. First, NPL has a significantly positive relationship with bank cost inefficiency in both developed and developing economies. Second, BIS adequacy ratio has a significantly negative relationship with bank cost inefficiency in both developed and developing economies. This outcome suggests that banks should focus on reducing NPL and increasing bank capital to improve cost efficiency.

Third, the cost-to-income ratio has a significantly negative relationship with bank cost inefficiency in the developed economies but a significantly positive relationship with bank cost inefficiency in the developing economies. Such results mean that increasing costs in the developed economies increases bank cost inefficiency. However, increasing costs in the developing economies decreased bank cost inefficiency. The outcome implies that the banks in the developing economies can generate greater returns for their spending [46].

4.5. SMF Cost Function

In the second step of the analysis, we adopted SMF to estimate the metafrontier cost functions for the two groups of banks. Before estimating the metafrontier cost function, we conducted the LR test to determine whether a difference exists between the two groups of banks in terms of the stochastic frontier. The null hypothesis was set as $H_0 : \beta_F = \beta_N$, which means that no difference existed between the two bank groups. The opposite H_1 means a significant difference existed between the two bank groups. The LR test statistic was 218.56, which was higher than the threshold calculated by Chi-square $\chi^2_{0.01,27}$= 46.96, thus rejecting H_0 at a 1% significance level. The results of the T-test and the LR test both

confirm a difference in the stochastic frontier between the two groups of banks. Therefore, it is feasible to estimate the metafrontier cost function.

To conduct SMF, we added a bank-specific variable, namely, asset size, and macroeconomic variables (unemployment rate, GDP per capita) to investigate their impact on bank cost efficiency. Table 7 contains the metafrontier cost function results estimated using SMF.

Table 7. SMF cost function results.

Variables	SMF	
	Estimated Coefficients	**t Values**
Constant	7.3720 ***	15.4556
lnY1	0.0053	0.0840
lnY2	0.8821 ***	9.5263
lnY3	2.7400 ***	5.3133
ln(P1/P2)	0.5957 ***	8.5457
ln(P3/P2)	0.0025	0.0146
$1/2 \times (\ln Y1)^2$	0.9254 ***	12.6705
$1/2 \times (\ln Y2)^2$	0.6576 ***	4.6619
$1/2 \times (\ln Y3)^2$	2.9270 ***	29.6286
lnY1 × lnY2	0.8331 ***	8.5519
lnY1 × lnY3	2.7987 ***	22.6504
lnY2 × lnY3	2.6337 ***	19.6825
$1/2 \times [\ln(P1/P2)]^2$	0.9316 ***	18.0750
$1/2 \times [\ln(P3/P2)]^2$	0.1687	0.2911
ln(P1/P2) × ln(P3/P2)	0.7532 ***	4.8917
lnY1 × ln(P1/P2)	0.1425	0.9214
lnY1 × ln(P3/P2)	0.0952	0.3478
lnY2 × ln(P1/P2)	2.4138 ***	6.1978
lnY2 × ln(P3/P2)	0.6266 ***	3.5068
lnY3 × ln(P1/P2)	1.5016 ***	6.2416
lnY3 × ln(P3/P2)	1.6195 *	1.9170
t × lnY1	−0.0503	−0.0726
t × lnY2	0.1993	0.4495
t × lnY3	1.3797	1.4036
t × ln(P1/P2)	0.3690	0.3721
t × ln(P3/P2)	1.3561	1.4119
T	0.0814	0.1906
t^2	0.6157	1.1474
Constant term	0.8028 ***	7.1214
Asset size	−0.04478 ***	−5.7462
Unemployment rate	0.02088 ***	4.4767
GDP per capita	−0.03738 ***	−2.8298
σ_μ^2	0.02218 ***	16.5001
γ	0.07308 ***	3.0538
Log likelihood function	301.3104	
	(1)	

Note: *** denotes 1% significance level; ** denotes 5% significance level; * denotes 10% significance level.

The results in Table 7 show that asset size has a negative relationship with cost inefficiency. This outcome means that larger banks can reduce cost inefficiency due to their economy of scale. The unemployment rate has a positive relationship with cost inefficiency. The GDP per capita has a negative relationship with bank cost inefficiency. The results using macroeconomic factors indicate that higher unemployment increases bank costs. In contrast, higher GDP per capita increases bank cost efficiency.

4.6. TGR and MCE

The SMF regression method was used to compute both the TGR and MCE of the banks in the developed and developing Asian economies. Figure 1 shows the TGR of the

two groups of banks. The banks in the developed economies had average TGR values between 1.0065 and 1.0070. The banks in the developing economies had average TGR values between 1.0739 and 1.1134. The TGR values of the banks in the developed economies are closer to one (1) than those of the banks in the developing economies. The bank group cost of the developed Asian economies is closer to the metafrontier cost, which means they managed costs better. The TGR of banks in the developing economies rose from 2015 to 2018. The increase in the technology gaps each year from 2015 to 2018 suggests that banks in the developing Asian economies deteriorate in their abilities to control costs.

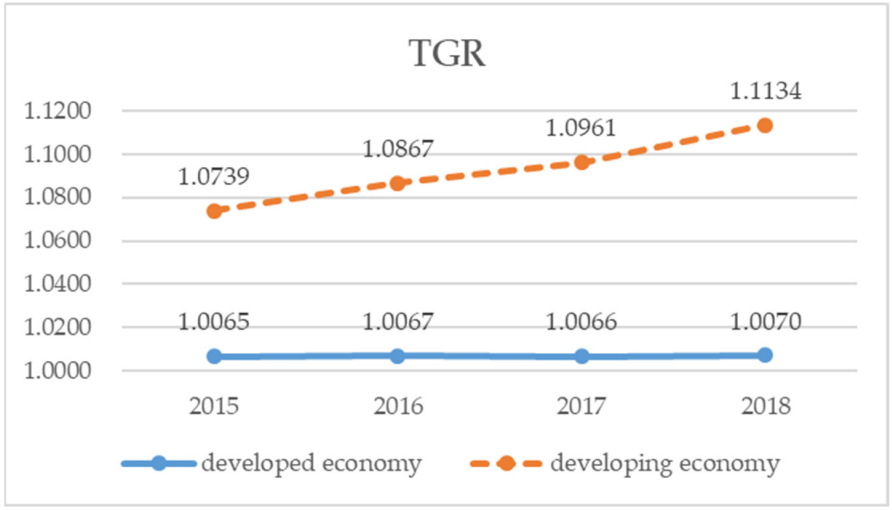

Figure 1. TGR of the banks in the developed and developing economies.

Figure 2 depicts the MCE of the two groups of banks in Asia. The banks in the developed economies had average MCE values between 1.3206 and 1.4242. The banks in the developing economies had average MCE values between 1.6638 and 1.6477. The results indicate that the MCE of the banks in the developed economies is superior to that of the banks in the developing economies because the values are closer to one (1). Overall, banks in the developed economies were more cost-efficient considering the ESG, bank-specific and macroeconomic variables altogether. However, the cost inefficiency of these banks continued to rise each year, notably from 2015 to 2016 and slightly from 2016 to 2018. This outcome suggests that the disclosure of ESG activities caused banks in the developed economies to be cost inefficient. It can be inferred that the ESG activities were considered altruistic behavior for these banks with costs not turned into more profits.

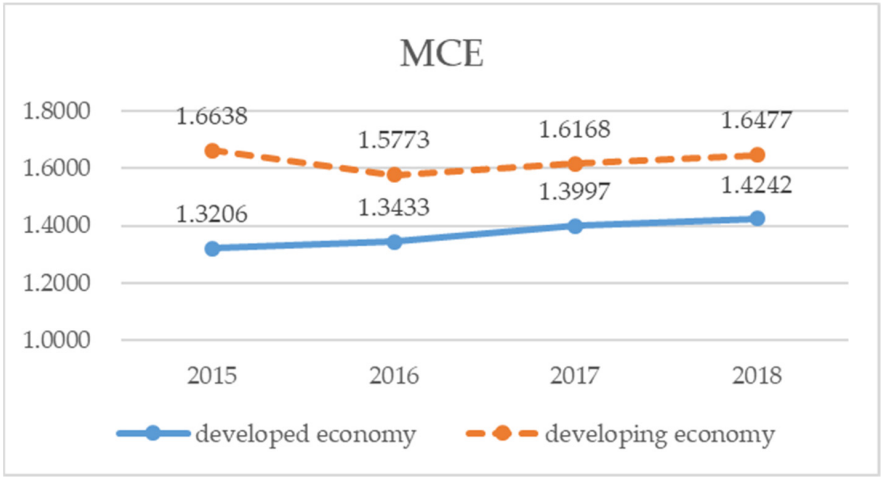

Figure 2. MCE of the banks in developed and developing economies.

5. Robustness Test

We conducted the robustness tests to confirm the impact of ESG on bank cost efficiency. The results show that the banks in the developed economies have significantly higher cost efficiency than the ones in the developing economies concerning CE, TRG, and MCE. Therefore, the results from the division of bank groups are robust.

6. Conclusions

The concept of ESG has gained increasing importance around the world in the last decade. Significantly, the UN specified 17 SDGs indicating actions in each of the ESG areas. An increasing number of companies are using ESGs as a measure of performance in addition to the widely used financial (bank-specific and macroeconomic) ratios. In the last ten years, Asian banks have grown rapidly and are expected to surpass the banks in other continents in terms of personal financial assets by 2025. Therefore, the sustainability of the Asian banks must be maintained to stabilize the economy. However, it remains unclear whether the additional costs incurred by banks due to ESG practices can be compensated for by higher revenue. This study applied a two-step analysis comprising SFA and SMF to examine the impact of ESG (17 SDGs) and financial indicators (bank-specific and macroeconomic) on the cost efficiency of the banks in developed and developing economies in Asia from 2015 to 2018.

In the first step of the analysis, we applied SFA. The results indicate that environmental variables increased the cost efficiency of the banks only in the developed Asian economies. Therefore H1 (Environmental variables have a positive impact on bank cost efficiency) is partially accepted. The social variables decreased the cost efficiency of the banks in the developed Asian economies but increased the cost efficiency of the banks in the developing Asian economies. Therefore, H1 (social variables have a positive impact on bank cost efficiency) is partially accepted. Governance decreased the cost efficiency of the banks in the developed Asian economies but increased the cost efficiency of the banks in the developing Asian economies. Therefore, H3 (Governance has a positive impact on bank cost efficiency) is partially accepted. Overall, only environmentally friendly activities helped banks in the developed economies to become cost efficient, possibly due to the large-scale energy saving schemes implemented bank-wide. Socially responsible activities and good governance aided banks in the developing economies to become more cost efficient, probably due to enhanced reputation and consumer confidence.

In addition, this study examined the impact of bank-specific factors on bank cost efficiency. The results from the cost-to-income ratio varied. Increasing costs in the developed economies increased bank cost inefficiency. However, increasing costs in the developing economies decreased bank cost inefficiency. This outcome suggests that banks in the developing economies were able to generate more revenues with more spending.

In the second step of the analysis, the SMF approach was utilized to compare the TGR and MCE for the two groups of banks. The results indicate that the banks in the developed economies had higher cost efficiency and a smaller technology gap than their counterparts in the developing economies. More importantly, banks in the developing Asian economies increased the technology gap each year, indicating that they deteriorated in their abilities to control costs effectively. The MCE of the banks in the developed economies is superior to that of the banks in the developing economies. Despite their higher cost efficiency, the banks in the developed economies continued to rise from 2015 to 2018, which implies that the overall ESG costs did not allow the banks in the developed economies to generate more revenues.

The current findings confirm that implementing environmentally-friendly practices such as using clean water, green energy, and recyclable products increased bank cost efficiency in the developed Asian economies. Therefore, these banks are recommended to focus on environmental activities. The empirical evidence also indicates that executing socially responsible activities, such as care for employees and community, and governance increased the bank cost efficiency in the developing Asian economies. Therefore, banks

in the developing Asian economies could engage more in socially responsible programs and governance. In addition, the results of this study may help investors in selecting banks with different ESG emphases.

Asian banks have gained increasing importance in the last decade with more than 30% of the top 100 banks in the world originating in Asia. Although the results of this study pertain to Asia, they could be generalized to banks in other developed and developing economies. The findings of the ways ESG impacts cost efficiency not only benefit investors and bank managers, but also the entire banking sector and the global economy seeking sustainable developments. In particular, the developing banks that emphasize ESG practices are likely to become more financially sustainable due to higher cost efficiency and a stronger connection with society. Moreover, banks that allocate more resources to ESG activities can better fulfill the needs of individuals and organizations, thus propelling global economic growth and sustainability.

Future research may aim at analyzing the direct impact of SDGs on value creation for banks, such as the actions which could be adopted to improve shareholder interests or customer satisfaction. The differences in the SDG approaches practiced by banks may be scrutinized to identify those which are most effective. In this way, we could deepen our understanding of the ways in which ESG impacts the financial industry to achieve sustainable development.

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Does Gender Diversity Affect the Environmental Performance of Banks?

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Abstract: Climate change is one of the greatest challenges facing humanity today. Therefore, all segments of society must act together to stop the deterioration of the planet and the depletion of its resources. The business sector must play an active role in acting responsibly toward the environment. Given the importance of this issue, major efforts have been made to analyze the environmental performance of the most polluting sectors. In contrast, other sectors that are also of great interest due to their contribution to sustainable development, such as the banking sector, have been overlooked. Notable factors conditioning performance include aspects of corporate governance such as gender diversity. However, the empirical evidence reveals a lack of consensus regarding the influence of women directors on corporate environmental performance. This background motivates the study of the commitment of the banking sector to reducing their environmental impact and the analysis the influence of board gender diversity on environmental performance. Data for the period 2009 to 2018 on 52 banks from the most polluting Western regions were studied using descriptive statistics and fixed effects econometric estimation to test the relationship between a selection of relevant variables. The key conclusions are that banks are committed to protecting the environment and that there are no significant differences between banks' commitment to the planet on the basis of board gender diversity.

Keywords: corporate social responsibility; environmental performance; climate change; gender diversity; board of directors; banking sector

1. Introduction

Climate change is one of the biggest challenges facing the planet. It is of vital importance, given its role as a cause of global warming. This phenomenon is having serious consequences throughout the entire planet, including rising sea levels, the flooding of low-lying coastal areas, extreme weather conditions, and severe difficulties for plants and animals to adapt to the new temperatures, potentially leading to the extinction of some species [1]. This irreversible damage is largely caused by human activity. Although some greenhouse gases (GHGs) are released naturally, human actions such as the burning of coal, oil, and gas are increasing the concentration of these gases [2]. Accordingly, in addition to appealing to governments to act following the adoption of the Sustainable Development Goals (SDGs), the United Nations has also called upon the private sector, civil society, and individuals. This call has been made under the premise that joint action is needed to achieve sustainable global economic development that respects the planet and its resources [3]. Otherwise, an environmental catastrophe is foreseen within 30 years [4].

Companies affect their surroundings through their economic activity. Therefore, it is essential that, while pursuing economic profit, they also ensure a positive social and environmental impact,

as well as a close-knit relationship with their stakeholders [5]. For this reason, they should consider all elements of corporate social responsibility (CSR) [6]. As business strategies have shifted towards more environmentally responsible practices in an attempt to achieve sustainable development [7], the number of researchers in this area has likewise grown. These scholars have examined the relationships between environmental performance and other variables, including the characteristics of the board of directors [8].

Among the numerous board characteristics that can be used for analysis, gender diversity is considered an essential factor for responsible practices [9]. It is therefore to be expected that women directors act differently from men in response to climate change, given women's greater awareness of the threat it poses and their greater willingness to combat it [10]. The greater commitment of women to ethical standards helps them address social and environmental problems in a more sensible manner [11,12]. For example, Arayssi, Dah, and Jizi [13] have provided evidence that women managers increase the environmental performance of companies by disseminating information to stakeholders and participating in decision making on environmental undertakings. However, the results of previous studies offer mixed conclusions [14–16], highlighting the need for further research to clarify the direction and robustness of the relationship between gender diversity and environmental performance.

According to Pillai et al. [17], the role of the private sector is fundamental to increase awareness and corporate action in support of the 2030 SDGs. It is imperative that firms apply their creative and innovative capacities to resolve the challenges of sustainable development [18]. Most research on the environmental performance of the business community tends to focus on the sectors that are considered the worst polluters, such as the manufacturing industry [14,19]. Insufficient attention has been paid to the service sector, particularly the banking sector, given its central role in the economy and its contribution to sustainable development.

The growing role of the financial sector in the development of Western economies over the last 30 years must be addressed. The role of the banking sector has conditioned both long-term economic growth and the volatility of this growth [20]. Similarly, the importance of banks is supported by their mission, namely, to act as intermediaries tasked with efficiently allocating resources by channeling the savings of one group of individuals toward another group of individuals in need to funds. This second group then invests these funds, thereby creating development and social well-being. Moreover, the banking sector also has a relevant role in ensuring that the business community adopts the SDGs, given that substantial amounts of funding are needed to implement these SDGs [21].

According to Buchner et al. [22], large investments are needed to research alternatives to fight climate change, and a high level of financing is required to implement projects to develop these alternatives and ensure a sustainable planet. Therefore, although the activities of banks do not have a direct impact on the environment, they can exert a positive influence by financing projects that help mitigate harmful effects [23]. Hence, banks play a central role in environmental performance by providing financial resources to other sectors.

Consequently, the importance of this sector leads us to analyze its involvement in environmental action. Similarly, we aim to ascertain whether gender diversity in the managerial echelons of banks actually leads to a difference in their environmental performance. In the literature, the corporate governance of such entities has generally been linked to aspects such as economic or financial performance [24–26], with some recent studies linking it to environmental, social, and governance (ESG) performance [27,28]. To the best of our knowledge, however, only one study has examined the environmental performance of the banking sector [29], although this issue has been studied using multi-sector samples [19,30,31]. Likewise, it may be concluded that the possible relationship between board gender diversity and environmental performance in this sector has received scant attention.

Consequently, our research aims are justified by the importance of climate change, the possible influence of gender diversity on this phenomenon, the lack of consensus in the literature, the lack of studies of the banking sector's role in this area, and the status of North America and Europe as the most polluting Western regions [32]. Our first research aim is to analyze the environmental performance

scores of the European and North American banking sector. This analysis can shed light on the level of involvement of banks in undertaking environmentally friendly, or at least non-harmful, actions to mitigate climate change. In addition, we also aim to ascertain whether gender diversity on the board of directors is a differentiating factor among banks with different environmental performance scores. The study is based on the SDGs pertaining to the "Planet" pillar, which is focused on the environment and the fight against climate change [3]. A sample of the largest European and North American banks by market capitalization was used to conduct descriptive statistical analysis and to estimate a fixed effects model.

To the best of our knowledge, this research differs from earlier studies in the following ways. These differences constitute the contribution of our study. First, this study offers the first characterization of the environmental involvement of the European and North American banking sector. This aspect is important for the literature for two reasons. First, for years, the banking sector has been viewed as a non-polluting sector given the nature of its activity [33]. Accordingly, interest in environmental concerns began to target the banking sector much later than the manufacturing sector [34]. Moreover, this sector represents a system that operates under centralized economic and monetary principles. Accordingly, the social and environmental costs associated with banking activity have traditionally been overlooked. Therefore, the banking sector still lacks these values in a context in which environmental damage has enormous scope and has accentuated the inequalities between the rich and the poor. Thus, it is fundamental to achieve social and environmental justice [35,36] and to strengthen social capital [37]. In addition, banking operations can have a powerful environmental impact through the intense use of energy required for the upkeep of buildings and electronic equipment, the generation of waste, and the distribution of financial resources for purposes that ultimately affect society and the environment [33]. This study aims to cover a gap in the research on the role of businesses in protecting the environment. The study achieves its aim by examining a sector that has received little attention (given the perception of the sector as a non-polluter) and that has taken a long time to become involved in protecting the environment, despite its undeniable strategic role in the value chain of the economic system.

Another differentiating factor of this study with respect to existing research is that it provides the first analysis of the role of board gender diversity in the environmental performance of the most polluting Western regions (North America and Europe). The study thus provides critical evidence to fill the current gaps in the literature. Specifically, the studies of this relationship reveal a lack of consensus. They have virtually ignored the banking sector, despite the aforementioned distinctive characteristics of this sector regarding its involvement in fighting climate change and its role as an economic agent. These factors indicate the need for special attention to be paid to this sector.

Finally, this study also offers the first use of a particular measure of gender diversity. The aim is to test the argument that it is necessary to achieve 30% representation of women board members to bring about change in the trend of environmental performance in the firms under analysis. An additional advantage is that the empirical analysis is based on a greater number of gender diversity measures than typically found in previous studies.

The article has five further sections following this introduction. Section 2 presents a review of the literature on the relationship between environmental performance and gender diversity. Section 3 explains the sample selection and provides justification for the method. Section 4 presents and discusses the results. Finally, Section 5 offers the conclusions, limitations, and proposals for future lines of research.

2. Board Gender Diversity and Environmental Performance: Literature Review and Research Hypothesis

Gender diversity is the subject of current debate in developed countries [38]. Numerous authors have studied the influence of women on corporate social responsibility (CSR) and, more specifically, the environmental dimension of CSR [16].

Several of these studies have concluded that companies with female representation on the board are more socially and environmentally responsible [19,39]. For example, they engage in more fundraising for social benefits [40], greater participation in decision making on environmental undertakings [13], and increased dissemination of non-financial information to stakeholders, notably with the Carbon Disclosure Project (CDP) [41]. Similarly, according to Cucchiella, D'Adamo, Gastaldi, Koh, and Rosa [42], women are more likely to adopt renewable energy systems as an alternative energy.

Li et al. [43] stress the importance of board gender diversity, specifically in the most polluting companies, because it encourages better development of environmental policies. The importance of gender diversity stems from the differences in the moral and social value systems of the two genders [44]. For instance, women are more aware of the importance of the stakeholders' well-being [45]. They are also more collaborative, which encourages the sharing of information [46]. Men, in contrast, are more competitive and ambitious [47]. However, the effectiveness of the role of women on the board may be weakened by increased conflict among members when there are at least three women directors [48].

Given these differentiating characteristics between men and women, the values and attributes of board members condition the board's decision making [49]. Therefore, the possible relationship between board gender diversity and CSR is based on three principal theories [50]: agency theory, resource dependence theory, and stakeholder theory.

The first of these three theories, agency theory [51], is based on the idea that greater board independence, due to, among other factors, the greater variety introduced by gender diversity, enabling greater control by reducing the costs derived from agency problems [52], thereby improving environmental action [15].

Similarly, the members of the board act as intermediaries between the company and the outside world. Therefore, resource dependence theory [53] would suggest that the inclusion of women on the board of directors enables greater access to resources and information channels by providing a wider network of contacts, which is particularly important for increasing the value of the business [54]. This situation can lead to better decision making [55] and the implementation of CSR policies such as those relating to the environmental dimension [15,56].

Third, the relationship studied in the present research can also be explained in terms of stakeholder theory [57], given that gender diversity can influence the implementation of environmental practices to meet the expectations of stakeholders [15]. The argument behind this idea is that women focus more on social well-being, given attributes such as emotional intelligence and the ability to understand and represent the needs of stakeholders [45].

In addition to the earlier arguments, an assessment of the consensus of previously reported empirical results reveals mixed findings. Some studies have confirmed a positive and significant relationship between the variables of interest. For example, Elmagrhi et al. [15] showed that the proportion of women on the board of directors positively affects environmental performance in terms of both putting in place environmental strategies and implementing and disseminating these strategies. Furthermore, Lu and Herremans [14] showed the existence of a positive relationship between gender diversity and environmental performance, emphasizing the significance of the results in relation to companies with a bigger environmental impact. Similarly, Liu [58] reported that companies with greater gender diversity are sued less often for environmental infringements.

By contrast, studies such as that of Walls, Berrone, and Phan [59] have shown that gender diversity does not influence environmental performance, a finding that has also been reported in relation to the banking sector [60]. This finding concurs with those of Prado-Lorenzo and García-Sánchez [61], who reported a positive but non-significant relationship between board gender diversity and the dissemination of information on GHG emissions. Alazzani et al. [16] found a positive influence of women on social performance but not on environmental performance, with this relationship being determined by the culture of the location where the company operates. This finding is supported by those of Fakoya and Nakeng [62], who reported that an increase in the number of women is not related

to greater energy use, focusing their analysis on responsible banks according to the Johannesburg Stock Exchange (JSE) Socially Responsible Investment (SRI) Index.

Despite the reported findings, the following hypothesis may be stated based on the earlier arguments that women are more sensitive to environmental issues and that their presence contributes to improving the effectiveness of the board of directors: *the presence of women on the board of directors contributes to better environmental performance of the European and North American banking sector.*

3. Sample and Method

3.1. Sample

Our study sample consists of the largest 52 banks in Europe (28 banks) and North America (24 banks) by market capitalization. The sample thereby covers the most polluting regions in the West [32] for the period 2010 to 2018. The selected banks had a market capitalization of more than $10 billion on 3 December 2019, according to Thomson Reuters Eikon [63]. This database has been used as a data source in previous studies (e.g., [16,64]). The criterion of market capitalization was used because Li et al. [43] suggest that companies with greater market capitalization protect the environment to a greater degree, possibly because they have more resources to combat environmental pollution. There are also more data available on listed and large companies. The aforementioned source was used to gather the data for the dependent and independent variables used in this study. The independent variables consist of the variables of interest (gender measures) to address our second research aim, as well as the control variables.

3.2. Dependent Variable

Environmental performance is usually measured by indicators composed of a weighting of environmental items. These scores of environmental performance are typically compiled by large companies, which have access to extensive information on firms' environmental performance. This study follows the approach adopted in previous studies [31,59,65]. The environmental score (EnvSc) is published by Thomson Reuters Eikon [63]. This score takes values between 0 and 100 and gives a score calculated as the weighted sum of the three categories that form this pillar: resource use (20 indicators), emissions (22 indicators), and environmental innovation (19 indicators).

3.3. Independent Variables

The board gender diversity variables chosen for this study are those that have been most widely used in previous environmental and corporate governance studies [29,66]. This choice of variables enabled verification of the robustness of the results given the use of multiple measures (Table 1).

Table 1. Gender diversity measures.

Label	Definition
Dum1	Dummy variable that takes the value 0 if there are no women on the board, and 1 otherwise.
Dum3	Dummy variable that takes the value 0 if there are fewer than three women on the board, and 1 otherwise.
Nwom	Number of women on the board.
Pwom	Proportion of women directors, calculated as the number of women on the board divided by the total number of board members.
Dum30	Dummy variable that takes the value 0 if fewer than 30% of the board members are women, and 1 otherwise.
Dum40	Dummy variable that takes the value 0 if fewer than 40% of the board members are women, and 1 otherwise.
Blau	Index reflecting the diversity of the board of directors. Values range between 0 and 0.5. A value of 0 indicates less diversity, owing to the absence of women on the board. The maximum value of 0.5 is attained when the number of female and male directors is the same. The interpretation of other values of this index depends on their proximity to the two limits of the range [67].

Source: Compiled by the authors.

Dum1 was included to control for differences between banks with no female directors on their board and those with at least one. Some studies have reported that women are more aware of environmental problems and lead to more egalitarian, social, and environmental organizations [64,68].

Dum3 was included because several studies have shown that the presence of at least three women on the board of directors enhances the role of women [58,69]. The reason is that the presence of only one or two women on the board is insufficient to bring about change because their opinion is more likely to be ignored [70]. Similarly, Liu [58] reported that firms with more than three women are sued less often for environmental infringements. However, the impact of a critical mass of women directors on environmental sustainability has received little attention [29].

In view of the previous arguments, the *Nwom* variable was included. It has been observed that environmental performance increases when there are more women on the board of directors [71]. The variable *Pwom* was also included because, in addition to the number of women on the board of directors, the proportion of women on the board is also important. It has been argued that the percentage of women on the board is positively related to environmental performance because women have greater environmental awareness [15,31].

The variables *Dum30* and *Dum40* were also included to control for differences between banks that have a board with, respectively, at least 30% and at least 40% women directors and banks with a proportion of women directors below these thresholds. These variables were included because the threshold of around 30% in the proportion of female directors explains a shift in the trend of environmental performance in the banking sector [29]. Furthermore, the effect of gender diversity on the board of directors should lead to better performance if there is a balanced gender distribution on the board; that is, 40% to 60% of board members are women [72]. To the best of our knowledge, this is the first time that *Dum30* has been used in this stream of literature, and the use of *Dum40* is relatively new in studies of gender and corporate governance [66]. Finally, the *Blau* index was used to measure the gender diversity of the board [67]. Several studies have reported that this index offers a good measure of diversity [14,73].

To improve the specification of the model, six control variables were included. These variables have been linked to environmental performance in previous studies [41,64]. Five are governance variables (*Ndir*, *CEODual*, *CSRCom*, *EnvTra*, *DirBon*) and one is an economic indicator (*SBank*).

Specifically, we selected the size of the board of directors (*Ndir*: number of directors). According to Kaspereit, Lopatta, and Matolcsy [74], it has a positive influence on CSR, thereby confirming its relationship with environmental concern [59]. It was therefore expected that companies with larger boards would have better environmental performance [75]. It was also important to consider CEO duality, which occurs when the same person simultaneously holds the position of CEO and chair of the board of directors (*CEODual*: dummy that takes the value 1 if there is CEO duality, and 0 otherwise). Studies, such as that of Galbreath [76], have shown that companies with CEO non-duality make greater efforts to tackle climate change.

Likewise, we considered whether each bank had a CSR committee (*CSRCom*: dummy that takes the value 1 if such a committee exists, and 0 otherwise). The aim of such a committee is to increase the awareness of employees about the environmental aspects of their work and their responsibility for the reduction of negative impacts on the environment, positively influencing the development of carbon strategies [41]. Furthermore, Orazalin [77] reported that the adoption of CSR committees improves the effectiveness of CSR strategies, leading to improved environmental and social performance. *EnvTra* was also included in the study (dummy that takes the value 1 if there are environmental management training policies, and 0 otherwise) because employee training and development practices condition a company's environmental performance [78].

We considered the existence of bonus policies for responsible practices by board members (*DirBon*: dummy that takes the value 1 if there are bonus policies, and 0 otherwise). Previous studies, such as that of Williams [79], have also examined this variable because an increase in salary is related to meeting sustainability goals [59]. Finally, consistent with the approach of Haque [64], we included

a variable to capture the size of the company in terms of number of employees (*SBank*: annual average number of employees). This variable was log-transformed to reduce the distortions caused by outliers.

3.4. Method

This study has two aims. We describe the procedure in each case. First, to characterize environmental performance, we used descriptive statistics. Common statistics were obtained to arrange and analyze the properties of the data. Regarding the relationship between gender diversity and environmental performance, in line with previous studies [64,74,80], we used panel data to perform the econometric estimation of a linear static equation, which is shown below:

$$EnvSc_{it} = \beta_1 + \beta_2\, Gen_{it} + \beta_3\, Ndir_{it} + \beta_4\, CeoDual_{it} + \beta_5\, CSRCom_{it} + \beta_6\, EnvTra_{it} + \beta_7\, DirBon_{it} + \beta_8\, Sbank_{it} + \eta_i + \varepsilon_{it} \quad (1)$$

Here, *EnvSc* is the environmental indicator, *Gen* denotes each of the seven selected gender measures, *Ndir* refers to the number of directors on the board, *CEODual* is the measure of CEO duality, *CSRCom* indicates whether there is a CSR committee, *EnvTra* indicates whether there are environmental management training policies, *DirBon* indicates whether there are bonus policies for responsible practices, *SBank* is the average number of employees, η_i is the unobservable individual effect, and ε_{it} is the random error term for company *i* in period *t*.

Two procedures can be used to estimate linear static equations with panel data: fixed effects models or random effects models. To determine which should be used, the assumption of absence of correlation between the unobservable individual effect and the explanatory variables must first be verified using the Hausman test. The results of the test are provided for each estimated equation in Table 4 under "*p* value (Hausman: FE/RE)." If this hypothesis of absence of correlation is rejected, then the only consistent estimator is the fixed effects estimator. However, if this hypothesis is not rejected, then both estimators are consistent, the difference being that the random effects estimator is the efficient estimator [81]. Therefore, the decision of which model to use for the analysis in this study was based on the results of the Hausman test. These results show the existence of correlation between the explanatory variables and the unobservable individual effect. Therefore, the results indicate that the fixed effects model should be used because it offers the only consistent estimator.

Crucially, for the fixed-effects estimator to be consistent, it requires the assumption of exogeneity of the explanatory variables to hold [81]. In view of the possible existence of endogeneity in the model due to the simultaneous causality between the dependent and independent variables [31,58], we tested the hypothesis of absence of correlation between the explanatory variables and the error term using the Hausman test. The result is given in Table 4 under "*p* value (Hausman: FEIV/FE)." The results show that the aforementioned assumption of exogeneity holds in all cases. The first lags of the explanatory variables were used as instruments [82].

However, robustness analysis was performed by repeating the estimation of the equation using a random effects model and the generalized least squares estimator. Given that it was also necessary to meet the assumption of exogeneity of the explanatory variables [81], we checked this assumption, providing the results in Table 5 under "*p* value (Hausman: REIV/RE)."

Finally, estimation was performed using a variances-covariance matrix of errors that were robust to heteroscedasticity between individuals and to serial correlation of the errors of the same individual. Time dummies were also included to control for any unobservable factors that could influence the behavior of the dependent variable over time.

4. Results

Tables 2 and 3 provide a general description of the variables for the sample and a comparison of the environmental performance scores at different levels of gender diversity. As Table 2 shows, *EnvSc* has a relatively high value, with an arithmetic mean of 75.43. The standard deviation indicates

low heterogeneity in the data, indicating the reliability of this mean value. The results for the 25th and 50th percentiles show that 75% of the observations of *EnvSc* have a score of more than 70, while 50% have a score of more than 80. Therefore, the vast majority have high scores, given that the maximum score is 100. The highest score is 97.84, and only 25% of the observations have scores above 90 (75th percentile). These data show that most of the analyzed banks have good environmental performance. Thus, in response to our first objective, we can conclude that the European and North American banking sector has a high level of involvement in actions to mitigate the effects of climate change. Similarly, according to Azarkamand et al. [83], companies are increasingly implementing measures to fight against them.

Table 2. Descriptive analysis.

	Arithmetic Mean	Standard Deviation	Minimum	Maximum	25th Percentile	50th Percentile	75th Percentile
EnvSc	75.4311	22.2269	13.57	97.84	70.57	83.95	90.68
Dum1	0.9463	0.2256	0	1	1	1	1
Dum3	0.6699	0.4706	0	1	0	1	1
Nwom	3.5799	1.7641	0	10	2	3.73	5
Pwom	0.2439	0.1224	0	0.6	0.17	0.25	0.33
Dum30	0.3538	0.4786	0	1	0	0	1
Dum40	0.1153	0.3197	0	1	0	0	0
Blau	0.1336	0.1336	0	0.5	0.28	0.38	0.44
Ndir	14.3499	3.5082	5	28	12	14	16
CeoDual	0.4780	0.4780	0	1	0	0	1
CSRCom	0.8170	0.3869	0	1	1	1	1
EnvTra	0.7057	0.4561	0	1	0	1	1
DirBon	0.5308	0.4995	0	1	0	1	1
Sbank	81,059.29	81,017.25	1250	33,012.5	19,960	47,005	105,348.5

Source: Compiled by the authors using Stata 16, StataCorp LLC, Badajoz, España.

Table 3. Descriptive statistics of *EnvSc* based on the value of observations of *Nwom* and *Pwom* with respect to the median values.

	Nwom		***Pwom***	
	***Nwom* < 3.73**	***Nwom* ≥ 3.73**	***Pwom* < 0.25**	***Pwom* ≥ 0.25**
Arithmetic mean	68.66872	82.46675	68.28934	81.30504
Standard deviation	24.31697	17.54534	24.71498	17.97563
Minimum	13.57	13.85	13.57	13.85
Maximum	97.42	97.84	97.42	97.84
25th percentile	49.3	80.735	49.3	79.135
50th percentile	77.24	87.64	77.24	86.735
75th percentile	88.21	92.51	88.3	92.375
Observations	251	252	227	276

Source: Compiled by the authors using Stata 16, StataCorp LLC, Badajoz, España.

We now consider the gender variables. On average, 94.63% of observations in the sample indicate that there is at least one woman on the bank's board of directors (see *Dum1*). This result implies that there are still leading banks with no women on their boards, although this is not generally the case. The average value of *Dum1* is greater than that of *Dum3*. It can therefore be deduced that in some banks with female representation on the board, there are few than three female directors. However, in almost 67% of the observations, there are at least three female directors on the board. As reflected by the 50th percentile, in 50% of cases, the board has at least three women directors.

Moreover, although the average number of women directors is 3.57, the standard deviation reveals heterogeneity in the data, with the *Nwom* variable taking values between 0 and 10. In cases with a value of 0, there are no women on the board, while the maximum number of female directors is 10. The data show that in 75% of the observations, this number is less than 5 (75th percentile).

The low presence of women on the board is further reflected by the fact that the average proportion of women directors is slightly less than 25%. The proportion of women is less than 30% and 40% in most cases, as reflected by *Dum30* and *Dum40*. Therefore, the data reflect the under-representation of women on the boards of directors of the banks in the sample. This finding is also corroborated by the *Blau* index. Despite showing that there is at least gender parity in one company (see maximum value of *Blau*), the average value is 0.1336.

We now consider the other corporate governance variables and the company size indicator (number of employees). On average, the banks have approximately 14 board members. There is little dispersion of the observations around this mean value, with the largest boards comprising 28 members and the smallest consisting of five. The opposite is true of the *Sbank* variable. The values for *SBank* fall within a wide range (1250 to 33,012 employees). This high dispersion, together with the values for the percentiles, indicates the variation of the sampled banks in terms of size. Furthermore, just under 50% of the banks have a CEO who is also the chair of the board. Regarding CSR and the environmental training of the board members, the average values of *CSRCom* and *EnvTra* imply that many banks have a specific CSR committee as well as policies for the training of board members in environmental matters.

Table 3 shows the descriptive statistics for *EnvSc*. The data are shown separately for banks with fewer than 3.73 women directors and those with 3.73 women directors or more. The data are also shown separately for banks with less than 25% women directors and those 25% or more women directors. Here, 3.73 and 25% are the respective median values of *Nwom* and *Pwom* for the sample.

In observations for which the number of women directors or the proportion of women directors is greater than or equal to the respective median value, the environmental performance score is approximately 13 points higher. Specifically, in cases where there are at least 3.73 women directors, the mean environmental performance score is 82.46. If the opposite is true, the score is 68.66. The same occurs with the percentage of women directors. When at least 25% of the board members are women, the dependent variable has a mean value of 81.30. By contrast, when this proportion is lower, the mean value of *EnvSc* is 68.28. The dispersion of observations around the mean value of *EnvSc* is greater in the sub-samples covering the lowest 50% of scores for the diversity measures. Likewise, there is a notable difference (of around 30 points) between the values at the 25th percentile of *EnvSc* for the two subsamples under these two criteria. In each case, the value is much higher for the subsample where the number of women directors and the proportion of women directors is greater than or equal to the median (49.3 vs. 80.73 and 49.3 vs. 79.13, respectively).

Finally, Table 4 shows the fixed effects estimates of the proposed equation. An equation was estimated for each of the seven proposed gender measures. The models were statistically significant at the 99% confidence level in all cases, as reflected by the p value of the F test.

We now consider the results of the regressions shown in Table 4. Regarding the relationship between *EnvSc* and the gender variables, only two of the coefficients associated with these explanatory variables are statistically significant (*Nwom* and *Dum30*). Therefore, the results indicate that none of the following measures results in a better environmental score of the sampled banks: raising the proportion of female directors (*Pwom*), having greater gender parity among directors (*Blau*), increasing the number of women on the board from zero to at least one (*Dum1*), increasing the number of women on the board to at least three (*Dum3*), or having at least 40% female representation on the board (*Dum40*). Our results thus confirm the conclusions of previous studies [60–62].

As shown in Table 2, there is a major gender imbalance on the boards of directors in the sample due to a clear predominance of men. Therefore, the benefits of female representation in the top echelons of these organizations are not apparent because a gender-balanced board is necessary for the role of women to truly influence company policies and performance [72]. This point has already been made by Konrad et al. [70], who argued that the number of women on the board caused the difference between a notable and non-notable effect of the female presence on that board. Those authors based their argument on the fact that only if there are several women on the board will they be able to break

down the predominant gender stereotypes and on the fact that there must be a critical mass of women to change the male-dominated communication dynamic.

Table 4. Dependent variable: *EnvSc*. Fixed effects estimator.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dum1	1.168						
Dum3		0.334					
Nwom			−0.898 **				
Pwom				−10.594			
Dum30					−2.443 *		
Dum40						0.475	
Blau							−9.598
Ndir	0.451 **	0.4503 **	0.570 **	0.395 *	0.387 *	0.455 **	0.402 *
CeoDual	−1.807	−1.745	−1.95	−1.916	−1.707	−1.728	−1.805
CSRCom	5.317*	5.226 *	5.359*	5.333 *	5.560 *	5.211 *	5.188 *
EnvTra	9.407 **	9.381 **	9.457 ***	9.558 ***	9.511***	9.414 **	9.577 ***
DirBon	0.020	−0.011	0.086	0.090	0.002	−0.051	−0.039
Sbank	6.357 ***	6.420 ***	5.753 **	5.875 **	6.279 ***	6.358 ***	5.794 **
Observations	494	494	494	494	494	494	494
R^2 (Within)	0.3614	0.3611	0.3688	0.3653	0.3684	0.3612	0.3648
p value (*F*)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
p value (Hausman: FE/RE)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
p value (Hausman: FEIV/FE)	0.9994	0.7747	0.6946	0.7334	0.7018	0.8316	0.8017

Source: Compiled by the authors using Stata 16, StataCorp LLC, Badajoz, España. *** significant at the 99% level, ** significant at the 95% level, * significant at the 90% level. R^2 (Within): coefficient of determination of the transformed model (within group). *p* value (F): *p* value of the test of model significance. *p* value (Hausman: FE/RE): *p* value of the Hausman test under the null hypothesis of absence of correlation between the explanatory variables and the individual unobservable effect. *p* value (Hausman: FEIV/FE): *p* value of the Hausman test under the null hypothesis of absence of correlation between the explanatory variables and the error term. The time dummies are omitted for brevity and practicality. The estimation was performed with errors that are robust to heteroscedasticity and autocorrelation.

Regarding the statistically significant coefficients (*Nwom* and *Dum30*), the evidence reveals a negative relationship at a confidence level of 95% and 90%, respectively. These results imply that as the number of women on the board of directors increases and female representation reaches at least 30%, the environmental performance score for the studied banking sector worsens. These results do not necessarily imply that women are unaware of environmental risks and are therefore less sensitive to taking environmental action, as confirmed by studies that report a positive relationship between board gender diversity and environmental performance [14,15,43]. The results merely indicate that having women on the board does not positively influence the environmental performance score. This situation may be due to a possible increase in conflict between board members such that, instead of leading to environmentally responsible decision making, this conflict would decrease consensus and therefore lead to poorer performance, as indicated by Bernardi and Threadgill [48].

Finally, to test the robustness of these results, Table 5 shows the estimations using a random effects model. As observed, none of the coefficients associated with the gender explanatory variables is significant. Therefore, the evidence confirms that the female representation on the boards of directors of the analyzed firms does not contribute to explaining their environmental performance.

Consequently, the proposed hypothesis cannot be verified. To conclude, we should stress the positive and significant relationship between the environmental performance score and *EnvTra*, *SBank*, *Ndir*, and *CSRCom*, as reflected by all equations in Tables 4 and 5. These results imply that the environmental performance score improves when environmental management training policies are put in place, the number of employees and directors is increased, and a CSR committee is established.

Table 5. Dependent variable: *EnvSc*. Random effects model.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dum1	2.032						
Dum3		0.937					
Nwom			−0.451				
Pwom				−2.751			
Dum30					−1.455		
Dum40						1.029	
Blau							−2.656
Ndir	0.441 **	0.434 *	0.509 **	0.434 **	0.415 *	0.450 *	0.435 **
CeoDual	−3.993 *	−3.881 *	−4.212 *	−4.165 *	−4.099 *	−4.134 *	−4.077 *
CSRCom	7.576 **	7.438 **	7.757 ***	7.689 **	7.826 ***	7.729 **	7.584 **
EnvTra	10.975 ***	10.931 ***	11.104 ***	11.133 ***	11.145 ***	11.206 ***	11.090 ***
DirBon	0.801	0.751	0.903	0.864	0.832	0.793	0.812
Sbank	5.436 ***	5.548 ***	5.301***	5.335 ***	5.374 ***	5.381 ***	5.366 ***
Observations	494	494	494	494	494	494	494
p value (Wald)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
p value (Hausman: REIV/RE)	0.0000	0.3283	0.3437	0.3665	0.2738	0.3842	0.4100

Source: Compiled by the authors using Stata 16, StataCorp LLC, Badajoz, España. *** significant at the 99% level, ** significant at the 95% level, * significant at the 90% level. *p* value (Wald): *p* value of the test of model significance. *p* value (Hausman: REIV/RE): *p* value of the Hausman test under the null hypothesis of absence of correlation between the explanatory variables and the error term. The time dummies are omitted for brevity and practicality. The estimation was performed with errors that are robust to heteroscedasticity and autocorrelation.

5. Conclusions

This study aimed to identify the behavior of the European and North American banking sector in response to climate change. The goal was to determine whether board gender diversity is a differentiating factor among banks with different environmental behavior. This question is highly relevant, given the lack of studies on this topic. To achieve our aims, descriptive statistics and a fixed effects model were used to analyze a sample of the largest European and North American banks in terms of market capitalization.

First, the results show that the analyzed banks generally have high environmental performance scores. This finding reflects the importance with which the sector views this problem. Second, only two of the seven gender measures used in the estimations have statistically significant coefficients, both negative. Similarly, the robustness analysis shows that none of the gender variables has a significant coefficient. Therefore, the results support the negligible effect of a greater presence of women directors on environmental performance scores. However, the literature offers several arguments for the sensitivity of women toward caring for the environment and their greater concern for different stakeholders. Consequently, this finding can be explained by the gender imbalance on the boards of directors of the banks under study, which have a clear under-representation of women. This under-representation of women on the board would imply that the role of women does not influence company policies and performance.

Thus, although the literature suggests that female representation on boards of directors is important for corporate performance, there are still many organizations, such as those in the banking sector, where the presence of women directors is low. This situation is noteworthy given that it is important not only for there to be women on the board but also for women to have a decent level of representation among the directors. Otherwise, a male predominance can prevent exposure to different perspectives provided by women and the positive influence that they can have on the processes and decision making of the board. Therefore, one of the implications of this study is that it reveals the need for a gender balance on the board of directors to ensure that female talent is fully utilized in an organization's decision-making processes. Doing so creates a context that enables women to broaden the perspectives of the board of directors by considering issues that involve different stakeholders and the community, such as protection of the environment.

Finally, it is worth noting this study's limitations. These limitations fundamentally derive from the use of a composite indicator as a dependent variable. When this variable is created as an average of

indicators, the sub-indicators with low values are masked and are offset by those with high values. Other indicators of environmental performance should be used in future studies to provide robustness analysis of the results. An example would be the those related to the SDGs. These indicators that measure commitment to the SDGs could show the level of involvement of banks in achieving these vital global goals, as well as providing evidence of the influence of gender diversity on reaching these goals.

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Sustainable Business Practices and Firm's Financial Performance in Islamic Banking: Under the Moderating Role of Islamic Corporate Governance

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Abstract: This paper examines the moderating role of Islamic corporate governance on the link between sustainable business practices and the firm's financial performance. A post-crisis period sustainability data for the decade of 2008–2017 was collected by the study. For data collection, this study used the weighted content method. The Generalized Method of Moments (GMM) statistical test was used for empirical testing. The results of the study found that the link between sustainable business practices with the firm's financial performance measured from the shareholders' and the management's perspective is positive, while the subjected link measured from the market perspective was found to be insignificant. This implies that the market stakeholders of the Islamic banks are reluctant for their bank's spending on sustainable business practices. Interestingly, the insignificant link between sustainable business practices and market performance became significant with the moderating role of Shariah governance and managerial ownership. It shows that the moderating role of Shariah governance and managerial ownership is giving confidence to market stakeholders of Islamic banks for receiving a higher financial return through sustainable business practices initiatives. These results may provide insights for several policymakers of the Islamic banking industry about integrating vital sustainability practices in their business models and about the balanced moderating role of Islamic corporate governance in the link between sustainable business practice and the firm's financial performance. It provides a roadmap to the Islamic banking industry for efficient management of sustainability practices from an Islamic perspective and subsequently improvement of financial performance through it.

Keywords: firm's financial performance; sustainability practices; Islamic corporate governance

1. Introduction

The world is frequently facing drastic economic, environmental, and social challenges of great impact due to the unsustainable business models of firms. The challenges include global warming, depletion in natural resources, increased human rights violations, excessive consumption of natural resources and food, accumulation of toxic waste, and chemicals among others [1]. It is widely believed that the world has consumed almost half of the natural resources which should be available to the future generation [2]. The "global risks report (2019)" published by the world economic forum reported that in terms of this likelihood, the top three global risks are sustainability-related risks. In the previous "global risks reports (2017 and 2018)", seven out of the ten highest global risks were

reported as sustainability-related. In terms of likelihood, sustainability risk is well ahead of the other global risks such as the risk of nuclear weapons. In order to cater for sustainability risk the United Nations UN launched the "UN Sustainable Development Goals" (SDGs) program, formally known as "Transforming our world: the 2030 Agenda for Sustainable Development". These SDGs are built upon a common understanding between the UN members' states with the common focal point "the future we want." According to the 17 sustainable development goals, business firms are required to enrich their business models with factors such as reducing poverty in the society, improving education and public health, clean water and affordable energy, decent labor practices, global climate change, and to reduce inequality among others. In line with those requirements, many businesses have domestically linked their business policies to the UN's sustainable development goals. The Islamic development bank plans to increase its financial support for SDGs realization to more than USD 150 billion over the next 15 years. These efforts clearly show how big and serious is the issue of sustainability on the world stage and to Islamic banking specifically. However, the literature suggests that despite its high importance, studies related to sustainability practices and their measurement in Islamic banking are scant [3,4]. The low quality, inefficient sustainable business practices of Islamic banks can depreciate a firm's financial performance. This is because the literature supports a positive relationship between sustainable business practices and a firm's financial performance [5]. On the other hand, frameworks/indices used to measure sustainable business practices in Islamic banks are also scant [4,6]. Muslim countries, especially Malaysia, show seriousness in manifesting Islamic values during their economic development. However, instead of recognizing the importance of religion in a multi-dimensional approach to development, the practical development of this alternative Islamic model is still lacking [7].

It is believed that the banking industry in general [8], and the Islamic banking industry specifically [4,9], have responded very slowly to the modern concept of sustainability. This study is sampling Malaysia for further investigation because Malaysia has the second-highest Islamic banking assets [4], and results from this sample can be generalized for the overall Islamic banking industry. Furthermore, in the context of the identified economic, environmental, and social challenges faced by the Islamic banks in Malaysia as reported by [4], it is vital for the Islamic banks to improve their sustainability practices and adopt a Shariah-based sustainability measurement framework/index for it. Because the stakeholder theory assumes a positive association between sustainability practices and the firm's financial performance. Additionally, the context of Islamic banking evidence also supports the stakeholder theory and indicates a positive association between sustainability practices and the firm's financial performance [10]. It implies that low sustainability practices can deteriorate the financial performance of Islamic banks and vice versa. In the context of associated sustainability challenges faced by the Islamic banks [4], and a missing Shariah-based sustainability measurement framework for the Islamic banks [9], it is highly expected that the sustainability practices and reporting of the Islamic banking industry in Malaysia would be very low, and could deteriorate its financial performance. However, it is also vital to first understand if there is any significant impact of sustainability practices on financial performance in the case of Malaysian Islamic banks. If so, then the techniques that can positively moderate this relationship must be identified. Furthermore, it ultimately improves sustainability practices and the subsequent financial performance of the Islamic banks through it. The Securities Commission (SC) Malaysia is determined to ensure sustainability practices through good corporate governance strategies. It alludes to the fact that effective corporate governance mechanisms can positively moderate the nexus between sustainability practices and financial performance. In line with the initiatives of SC Malaysia to promote sustainability practices through effective corporate governance mechanisms, it would be of great interest and importance to explore the role of Islamic corporate governance, which is comprised of the traditional corporate governance tools such as "managerial ownership" and the industry-specific Islamic corporate governance tools "Shariah governance". The resource-based view theory and the convergence of interest hypothesis support the positive moderating role of these variables and financial performance. Hence practically, testing this

theory in the Islamic context would be of great importance. Against this background, an in-depth analysis of the sustainability profile of the Islamic banking industry in Malaysia is mandatory. This is because, in its quest to become a fully developed country, Malaysia demands higher sustainability from its different business sectors. In a way, a gentle push in the same direction is also required from its Islamic banking industry as well, which at present is lacking. The discussion above has given a base to some fundamental questions which need to be addressed. The questions and their subsequent objectives are stated below. The first question that arose from the above discussion is: what is the causal relationship of sustainability practices on the financial performance in the case of Islamic banking industry in Malaysia? Secondly, is there any moderating effect of managerial ownership and Shariah governance on the causal relationship between sustainability practices and the financial performance? In order to address the above questions, subsequent objectives of the study have been set. The first objective is to evaluate the causal relationship between sustainable business practices and a firm's financial performance. For a better understanding and more detailed view on the subject this study measures financial performance from three different perspectives, i.e., management perspective through Return on Assets (ROA), shareholders' perspective through ROE, and to measure firm's financial performance from a market perspective using Tobin's Q ratio; these measures are consistent with [5,11–19]. The second objective of the study is to examine the moderating role of the proposed variables in the causal relationship between sustainable business practices and a firm's financial performance. The accomplishment of this objective will illuminate the balanced role of Islamic corporate governance in promoting sustainable business practices and subsequently improving financial performance of the Islamic banks. This investigation will help Islamic banks in understanding the role of sustainable business practices and the importance of Islamic corporate governance mechanisms for achieving better financial performance. Holistically, better financial performance will allow the Islamic banks to grow internationally. Moreover, their inclusion on the world stage will provide financial equilibrium and stability to the global financial market. The outline of the remaining paper is as follows; the proceeding section explains the literature review which includes the theoretical framework and hypotheses development, and the conceptual framework of this study. The following section explains the methodology part, followed by the results and discussion. Furthermore, the last part shows the conclusions, significance of this study, and future recommendations.

2. Literature Review

Examining the link between sustainable business practices and a firm's financial performance received great attention in the recent literature. Table 1 shows the summary of the notable work that evaluated the link between sustainable business practices and a firm's financial performance.

Table 1. The link Between Sustainable Business Practices and Firm's financial performance.

Author	Country/Region/ /Sample	Dependent Variable	Methodology	Accounted for Endogeneity	Instrumental Variable	Finding
Mehmet Ali Soytas [20]	North America	ROA (Return on Assets)	First-stage estimation	Yes	Sustainability median	Positive Impact
Platonova, Asutay, Dixon and Mohammad [5]	GCC	ROAA (Return on Average Assets), ROAE (Return on Average Equity)	Fixed-effect regression	Yes	No	Positive Impact
Nobanee and Ellili [21]	UAE	Growth in interest income	GMM	No	No	Negative Impact
Abduh and Azmi Omar [22]	S&P500 stock market index	ROA, ROC (Return on Capital) Excess stock return	OLS	No	No	Mixed
Eccles, et al. [23]	United States	ROA, ROE	Four-factor model	Yes	Sustainability means	Mixed
Mallin, et al. [24]	13 countries	ROA, ROE	OLS, 2SLS, and 3SLS	Yes	Bank's visibility	Positive Impact
Arsad, et al. [25]	Shariah Compliant companies Malaysia	EPS (Earnings per Share	SEM	No	No	Positive Impact
Islam, et al. [26]	Bangladesh	ROAA, EPS	T-test	No	No	Inconclusive/ Insignificant
Torugsa, et al. [27]	Australia	Confirmatory factor analysis (CFA)	SEM	No	No	Positive Impact
Lin, et al. [28]	Taiwan	ROA	Regression	No	No	Positive Impact
Nelling and Webb [29]	United States	ROA, Stock return	Fixed-effect regression	No	No	Inconclusive/ Insignificant
Cochran and Wood [30]	Moskovitz list	Operating earnings/sales	Regression	No	No	Weak relationship

3. Theoretical Framework and Hypotheses Development

3.1. Sustainable Business Practices and Firm's Financial Performance: The Stakeholders' Theory, the Good Management Theory, and the Slack Resource Theory

Freeman presented the stakeholder's theory in 1984, which attempts to address the principle of who or what really counts [31]. While proposing the theory, Freeman divided the stakeholders into two main categories, i.e., direct and indirect stakeholders. Different researchers have reported them with different names. For instance, [32] referred them as the primary and secondary stakeholders. The authors of [33] mentioned them as business and social stakeholders. The stakeholders' theory argues that the value of the firm increases when the multiple stakeholders of the company are addressed and satisfied [4]. The stakeholders of the company may include those individuals or groups which are affected by the actions of the company. Generally, it includes its customers, employees, financiers, suppliers, government bodies, trade associations, political groups, communities, the environment, etc. Companies addressees these stakeholders through efficient sustainable business practices and their subsequent reporting. For instance, the employees, local communities and suppliers of the company are addressed through economically sustainable business practices and reporting, as the economic sustainable business practices management preaches about reporting the minimum wages to be paid to the employees, to promote investment in communities, and to promote and

prioritized purchases from the local suppliers. The stakeholders (government bodies, communities, and environment) may be addressed through environmental sustainability practices, as the economic sustainable business practices management preaches about compliance with environmental laws enacted by the government, it also expounds about waste reduction, energy consumption, recycling, etc. The practices and its subsequent reporting address communities and environmental observes. Similarly, the stakeholders (employees, customers, suppliers) may be addressed by socially sustainable business practices and management. As socially sustainable business practices expound about decent work practices, human rights protection, occupational health, and safety. In short, efficient sustainable business practices and its subsequent reporting may address multiple stakeholders. Furthermore, the stakeholders' theory assumes that when the multiple stakeholders are addressed, it may improve a firm's performance. The findings of the past studies and the trade-off hypothesis, which drew a negative or neutral relationship for the subjected link, are less supported because they only performed a conceptual interpretation of the subject [24]. On the other hand, empirical studies of [5,34] found a positive association between sustainable business practices and the firm's financial performance in the Islamic banking industry. The stakeholder's theory presented by [31] also postulates the link between sustainable business practices and the firm's performance to be positive.

Two important things to be considered in evaluating the link between sustainable business practices and the firm's financial performance are its impact, i.e., negative, positive or neutral, and the direction of causality. The causality between sustainable business practices and the firm's financial performance is being used bi-directionally in the literature. The authors of [35] put forward two theories—namely good management theory and the slack resource theory—to argue on the direction of causality. Under the slack resource theory, the direction of causality treats sustainable business practices as a dependent variable while a firm's financial performance is considered to be an independent factor. It argues that the firm with slack resources can spend more finance on sustainability practices. On the other hand, under the good management theory, the direction of causality treats sustainable business practices as an independent variable, while the firm's financial performance is considered to be the dependent factor. The theory suggests that a sustainability initiative made by the firm increases its reputation in the minds of various stakeholders, which ultimately helps them to gain more financial benefits. In terms of impact, the trade-off hypothesis assumes the link between sustainable business practices and firm's financial performance to be negative, while the stakeholders' theory assumes a positive impact of sustainable business practices on the firm's financial performance.

In the case of the Islamic banking industry, most of the researchers have followed the good management theory by using banks' firm's financial performance as the dependent and sustainable business practices as an independent variable [4]. Moreover, in terms of impact, researchers are consistent with the view of the stakeholder's theory and assume a positive of the impact of sustainable business practices on a firm's financial performance in the Islamic banking [4,5]. Against the background, this study is consistent with the good management theory for the direction of causality, and with the stakeholders' theory for the positive impact of the subjected relationship. Hence, this study uses banks' financial performance as a dependent, while using sustainable business practices as the independent variable. As shown in Figure 1 below, business sustainability has main three dimensions, i.e., economic, environmental, and social sustainability. This study blended those dimensions with general standards sustainability strategies such as those of the Global Reporting Initiative GRI framework for the financial sectors/banking sector. This study measures banks' financial performance from three different perspectives, i.e., management's perspective, the market's perspective, and the shareholders' perspective. Different researchers have proposed different ratios for measuring management, market and shareholder's perspective in the Islamic banking industry. The authors of [4,11] have used Return on Average Assets (ROAA) to proxy the firm's financial performance of Islamic banks from a management perspective. The authors of [36] have used Tobin's Q ratio for measuring the firm performance of Islamic banks from a market perspective. The authors of [37] used Return on Average Equity (ROAE) ratios to proxy firm's financial performance of Islamic banks from a

shareholder's perspective. This investigation will first illuminate the impact of sustainable business practices on a firm's financial performance of Islamic banks from different perspectives, which will eventually assist the practitioners and management to safeguard and expedite the identified and targeted sustainable business practices that can increase their firm's financial performance positively and vice versa. In a way, this investigation will be helpful for the practitioners of the global Islamic banking for policy formulation. Although the prior studies [4], found this nexus to be positive, in order to see it in comparison with the moderating role of Islamic corporate governance it is necessary to re-examine this link and then to witness whether the moderation has further accelerated the nexus in a positive direction or not. Thus, the following hypotheses are developed.

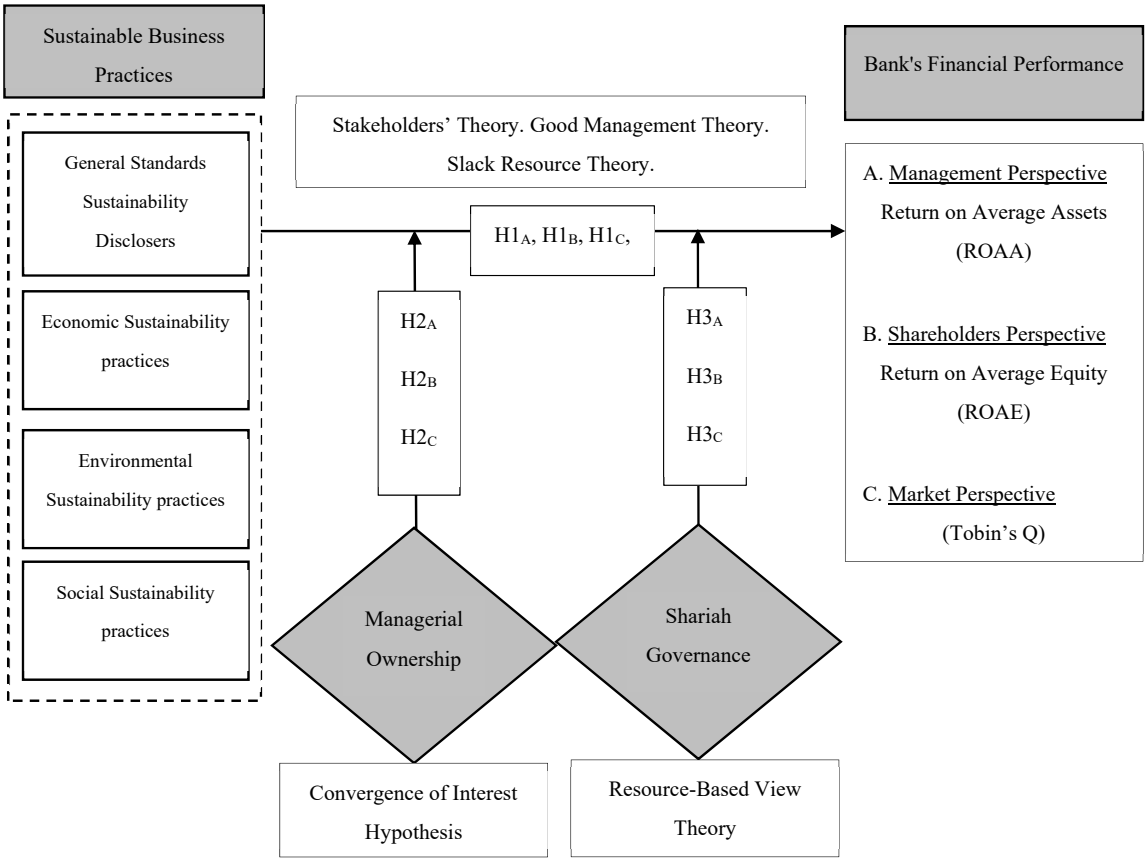

Figure 1. Conceptual Framework of the Study (Graphical Abstract).

Hypothesis ($H1_A$). *The link between sustainable business practices and the firm's financial performance indicating a management perspective is positive.*

Hypothesis ($H1_B$). *The link between sustainable business practices and the firm's financial performance indicating a shareholder's perspective is positive.*

Hypothesis ($H1_C$). *The link between sustainable business practices and the firm's financial performance indicating a market perspective is positive.*

3.2. The Moderating Role of Islamic Corporate Governance on the Link Between Sustainable Business Practices and Firm's Financial Performance

The existing governance framework of the Islamic banks is at least different in theory from the conventional counterpart by a commitment to social justice [11]. The authors of [38] argued that the introduction of Islamic principles and laws makes it different from the conventional corporate governance structure. Islamic corporate governance has two main aspects. Firstly Shariah governance, which ensures Shariah principles by following the rules of Islamic laws in the banking operations. Secondly, the traditional corporate governance mechanism, which ensures the efficiency and performance of the banks through directing, controlling, and management of the banking operations. Shariah Supervisory Board (SSB) is the central feature of Islamic corporate governance under the aspect of Shariah governance, while the management is considered to be one of the main features of Islamic corporate governance under the traditional corporate governance aspect. The SSB represents the total number of members available in the Shariah supervisory committee of the Islamic banks. The SSB has main three roles that are the consulting, controlling, and ensuring [38]. According to the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), the preferred minimum number of the SSB is three. AAOIFI also recommends professional other than religious scholars to sit on the SSB [24]. The purpose of encouraging professionals like bankers and economists (even with little religious knowledge) is to encourage diversity on the SSB and to bring expertise on technical matters like sustainability disclosers blended with Shariah principles. For this to happen, the size of the Shariah supervisory board size must be large. The agency theory and the stakeholders' theories also support the argument that better governance practices ensure a firm's better financial performance. Managerial ownership under the traditional corporate governance aspect of Islamic corporate governance also improves a firm's performance. The convergence of interest hypothesis also supports a positive association between managerial ownership and a firm's financial performance.

Previous studies under the Shariah aspect of Islamic corporate governance were found to have a positive association with sustainable business practices and the firm's performance. The authors of [39] found that the SSB has a positive impact on the sustainability practices of Islamic financial institutions. The SSB was found to have a positive impact on sustainability disclosures [40]. The authors of [11] used the Shariah Supervisory Board Size (SSBS) as a proxy for measuring Shariah supervision and reported its positive association with the Islamic bank's firm's financial performance. The authors of [39] found that the SSBS was positively related to a firm's performance. The authors of [24] also found a positive association between the SSBS and firm's performance of the Islamic banks across 13 countries. The above discussion alludes that under the Shariah aspect of Islamic corporate governance, the link between sustainable business practices and the firm's performance is positive.

The gap identified from the above discussion is that all the previous studies either evaluated the impact of Islamic corporate governance on sustainability practices or on the firm's performance itself. The role of Islamic corporate governance as a moderating variable is an oversight. In addition, tools from the traditional aspect of Islamic corporate governance (the role of management) are also overlooked in evaluating the link between sustainable business practices and a firm's performance. Therefore, this study is proposing a broader role of the Islamic corporate governance covering its Shariah aspect and the traditional corporate governance aspect as a moderating variable in evaluating the link between sustainable business practices and firm's financial performance. The Bank Negara Malaysia (central bank of Malaysia) has also proposed the Shariah governance framework [41], for the Islamic financial institutions in Malaysia. The main objective of the Shariah governance framework is to ensure business follows Shariah principles and to provide guidance to the Shariah board and the management. A further objective of the framework deals with Shariah risk management and Shariah research; this process ensures that the Shariah board and management of the Islamic banks adopt the latest trend in corporate governance, such as promoting sustainability which can eventually affect the firm's performance positively. The securities commission of Malaysia is determined to ensure sustainable business practices through good corporate governance strategies. In line with the

above discussion, this study is proposing the moderating role of Islamic corporate governance for the nexus of sustainable business practices and the firm's financial performance. Details about this are presented below.

3.3. The Moderating Role of Managerial Ownership on the Link between Sustainable Business Practices and Firm's Financial Performance: The Convergence of Interest Hypothesis

The second moderating variable used in this study is managerial ownership. The findings of the impact of managerial ownership on the firm's financial performance are bidirectional. The entrenchment hypothesis argues that when the managers are highly entrenched in the business, they are less likely to work for the shareholder's interest. On the other hand, the convergence of interest hypothesis argues the other way around. It argues that the higher the managerial ownership in the firm, the stronger the firm's performance. This is because the high shares motivate managers to work devotedly for increasing share prices because of their own high stake in the shares. At this point, the interest of managers converges with the interest of the firm, and in the process, the firm's value gets better. The past studies of [42,43] proxied managerial ownership through the director's ownership. In Malaysia [44] the director's ownership was also as a proxy for measuring managerial ownership. Director's ownership refers to the percentage of shares held by the directors of the company. These directors are highly motivated towards the better decisions made by their board., because due to their stake in the company's shares, they are directly affected by decisions made by the board. This convergence of interest motivates them for better decision making to increase the firm's financial performance of the firm. Against this background, it suggests that the higher the director's ownership in the firm, the higher the firm's financial performance will be [45]. The convergence of interest hypothesis presented by DeAngelo and DeAngelo [46] and some past studies also assumes a positive association between managerial ownership and firm's financial performance of firms [43,47–49]. Hence, in the context of the above discussion, the following hypotheses are designed.

Hypothesis ($H2_A$). *Managerial ownership positively moderates the link between sustainable business practices and the firm's financial performance proxied through a management perspective.*

Hypothesis ($H2_B$). *Managerial ownership positively moderates the link between sustainable business practices and the firm's financial performance proxied through the shareholders perspective.*

Hypothesis ($H2_C$). *Managerial ownership positively moderates the link between sustainable business practices and the firm's financial performance proxied through the market perspective.*

3.4. Moderating Role of Shariah Governance on the Link between Sustainable Business Practices and Firm's Financial Performance: The Resource-Based View Theory

The authors of [50] presented the Resource-Based View (RBV) theory, which argues that the basis of competitive advantages for a firm lies primarily in the application of a bundle of valuable tangible and intangible resources available at the firm's disposal. In short, the RBV suggests that improving and accelerating the internal activities of the firm can help the company to obtain an external competitive advantage, which ultimately increases the value of the firm. Shariah governance is measured through the Shariah supervisory board size. The RBV theory has already been used for the moderating role between sustainable business practices and the firm's financial performance. This study uses RBV theory in the Islamic banking context for the moderating role of Shariah governance between sustainable business practices and the firm's financial performance of Islamic banking. This study expects a positive moderating role of Shariah supervisory board size between sustainable business practices and the firm's financial performance. This is because, due to the big Shariah supervisory board size, the capacity of monitoring increases, which facilitates better decision making, and better

decision making increases a firm's performance. In the conventional context, [51] found a negative association between board size and firm performance.

On the other hand, from the Islamic perspective, past studies also found the association between Shariah supervisory board size and firm's financial performance to be positive. The SSB was found to have a positive impact on sustainability disclosures [40]. The authors of [11] used Shariah Supervisory Board Size (SSBS) as a proxy for measuring Shariah supervision and reported its positive association with the Islamic bank's firm's financial performance. The authors of [39] found that the Shariah supervisory board size was positively related to a firm's performance. The authors of [24] also found a positive association between the Shariah supervisory board size and firm's performance of the Islamic banks across 13 countries. Hence, in the context of the above discussion, the following hypotheses are designed.

Hypothesis ($H3_A$). *Shariah governance positively moderates the link between sustainable business practices and the firm's financial performance proxied through a management perspective.*

Hypothesis ($H3_B$). *Shariah governance positively moderates the link between sustainable business practices and the firm's financial performance proxied through the shareholders perspective.*

Hypothesis ($H3_C$). *Shariah governance positively moderates the link between sustainable business practices and the firm's financial performance proxied through the market perspective.*

The detailed theoretical discussion is graphically abstracted in Figure 1 below.

4. Methodology

4.1. Sample and Population

Malaysia has the second-highest Islamic banking assets in the world [34]. In order to offer a true picture of world Islamic banking, this study selected all 16 Islamic banks from Malaysia; hence, this is a population data in nature.

4.2. Collection of Data

This study collected sustainability data from the annual reports of the Islamic banks in Malaysia for the decade of (2008–2017) using a weighted content analysis method.

4.2.1. Weighted Content Analysis Method

The weighted content analysis technique beyond the dummy codes of only 0–1 allows further weight in the quality of disclosure. The authors of [52], while measuring sustainability practices of the top global corporations used the dummy codes 0–4. The authors of [53] used the dummy codes of 1–3. The authors of [54], in line with the Global Reporting Initiatives GRI guidelines, used the dummy codes of 0–2 for measuring corporate sustainability practices of the nine selected public firms in Turkey. For data collection, this study followed the Islamic bank's sustainability measurement index extended by the author of [4] (refer to Table A1). The index has a total of 65 items divided into general standards disclosures (7 items), economic sustainability (10 items), environmental sustainability (12 items), and social sustainability (36 items). The index used the dummy code 0–2 using the wording about each item in the annual report. The study gave code (2) for a significant positive contribution to an item in the annual reports of the Islamic banks. A significant positive contribution of the Islamic banks about an item must be in the form of measurability, such as monetary measurement, weight, and volume of an item, etc., The dummy code of "0" was given when no wording about an item was found in the annual report of the Islamic banks. The dummy code of "1" was given for partial reporting about an item. For instance, in line with the item of "energy reduction and preservation" under the

environmental sustainability dimension (refer to Table A1), the CIMB bank annual report 2008 page. 180, highlighted that "*The Group encourages employees to adopt energy-saving practices internally such as switching off the lights, air-conditioners, and equipment when leaving the office.*" This study gave the code (1) because a measurement scale in terms of reduction was missing. Similarly, the dummy code of (2) was given when the Islamic banks made a significant positive contribution to an item. For instance, in line with the item of "energy reduction and preservation" under the environmental sustainability dimension (refer to Table A1), the CIMB bank citizenship report 2017 page 107, highlighted a "*40% reduction in paper consumption through Managed Print Services (MPS) at Menara CIMB; Fuel consumption reduced by >41%, electricity and water consumption reduced by >5%, and >4% respectively*".

4.2.2. Content Validity and Reliability

This study established the content validity of the items used in this study with the measurement criteria for each item as per the Global Reporting Initiatives GRI index for the banking sectors (refer to Table A1). The GRI index provides different measurement criteria for each item as used in this study. We used the same measurement criteria in the Islamic banks, as reported by the GRI index. Which made the content analysis process of this study to be valid. Content reliability refers to obtaining the same results after repeating the measurement process for an item over a period of time [52]. In order to evaluate reliability of the content analysis, firstly a decade sustainability data was collected for two random Islamic banks. Secondly, to check the consistency of the data, the same banks were given to two expert coders in the respected field along with the measurement index (refer to Table A1). The same process was repeated over the period, and some minor changes were incorporated into the data collection process as per the suggestion of the expert coders to enhance reliability of the content analysis process of this study.

4.3. Independent Variables Explanation

This study used four independent variables, namely general standards sustainability disclosures, economic sustainability, environmental sustainability, and social sustainability (see Figure 1).

4.3.1. General Standards Sustainability Disclosures

The first independent variable used in this study is the general standards sustainability discourse, which is also called as the integrated sustainability strategies. The Global Reporting Initiative (GRI) has used this variable specifically for the banking sector. A total of 7 items are used for measuring this dimension (refer to Table A1). This study measures the general standards sustainability disclosers and the proceeding independent variables using a weighted content analysis method with the help of dummy codes of 0–2 for the decade of 2008–2017, where '0' is used for no reporting, '1' is used for partial reporting, and '2' is used for fully reporting about an item. Annual reports of the subjected banks were used for data collection with the help of the following Equation (1),

$$\text{General Standards sustainability disclosure} = \frac{\text{Summation of total disclosures per section}}{\text{Total possible disclosures per section}} \quad (1)$$

Later, the ten (10) years mean average of all the seven (7) items from this dimension was taken for sampled banks to form a general standards sustainability disclosures score.

4.3.2. Economic Sustainability

The economic dimension of sustainability concerns the organization's impacts on the economic conditions of its stakeholders, and economic systems at local, national, and global levels [55]. A total

of 10 items are used for measuring this dimension (refer to Table A1). Annual reports of the sampled Islamic banks were used for data collection with the help of the following Equation (2).

$$\text{Economic Sustainability Formula} = \frac{\text{Summation of total disclosures per section}}{\text{Total possible disclosures per section}} \quad (2)$$

Later, the ten (10) years mean average of all the ten (10) items from this dimension was taken for the sampled Islamic banks to form a general standards sustainability disclosures score.

4.3.3. Environmental Sustainability

The environmental dimension of sustainability concerns the organization's impact on living and non-living natural systems, including land, air, water, and ecosystems [55]. A total of 12 items are used for measuring this dimension (refer to Table A1). Annual reports of the subjected banks were used for data collection with the help of the following Equation (3).

$$\text{Environmental Sustainability Formula} = \frac{\text{Summation of total disclosures per section}}{\text{Total possible disclosures per section}} \quad (3)$$

Ten (10) years mean average of all the 12 items from this dimension was taken for the sampled banks to form a general standards sustainability disclosures score.

4.3.4. Social Sustainability

The social dimension of sustainability concerns the impacts the organization has on the social systems within which it operates [55]. A total of 36 items are used for measuring this dimension (refer to Table A1). Annual reports of the subjected banks were used for data collection with the help of the following Equation (4).

$$\text{Social Sustainability Formula} = \frac{\text{Summation of total disclosures per section}}{\text{Total possible disclosures per section}} \quad (4)$$

Later, the ten (10) years mean average of all the 36 items from this dimension was taken for the sampled banks to form a general standards sustainability disclosures score.

4.3.5. Total Sustainability Score (Formative Variable)

The ten (10) years mean values of the above independent variables are added to form a total sustainability score. The variable of total sustainability was used for empirical testing. Consistent with [56], for measuring sustainability scores the following formula was used, i.e., $\sum = \frac{dj}{N}$, where, N means the total number of disclosures while d_j are the numbers of discoursers performed by the banks. The formative variable of total sustainability is considered as an endogenous variable by the previous studies [57]. The authors of [58] also suggest that evaluating the link between sustainable business practices and a firm's financial performance may be biased if it does not account for endogeneity. Consistent with the past study of the author [57], this study for setting an instrumental variable gave a dummy code of "1" to the Islamic banks, which had their sustainability score above the industry median and a code of "0" otherwise. The instrumental variable was then verified through the orthogonality condition test and the first-stage regression summary statistics summary test before being used in the GMM model.

4.4. Dependent Variables Explanation

This study measures the financial performance from three different perspectives, i.e., market, management, and the shareholder's perspective (refer to Figure 1). For the operationalization of each perspective, see Table 1 below.

4.5. Moderating Variables Explanation

4.5.1. Managerial Ownership

It represents the share held by the top management of the firm. This study used the "director's interest" to measure managerial ownership of the Islamic banking industry in Malaysia. It can be measured using the following Equation (5). The Equation (5) used for this variable is consistent with the author of [59].

$$\text{Formula of Director's ownership} = \frac{\text{No of shares held by directors}}{\text{Total ordinary shares}} \quad (5)$$

4.5.2. Shariah Supervisory Board Size (SSBS)

It represents the total number of members available in the Shariah supervisory committee of the Islamic banks. The author of [11] used the average of SSB, while [56] used the number of SSB members to proxy this variable. This study will use the log of the total number of Shariah scholars on the board.

4.6. Control Variables Explanation

4.6.1. Bank Age

Older banks ages are generally considered to be more profitable and larger [60]. This old age, large size, and high profit brings them into the spotlights of policymakers, media groups, and different public groups, and they are often criticized by different interest groups due to their visibility. In order to avoid their criticism and pacify these interest groups, the banks adopt more sustainable measures and practices for the environment and society in general [61]. Adoption and disclosures of more sustainability measures further improve their firm's financial performance. It shows that bank age does affect the link between sustainable business practices and a firm's financial performance; therefore, this study controlled it.

4.6.2. Debt Ratio/Risk Ratio

A higher debt ratio gives more freedom to the management of firms to access more capital and vice versa [62]. The managers with more capital can invest more finance in sustainable business practices, which will ultimately improve their firm's financial performance [4]. Hence in order to control the expected variation, this study uses risk ratio/debt ratio as a controlled variable.

4.6.3. Capital Ratio

The high capital ratio implies that the banks have sufficient internal funding available [63]. Banks with high funding can invest more in sustainable business practices, which will ultimately improve their firm's financial performance. As this ratio can affect the link between sustainable business practices and the firm's financial performance, this study has used the ratio as a controlled variable during statistical testing.

4.7. Regression Models

This study has a total of six regression models, three for each objective. The first objective deals with evaluating the impact of sustainable business practices (TotalSus) on a firm's financial performance measured from three different perspectives, i.e., Management (ROAA), Shareholders (ROAE), and the Market perspective (Tobin's Q). Similarly, the second of the study deals with evaluating the moderating role of managerial ownership proxied through Director's Ownership DO and the moderating role of Shariah governance proxied through Shariah Supervisory Board Size (SSBS) between sustainable business practices and the firm's financial performance subsequently. For details about the variable used in all regression models see Table 2 below.

Table 2. Variables operationalization summary.

Dimension	Variables	Symbol	Formula
Sustainability Practices (Independent)	1. General Standards Sustainability Disclosers 2. Economic sustainability 3. Environmental Sustainability 4. Social Sustainability	TotalSus Formative Variable	$\Sigma X/N$ $\frac{Number\ of\ discloused\ items\ per\ section}{Total\ number\ of\ items\ per\ section}$
Firm Performance (Dependent)	Management's Perspective	ROAA	$\frac{Net\ income\ before\ zakat\ and\ tax}{Average\ Assets}$
Firm Performance (Dependent)	Shareholders' Perspective	ROAE	$\frac{Net\ income\ before\ zakat\ and\ tax}{Average\ Book\ value\ of\ equities}$
Firm Performance (Dependent)	Market's Perspective	Tobin's Q	$\frac{Market\ Value\ of\ Equity}{Total\ Assets}$
Managerial Ownership (Moderating)	Director's Ownership	DO	$\frac{Number\ of\ Shares\ held\ by\ Directors}{Total\ \text{Ordinary}\ Shares}$
Shariah Governance Moderating)	Shariah Supervisory Board Size	SSBS	Log of the total Number of Shariah scholars on board
Age (Controlled)	Bank Age	BankAge	Log of Bank Age
Risk (Controlled)	Debt Ratio	DR	$\frac{Long\ term\ debt}{Total\ Assets}$
Capital Adequacy(Controlled)	Capital Ratio	CR	$\frac{Total\ Equities}{Average\ Total\ Assets}$

4.7.1. Regression Models for the Moderating Role of Managerial Ownership

$$\textbf{ROAA} = \alpha + \beta_1 \text{TotalSus}_{it+} \beta_2 \text{DO} + \beta_3 \text{TotalSus} * \text{DO}_{it} + \beta_4 \text{BankAg}_{it} + \beta_5 \text{RiskRatio} + \beta_6 \text{CapitalRatio}_{it} + \varepsilon \quad (6)$$

$$\textbf{ROAE} = \alpha + \beta_1 \text{TotalSus}_{it+} \beta_2 \text{DO} + \beta_3 \text{TotalSus} * \text{DO}_{it} + \beta_4 \text{BankAg}_{it} + \beta_5 \text{RiskRatio} + \beta_6 \text{CapitalRatio}_{it} + \varepsilon \quad (7)$$

$$\textbf{Tobin's Q} = \alpha + \beta_1 \text{TotalSus}_{it+} \beta_2 \text{DO} + \beta_3 \text{TotalSus} * \text{DO}_{it} + \beta_4 \text{BankAg}_{it} + \beta_5 \text{RiskRatio} + \beta_6 \text{CapitalRatio}_{it} + \varepsilon \quad (8)$$

4.7.2. Regression Models for the Moderating Role of Shariah Governance

$$\textbf{ROAA} = \alpha + \beta_1 \text{TotalSus}_{it} + \beta_2 \text{SSBS}_{it} + \beta_3 \text{TotalSus} * \text{SSBS}_{it} + \beta_4 \text{BankAge}_{it} + \beta_5 \text{RiskRatio}_{it} + \beta_6 \text{CapitalRatio}_{it} + \varepsilon \quad (9)$$

$$\textbf{ROAE} = \alpha + \beta_1 \text{TotalSus}_{it} + \beta_2 \text{SSBS}_{it} + \beta_3 \text{TotalSus} * \text{SSBS}_{it} + \beta_4 \text{BankAge}_{it} + \beta_5 \text{RiskRatio}_{it} + \beta_6 \text{CapitalRatio}_{it} + \varepsilon \quad (10)$$

$$\textbf{Tobin's Q} = \alpha + \beta_1 \text{TotalSus}_{it} + \beta_2 \text{SSBS}_{it} + \beta_3 \text{TotalSus} * \text{SSBS}_{it} + \beta_4 \text{BankAge}_{it} + \beta_5 \text{RiskRatio}_{it} + \beta_6 \text{CapitalRatio}_{it} + \varepsilon \quad (11)$$

5. Results and Discussions

Table 3 shows descriptive statistics of the Islamic banking industry in Malaysia. The mean value of the dependent variables ROAE is 7.344, which is very efficient. It implies that on average the return of an Islamic bank's equity share is very high in Malaysia. The negative values show that the return on equity of a few Islamic banks is inefficient and hence deliver a negative return on equity. The mean values of the other dependent variables of Tobin's Q and ROAA are near to 1. For ROAA it implies that the management is efficiently utilizing the Islamic bank's assets and, as a result delivering an efficient return. For Tobin's Q ratio, the mean value of 0.94—which is near to 1—implies that the market is

fairly rating the Islamic banking assets. On the independent variables, the mean values of the above table show that when converted to percentage the Islamic banks have recorded the lowest disclosures of 30% on social sustainability (21.793/72 × 100). The total possible score for the social sustainability dimension was 72, i.e., 36 items and a maximum score of 2 for an individual item (refer to Table A1). Similarly, considering the mean values and the total possible scores for each dimension, the Islamic banks recorded 32% disclosures and environment sustainability, 58% on economic, 68% on general standards disclosures, and 39% on the total sustainability disclosers. The 39% overall disclosures may be considered to be very low.

Table 3. Descriptive statistics.

Variables	N	Min	Max	Mean	Std. Dev.
Dependent Variables					
• Return on Average Equity ROAE	160	−23.03	69.27	7.344	10.90
• Tobin's Q	160	0.079	1.084	0.940	0.143
• Return on Average Assets ROAA	160	−3.056	9.291	0.995	1.458
Independent Variables					
• General Standard Sustainability Disclosures	160	0	14	9.556	2.990
• Economic Sustainability	160	0	17	11.68	3.559
• Environmental Sustainability	160	0	23	7.687	5.853
• Social Sustainability	160	0	58	21.793	14.45
• Total Sustainability	160	8	110	50.725	23.39
Moderating Variables					
• Managerial Ownership (MO)	160	0.000	1.000	0.7812	0.41
• Shariah Supervisory Board Size (SSB)	160	2.000	9.000	4.7000	1.368
Controlled Variables					
• Risk Ratio	160	0.310	1.11	0.907	0.076
• Capital Ratio	160	0.02	1.33	0.105	0.127
• BankAge	160	1.00	34.0	9.125	6.912

The descriptive statistics on moderating variables shows that the means value of SSB is 4.700, while its minimum and maximum values are recorded as 2 and 9, respectively. The authors of [11], by conducting a study on 86 Islamic banks from 25 countries, found the average of SSB at 4.17. Nor and Hashim [64], found the average of SSB with the value of 4.1, while [24] also found the average of SSB with the value of 4.16. These SSB averages are almost the same as of this study, i.e., 4.70. Moreover, the authors of [11] found the impact of an average of 4.70 SSB to be positive on the financial performance of the Islamic banks for the post-crisis period. Hence, we can conclude that the average SSB of this study, which is 4.700, is a perfect average. Furthermore, in line with the past literature, this average may also positively affect the financial performance of Islamic banks in Malaysia as well. The mean value of the director's ownership is recorded at 0.7812, while its minimum and maximum values were recorded at 0 and 1, respectively. The convergence of interest hypothesis suggests that higher managerial ownership helps in achieving higher firm value. Past studies from Malaysia also show that managerial ownership increases financial performance [44]. Against that background, the average mean value of 0.7812 looks satisfactory. Holistically, the higher mean value implies that it may positively affect the financial performance of the Islamic banks in Malaysia. On the controlled variables, the mean values of the variable bank age and risk ratios are found to be satisfactory. This implies that the expected variation during the statistical testing process will be efficiently controlled.

Moderating Role of Islamic Corporate Governance on the Link between Sustainable Business Practices and Financial Performance

To examine the moderating role of Islamic corporate governance in the link between sustainable business practices and a firm's financial performance, this study used the GMM statistical model. Before applying GMM, this study carried out all the basic panel data tests. Starting with the panel unit root tests, this study applied [65–67] panel unit root tests. The results of those tests confirmed that the data taken for this study is stationary. After the panel unit root test, this study applied the basic diagnostic tests on the panel data. For the purpose, this study conducted heteroscedasticity serial correlation and omitted variables diagnostic tests. Results of the Breusch–Pagan test [68] for heteroscedasticity, and the Wooldridge test [69] for serial correlation in panel data confirmed that the panel data used in this study has the problem of heteroscedasticity and serial correlation.

Additionally, the omitted variables test (Ramsey RESET test) [70], confirmed the problem of endogeneity in the data. To further confirm that the variable of sustainability was endogenous, this study carried out the orthogonality condition text in STATA. The results of the test confirmed that the variable of sustainability was endogenous, and it should account for endogeneity. This study, by dealing with the problem of endogeneity, set an instrumental viable. Consistent with the past study of Reference [20], a dummy code of (1) was given to those banks which had their total sustainability scores above the then median of the sample, while a dummy code of (0) was given to those banks which had their total sustainability scores below the then sustainability median of the sample. To test whether the set instrument was efficient or not, this study ran the first-stage regression summary statistics for instrumental variable through STATA, and the results confirmed the instrument used in this study was strong. After dealing with the problem of endogeneity to further fix the problem of heteroscedasticity and serial correlation pursuant to past studies [71], this study used a cluster robust GMM model. The results of the GMM results are shown in Tables 4 and 5.

Table 4. The link between sustainable business practices on firm's financial performance, with the moderating role of managerial ownership.

Variables	**Management Performance (Model I) ROAA: (R2 = 0.42)**			**Shareholders' Performance (Model II) ROAE: (R2 = 0.42)**			**Market Performance (Model III) Tobin's Q: (R2 = 0.38)**		
Particulars	**Coef.**	**z**	**P > z**	**Coef.**	**z**	**P > z**	**Coef.**	**z**	**P > z**
Total Sustainability (TS)	0.660	4.36	**0.000** ***	4.562	2.14	**0.032** **	2.623	1.09	0.277
Managerial Ownership (MO)	0.408	2.43	**0.015** ***	3.658	2.27	**0.023** **	−13.25	−3.53	**0.000** ***
TS * DO (Moderation)	0.595	3.69	**0.000** ***	4.808	2.24	**0.025** **	3.033	1.99	**0.046** **
Bank Age	0.0302	2.97	0.003	0.242	1.63	0.102	0.5321	1.81	0.070
Risk Ratio	0.227	2.11	0.035	1.55	1.15	0.249	−1.820	−0.93	0.351
Capital Ratio	−0.018	−0.23	0.815	−0.45	−0.64	0.525	−10.81	−3.59	0.000
_cons	0.613	4.58	0.000	4.293	2.10	0.035	87.898	25.68	0.000

Note: *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 5. Impact of sustainable business practices on firm's financial performance, with the moderating role of Shariah governance.

Variables	Management Performance (Model IV) ROAA: (R2 = 0.35)			Shareholders' Performance (Model V) ROAE: (R2 = 0.35)			Market Performance (Model VI) Tobin's Q: (R2 = 0.19)		
R Particulars	**Coef.**	**z**	**P > z**	**Coef.**	**z**	**P > z**	**Coef.**	**z**	**P > z**
Total Sustainability	0.547	3.94	**0.000** ***	3.707	3.26	**0.001** ***	0.0578	0.29	0.770
Shariah Governance	−0.087	−0.99	0.320	−0.0633	−0.97	0.334	−0.922	−0.53	0.593
TS * SSBS (Moderation)	0.139	3.03	**0.002** ***	0.950	2.65	**0.008** ***	3.830	2.81	**0.005** ***
Bank Age	0.036	2.58	0.010	0.029	2.84	0.005	0.02697	1.66	0.097
Risk Ratio	0.359	2.83	0.005	2.612	2.37	0.018	−2.380	−1.32	0.187
Capital Ratio	0.053	0.67	0.505	−0.00	−0.00	0.997	−5.919	−2.41	0.016
-cons	0.627	3.56	0.000	4.4154	3.25	0.001	90.53	36.26	0.000

Note: *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 4 shows that the link between sustainable business practices and financial performance indicating management performance in Model I, and the shareholders' performance in Model II is significant. Hence, the hypotheses $H1_A$ and $H1_B$ are accepted. These results are consistent with [5], and the stakeholders' theory, which assumes a positive association between sustainable business practices and the firm's financial performance. While, the link between sustainable business practices and financial performance indicating the market performance in Model III is insignificant; therefore, the hypothesis $H1_C$ is not supported. These results are in contrast with [72]. In general, the results from the above three models imply that the management and shareholders are convinced of the fact that all the sustainable business practices initiatives started by the Islamic banks will add a financial return to their portfolios. On the other hand, the market is hesitant for their bank's spending on sustainability initiatives, and hence the subjected link was found insignificant. To further investigate this issue, this study proposed the moderating role of managerial ownership (see Section 3.3). Interestingly, under the moderating role of managerial ownership, the market behavior towards sustainable business practices and financial performance became positive. The authors of [73] argued that, during the process of moderation, the independent variable (X) and the moderating variables (M) might be significant individually. Nevertheless, it is not directly relevant to testing the moderating hypothesis. For the moderation process to be accepted, the interaction of independent and moderating variables (XM) should be significant. In line with this, the p-value of the interacting variable (TS * DO) in Table 4 is significant at 1% in Model I, 5% in Model II and at 1% in Model III. It approves the moderation process for all three models and implies that the moderating variable of managerial ownership positively moderates the relationship between sustainable business practices and the firm's financial performance. It shows that a unit increase in the interacting variable will enhance the firm's financial performance by 0.595 units from a management perspective, by 4.808 units from the shareholder's perspective and by 3.033 units from the market perspective. This means that the moderation of managerial ownership will improve firm's financial performance proxied through shareholders, management and the market perspective as well. These results approve the hypotheses $H2_A$, $H2_B$, and $H2_C$. The firm's financial performance indicating the market perspective was insignificant without moderation (see Model III). However, the link became significant with the moderating role of managerial ownership, implying that the high managerial ownership is giving confidence to market stakeholders. Because it is based on the principle of management entrenchment, the market players are convinced of the fact the management will not pursue those policies which can depreciate their own financial returns and vice versa. Therefore, the role of high managerial ownership may ensure the latest sustainable business

practices in the business policies of the Islamic banks which will eventually ensure a higher financial return to its various stakeholders. The results of this study are consistent with the convergence of interest hypothesis and [74].

Table 5 shows that the link between sustainable business practices and financial performance, indicating management performance (Model IV), and the shareholders' performance (Model V) is significant. Hence, hypotheses $H1_A$ and $H1_B$ are accepted. These results are consistent with [5], and the stakeholders' theory, which assumes a positive association between sustainable business practices and the firm's financial performance, while the link between sustainable business practices and financial performance indicating the market performance in Model VI is insignificant. Therefore, hypothesis $H1_C$ is not supported. These results are in contrast with [72]. In general, the results from the above Table 5 imply that the management and shareholders are convinced of the fact that all the sustainable business practices initiatives made by the Islamic banks will add a financial return to their business portfolios and vice versa.

On the other hand, the market is hesitant for their bank's spending on sustainability initiatives, and hence the subjected link is insignificant. To further investigate this issue, this study proposed the second moderating variable of Shariah governance (see Section 3.4). Interestingly, under the moderating role of Shariah governance, the market behavior towards sustainable business practices and financial performance became positive. The p-value of the interacting variable (TS * DO) in Table 5 is significant at 1% in Model IV, 5% in Model V, and 1% in Model VI, respectively. It approves the moderation process for all three models and implies that the moderating variable of Shariah governance positively moderates the relationship between sustainable business practices and a firm's financial performance. It shows that a unit increase in the interacting variable will enhance the firm's financial performance by 0.139 units from a management perspective, by 0.950 units from the shareholder's perspective, and by 3.830 units from the market perspective. It means that the moderation of Shariah governance will improve firm's financial performance proxied through shareholders, management and the market perspective as well. Hence, the following hypotheses $H3_A$, $H3_B$, and $H3_C$ are supported. The firm's financial performance indicating the market perspective was insignificant without moderation (see Model VI). However, the link became significant with the moderating role of Shariah governance. It implies that Shariah governance is giving confidence to the market stakeholders along with the other stakeholders (management and shareholders) for obtaining a higher financial return through strong Shariah governance. This is because the strong Shariah governance (Shariah Supervisory Board (SSB) size in this case) facilitates professionals like bankers and economists—even with little religious knowledge—to sit on the board and provide expert opinions on technical matters like sustainability. The Shariah Supervisory Board issues its Shariah committee reports in the annual reports of the banks, which provides Shariah rulings on the conduct of business. This diversity may enrich the level of understanding of the Shariah supervisory committee about sustainable business practices from an Islamic perspective and its subsequent rulings and reporting. This process will give confidence to the various stakeholders that SSB will ensure and enacts sustainability practices, which may eventually increase their financial performance. The results of this study are providing policy insights to the practitioners and policymakers of the Islamic banks for achieving better financial performance for firms through efficient sustainable business practices and reporting. It is also guiding them for the balanced role of Islamic corporate governance practices in the link between sustainable business practices and firm's financial performance.

Table 6 shows the trend in the R-squared during the process of investigation. First, it shows the R-squared results without moderation, followed by the moderation of managerial ownership and the Shariah governance moderation. The trend shows that the value of R-squared has increased during the moderation process. It confirms the accuracy of the moderating variables used in this study.

Table 6. R-Squared trend during the process of investigation.

R-Squared Trend	Without Moderation	With Managerial Ownership Moderation	With Shariah Governance Moderation
Management Performance	0.34	0.35	0.42
Shareholders' Performance	0.31	0.35	0.42
Market Performance	0.17	0.19	0.38

6. Conclusions

This paper examined the moderating role of Islamic corporate governance on the link between sustainable business practices and the firm's financial performance. The results of the study show that the link between sustainable business practices and a firm's financial performance indicating management performance and the shareholders' performance is significant. These results are in line with [5]. This suggests that the management and shareholders are convinced of the fact that the initiation of sustainable business practices by their banks will add financial returns to their business portfolios. On the other hand, the link between sustainable business practices and the firm's financial performance indicating the market performance was found to be insignificant. These results are in contrast with [72], and imply that the market stakeholders of the Islamic banks are hesitant toward their bank's spending on sustainable business practices, i.e., economic, social, and environmental business sustainability practices. To further investigate this issue and to understand why the market is reluctant for their bank's spending on sustainable business practices, this study conducted further analysis by proposing a moderating role of managerial ownership and Shariah governance. Interestingly, the proceeding analysis found an insignificant link between sustainable business practices and firm's financial performance measured from the market perspective became significant during the moderation process. Therefore, management entrenchment and Shariah governance supervision is positively influencing the market stakeholders of the Islamic banks for their intuition about sustainable business practices and the financial performance of firms. This is because the high management entrenchment ensures the inclusion of those sustainability initiatives, which may positively impact the financial performance of the firm and vice versa. Otherwise, the management itself will suffer a huge loss due to their higher stakes in the business. This factor motivates the market stakeholders to change their intuition positively in favor of sustainable business practices initiatives made by their Islamic banks. Secondly, Shariah governance is also giving confidence to the market stakeholders for obtaining a higher financial return through strong Shariah governance. This is because the strong Shariah governance (Shariah Supervisory Board (SSB) size in this case) facilitates professionals like bankers and economists—even with little religious knowledge—to sit on the board and provide expert opinions on technical matters like sustainability. This diversity may enrich the understanding level of the Shariah supervisory committee about sustainable business practices from an Islamic perspective and its subsequent rulings and reporting. This process is giving confidence to the various market stakeholders that SSB will ensure and enacts sustainability practices, which may eventually increase their financial performance. These results may provide insight to several policymakers of the Islamic banking industry about integrating vital sustainability practices in their business models and about the balanced moderating role of Islamic corporate governance in the link between sustainable business practice and a firm's financial performance. This research is providing a roadmap to the Islamic banking industry for efficient management of sustainability practices from an Islamic perspective and subsequently improving financial performance through it.

7. Future Work and Directions

The study selected only Malaysian Islamic banks for studying the link between sustainable business practices and the firm's financial performance from the Islamic perspective. Other countries can also be sampled to study the comparative behavior of the subjected link. Further Islamic items can also be added to the adopted sustainability measurement index of the author of Reference [4] to make it more reliable and compatible with the Islamic banking industry.

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Appendix A

Table A1. Index Used for Measuring Sustainability Practices in The Islamic Banks.

Aspect	Parameters for Measurement of an Individual Items Fully Reported = (02), Partially Reported = (01), No Reporting = (0)
(A). General Standards Disclosures (Integrated Sustainability Strategies)	
1. Strategy and analysis	CEO/ Chairman's statement with its relevance to sustainability, key events, and achievements regarding sustainability during the reporting period
2. Organization profile	An organizational chart including name, location, and countries of operations
3. Identified material aspect and boundaries	Joint ventures, subsidiaries, Consolidated statements, data measurement techniques, significant changes from the previous reporting period
4. Stakeholder engagement	List of stakeholders group engaged by the organization
5. Report profile	Reporting period (fiscal or calendar) reporting cycle (annual or biannual)
6. Governance	The governance structure of the organization
7. Ethics and Integrity	Codes of conduct and codes of ethics for the organization
(B). Economic Sustainability Indicators	
8. Shariah screening during the investment	Reporting about Shariah screening process for investment in the Shariah Committee's report
9. Allocation of profit based on Shariah principles	Certification of distribution of profit/loss complying with Shariah in the Shariah Committee's report
10. Economic performance	Direct economic value generated and distributed: Community investment
11. Market presence	Reporting about minimum wages paid
12. Indirect economic impact	Reporting about the investment made in infrastructural development and services supported/ commercial investment
13. Procurement practices	Percentage of product and services purchased from local suppliers
14. Zakat payment	Procedure and disclosure about the total amount of zakat paid
15. Qardh-e-Hassan	Amount of Qardh-e-Hassan/ Benevolent fund paid
16. Charity - Sadaqah - Waqaf	Reporting about total Charity - Sadaqah – Waqaf paid by the banks
17. Disclosure of earnings prohibited by Shariah	Disclosure of earning prohibited by Shariah in the Shariah committee's report

Table A1. *Cont.*

Aspect	Parameters for Measurement of an Individual Items Fully Reported = (02), Partially Reported = (01), No Reporting = (0)
(C). Environmental Sustainability Indicators	
18. The material used and recycled by the Islamic banks	Reporting about the total weight and volume of the material used, and the percentage of material recycled
19. Energy reduction and preservation initiatives made by Islamic banks	Reporting about methodologies used for the reduction of energy consumption required for heating, cooling and steaming purposes of the banks
20. Water recycling initiates made by the Islamic banks	The total volume of water recycled and reused by the Islamic banks
21. Biodiversity	Reporting about habitat protected or restored due to green investment
22. Emission (reducing greenhouse gas /carbon emission)	Accounting for the greenhouse gas emission resulting from the business travel and the courier services of banks
23. Effluents and Waste cleaning	Reporting about waste management techniques applied to the papers and IT products used by the banks
24. Product and services impact on the environment	The extent of impact mitigation of environmental impacts of banks products and services
25. Compliance with Islamic laws for the environment	Reporting on compliance with Islamic laws for the environment in the annual report of the bank
26. Transport (mitigation impact, responsible automation)	Reporting about how the environmental impacts of transporting the bank's members/workforce, and other goods and services are mitigated
27. Overall environmental expenditure	Total environmental expenditure by type
28. Supplier environmental assessment	Reporting about new suppliers that were screened using environmental criteria
29. Environment grievance mechanisms	Reporting about the total number of grievances about environmental impacts filed, addressed and resolved through a formal grievance mechanism
(D). Social Sustainability Indicators	
D1: Labor Practices and Decent Work	
30. Employment	Reporting about the total number and rate of new employee hires during the reporting period, by age group, gender, and region
31. Labor management Relation	Reporting about minimum time period required for notice prior to the implementation of operational change
32. Occupational health and safety	Reporting about policies designed for reducing bank robberies and money laundering used for terrorism
33. Islamic training and education to staff	Reporting about Islamic training and education provided to the staff in the annual report of the banks
34. Diversity and equal opportunity	Reporting about the diversity and equal opportunity provided for the bank's staff
35. Equal remuneration for women and men	Reporting about the ratio of the basic salary and remuneration of women to men for each employee category, by significant locations of operation
36. Supplier assessment for labor practices	Reporting about the percentage of new suppliers that were screened using labor practices criteria
37. Labor practices grievance	Number of grievances about labor practices filed, addressed and resolved through formal grievance mechanisms

Table A1. *Cont.*

Aspect	Parameters for Measurement of an Individual Items Fully Reported = (02), Partially Reported = (01), No Reporting = (0)
D2: Human Rights	
38. Investment	The total investment made by the banks to train its employees in human rights policies and procedures
39. Non- discrimination	Reporting about the total number of incidents of discrimination and corrective actions taken by the bank
40. Freedom of association and collective bargaining	Reporting about the measures taken by the banks to support the right to exercise, freedom of association and collective bargaining
41. Child labor	Reporting about the identification of child labor in the banking operations and supplier activities and effective measures are taken
42. Forced or compulsory labor	Reporting about the identification of forced and compulsory labor in the banking operations and supplier activities and effective measures are taken
43. Security Practices	Percentage of security personnel trained in the organization's human rights policies or procedures that are relevant to operations
44. Indigenous rights	Total number of incidents of violations involving rights of indigenous peoples and actions taken
45. Assessment	Report the total number and percentage of operations that have been subject to human rights reviews or human rights impact assessments, by country
46. Supplier human rights assessment	Report the percentage of new suppliers that were screened using the human rights criteria
47. Human rights grievance mechanism	Number of grievances about human rights impacts filed, addressed and resolved through formal grievance mechanisms
D3: Society	
48. Local communities	Initiatives to improve access to financial services for disadvantaged people
49. Anti-corruption	Percentage of operations assessed for risks related to anti-corruption and action taken. Training provided on anti-corruption policies and procedures
50. Pilgrimage	Reporting about the total number of subjects sent for pilgrimage
51. Scholarships	Reporting about the total sum of money spent on offering scholarships
52. Public policy	Report the total monetary value of financial and in-kind political contributions made directly and indirectly by the banks by country and recipient/beneficiary
53. Anti-competitive behavior	Total number of legal actions for anti-competitive behavior, anti-trust, and monopoly practices and their outcomes
54. Compliance	The monetary value of significant fines and the total number of non-monetary sanctions for non-compliance with laws and regulations
55. Supplier assessment for impact on society	Percentage of new suppliers that were screened using criteria for impacts on society
56. Grievance mechanism for impact on society	Number of grievances about impacts on society filed, addressed, and resolved through formal grievance mechanisms
D4. Product Responsibility	
57. Consumer health and safety	Reporting about the percentage of significant product and service categories for which health and safety impacts are assessed for improvement
58. Product and service labeling	Policies for the fair design and sale of financial products and services
59. Products and services labeling (approved by the Shariah Committee	Reporting about the approval about product and service labeling in the Shariah committee's report
60. Marketing communications	Total number of incidents of non-compliance with regulations and voluntary codes concerning marketing communications, including advertising, promotion, and sponsorship, by type of outcomes

Table A1. *Cont.*

Aspect	Parameters for Measurement of an Individual Items Fully Reported = (02), Partially Reported = (01), No Reporting = (0)
61. Customer privacy	Reporting about the total number of substantiated complaints received concerning breaches of customer privacy
62. Compliance	The monetary value of significant fines for non-compliance with laws and regulations concerning the provision and use of product and services
63. Product Portfolio	Policies with specific social components applied to business lines
64. Audit	Coverage and frequency of audits to assess implementation of social policies and risk assessment procedures
65. Active Ownership	Percentage and number of companies held in the bank's portfolio with which the bank has interacted on social issues

Source: [4]

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Perception and Drivers of Financial Constraints for the Sustainable Development

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Abstract: Financial market imperfections constrain firms' ability to obtain funds. This is especially true for the former communist bloc countries. However, the restrictions on access to financing and the attitudes of management in these geographies remain overlooked by academic research and represent an important obstacle on the roadmap to sustainable development. The objective of this paper is to fill this gap by analyzing the impact of ownership structure, institutional environment development, and debt market profile on the perception of financial constraints by the representatives of corporate top management from 28 countries of the former communist bloc. Our analysis spans over the period 2002–2013. We apply the probit and Heckman models to investigate nonlinear and multicast effects of the considered factors. We evidence that during the crisis and post-crisis periods, foreign ownership alleviates the restrictions on access to financial resources. We also discuss the role of state ownership. We find that the volume of local currency bond market has a nonlinear U-shape relationship. Our results are useful for policy makers focused on sustainable development of the former communist economies by means of improving access of businesses to financing.

Keywords: financial constraints; sustainable development; ownership structure; state subsidies; former communist bloc; institutional environment; financial system

1. Introduction

A policy of transition to market economy and to sustainable development was conducted within the former communist bloc. Many countries of Eastern and Southern Europe chose the way of consequent accession to the EU, as well as international capital flow liberalization and dynamic privatization of national property. Russia, Belarus, and a range of Asian countries carried out a restrictive policy of foreign capital cash flow in order to maintain the government control over the largest enterprises. The key feature of the countries in the sample under our consideration is the incompleteness of the transit process from a centrally planned to market economy. Due to the lack of independence of many companies, especially large ones, when many decisions are based on directives (government recommendations) and viability is ensured by subsidies and various forms of state support, there is a high risk of political and economic crises (example of 2020—Belarus). Sovereign democracy is a very fragile structure that can turn into a collapse for many companies when a totalitarian leader changes. Such highly probable events can further increase barriers to financial

resources, both at the state level (sanctions) and at the firm level. The move towards sustainable development could be set back many years.

The financial markets of the former communist bloc have poor financial depth, a hypertrophied or small national banking sector, a gap in regulating measures, and weak protection of investors' rights. Diverse imperfections of financial markets constrain firms' ability to obtain funds. The imperfections lead to high transaction costs and high cost of capital. Empirical research on firm financial reporting data supports this underlying theory. The issues of perception of factors that are barriers to sustainable development are less studied. This perception is determined not only by the characteristics of firms (size, government support, company's age, etc.), but also by the institutional environment and the degree of development of the country's financial system as a whole.

Nevertheless, different countries of the former communist bloc are characterized by different share of state participation in the economy as well as different extent of foreign participation (Figures A1–A3, Appendix A), government support, business experience, and the degree of institutional development.

To what quality of the institutional environment (laws and law enforcement, combating corruption) is absolutely important to smooth out financial tensions and sustainable growth and development is an open question [1]. Research on emerging markets shows that the recognition of the importance of institutions grows as an economy grows [2]. We are contributing to the study of this issue through the prism of perception (awareness) of this value in the eyes of top management along the transition period from the communist ideology and planned economy to the sustainable market-driven development of the firms.

Our research is motivated by the search for the answers to the following questions. (i) What is the role of the state and foreign investors in overcoming financial constraints? (ii) How does ownership structure and business experience of the firm help to overcome restrictions to access financing? (iii) What is the perception of financial barriers by top managers, who are often the owners and/or founders of businesses, especially in the Soviet bloc countries? (iv) Is the role of the institutional environment important in smoothing out the problems of access to financial resources? (v) What factors should be considered by investors and other market participants in order to understand the possible roadmap towards sustainable economic development?

Our study on the perception of financial constraints using the sample of Soviet bloc countries sheds light on the processes taking place in transit economies and gives tips to regulators and policy makers since it compares the influence of diverse factors, such as ownership structure, institutional environment, and debt market profile, during the three following time intervals: period of growth (2002–2007), crisis (2008–2009), and the post-crisis period of tightening banking regulation and easing monetary policy. We account for nonlinearity and multicativity.

We contribute to the empirical literature in several ways. First, we consider a sample of 28 post-communist countries (Figures A1–A3, Appendix A). In these geographies, an easy access to financing is a necessary condition for stable investment growth and economic development. We document that in the considered transition economies, the government still plays an important role (Figure A2). It influences strategic decisions and investment policies of large firms. Transition economies are characterized by relatively low quality of institutional environment and by relatively high levels of corruption. However, in most such economies, the share of foreign capital and multinational corporations gradually increases. Another problem is related to the underdeveloped stock and bond markets, resulting in difficulties for corporations to issue equity instruments and corporate bonds, and causing diverse economic agents to increase the volume of bank credits. Nonetheless, the investigation of financial constraints, ownership structure, and different financing sources in developing countries has received limited attention in the literature. This paper fills this gap. In particular, as far as we know, there are no papers that analyze the relationship between the development of the corporate bond market and the level of financial constraints. Hence, overcoming financial constraints is one of the key issues to enable progress along the path of sustainable economic growth in the long run.

Second, we directly measure financing constraints based on the Business Environment and Enterprise Performance Survey (BEEPS) survey dataset [3]. Majority of the previous papers uses the data of financial statements and identify the financial constraints indirectly [4–7]. Our study registers the perception of financial constraints by top managers. Our survey is based on straightforward questions regarding the existence of financial constraints (like [8,9]). In addition, we directly measure the existence of financial constraints. However, the collected answers certainly contain several elements of subjectivity and are influenced by the social and cultural diversity of the countries. The original methodology of our research on Heckman model (Heckprobit) allows us to identify the peculiarities of financial constraints perception in different countries, being applied to the abovementioned survey dataset.

Third, we use advanced econometric methods that take into account the specifics of the employed data. Unlike most previous studies, we consider nonlinear and multiplicative impacts of different factors on financial constraints. To test the hypotheses, we use both the simple probit model and the model with a system of equations where the possibility to face financial constraints is regulated by the availability of bank credits. Heckman's model is applied for specification of the system of equations.

Fourth, we compare two periods to analyze the financial constraints of firms: before the global financial crisis and after, following previous research (see, e.g., [3]), which documents that business cycles have an impact on firms funding. We demonstrate that economic growth, i.e., high GDP growth, is associated with less financial constraints and vice versa and focuses on changing the perception of financial difficulties after the crisis.

The rest of the paper is organized as follows. Section 2 presents the literature overview and develops a set of research hypotheses. Section 3 provides the model specification and describes the methodology to study the nonlinear and multiplicative effects of different factors on financial constraints. Section 4 surveys the stylized facts regarding the former communist bloc countries and presents the sample descriptive statistics. Section 5 provides our empirical results and discusses their implications. Section 6 concludes the paper.

2. Literature Overview and Hypotheses Development

The long list of literature shows that imperfections in financial markets create restrictions on access to financial resources and thus adversely affect enterprises and the economy as a whole. Among such shortcomings in financial markets could be distinguished the government interventions ([5,9–12]; and the references therein). The degree of hardship related to financing opportunities, in general, depends on a set of firm characteristics, such as size, age, credit rating, export orientation, concentration of ownership, and membership in industry associations, among others ([13–17]; and the references therein).

In general, the research on determinants of financial constraints could be systematized into the four following directions. The first is related to the studies of the role of public sector. For example, Ref. [8] investigated the influence of state ownership on firm's financial constraint and addressed the impact of country-level corruption on accessibility to corporate financing. Analyzing the cross-country sample, which consists of more than 8000 firms from 81 countries, the authors concluded that both state ownership and low corruption make financial constraints decrease. The most recent study [17] also evidences that the low level of corruption, developed legal system, and advanced property rights result in lowering of the level of financial constraints experienced by small- and medium-sized enterprises (SMEs) from 28 Eastern European and Central Asian countries.

Ref. [16] investigated the influence of internal cash flow, access to external finance, and government connections on the investment rate for the case of the Chinese manufacturing firms. They found that the sensitivity of the investment rate is an adequate indicator of financial constraints. The authors evidenced that the investment rate of state-owned firms is not sensitive to cash flows, i.e., such firms have minor obstacles to access financing if compared to foreign and non-state-owned domestic firms.

In their turn, Ref. [12] demonstrated that the influence of state ownership on firm's cost of debt and financial indicators is mixed. On one hand, the government can force state-owned firms to realize projects according to political goals, which may negatively influence their profitability and increase risk. On the other hand, the government provides guarantees in case of a potential default.

The second stream of the literature on financial constraints is related to the foreign ownership impact. For instance, Ref. [9] investigated how Foreign Direct Investments (FDI) influence financial constraints of Chinese firms. The results showed that domestic private firms, unlike state-owned ones, suffer from financial constraints. Investment decisions of private firms are affected by debt burden and cost of capital, while foreign investment reduces financial obstacles.

In this stream of literature, it is also worth mentioning the research by [5], who found a causal relationship between FDI and the decreasing sensitivity of the investment cash flow for the 3500 US manufacturing firms from 1988 to 2012. The multiplicative impact of cash flow and FDI presence on the investment rate is significantly negative.

Additionally, Ref. [6] studied the impact of foreign acquisitions and ownership on financial constraints of Chinese corporate entities. The authors concluded that foreign-owned firms face obstacles to obtain funding. It is explained by the fact that dominating state-owned banks make preferences to state-owned firms in credit allocation.

The third line of the studies on financial constraints is focused on the influence of debt choice. The main gap in this line of research is associated with the limited analyses of the role of corporate bond markets, while most of the literature is dedicated to the investigation of the bank and trade credits influence on financial constraints. For example, Ref. [7] analyzed the investment activities of Japanese firms with large publicly traded debt (corporate bonds) during the global financial crisis of 2008. It was found that firms with close bank-firm relationships are less financially constrained and have low borrowing costs.

Ref. [18] examined the interrelationship between bank lending constraints and alternative external finance: trade credit, informal lending, non-banking loans, market financing, and state grants, for a sample of SMEs from 11 European countries. The authors revealed that credit-rationed firms tend to use trade credit and, in a lesser degree, informal lending or loans from other companies. Self-rationing firms are more likely to use informal lending. There is no statistical evidence that bank-constrained SMEs apply for or use market finance (debt or equity).

The author of [19] investigated the influence of debt level and debt maturity on corporate investment for the Vietnamese listed firms from 2010 to 2016. The author showed that the debt level significantly reduces investment expenditures. State-owned and equitized firms have less financial constraints.

The fourth direction of research on financial constraints considers the impact of the quality of institutional environment and the level of development of national financial market ([8,20]).

To the best of our knowledge, there are no papers analyzing the influence of development of the bond market on financial constraints at the firm level. We fill this gap by tracking the depth of national debt market in corporate bonds segment while also simultaneously gauging the development of bank crediting to the private sector. We also address the technical challenge of how to measure them and present our solution.

Regarding this measurement issue, we recommend for advance reading an overview by [21] on the literature related to measuring financial constraints. One stream of literature uses the data of financial statements and identifies the financial constraints indirectly—by means of sensitivity of investment costs to diverse factors [4,5,7,11].

Alternative approach to assess financial constraints is based on the data survey, including straightforward questions of financial constraints existence ([8,9]). We follow this direct technique to determine the existence of financial constraints, enhancing it with the elements allowing to reduce subjectivity and account for possible exposure to social and cultural diversity of the countries.

We consider an original binary variable, which describes the obstacle to finance obtained from company surveys.

Previous studies prove that state participation in the capital of a company removes financial constraints because the government provides implicit guarantees and can bail out firms in case of a potential bankruptcy [8]. Ref. [16] arrived at a similar conclusion for the companies where the state is involved in CEO appointment. Ref. [4] showed that obtaining state subsidies enables to reduce barriers for financing. In case of possible default, the state may act as a guarantor of the funds.

However, Ref. [12] argued that the influence of state ownership on firm's cost of debt and financial indicators is mixed. On one hand, the government provides guarantees in case of a potential default. However, this can only affect strategically important companies. For small businesses, support may not be available. On the other hand, the government can force state-owned firms to realize projects according to political goals, which negatively influence their profitability and increase risk. Empirical research [12] has shown that state ownership, in general, increases the cost of debt, but during financial crisis it reduces the cost of debt. It could be assumed that with a change in the macroeconomic situation, the role of the state changes. In our study, we compare the influence of the state in the capital structure before and after the global financial crisis.

We empirically test three groups of hypotheses, which shed light on the factors that determine the perception of financial constraints. The first group of hypotheses concerns the structure of equity capital and the role of government support:

Hypothesis 1. *State ownership is negatively perceived by top management and does not ease financial constraints. Top management assumes the state as inefficient owner. In the presence of bank loans, the state acts as a guarantor for credit risk.*

Hypothesis 2. *The provision of state subsidies helps to overcome financial constraints. Subsidies improve the financial state of the company. It is fundamentally important during the period of crisis, and, in coordination with banks, allows for alleviating difficulties in attracting financing.*

The role of foreign ownership is not obvious. Ref. [5,6,9] for the US and Chinese markets found that it is easier for the companies with foreign capital in the ownership structure to obtain the access for financing. Foreign capital is able to provide global expansion with cheaper sources of financing. Ref. [6] concluded that after foreign acquisition, the financial constraints of target firms are reduced, and R&D expenditures and productivity of target firms increase after foreign acquisition. However, on the other hand, totalitarian states are bothered by the presence of foreign capital. In a number of countries, there are restrictions on the entry of foreign capital into a number of industries and strategically significant enterprises (Russia, Belarus). Ref. [22] analyzed firms' financing (formal and informal), but did not discover what determines the firm's access to financing when legal institutions are undeveloped. The impact of controlling owner on financing decisions remains underexplored.

Hypothesis 3. *Foreign ownership is important for removing financial constraints. The perception of the benefits of a foreign investor changes with the changing external environment after crisis. The presence of a foreign investor changes the perception of the state as an additional barrier in attracting financial resources. To remove financial constraints, the help of foreign capital is important precisely in the period of crisis. Foreign capital assumes control functions in the case of state participation in the ownership structure.*

The second group of hypotheses follows the direction of research on the influence of debt choice.

As previous studies have shown [23], the financial system (bank-based or bond-market-based) is critical to providing companies with financial resources. Most researchers investigate the influence of bank credits and trade credits, while the analysis of the role of corporate bond markets is very limited. Ref. [18] analyzed the interrelationship between bank lending constraints and alternative external finance: trade credit, informal lending, non-banking loans, market financing, and state grants,

for a sample of SMEs from 11 European countries. The 2008 financial crisis significantly changed the financial sector regulation policies. This affected the perception of financial constraints on access to financial resources. Ref. [24] showed that for the pre-crisis period, the higher competition among the banks and entrance of foreign-owned banks, the weaker financial constraints. Ref. [23] confirmed the hypothesis that the strengthening of the market power of banks in Europe after the crisis generated more financial constraints.

Hypothesis 4. *The role of the development of the banking system changes over time. The role of bank loans changed during the crisis. The volume of bank credit to the private sector has nonlinear effects on access to financial resources.*

Hypothesis 5. *The volume of local currency (LCY) corporate bond market has nonlinear effects on access to financial resources.*

We suggest that banking sector development tends to increase interbank competition, reduce the cost of debt, and improve service quality. As a result, the exposure of credits tends to grow. Bond market has a similar influence on reducing barriers for financing. The development of various segments of debt market can be quite advantageous due to the fact that in order to realize investment projects, the companies are able to substitute successfully one source of financing for another [7]. At the same time, a high level of debt burden at the firm level may increase the barriers for financing and facilitate the reduction of investments costs of the company [19]. Therefore, we can expect that the optimal level of development of debt sector reduces the barriers for financing for the national companies, which in turn contributes to the movement towards sustainable development.

As far as the authors know, nowadays there are no papers analyzing the influence of the development of the bond market on financial constraints at the firm level. We measure the financial depth of national debt market by the level of development of bank crediting to the private sector and corporate bonds segment. The impact of the quality of the institutional environment and the level of the development of the national financial market on financial constraints was considered by [8]. We expand this line of research by introducing control over the factors of financial market development.

The companies, which operate in the countries with low quality of institutional environment, face high agency costs and barriers for financing [2,25]. Index of Economic Freedom may have a nonlinear impact, because it is calculated based on a wide range of components, which influence differently on the barriers for financing (protection of investor rights, investment freedom, tax freedom, corruption freedom, etc.).

Research prior to the crisis has clearly highlighted the positive role of institutions [1,26]. However, the crisis has slightly changed the assessment, especially for major emerging markets, such as China (see [2]).

The third group of hypotheses assesses the role of the institutional environment:

Hypothesis 6. *Such factors as political stability, government effectiveness, the quality of regulation, the rule of law, and corruption control reduce constraints for financing.*

Hypothesis 7. *Index of Economic Freedom (IEF) Heritage Foundation has a nonlinear impact on the barriers for financing.*

3. Model Specification

Ref. [21] presented an overview on the literature related to measuring financial constraints. We consider an original binary variable, which describes the obstacle to finance obtained from company surveys. Unlike previous researches, the focus of our research is on post-communist countries.

An originality of our research is that we analyze nonlinear and multiplicative effects of different factors on financial constraints.

To test the abovementioned hypotheses, we apply random models: simple probit model and Heckman's model.

We test probit models expressed by Equations (1) and (2):

$$f(Z) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}Z^2} \tag{1}$$

$$Z = \beta_1 + \sum_i \beta_i \cdot X_i \tag{2}$$

where β_i are coefficients before explanatory variables, X_i are explanatory variables. Further details could be found in Appendix E.

The average marginal effects are calculated according to the formula:

$$\frac{\partial p}{\partial X} = \frac{\partial p}{\partial Z} \cdot \frac{\partial Z}{\partial X} = f(Z) \cdot \beta_i = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}Z^2} \cdot \beta_i \tag{3}$$

Considering the possible sample bias due to self-selection, we formulate different specifications of binary choice model of Heckman (heck-probit).

The Heckman model in general form is the following:

Outcome:

$$Obstacle = 1 \text{ if } y^* > 0; = 0 \text{ otherwise,} \tag{4}$$

$$y_i^*(outcome) = \beta X_i + u_{i1}, \text{ where } u_{i1} \sim N(0;1), \tag{5}$$

with the following selection condition:

Select:

$$Have\_credit = 1 \text{ if } y^* > 0; = 0 \text{ otherwise,} \tag{6}$$

$$y_i^*(select) = (\beta X_i + u_{i2} > 0), \tag{7}$$

$$u_{i2} \sim N(0; 1), corr(u_{i1}; u_{i2}) = \rho, \tag{8}$$

where β is the coefficient for the explanatory variable, X_i are independent variables, $I = 1, \ldots, N$ is the number of independent variables, u_{i1} and u_{i2} are random errors, $y_i^*(outcome)$ is the obstacle to access to finance, $y_i^*(select)$ is an attribute of a loan or a credit line in the last year.

Descriptions of the dependent and explanatory variables are given in Appendix E.

4. Stylized Facts and Sample Descriptive Statistics

The former communist bloc is essentially different regarding the policy of transition to market economy. In Appendix A, the figures show significant progress since the 1990s. Figure A1 demonstrates the dynamics of the accumulated amount of foreign direct investment (% GDP) from 1995 to 2015 and presents the list of countries in our sample. In 1995, in the large majority of the considered countries, excluding Hungary and Estonia, the FDI stock did not exceed 15% of GDP. In subsequent years, a number of small countries proactively followed the policy of liberalization of foreign participation in economy and as a result, the FDI stock moved beyond 40% of GDP in 2015 for the half of the considered countries, and in some countries (Bulgaria, Estonia, Georgia, Mongolia), 80% of GDP (Figure A1). On the contrary, in countries such as Russia, Tadzhikistan, and Uzbekistan, foreign investments were strictly regulated and limited, and as a result, the FDI stock in these countries did not reach 30% of GDP (Figure A1 and Appendix A for the sampling period of the survey).

In general, in accordance with the sample of the considered countries, the most significant reducing of the share of the public sector took place between 1995 and 2005: the median share of the employed

in the public sector was 41.2% in 1995, in 2005—25.1%, in 2015—26%, practically corresponding to the level of 2005 (Appendix A). Nevertheless, the share of employed in the public sector is essentially different over the countries. Thus, in 2005 in Belarus the share of employed in the public sector was 66.5%; in Russia, Lithuania, and Latvia was 30–32%; in Estonia, Slovenia, Poland, and Moldova was 25–26%; and in Albania, Kirghizia, and Armenia only 16–18% (Figure A2).

There are significant cross-border differences in indicators of debt market growth (bank-based or bond (market)-based) (Figure A3). Thus, in 2012, the amount of bank credits provided to the private sector in Bulgaria, Croatia, Estonia, Slovenia, and Ukraine exceeded 60% of GDP, and in Azerbaijan, Kirghizia, Tadzhikistan it did not reach even 20% of GDP (Figure A3). For all former communist bloc the amount of bank crediting is prevalent in comparison with the amount of local currency corporate bonds outstanding (Figure A3). The opening of the stock market took place between 1989 and 1995 (Appendix B, Table A1) in the vast majority of the former communist bloc. As for Armenia, Azerbaijan, Bosnia and Herzegowina, Kirghizia, Serbia, and Tadzhikistan, the stock market did not appear until 2000. The starting date of issuance of corporate bonds is different as well (Appendix B).

There are significant cross-border differences in the quality of institutional environment (Appendix B), caused by distinct state policy in the framework of granting political and economic freedom.

In previous studies, there is no consensus about the best measure of financial constraints [27,28]. A popular approach [4,5,16] is the indirect measurement based on the analysis of the sensitivity of investment expenditures to cash flow. Such indirect methods are not without disadvantages, and over the last years there were critical papers showing the deficiency of popular metrics of financial constraints through investment activities. For example, [29] found that for US firms the sensitivity 'investment-cash flow' is not a reliable indicator. We introduce a binary dummy reflecting the level of financial constraints. We form a representative sample (more than 32,000 observations) from different sources ([3,30,31]), including firm-level and county-level data.

We study 28 countries that were formerly part of the USSR and the Council for Mutual Economic Assistance (CMEA), which operated before 1991. Our research is based on the survey data of the private sector "EBRD-World Bank Business Environment and Enterprise Performance Survey (BEEPS)" (see [32]). The CMEA was an intergovernmental economic organization that advocated non-market economic relations. After the collapse of the CMEA and the USSR, the breakaway countries began to implement market reforms with varying degrees of intensity. The reforms affected both the state presence in the economy, state support, and access to the foreign capital markets. In different countries, the financial sector was formed according to different strategies. We supplemented the sample with indicators of the development of financial markets and institutional environment.

This sample may be useful as for the companies—better understanding of the business environment and for the regulatory authority—to implement reforms in order to facilitate the effectiveness of private business operations. The data is represented as a spatial sampling at a representative level. The sample includes 28 countries of the former communist bloc (Southern and Eastern Europe, Asia) (Appendix D).

The initial number of observations is 32,236, of which 9948 are observations conducted between 2002 and 2007, 9504during the crisis period (2008–2009), and 12,784during the post-crisis period (from 2011 to 2013).

In respect to the number of employees, the companies with a number of employees varying between 5 and 19 persons are placed in the category of small enterprises, from 20 to 99 to medium, and more than 100to a large one. The small and medium enterprises represent, respectively, 47.4% and 35.7% of the sample. The large corporations represent 16.9%.

One of the multiple focuses of our study is centered at the ownership structure (state and foreign) and the governmental support.

In Table 1, the presence or absence of foreign owners is compared with the estimation of obstacles to access to finance made by the executives of the considered companies. From Table 1, without taking into account the influence of other factors, it follows that companies with foreign capital benefit from

the absence of barriers to financial resources. Our further econometric calculations should confirm this conclusion, taking into account a number of other factors and with the multiplicative influence of state property.

Table 1. Foreign shareholders and access to financing.

Restrictions on Access to Financing	Foreign Shareholders								
	2002–2007			2008–2009			2011–2013		
	No	Yes	Total	No	Yes	Total	No	Yes	Total
No	6920	1091	8011	5989	764	6753	9525	758	10283
	(86%)	(14%)	(100%)	(89%)	(11%)	(100%)	(93%)	(7%)	(100%)
Yes	1659	278	1937	2522	229	2751	2362	139	2501
	(86%)	(14%)	(100%)	(92%)	(8%)	(100%)	(94%)	(6%)	(100%)

Source: [3], authors' calculations.

Table 2 shows the balance of the state participation in the ownership structure and company's assessment regarding the availability of financial resources. Based on Table 2, we conclude that companies with state ownership are more confident in access to financial resources. Confidence has been built up since 2005. The question of how much this perception changes when other factors are taken into account is the next stage of our study using the Heckman model.

Table 2. State shareholders and access to financing.

Restrictions on Access to Financing	State Shareholders								
	2002–2007			2008–2009			2011–2013		
	No	Yes	Total	No	Yes	Total	No	Yes	Total
No	7042	969	8011	6495	258	6753	10067	216	10283
	(88%)	(12%)	(100%)	(96%)	(4%)	(100%)	(98%)	(2%)	(100%)
Yes	1647	290	1937	2612	139	2751	2469	32	2501
	(85%)	(15%)	(100%)	(95%)	(5%)	(100%)	(99%)	(1%)	(100%)

Source: [3], authors' calculations.

The relationship among state subsidies, the structure of debt instruments used, and concerns expressed by top managers about access to funding based on the survey are shown in Appendix C. Tables A2 and A3 are constructed similarly to Tables 1 and 2.

According to Table A2 (Appendix C), the presence of state subsidy is observed both when estimating the access to finance as a serious barrier and in case if financing is not considered as a problem. It follows from Table A2 (Appendix C) that firms with and without government support equally felt the presence of financial constraints. The situation changed during the crisis, but after the crisis it returned to its previous level. It can be assumed that support is important precisely during a crisis. In other periods, the role of the state as an assistant is not important for companies. It is more important not to interfere. To what degree is important the role of the state as an arbiter and protector of the interests of entrepreneurs and investors, we analyze considering the introduction of institutional development indices by country.

Since financial constraints may be regarded in different ways depending on whether the company took on credits or opened a credit line last year, further analysis of financial constraints is conducted under control of bank's relations. Table A3 (Appendix C) shows the statistical relationship between bank crediting and the access to financing our sample. It should be noted that for the period of 2002–2007 the data is not presented, as there are no mutual observations of two variables. In other words, if the

company answered the question whether the credit was received last year, it would be few answers regarding the estimation of access to finance, and vice versa. For this period, we use the probit model.

Let us consider the period 2008–2013. In accordance with descriptive analysis, for the companies with no credits or open credit lines for the last year, the access to finance is not considered as a serious barrier (63%), rather than for those in which crediting is considered as a form of borrowing (37%).

The descriptive analysis of data is not able to give a full recognition of diversity and individual features of the given companies, i.e., it does not demonstrate the whole picture of dependence of access to finance on availability of crediting.

Tables 3 and A5 (Appendix D) demonstrate the descriptive statistics for variables of the sample for two periods of time: from 2002 to 2007 and from 2008 to 2013. The number of country observations is demonstrated in Table A4 (Appendix D).

Table 3. Descriptive statistics (2008–2013).

Variable	Obs	Mean	Std.Dev.	Min	Max
obstacle	22288	0.2356	0.4244	0	1
age	22288	19.0918	8.0185	5	45
foreign_ownership	22288	6.0972	22.0663	0	100
foreign_ownership_in_crisis	22288	3.1937	16.2841	0	100
have_foreign_owner	22288	0.0848	0.2786	0	1
gov_ownership	22288	6.0972	22.0663	0	100
gov_ownership_in_crisis	22288	3.1937	16.2841	0	100
have_foreign_gov_owners	22288	0.00426	0.0651	0	1
ief	22288	48.6482	21.6003	0	77.938
rule	22288	−0.3023	0.6104	−1.338	1.2
Europe	22288	0.6664	0.4715	0	1
Russia	22288	0.2276	0.4193	0	1
domestic_credit	22288	39.3629	23.6383	0	88.094
domestic_credit_in_crisis	22288	19.3475	26.1341	0	88.094
developed_bond_market	22288	0.4938	0.5000	0	1
bond_market	22288	2.4756	3.3125	0	16.582
bond_market_in_crisis	22288	0.9130	2.3517	0	16.582
crisis	22288	0.4264	0.4946	0	1
gov_subsidies	22288	0.0786	0.2691	0	1

Source: [3,30,31], Authors' calculations.

The descriptive statistics show that the sample contains no startups and no 100-year-old companies. The average age of 25 years corresponds to the period of the beginning of soft reforms in the economy. The firms in the sample got younger after the crisis (Table 3).

Our sample does not include completely state-owned companies; for most companies, the state does not even have a blocking stake. However, there are companies in the sample with a share close to the control. The position on foreign presence is similar. The presence of foreign capital decreased after the crisis.

The share of the state in the ownership structure is inversely proportional to the degree of development of a financial system (share of bonds and bank credits) and indicators of the institutional environment (legislative protection, etc.). Before the crisis, the share of foreign participation in the ownership structure was negatively correlated with the share of the state. After the crisis, the statistical significance of this negative relationship disappeared.

The level of development of the bond market (market-based financial system) is closely related to economic freedom (IEF).

It follows from Tables 4 and 5 that a significant high correlation is observed only between institutional variables when a variable is taken into account separately for both the pre-crisis and crisis periods. Furthermore, in the study, such explanatory variables were not simultaneously included in the same model specification.

Table 4. Correlation matrix (from 2002 to 2007).

	Age	foreign_ownership	gov_ownership	Ief	Rule	domestic_credit	bond_market	dom_credit_develop_bond
age	1							
foreign_ownership	−0.0813 ***	1						
gov_ownership	0.3882 ***	−0.1169 ***	1					
ief	0.0162 *	0.0381 *	−0.0212 ***	1				
rule	0.095 *	0.0409 ***	−0.0432 ***	0.8286	1			
domestic_credit	−0.0468	0.0071 **	−0.0505	0.5495 ***	0.4612 ***	1		
bond_market	−0.1262 ***	−0.0031 *	−0.0617 ***	0.081 ***	−0.0666 ***	0.3224 *	1	
dom_credit_develop_bond	−0.1124	0.0103	−0.0426 ***	0.1806 ***	−0.0096 ***	0.5781 *	0.6763 ***	1

***, **, *—Statistical significance 1%, 5%, and 10%, respectively.

Table 5. Correlation matrix (from 2008 to 2013).

	Age	foreign_ ownership	foreign_owner ship_in_crisis	gov_own ership	gov_owners hip_in_crisis	Ief	Rule	domestic _credit	domestic _credit_ in_crisis	dom_credit _develop _bond	dom_credit_ develop_bond _in_crisis	bond_ market	bond_market _in_crisis
age	1												
foreign_ ownership	−0.0003	1											
foreign_owner ship_in_crisis	0.0381 ***	0.7122 ***	1										
gov_ ownership	0.0984 *	−0.0208 *	−0.0115	1									
gov_ownership _in_crisis	0.0973 *	−0.0142	0.0007 *	0.7426 *	1								
ief	0.1036 ***	0.0256 **	0.1106 **	−0.0085	0.0278 *	1							
rule	0.1742 *	0.1067 **	0.0597 *	−0.0868 *	−0.0687	0.06	1						
domestic _credit	0.1439 *	0.0274 *	0.0729	−0.0523 **	−0.0203 *	0.7045	0.262	1					
domestic_credit _in_crisis	0.2406 *	0.0621	0.2162 **	0.0051	0.0674	0.3778 **	0.1835 ***	0.4787 **	1				
dom_credit_ develop_bond	0.0629	−0.0364	−0.0063 *	−0.0381 **	−0.015	0.2615 ***	−0.0172 *	0.6235 *	0.2178	1			
dom_credit_ develop_bond _in_crisis	0.175 **	0.021 *	0.1143 **	0.0091 ***	0.0516 *	0.1949	0.0908 ***	0.3914 ***	0.7231 **	0.5806 ***	1		
bond_market	−0.02	−0.0467 **	−0.0397 ***	−0.0033 ***	0.0274 **	0.1961 **	−0.0986	0.4379 **	0.0517 **	0.7434 *	0.3198 **	1	
bond_market _in_crisis	0.1159 ***	0.0039 *	0.0744 *	−0.0033 *	0.0274 ***	0.1554 *	0.0075	0.2957 **	0.5648 **	0.4387 ***	0.7706 *	0.5268 **	1

***, **, *—Statistical significance1%, 5%, and 10%, respectively.

5. Empirical Results

Table 6 shows the average marginal effects for heckprobit models for the period from 2008 to 2013. Wald test shows that the model is well specified. All covariates are significant. Null hypothesis of correlation of equation errors of outcome and selection is rejected. We conclude that the heckprobit model is considered more appropriate than the simple probit model. Our choice is determined by the presence of bias influence of given factors on difficult access to finance, for the reason whether the company has credits or open credit lines. Robustness check for the period from 2008 to 2013 was realized by testing the simple probit models for the set of variables previously included in heckprobit models. In general, the signs and directions of influence of the variables coincide, excluding the variable of state subsidies (Table 6). Appendix E shows the average marginal effect for probit models for the period from 2002 to 2007.

For the years 2008–2013 (Table 6), if there is a foreign participation, it reduces the possibility that companies consider the access to finance as a serious barrier. During the crisis period, the sign of this variable is negative as well. Thus, the presence of foreign investor reduces agent costs, and companies go through less financial constraints. Our results show that during the crisis and post-crisis periods, the presence of foreign capital is considered by top managers as a positive factor for removing constraints. This conclusion coincides with the results obtained by [5,9]. For the years 2002–2007 (Table A6, Appendix E), the dependence is inverse: an increase in barriers for financing on the national market is observed provided that foreign participation is available. The pre-crisis period was characterized by the high rates of economic growth, in general, and of financial sector, in particular. Under these circumstances, the presence of foreign investor gave no significant advantages. Moreover, foreign investors were not aware of internal markets features of economies in transition or the established practice of law enforcement. Hereby, we explain the positive sign with foreign capital variables (*foreign_ownership*, have_foreign_owner). During the crisis, under conditions of liquidity shortage, the presence of direct foreign investor became significant and it is probably related with the availability to access foreign sources of financing. The direction of influence is changed (Hypothesis 3 is accepted).

State participation in capital is considered by top managers as a barrier for financing (Hypothesis 1 is accepted). Upon state share growth in ownership structure in the pre-crisis period (2002–2007) and during the crisis, there is a possibility that access to finance will be a serious barrier for the company. This conclusion coincides neither with the results by [8] for 81 countries nor [16] regarding Chinese market, but it corresponds with the results obtained by [12]. We explain the fact that top management assumes the state as an inefficient owner as follows: poor experience in managing enterprises in the market economy environment, and implementation of political and social purposes are the highest priorities. During the post-crisis period, the statistical significance of the state share in ownership structure is not high.

The use of multiplicative variables in the model allowed us to come to an original conclusion: if the structure of equity capital has both state and foreign participants, it will reduce the probability of financial constraints. This relationship is stable for both time periods. This conclusion is in compliance with the results by [5,6,8,9,16], which analyzed state and foreign participation in the ownership structure on a standalone basis. We attribute this to the positive effect as the foreign owner controls over weak state management (Hypothesis 3 is accepted). Management considers such kind of control as a favorable factor for company development.

Table 6. Results for heckprobit and probit models for the period from 2008 to 2013. Average marginal effects.

	Heckprobit Models										**Probit Models**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
foreign_ownership_ in_crisis	−0.0005 * (0.0003)	−0.0006 * (0.0003)	−0.0005 * (0.0003)	−0.0006 ** (0.0003)	−0.0005 * (0.0003)	-	-	-	-	-	−0.0007 *** (0.0002)	-
have_ foreign_ owner	-	-	-	-	-	-	−0.04 ** (0.018)	−0.038 ** (0.017)	−0.04 ** (0.018)	-	-	−0.0006 *** (0.0001)
have_ foreign_gov_owners	-	-	-	-	-	-	−0.121 * (0.069)	−0.121 * (0.067)	−0.121 * (0.072)	−0.171 *** (0.062)	-	−0.032 (0.045)
gov_ ownership _in_crisis	-	-	-	-	-	0.001 * (0.0006)	-	-	-	-	-	-
gov_ subsidies	−0.119 *** (0.027)	−0.133 *** (0.026)	−0.136 *** (0.018)	−0.119 *** (0.025)	−0.146 *** (0.016)	−0.091 *** (0.023)	−0.092 *** (0.028)	−0.091 *** (0.024)	−0.087 *** (0.034)	−0.143 *** (0.023)	0.0037 (0.011)	0.025 * (0.015)
gov_subsidies_ in_crisis	-	-	-	-	-	−0.077 *** (0.029)	−0.072 ** (0.031)	−0.08 *** (0.03)	−0.051 * (0.031)	-	-	−0.046 ** (0.021)
gov_subsidies_have_ gov_owner	-	-	-	-	-	-	-	-	-	0.111 *** (0.061)	-	-
domestic_credit_in_ crisis	0.004 ** (0.002)	0.0025 (0.002)	-	-	-	-	-	-	-	-	0.0025 ** (0.001)	-
domestic_ credit2_in_crisis	−0.00005 ** (0.00002)	−0.00003 ** (0.00002)	-	-	-	-	-	-	-	-	−0.00003 *** (0.00001)	-
developed_bond_ market	0.062 *** (0.015)	0.042 *** (0.014)	0.206 ** (0.087)	0.077 *** (0.02)	-	-	-	-	-	-	0.011 (0.008)	-
bond_ market	-	-	-	-	-	-	−0.008 * (0.005)	-	-	−0.008 (0.005)	-	−0.009 *** (0.003)
bond_ market2	-	-	-	-	-	-	0.0009 ** (0.0004)	-	-	0.001 ** (0.0004)	-	0.0009 *** (0.0002)
bond_ market_in_crisis	-	-	-	-	0.009 * (0.005)	0.024 *** (0.004)	-	0.014 *** (0.006)	-	-		-
bond_ market2_in_crisis	-	-	-	-	−0.001 * (0.0004)	−0.001 *** (0.0004)	-	−0.001 ** (0.0005)	-	-	-	-
dom_credit_develop_ bond	-	-	−0.006 * (0.004)	-	-	-	-	-	−0.003 *** (0.001)	-	-	-
dom_credit2_develop_bond	-	-	0.00007 * (0.00003)	-	-	-	-	-	0.00004 *** (0.00001)	-	-	-

Table 6. *Cont.*

	Heckprobit Models										Probit Models	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
dom_credit_develop_ bond_in_crisis	-	-	-	−0.0022 ** (0.001)	-	-	-	-	-	-	-	-
dom_credit2_develop_bond_in_ crisis	-	-	-	0.00003 ** (0.00001)	-	-	-	-	-	-	-	-
crisis	0.096 ** (0.046)	−0.018 (0.047)	−0.025 (0.026)	0.008 (0.022)	−0.019 (0.023)	0.023 ** (0.012)	0.075 *** (0.016)	0.053 *** (0.016)	0.042 *** (0.016)	0.062 *** (0.018)	0.087 *** (0.025)	0.124 *** (0.007)
age	−0.0067 *** (0.002)	−0.007 *** (0.002)	−0.006 *** (0.002)	−0.006 *** (0.002)	−0.007 *** (0.002)	−0.009 *** (0.002)	−0.009 *** (0.002)	−0.009 *** (0.002)	−0.008 *** (0.003)	−0.009 *** (0.002)	−0.0003 (0.001)	−0.0003 (0.001)
age2	0.0001 ** (0.00005)	0.0001 ** (0.00005)	0.00009 ** (0.00004)	0.0001 ** (0.00005)	0.0001 ** (0.00005)	0.0001 *** (0.00004)	0.0001 *** (0.00004)	0.0001 *** (0.00004)	0.0001 *** (0.00005)	0.0001 *** (0.00004)	0.00002 (0.00003)	0.00002 (0.00003)
ief	-	0.008 *** (0.001)	-	-	0.0097 *** (0.001)	-	0.009 *** (0.001)	0.008 *** (0.001)	-	0.009 *** (0.001)	0.003 *** (0.0006)	0.003 *** (0.0006)
ief2	-	−0.0001 *** (0.00002)	-	-	−0.0002 *** (0.00001)	-	−0.0002 *** (0.00001)	−0.0001 *** (0.00001)	-	−0.0001 *** (0.00002)	−0.0001 *** (0.00001)	−0.0001 *** (0.00001)
rule	−0.103 *** (0.01)	-	−0.101 *** (0.01)	−0.104 *** (0.01)	-	−0.093 *** (0.009)	-	-	−0.098 *** (0.009)	-	-	-
Europe	−0.074 *** (0.015)	−0.112 *** (0.015)	−0.079 *** (0.011)	−0.068 *** (0.016)	−0.107 *** (0.01)	−0.06 *** (0.012)	−0.091 *** (0.014)	−0.101 *** (0.013)	−0.05 *** (0.0144)	−0.094 *** (0.11)	−0.021 *** (0.008)	−0.012 * (0.007)
Russia	0.045 *** (0.017)	0.071 *** (0.017)	0.063 *** (0.022)	0.048 *** (0.018)	0.081 *** (0.015)	0.089 *** (0.015)	0.121 *** (0.019)	0.099 *** (0.015)	0.126 *** (0.024)	0.121 *** (0.019)	0.053 *** (0.009)	0.076 *** (0.010)
Wald Chi2()	11/ 346.89 ***	12/ 368.73 ***	11/ 547.14 ***	11/ 333.19 ***	11/ 515.63 ***	11/ 401.12 ***	12/ 336.96 ***	13/ 345.68 ***	12/ 283.63 ***	12/ 436.37 ***	12/ 524.56 ***	13/ 530.14 ***
Log pseudolikelihood	−19639.7	−19670.2	−19632.3	−19632.5	−19683.0	−19475.7	−19540.1	−19469.1	−19522.2	−19545.6	−11907.1	−11904.3
Number of obs	22288	22811	22811	22811	22811	22811	22811	22811	22811	22811	22288	22288
Censored obs	13412	13412	13412	13412	13412	13412	13412	13412	13412	13412		
Uncensored obs	8876	8876	8876	8876	8876	8876	8876	8876	8876	8876		
Wald test of indep. eqns. (rho=0): chi2(1)	6.08 **	5.96 **	7.99 ***	7.69 ***	11.5 ***	17.19 ***	6.82 ***	14.22 ***	3.81 **	5.66 **		

Note: Significance levels: ***—1%; **—5%; *—10%.

Throughout the years 2002–2013, state subsidies significantly reduce barriers for financing, especially a positive effect appears during the crisis. This conclusion coincides with the results obtained by [4] for the Italian market. Thus, from the top managers point of view, the benefit of state participation in companies is to provide financial support, but the state is unable to ensure effective decision-making or assistance in attracting external sources of financing. Moreover, state-sponsored companies, which obtain subsidies, are unable to take full advantage of this financial support (Hypothesis 2 is accepted). The management of these companies considers these subsidies as additional barrier factors. Probably, the state by means of subsidies provision is trying to mitigate adverse effects of non-economic decisions, but company management considers this support in a negative way. Subsidies do not overcome the fact that political and social interests of the state prevail over economic ones.

If we consider simple probit models (Table 6), the variable of state subsidies will change the direction of influence and will have the low statistical significance. However, under the bank credit control, this variable becomes significant and its influence on the barriers for financing is negative. We conclude that for the companies, which attract financing, state subsidies are important in terms of removing barriers, the fact of subsidy obtaining has a positive effect in coordination with banks (Hypothesis 2 is accepted).

For the group of hypotheses of significance of financial market development, we obtained the following results. During the period of 2002–2007, the variable of bank credit to private sector (% of GDP) demonstrates a U-shape relationship on the probability of barriers existence (parabola, branches up, Figure 1 below). This figure and the four following figures below are given only for clarity and provide a schematic representation of the quadratic relationship between the variables. They are based primarily on the signs of the regression coefficients. The presented coordinates of the apexes of the parabolas are calculated based on the values of the regression coefficients.

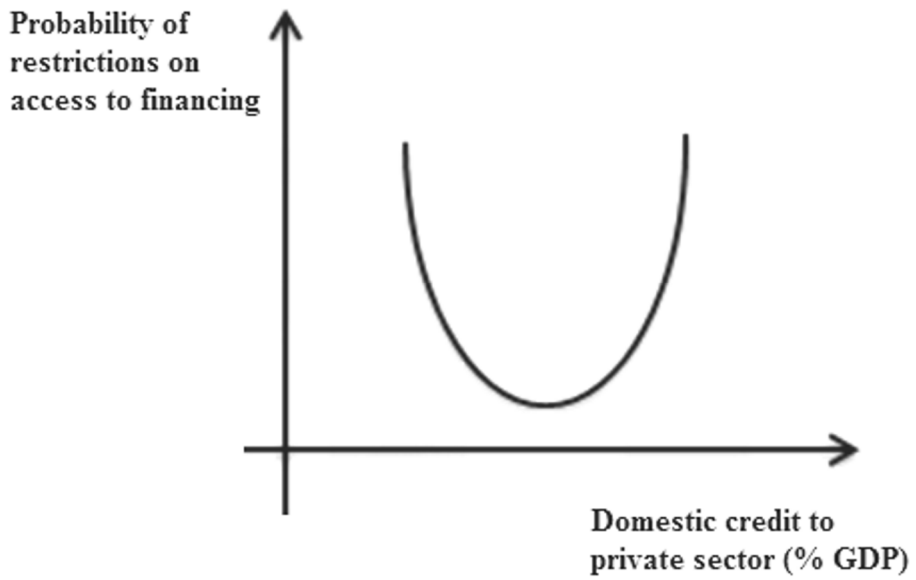

Figure 1. Credit to private sector: probability of restrictions on access to financing before the global financial crisis.

It was easier to get the access to finance for the countries with more developed banking sector, but up to a certain development level of this sector. A highly developed banking sector (in % of GDP) was understood as an additional barrier. We explain this paradox as follows: the role of regulatory exposure was enhanced. The developed banking sector even before the crisis of 2008–2009 had been the object of more intensive state supervision and regulating, and the companies experienced this effect as well.

We obtained an original conclusion concerning the change in the role of the developed bank crediting during the crisis period (Hypothesis 2). The low volume of bank crediting shows that the

companies are forced to find financial resources beyond the national market. Especially, it deals with small countries where the companies with foreign participation have the opportunity to enter global debt markets or take advantage of trade credit. During the crisis, a developed financial sector is considered to reduce the barriers for financing. Even when losing liquidity during the crisis, a strong banking sector will help to attract financing. The companies with poorly developed national market are placed at a difficult situation. During the crisis, the resources are reduced rapidly and tend to be deficient for the companies. The companies consider it as an increase of financial constraints. Thus, bank credit during financial crisis period demonstrates U-shape-like relationship (parabola with flex point at the level of 37% of GDP, Figure 2 below). During the post-crisis period (2010–2013), the growth level of bank credit is no longer significant.

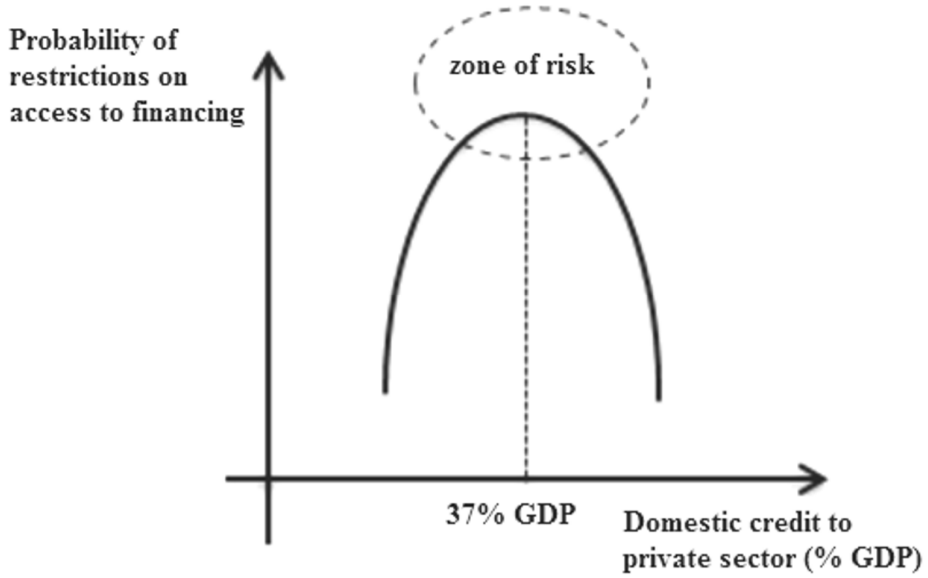

Figure 2. Credit to private sector: probability of restrictions on access to financing during the financial crisis.

We obtained original conclusions concerning the influence of financial depth of financial sector in economy. The financial depth was measured by the extent of development of national publicly traded debt market (corporate bond market). During the pre-crisis period, a developed bond market tends to reduce barriers to access to finance. The insufficient development of bond market is not perceived by top management as a problem, probably because the companies attract financing by means of bank crediting and other sources. For the countries with an average level of bond market development, the companies note the presence of barriers. We explain it as follows: when the bond market is not developed sufficiently, only large companies may take its advantages. Their share in the sample is insignificant; therefore, for the majority of the market participants, the access to this source of financing is considered as valuable. The large companies withdraw liquidity from this sector of financial market (Figure 3 below).

The similar nonlinear impact of the development of bond market (parabola, branches down) was observed during the crisis period, besides for 96% of the companies the barriers for attracting finance are increased in the bond market (Hypothesis 5 is accepted). The bond market turns to be more enclosed concerning financial resources availability: during the crisis period, the bond market is less available for the companies while the bank crediting remains more stable. Our conclusion coincides with that of [7] for the Japanese market.

During the post-crisis period (2010–2013), the direction of influence is changed for the opposite one (parabola, with branches going up). During this period, the banking sector of European countries began to experience enormous regulatory burden.

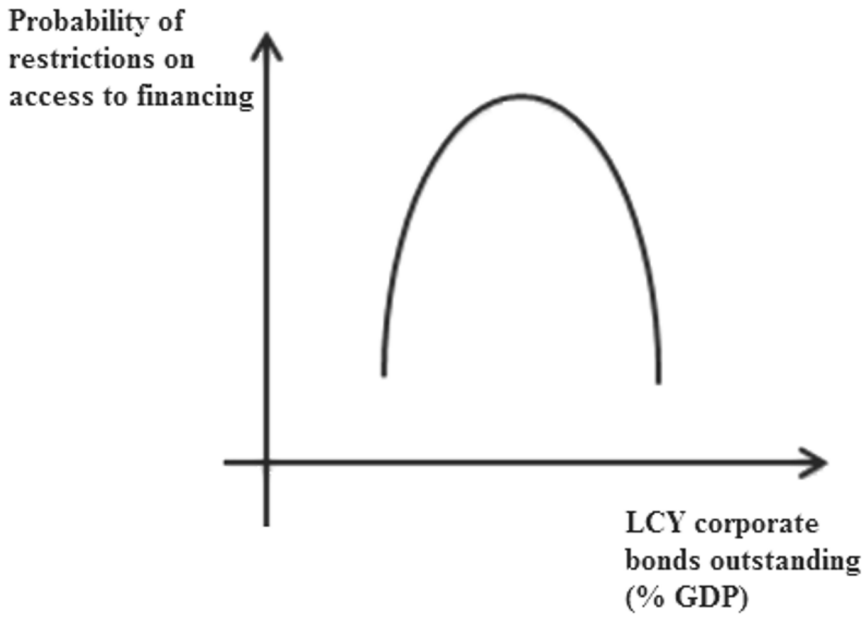

Figure 3. Bond market: probability of restrictions on access to financing before the global financial crisis.

We note that during pre-crisis, crisis, and post-crisis periods, the variable of developed financial market (multiplicative variable of the bank crediting and bond market) showed the negative effect on barriers. The companies of the countries with developed financial sector succeeded.

For the group of hypotheses of institutional factors, we identify the significance of rule variables. During the period of 2008–2013, when the rule-of-law index increases, the probability that access to finance is regarded as a serious barrier, decreases, i.e., the rule variable of all the institutional variables shows the significance of the institutional environment. During the pre-crisis period, the influence of institutional factors (including rule variables) is insignificant.

Concerning the Index of Economic Freedom (IEF) variable, we obtained a very interesting result: during the pre-crisis and post-crisis periods, the perception of institutional standards by top managers was different. If in the pre-crisis period, for most of the countries the increase of IEF was perceived as a negative factor for attracting finance (Figure 4), during the crisis period, the direction of influence of institutional environment changed to the opposite (Figure 5). In 2002–2007, the high standards of IEF were regarded by managers as extra costs for the company.

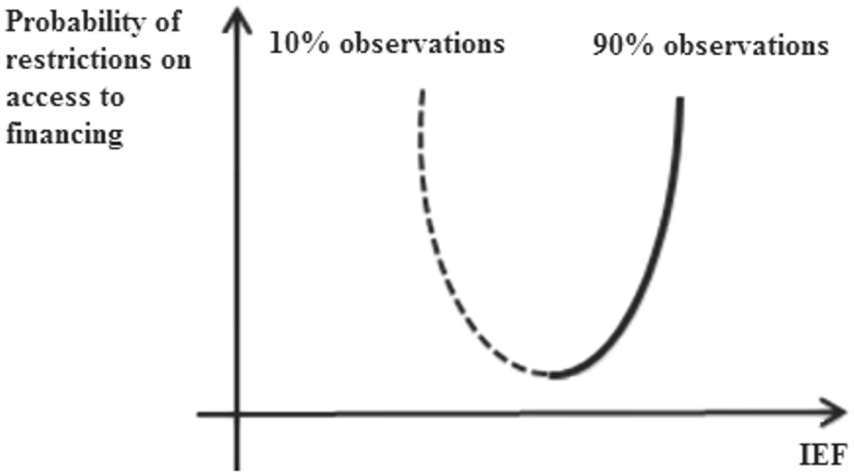

Figure 4. Index of Economic Freedom (IEF): probability of restrictions on access to financing before the global financial crisis.

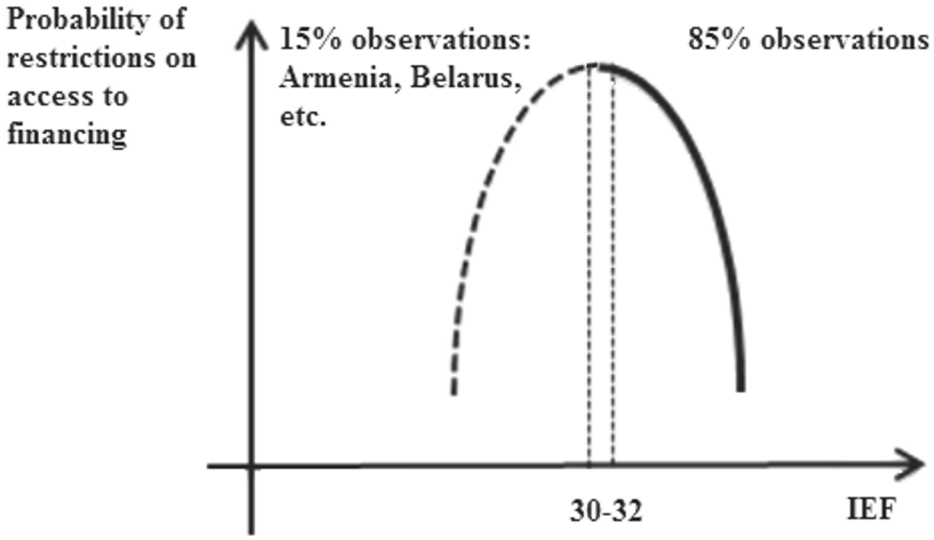

Figure 5. IEF: probability of restrictions on access to financing after the global financial crisis.

Along with the change of economic situation, when the number of effective investment projects decreased, it became more difficult to compete for consumers due to decreasing consumer purchasing power, and the value of game rules, market transparency, liberalization of capital flow increased (Figure 5). It should be noted that this effect is not observed for all countries. The factor of IEF demonstrates a nonlinear U-shape relationship: parabola with branches down, flex point is identified at the level of 30–32 (Figure 5, Hypothesis 3 is accepted). For a smaller part of observations (15%) between 2010 and 2013 for Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, FYR Macedonia, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Mongolia, and Romania when IEF is increased, barriers for financing also increased. Large countries, such as Russia, Poland, etc., stand to gain from quality improvement of institutional environment. Simple probit models for the period of 2008–2013 also show nonlinear impact (parabola, branches down, Table 6).

The results for the pre-crisis period (2002–2007) show that for European companies it is easier to get access to finance in comparison with Asian ones. This dependence is true for both Russia and parts of Europe. During the crisis and post-crisis periods (2008–2013), European companies also found it easier to get access to finance than Asian ones from our sample. However, for the Russian companies the situation is changed: the barriers for financing are growing significantly.

Control variable "firm's age" demonstrates U-shape relationship for both time periods. In general, the older the company, the easier the access for finance. This conclusion coincides with the results obtained by [4]. However, after 30 years of age (the companies which had run on the market before market-type reforms in the considered countries), it is possible that the dependence is changed to the opposite (it should be noted that less than 4% of the sample was subject to this inverse dependence). Probably, the companies in which activity had started before the period of market-type reforms, failed to adjust to new realities.

6. Conclusions

Financial constraints have been duly addressed in the academic literature as an important barrier for sustainable development. However, the restrictions on access to financing and the attitudes of management in the former communist countries have been overlooked by the previous studies. Moreover, financial constraints experienced by businesses in these geographies represent an important obstacle on the roadmap to sustainable economic development. Our paper fills this gap in the literature by analyzing the impact of ownership structure, institutional environment development, and debt

market profile on the perception of financial constraints by the representatives of corporate top management from 28 countries of the former communist bloc.

This paper contributes to the sustainable economic development literature by proposing the original methodology based on the Heckman model to study the nonlinear and multiplicative impacts of diverse factors during the pre-crisis, crisis, and post-crisis periods in the former communist bloc countries. The advantage of our methodology is the use of heckprobit model, which allows us to consider the equation system when the probability of financial constraints is regarded together with the probability of obtaining bank credits and credit facilities. Our approach allows for such variable as a subjective perception of problems by management to be controlled by objective factors of access to financial resources.

The hypotheses of our study have found empirical confirmation. The results obtained according to the heckprobit model led to original conclusions regarding the complex influence of a large set of factors. We emphasize the significance of state ownership and governmental support, foreign ownership, level of credit market development (bank credit and bond market), and the quality of institutional environment.

We built up a panel based on the survey that allowed to identify the perception of financial constraints by the top management of the companies. We demonstrate that: (1) agent relations with owners in the framework of Index of Economic Freedom (IEF) standards (protection of minorities rights, etc.) are perceived by managers as additional financial difficulties; (2) the role of various owners in handling company's influences decision making processes and, therefore, the cash flows of the companies.

We provide the evidence that during the crisis and post-crisis periods, the presence of foreign owner makes the restrictions on access to financing decrease. If the ownership structure has boththe state and foreign participants, the probability of financial constraints is also reduced. The foreign investor is considered by top managers as an efficient supervisor.

For the pre-crisis period, we find that with the relatively poor development of the bank sector, the increase of volume of bank credit reduces the barriers for financing. During financial crisis, the influence of bank credit is reversed (parabola, branches down). We explain this effect as follows: banks begin to manage risks carefully; particularly, they increase the requirements for borrowers. However, since 2008 onwards, it is more difficult for companies to work with banks as the banks adversely impacted by the crisis begin to manage risks more carefully, particularly increasing the scrutiny level and the requirements for borrowers.

The bond market is perceived by the companies as less favorable for removing barriers to access to finance. Only a few companies are able to take advantages of this financial sector. During the pre-crisis period, only some large companies by means of national bond market are solving their funding necessities, but for the majority of medium and small companies the bond market was unavailable due to cost inefficiencies of scale. During the crisis period, access to the bond market becomes even more complicated. We reveal the nonlinear impact of the bond market. However, we find that when the financial sector is developed (bank credit and corporate bond segment), the barriers to access financing are reduced significantly.

We have shown the process of change in the perception of financial constraints after the crisis for companies from the countries of the post-Soviet sample. During the periods of 2008–2013, with the increase of the rule-of-law index, the restrictions on access to financing are considerably reduced. Nonlinear impact is identified by means of index of economic freedom (IEF). We explain it by the fact that a lot of not homogenous components determine the IEF. For example, the IEF considers simultaneously both the protection of investor's rights and investment freedom. It is also worth mentioning that minor institutional improvements are perceived by top managers as difficulties related to the "unnecessary" losses of administrative resources, etc. However, we evidence that an elevated level of institutions' development gives an opportunity for harvesting significant benefits in terms of gradual eliminating of barriers to access financing, which is a necessary condition for sustainable

economic growth. Finally, our findings demonstrate that growing IEF is capable of erasing obstacles to corporate funding sources, as the overall sustainable business climate depends upon the overall level of trust in the society.

Last but not least, looking forward to the future research, we acknowledge that the main limitations of the present study are the limited time elapsed by the observation period, as well as the inhomogeneity of the data due to the different levels of the economic development of the considered countries. Therefore, as a continuation of this investigation, which spans over the global financial crisis, we envisage the following steps expanding the covered historical period over the COVID-19 fueled crisis and the recovery from it. A more country-specific focus of conclusions will be our priority during the continuation of this line of research.

Author Contributions: Conceptualization, T.T., T.S., and M.G.; methodology, T.T. and T.S.; software, K.G. and A.T.; validation, T.T., T.S., and M.G.; formal analysis, T.T. and T.S.; investigation, T.T., T.S., M.G., K.G., and A.T.; resources, T.T.; data curation, T.T., T.S., K.G., and A.T.; writing—original draft preparation, T.T. and T.S.; writing—review and editing, M.G.; visualization, T.T. and M.G.; supervision, T.T.; project administration, T.T.; funding acquisition, T.T. All authors have read and agreed to the published version of the manuscript.

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Appendix A

Showing the changes by 2015 relative to 1995, we wanted to emphasize how much the situation in the economies of the countries under consideration has changed (it has not changed uniformly, in the results we emphasize the differences in Eastern Europe and Asia in the perception of restrictions and the factors determining them). Our empirical analysis is based on a slightly narrower time horizon (2002–2013) due to the availability of BEEPS data ([3]). The 1995–2015 statistics show really striking changes and they could not but affect the perception of events, processes and decision-making by top managers of companies.

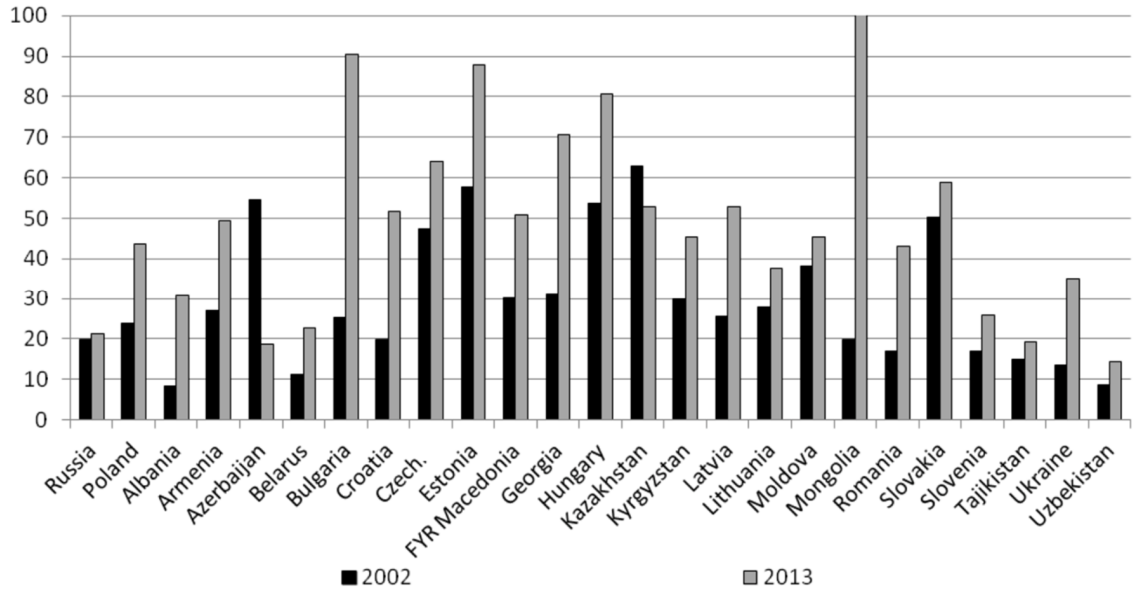

Figure A1. Foreign Direct Investments (FDI) stock (% GDP) for post-communist countries, 2002 and 2013. Source: [33].

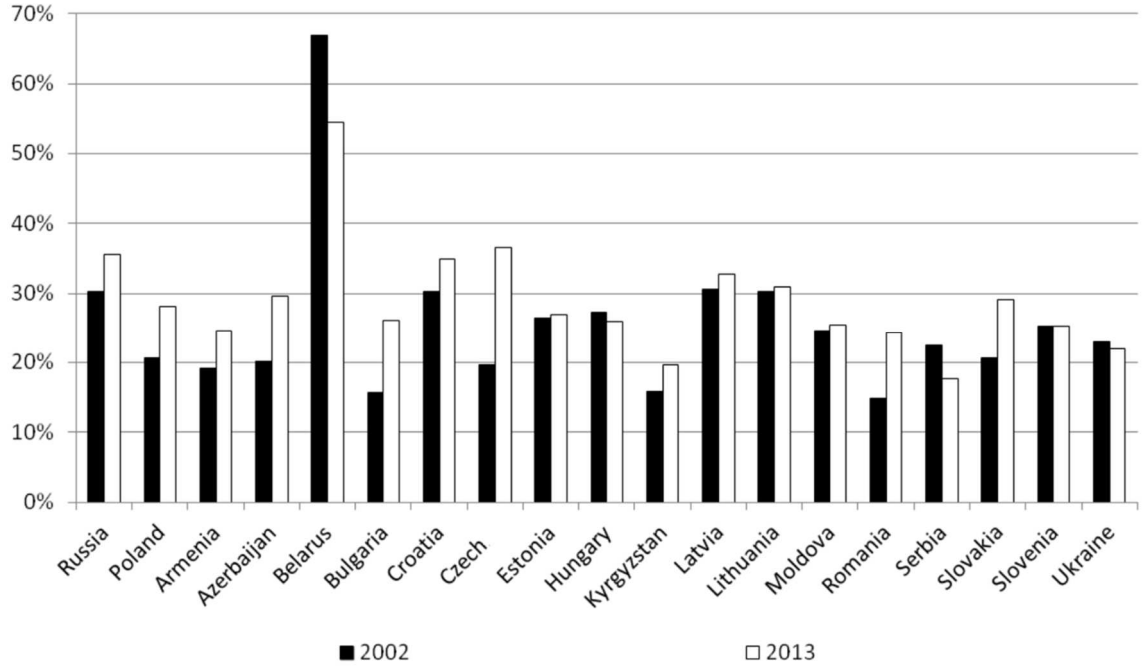

Figure A2. Share of employed in the public sector (% of the total number of employed persons) for post-communist countries, 2005–2015. Source: [34], Authors' calculations.

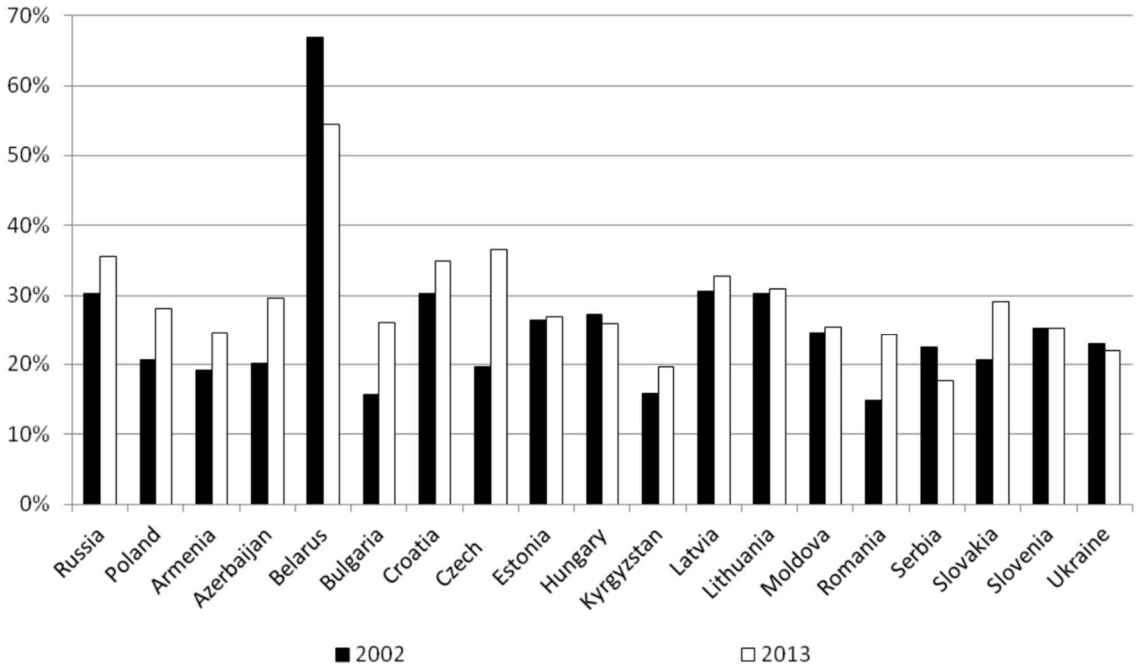

Figure A3. Development of the national debt market: domestic credit to private sector and volume of local currency (LCY) corporate bond market, 2012. Source: [30,31], Authors' calculations.

Appendix B

Table A1. Post-communist countries: development of financial markets and institutional variables.

Country	Foundation of Stock Exchange (after 1989)	Issuance of First Corporate Bonds	Rule of Law		IEF	
			2002	2013	2002	2013
Russia	1991	1994	−0.84	−0.78	48.7	51.1
Poland	1991	1992	0.71	0.82	65.0	66.0
Albania	1996		−0.76	−0.52	56.8	65.2
Armenia	2001	2005	−0.42	−0.34	68.0	69.4
Azerbaijan	2000	2004	−0.91	−0.72	53.3	59.7
Belarus	1998	2017	−1.34	−0.90	39.0	48.0
Bosnia and Herzegovina	2001		−0.66	−0.15	37.4	57.3
Bulgaria	1991		−0.03	−0.10	57.1	65.0
Croatia	1991	2002	−0.15	0.29	51.1	61.3
Czechia	1993	1993	0.86	1.04	66.5	70.9
Estonia	1994		0.82	1.20	77.6	75.3
FYR Macedonia	1995	2007	−0.55	−0.20	58.0	68.2
Georgia	1999	2005	−1.06	−0.01	56.7	72.2
Hungary	1990	1993	0.98	0.58	64.5	67.3
Kazakhstan	1993	1998	−1.14	−0.69	52.4	63.0
Kyrgyzstan	2000	2013	−0.81	−1.11	51.7	59.6
Latvia	1993		0.34	0.77	65.0	66.5
Lithuania	1993		0.45	0.84	66.1	72.1
Moldova	1994	2018	−0.60	−0.37	57.4	55.5
Mongolia	1991	2001	0.18	−0.38	56.7	61.7
Montenegro	1993		0.29	0.05	46.6	62.6
Romania	1995	2003	−0.26	0.13	48.7	65.1
Serbia	2003	2010	−0.86	−0.33	46.6	58.6
Slovakia	1991	1993	0.32	0.48	59.8	68.7
Slovenia	1989	1998	0.99	1.00	57.8	61.7
Tajikistan	2015	2017	−1.19	−1.25	47.3	53.4
Ukraine	1991	2001	−0.81	−0.80	48.2	46.3
Uzbekistan	1994	1999	−1.48	−1.23	38.5	46.0

Source: [35].

Appendix C

Table A2. State subsidies and access to financing.

Restrictions on access to Financing	State Subsidies								
	2002–2007			2008–2009			2011–2013		
	No	Yes	Total	No	Yes	Total	No	Yes	Total
No	7359 (92%)	645 (8%)	8004 (100%)	6174 (91%)	579 (9%)	6753 (100%)	9506 (92%)	777 (8%)	10283 (100%)
Yes	1789 (92%)	147 (8%)	1936 (100%)	2550 (93%)	201 (7%)	2751 (100%)	2307 (92%)	194 (8%)	2501 (100%)

Source: [3], Authors' calculations.

Table A3. Loans and obstacle to financing.

Obstacle Is Access to Financing	Have a Line of Credit or Loan from a Financial Institution					
	2008–2009			2011–2013		
	No	Yes	Total	No	Yes	Total
No	3641 (54%)	3112 (46%)	6753 (100%)	7075 (69%)	3208 (31%)	10283 (100%)
Yes	1356 (49%)	1395 (51%)	2751 (100%)	1340 (54%)	1161 (46%)	2501 (100%)

Source: [3], Authors' calculations.

Appendix D

Table A4. Number of observations in 2002–2013.

Country	Periods			Total
	2002–2007	2008–2009	2011–2013	
Albania	0	52	300	352
Armenia	0	364	351	715
Azerbaijan	0	351	381	732
Belarus	0	234	344	578
Bosnia and Herz.	0	342	346	688
Bulgaria	0	257	355	612
Croatia	8	97	353	458
Estonia	357	256	257	870
FYR Macedonia	350	345	340	1035
Georgia	366	343	352	1061
Hungary	835	280	112	1227
Kazakhstan	789	513	541	1843
Kosovo	0	164	195	359
Kyrgyz Rep.	365	231	257	853
Latvia	373	261	313	947
Lithuania	395	265	228	888
Moldova	506	343	330	1179
Mongolia	0	345	117	462
Montenegro	26	107	121	254
Poland	1372	449	476	2297
Romania	816	437	525	1778
Russia	1053	1113	3960	6126
Serbia	500	368	332	1200
Slovak Rep.	364	252	166	782
Slovenia	169	274	264	707
Tajikistan	179	335	276	790
Ukraine	576	774	904	2254
Uzbekistan	549	352	388	1289
Total	9948	9504	12784	32236

Source: [3], Authors' calculations.

Table A5. Descriptive statistics (2002–2007).

Variable	Obs	Mean	Std.Dev.	Min	Max
obstacle	9948	0.1947	0.3960	0	1
age	9948	25.245	8.6524	16	45
foreign_ownership	9948	10.4187	27.9541	0	100
have_foreign_owner	9948	0.1376	0.3445	0	1
gov_ownership	9948	10.3729	29.3156	0	100
have_foreign_gov_owners	9948	0.00814	0.0899	0	1
ief	9948	48.2418	20.0879	0	75.2
rule	9948	−0.2753	0.6885	−1.189	0.975
Europe	9948	0.7740	0.4182	0	1
Russia	9948	0.1059	0.3077	0	1
domestic_credit	9948	20.5159	14.9621	0	68.164
developed_bond_market	8335	0.8203	0.3840	0	1
bond_market	8335	1.3633	1.8373	0	5.848
gov_subsidies	9940	0.0797	0.2708	0	1

Source: [30,31,33,35], Authors' calculations.

Appendix E

Table A6. Description of variables.

Variable	Description	Source	Sign	Reason for Consideration
obstacle	Dependent variable - barriers to access to finance, characterizing its availability and cost. It is based on the variable *k30* (Source: [3]). If *k30* = 0 (no obstacle to finance), 1 (minor obstacle) or 2 (moderate obstacle), than *obstacle* = 0 (no severe obstacle to finance). If *k30* = 3 (major obstacle) or 4 (very severe obstacle), than *obstacle* = 1 (severe obstacle to finance).	[3], authors' calculation		
	Explanatory variables			
foreign_ownership	Share of a foreign owner in the ownership structure	[3]	–	[5,6,11] show that firms with foreign capital in the ownership structure have an easier access to finance
have_foreign_owner	Dummy of existence of a foreign owner in the ownership structure: 1—yes, 0—no		–	
gov_ownership	State share in the ownership structure		–	[8,16] reveal that state participation in the ownership structure reduces financial barriers
have_gov_ owner	Dummy of existence of a state share in the ownership structure: 1—yes, 0—no		–	
have_foreign_gov_owners	Dummy of simultaneous existence of a foreign and state share in the ownership structure: 1—yes, 0—no		–	Both state and foreign participation in the ownership structure allows reducing barriers to access to finance ([5,8,11,16])
gov_subsidies	Dummy variable: 1—if over the last three years this firm received any state subsidies, 0—otherwise		–	[4] show that state subsidies help to reduce barriers to access to finance
domestic_credit	Domestic credit to private sector (% GDP)	[31]	–	The influence of development of the debt market can be twofold: on the one hand, companies from developing countries use more debt as a source of financing, compared with companies from developed countries ([19,31]). Consequently, the development of the debt market facilitates the removal of barriers to access to finance. On the other hand, a high level of debt burden can increase barriers to access to finance and reduce investment costs ([19]).
domestic_ credit2	Square of *domestic_credit*		+	
bond_market	Volume of outstanding local currency (LCY) corporate bond market (% GDP)	[30]	–	
bond_market2	Square of *bond_market*		+	
developed_ bond_market	Dummy: 1—if an outstanding LCY corporate bond market (% GDP) is more than median, 0—otherwise		–	

Table A6. *Cont.*

Variable	Description	Source	Sign	Reason for Consideration
ief	Heritage Foundation's Index of Economic Freedom: 0—minimum, 100—maximum	Heritage Foundation	−	Firms operating in countries with poor quality of institutional environment face higher agency costs and barriers to access to finance ([25])
ief2	Square of *ief*		+/−	
rule	Rule of law: −2,5—minimum,+2,5—maximum	[31]	−	
polit_stab	Political stability: −2,5—minimum, +2,5—maximum			
regul_quality	Regulatory quality: −2,5—minimum, +2,5—maximum			
corrupt	Control of corruption: −2,5—minimum, +2,5 - maximum			
gov_effect	Government effectiveness: −2,5—minimum, +2,5—maximum			
Control variables				
age	Age of a company, years	[3]	−	[4] show that barriers to access to finance are higher for young firms.
age2	Square of *age*		+/−	
Europe	Dummy variable of companies from European countries: 1—a European country, 0—otherwise	Authors' calculations	−	In general, for the sub-sample of European countries the quality of the institutional environment is better and level of capital flows liberalization is higher. It contributes to the development of financial markets and facilitates access to finance.
Russia	Dummy variable of Russian companies: 1—a Russian country, 0—otherwise		+	In Russia, there are significant barriers to foreign investment, the quality of institutions is lower than in Eastern Europe, in the period under review interest rates are high. We expect that these factors increase the barriers to access to finance
crisis	Dummy variable of the global financial crisis of 2008–2009: 1—the period of the financial crisis, 0—otherwise	Authors' calculations	+	During the global financial crisis in 2008 there were processes of capital withdrawal from developing countries, and a policy of toughening regulation of the banking sector was carried out. As a result, we can expect the growth of financial constraints
Multiplicative variables				

Table A6. *Cont.*

Variable	Description	Source	Sign	Reason for Consideration
dom_credit_develop_bond	*domestic_credit * developed_bond_market*	[30,31], authors' calculations		
dom_credit2_develop_bond	*domestic_credit2 * developed_bond_market*			
foreign_ownership_in_crisis	*foreign_ownership * crisis*	[3], authors' calculations	+/−	
foreign_owner_in_crisis	*foreign_ownership*crisis*			
gov_ownership_in_crisis	*gov_ownership * crisis*			
gov_subsidies_in_crisis	*gov_subsidies * crisis*			
gov_subsidies_ownership	*gov_subsidies*gov_ownership*			
gov_subsidies_have_gov_owner	*gov_subsidies*have_gov_owner*			
domestic_credit_in_crisis	*domestic_credit * crisis*	[31], authors' calculations		
domestic_credit2_in_crisis	*domestic_credit2 * crisis*			
bond_market_in_crisis	*bond_market * crisis*	[30], authors' calculations		
bond_market2_in_crisis	*bond_market2 * crisis*			
dom_credit_develop_bond_in_crisis	*domestic_credit * developed_bond_market * crisis*	[30,31], authors' calculations		
dom_credit2_develop_bond_in_crisis	*domestic_credit2 * developed_bond_market * crisis*			

Table A7. Results for probit models for the period from 2002 to 2007. Average marginal effects.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
foreign_ownership	0.0002 (0.0002)	-	-	-	-	-	0.0002 (0.0001)
have_foreign_owner	-	0.02 * (0.013)	-	-	-	-	-
have_foreign_gov_ owners	-	−0.09 * (0.052)	-	-	-	-	-
gov_ownership	-	-	0.0003 ** (0.0002)	-	-	-	-
have_gov_owner	-	0.042 *** (0.015)	-	-	-	-	0.025 * (0.014)
gov_subsidies	−0.042 ** (0.02)	-	-	−0.035 * (0.02)	−0.025 (0.019)	−0.029 (0.02)	-
gov_subsidies_ ownership	-	-	-	0.001 *** (0.0003)	0.001 *** (0.0003)	0.001 *** (0.0003)	-
gov_subsidies_have_ gov_owner	0.104 *** (0.03)	-	-	-	-	-	0.044 * (0.025)
domestic_credit	-	-	-	-	−0.009 *** (0.001)	-	-
domestic_credit2	-	-	-	-	0.0001 *** (0.00002)	-	-
bond_market	0.035 *** (0.011)	0.034 *** (0.01)	0.034 *** (0.01)	0034 *** (0.011)	-	-	-
bond_market2	−0.008 *** (0.002)	−0.007 *** (0.002)	−0.007 *** (0.002)	−0.007 *** (0.002)	-	-	-
dom_credit_develop_ bond	-	-	-	-	-	−0.009 *** (0.002)	-
age	−0.006 * (0.004)	−0.006 (0.004)	−0.006 (0.004)	−0.006 (0.004)	−0.002 (0.004)	−0.003 (0.004)	−0.005 (0.004)
age2	0.0001 * (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.00003 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)
ief	-	-	-	-	-	-	−0.003 *** (0.001)
ief2	-	-	-	-	-	-	0.0002 ** (0.00001)
rule	0.007 (0.008)	0.006 (0.008)	0.007 (0.008)	0.007 (0.008)	-	0.005 (0.009)	-
Europe	−0.115 *** (0.012)	−0.114 *** (0.012)	−0.115 *** (0.012)	−0.115 *** (0.012)	−0.026 * (0.014)	−0.061 *** (0.013)	-
Russia	−0.046 *** (0.017)	−0.047 *** (0.017)	−0.047 *** (0.017)	−0.047 *** (0.016)	0.012 (0.016)	−0.019 (0.018)	-
Log likelihood	−4042.76	−4046.80	−4050.09	−4044.47	−4014.84	−4023.55	−4822.65
Number of obs	8327	8335	8335	8327	8327	8327	9940
Preudo R2	0.0151	0.0148	0.0140	0.0146	0.0219	0.0197	0.0160

Note: significance levels: ***—1%; **—5%; *—10%.

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Human Capital, Social Capital, and Farmers' Credit Availability in China: Based on the Analysis of the Ordered Probit and PSM Models

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Abstract: Rural credit is very important to the increase of farmers' income and the development of rural economy, and it has attracted wide attention from scholars. Many scholars have paid attention to the impact of social capital on farmers' credit availability, but the research conclusions have not yet been unified. In addition, human capital is also one of the important factors that scholars pay attention to. However, the research mainly focuses on farmer education and pays less attention to their health. Based on the China Household Income Project (CHIP2013) database, we evaluated the impact of human capital (education and health of farmers) and social capital on the credit availability of farmers. To ensure the robustness of our results, we used both the ordered probit model and the propensity score matching (PSM) model to carry out the estimations. Therefore, the study not only improves the research framework of the impact of human capital on farmers' credit availability, but also uses a more accurate method to estimate the net impact of social capital on farmers' credit availability. The results showed that, firstly, in terms of human capital, farmers' educational and health levels have a significant positive impact on their formal credit availability, but no significant impact on their informal credit availability. In particular, farmers with a high school education or above are more likely to obtain a formal loan. Secondly, in terms of social capital, interpersonal relationship capital and political relationship capital are beneficial for farmers obtaining loans from formal and informal channels. Organizational relationship capital only has a more significant positive impact on the informal credit availability of farmers. These results imply that formal financial institutions not only pay attention to farmers' human capital but also their social capital to reduce the risk of lending. However, informal lenders, that is, relatives or friends, pay more attention to the social capital of farmers.

Keywords: human capital; social capital; credit availability; propensity score matching; China

1. Introduction

The development of the rural economy cannot do without the support of rural finance [1]. A relatively perfect rural financial market can significantly improve farmers' technical efficiency and increase their income and consumption [2,3]. However, at present, the credit constraints on farmers are still relatively serious in China, especially the credit constraints from formal financial institutions. Further research also found that the welfare of farmers with credit constraints has been significantly reduced. Kumar et al. [4] found that credit constraints had a negative impact on farmers' health and education expenditures, food consumption, and agricultural investment. Therefore, researchers have

focused on methods to reduce the credit constraints on farmers or improve their credit availability. Among them, the impact of material capital and social capital on the credit availability of farmers has received considerable attention.

Relevant research shows that there are many reasons why farmers are subject to credit constraints, such as the lack of effective mortgages and a perfect rural credit system and the asymmetric information between borrowers and lenders [5]. Material capital has a positive impact on farmers' credit availability because it can be used as an effective mortgage to restrain the potential default behavior of farmers. Furthermore, due to "limited liability", banks often decide whether to lend to farmers and the specific loan amount based on the farmers' wealth owned. Alternatively, they may set a higher credit threshold (e.g., mortgage and guarantee) to ensure that the borrower has a certain ability to repay to reduce their lending risk [6]. Consequently, wealthier families often have more access to bank loans because they have the necessary mortgage for loans [7]. Moreover, farmers who have a higher income always have a higher credit rating, and a bank will treat them as quality customers and lend them more money [8]. Furthermore, Xu and Yuan [9] argued that wealthier farmers have more additional capital to invest in their social networks and expand financing channels. Their study found that, compared with the least wealthy 10% of farmers, the credit availability of the wealthiest 10% of farmers is significantly better.

However, the income of farmers is generally low in China, and the material capital that can be used as an effective mortgage is generally insufficient. Social capital can be used as a substitute or supplement to material capital and can reduce the negative impact of insufficient material capital on farmers' credit availability [10]. Therefore, the impact of social capital on farmers' credit availability is also one of the important factors to which many scholars pay attention. However, studies on farmers' credit availability mostly used a binary variable ("whether to obtain loans?") or specific financing amounts [11,12]. However, with the development of the economy and the improvement of farmers' income and consumption, the borrowing amount of farmers has increased significantly, while the credit constraints felt by farmers have not eased and even increased [8]. This may be because the credit demand of farmers is also increasing. Consequently, it may not be appropriate to use a binary variable (yes or no) or a specific borrowing amount to express farmers' credit availability. The dependent variable selected in this work also considered the credit demands of farmers, which may better express the credit availability of farmers.

In terms of human capital, most studies about the impact of human capital on the credit availability of farmers have focused on their education and less on their health [13,14]. However, human health is also one of the most important components of human capital [15]. Therefore, in this study, we estimated the impact of both farmers' education and health on their credit availability and improved the research framework of the impact of human capital on farmers' credit availability.

Furthermore, there is a lack of consistency among the research conclusions regarding the impact of human and social capitals on farmers' credit availability. To ensure the robustness of our results, we used both the ordered probit model and the propensity score matching (PSM) method to carry out the estimations. For some important human and social capital variables (e.g., participation in cooperative organizations) that are self-selective, we re-estimated their impact with the PSM method to avoid the impact of sample selection bias on the estimation results.

The remainder of this paper is arranged as follows. The second part mainly introduces the credit situation of farmers and the cultural background of China. The third part mainly reviews the literature on human and social capitals and the credit availability of farmers. The fourth part explains the ordered probit and propensity score matching models to analyze the net effect of human and social capitals on the credit availability of farmers. It also explains the data source and the data type used for the estimation. The fifth part empirically analyzes the impact of human and social capitals on the credit availability of farmers. The last part summarizes and discusses the main findings and draws some suggestions to improve the credit availability of farmers.

2. Research Context

China is a large agricultural country. However, China's agricultural production is small-scale and decentralized, with a low production efficiency and rising production costs. Moreover, agricultural production also faces both natural and market risks. Therefore, farmers' agricultural income is low and unstable. In such circumstances, financial institutions are generally unwilling to lend to farmers.

Furthermore, the construction of the rural financial system is not perfect in China. There are few financial institutions and an uneven distribution in rural areas. Financial services are more traditional and single, which cannot effectively meet the needs of farmers. Besides, rural finance also lacks a risk-sharing mechanism. Therefore, the phenomenon of "de-ruralization" of financial institutions is serious [16], and farmers are severely constrained by credit.

However, at present, the credit constraints on farmers are still relatively serious in China, especially the credit constraints from formal financial institutions. Li et al. [17] made a survey of 1773 households in China, and the data shows that among the farmers with a borrowing demand, about 66.92% of the farmers are subject to credit constraints. He et al. [18] also conducted a field survey on the credit constraints of 1730 households in Shandong, Henan, and Guangxi provinces. They found that about 31.21% of the households were subject to credit constraints and could not obtain loans from formal and informal channels. Among the farmers who had received loans, only about 34.02% of them obtained loans from formal channels, and about 53.61% of them could only acquire loans from informal channels. Furthermore, compared with farmers who are not subject to formal credit constraints, the productive income of farmers with partial or complete credit constraints would decrease by 13.0% and 9.8%, respectively. Additionally, the non-basic consumption of farmers with partial or complete credit constraints would decrease by 14.8% and 12.5%, respectively [19].

China's rural residents are collective and closely related based on blood, kinship, and geography. Farmers live in the same place for a long time, forming certain social norms. All farmers will consciously abide by these unwritten norms. In addition, the spatial distance between families is close, and the communication between farmers is frequent. Therefore, the degree of information sharing between farmers is high, and the speed of information transmission is also fast. If someone violates these norms, they will be rejected by others and under the pressure of gossip. As an old Chinese saying goes, "good news never goes out, while bad news has wings". That is, the transmission speed of "bad news" is very fast, such as information that does not comply with the norms. Therefore, under social pressure, farmers may be more likely to comply with the norms. The unique rural culture in China implies the particularity of China's problems.

3. Theoretical Analysis and Research Hypothesis

Farmers' borrowing is a transaction between farmers, or between farmers and financial institutions. Transactions always have costs. Transaction costs include the cost of information search before the transaction, the cost of bargaining during the transaction, and the cost of supervision and execution after the transaction [20]. One of the reasons for the transaction cost is the information asymmetry between the borrowers and lenders. In the case of information asymmetry, borrowers may produce opportunistic behavior. To reduce or prevent the borrowers' opportunistic behavior, lenders need to spend more money to collect more information.

For human capital, farmers with higher education levels tend to have higher comprehensive qualities and a lower probability of opportunistic behavior. For social capital, the collateral function and information transmission function of social capital can reduce transaction costs such as the cost of information search between farmers or between farmers and banks. Therefore, both human capital and social capital can reduce the transaction costs between borrowers and lenders, and help farmers obtain loans.

3.1. Human Capital and the Credit Availability of Farmers

Human capital is formed by workers' investments, which reflect the knowledge, skills, and health level of workers [21]. It is an important factor in promoting economic growth and increasing the income of farmers [22]. Cheng et al. [23] found that human capital contributed 38.57% to the increase in farmers' income, among which the health and education of farmers played an important role. Studies have also shown that, due to "limited liability", lenders such as banks tend to lend more money to wealthier farmers [24]. Therefore, farmers with a higher human capital may be more likely to obtain loans. The measurement of human capital also differs in the literature. It is often measured by an individual's education, training, working seniority, health, and other indicators [25,26]. However, an individual's education and health are the two most important components of human capital [15]. Therefore, we chose farmers' education and health to express the human capital of farmers in this study.

Generally speaking, education can effectively distinguish high-ability from low-ability people [27]. Farmers with a higher level of education always have a higher comprehensive quality, and there are more or better employment and learning opportunities available to them to improve their income [22]. At the same time, Yi and Cai [28] claim that, compared with low-income farmers, high-income farmers tend to have a better repayment willingness and ability. This may reduce the potential default risk that banks and other lenders may bear. Finally, a higher level of education may make it easier for farmers to obtain loans.

As the saying goes in China, the "body is the capital of the revolution". A healthy body is an important carrier of other human capital components [29]. The health of farmers also has a significant impact on farmers' current income, even more so than the education [30]. Furthermore, farmers' health also indicates their future income and repayment ability. Farmers with a better health level can maintain and improve their income and repayment ability [31]. Therefore, the health of householders represents the credit risks of lenders to some extent; the healthier the householder is, the less risk the lender will face [10], and the healthier householders will have a higher probability of obtaining a loan. Yin et al. [31] found that the average health level of family members has a significant positive impact on the formal financing capacity of farmers. Based on this, we hypothesized the following:

Hypothesis 1. *Human capital has a significant impact on farmers' credit availability. The higher the education and health level, the higher the credit availability of farmers.*

3.2. Social Capital and the Credit Availability of Farmers

For social capital, there is currently no universally agreed-upon definition, but the definition described by Putnam is widely used. Putnam [32] points out that social capital is an organizational characteristic that can improve economic efficiency and people's income, which includes trust, norms, and networks. Heikkilä et al. [33] studied the relationship between individual social capital and credit availability in Uganda. They found that the importance of individual social capital to formal banks was significantly reduced because they valued a physical mortgage more greatly. However, social capital has a significant impact on the semi-formal and informal credit availability, especially for poor people, and for those in rural areas or areas with low general trust. These findings support the views of Liang et al. [6], who found that formal financial institutions have not yet taken farmers' social capital as the basis for lending. This results in social capital having no significant impact on the formal financing ability of farmers and only having a significant impact on their informal financing ability. However, van Bastelaer [34] argued that social capital could reduce the cost of incomplete information in financial transactions. Social connections between borrowers allow significant savings in terms of screening, mutual monitoring, and enforcement. This kind of interpersonal relationship is a central factor in ensuring repayment and is one of the important factors that lenders consider. Tan and Hu [24] also found that social capital could significantly improve the formal credit availability of farmers. When

social capital is increased by one unit, the probability of farmers being subject to credit constraints is reduced by about 20%.

There may be three main mechanisms for the impact of social capital on the credit availability of farmers. First, social capital owned by farmers can be used as a social mortgage, and its punishment and reputation mechanism can effectively restrict the behavior of farmers [35]. The countryside is a typical acquaintance society in China. Farmers live in a group for a long time and form some social norms. Once farmers violate the social norms, they come under social pressure from the group (e.g., relatives and friends), which causes a certain loss of their reputation and increases the cost of their default [12]. Moreover, the higher the social capital stock of farmers, the higher the cost of their default. This may give farmers a stronger incentive to repay on time to maintain or further enhance their social capital [36]. The high cost of default may also reduce the concerns of lenders such as banks, and then improve the credit availability of farmers.

Second, social capital also has the function of information transmission, which can reduce the information asymmetry between borrowers and lenders. With the low marketization degree of rural finance in China, the role of social capital becomes particularly important. Villages with higher trust levels and developed social networks have a higher information sharing level. In such a village, farmers' personal information is more fully disclosed [37], such as farmers' risk type, borrowing demand, repayment ability, and other information. To a certain extent, it may alleviate the adverse selection and moral hazard caused by information asymmetry between borrowers and lenders.

Third, social capital can also help farmers acquire more borrowing resources. Dinh et al. [38] argued that building strong ties with people of a higher social status could reduce credit constraints. Li et al. [17] found that one of the important reasons why farmers think they cannot obtain loans from banks was that they had no acquaintances at the banks. Farmers with relatives working in the financial sector tend to have more borrowing resources [39]. In addition, participation in credit cooperatives could significantly reduce farmers' credit constraints. Even for poor farmers, their borrowing opportunities also increase significantly [40]. Therefore, we hypothesized the following:

Hypothesis 2. *Social capital has a positive impact on farmers' credit availability.*

4. Research Methodology

This study mainly aims to answer the following question: "Do human and social capitals have a significant impact on the credit availability of farmers?" We mainly use an empirical analysis to test, including ordered probit and propensity score matching (PSM) models. However, it is worth noting that some variables representing human and social capitals are a kind of self-selection of farmers. These selections may not be random and may be influenced by the characteristics of the farmers themselves. Moreover, these characteristics may also affect the credit availability of farmers. If so, the general regression model cannot completely exclude the influence of other factors and obtain the net impact of these variables on farmers' credit availability. However, the propensity score matching (PSM) model can effectively control this nonrandom bias problem through a counterfactual estimation [41,42]. Therefore, we choose both the ordered probit and PSM models to estimate the impact of human and social capitals on the credit availability of farmers.

4.1. Collection of Data

The data used in this study came from the China Household Income Projects (CHIP2013) database, which was completed by the China Income Distribution Institute of Beijing Normal University and domestic and foreign experts in 2014. The CHIP project team took samples according to stratified random sampling and systematic sampling methods. They stratified the region according to the east, the middle, and the west, and then obtained samples according to the systematic sampling method. Finally, the sample covers the eastern, central, and western parts of China: 15 provinces;

126 cities; 234 counties and districts; and a total of 18,948 household samples, including 11,013 rural household samples, 7175 urban household samples, and 760 migrant household samples. Considering the research topic of this study, we mainly selected farmers who had applied for loans from 11,013 rural household samples. Then, we removed the samples with missing data and finally obtained a total of 3127 effective samples.

The database collects the basic characteristics of householders and family members, including their education, health, trust, family income, and family loans. The database has a large sample size and strong credibility. Based on this database, there have been many good studies.

4.2. Empirical Model

4.2.1. Ordered Probit Model

The data reflecting the credit availability of farmers are ordered variables of classification, and there are three categories, including "weak credit availability", "general credit availability", and "strong credit availability". Therefore, we use an ordered probit model for the estimation. The model is set as follows:

$$Y* = X'\beta + \varepsilon \tag{1}$$

$$Y = \begin{cases} 1, & Y* \le \gamma_0 \\ 2, & \gamma_0 < Y* \le \gamma_1 \\ 3, & Y* > \gamma_1 \end{cases} \tag{2}$$

where Y^* is an unobservable latent variable, and Y is the observation-dependent variable. $Y = 1$ means that the farmer's loan application is rejected; that is, the credit availability of farmers is weak. $Y = 2$ means that the farmer's loan application is accepted but not fully satisfied; that is, the credit availability of farmers is general. $Y = 3$ means that the farmers' loan applications are fully satisfied; that is, the credit availability of farmers is strong. X is the set of explanatory variables, which may affect the credit availability of farmers. γ_0 and γ_1 are unknown cutoff points, and satisfy $\gamma_0<\gamma_1$. We assume ε~N (0, 1), the probability of variable Y taking each value is:

$$P(Y = 1|X|) = P(Y* \le \gamma_0|X) = P(X'\beta + \varepsilon \le \gamma_0|X) = P(\varepsilon \le \gamma_0 - X'\beta|X) = \phi(\gamma_0 - X'\beta) \tag{3}$$

$$P(Y = 2|X|) = P(\gamma_0 < Y* \le \gamma_1|X) = P(Y* \le \gamma_1|X) - P(Y* \le \gamma_0|X) = \phi(\gamma_1 - X'\beta) - \phi(\gamma_0 - X'\beta) \tag{4}$$

$$P(Y = 3|X|) = P(Y* > \gamma_1|X) = 1 - P(Y* \le \gamma_1|X) = 1 - \phi(\gamma_1 - X'\beta) \tag{5}$$

Formula (3) refers to the probability that a farmer belongs to the group with a weak credit availability under the influence of factor X. Formula (4) refers to the probability that a farmer belongs to the group with a general credit availability under the influence of factor X. Formula (5) refers to the probability that a farmer belongs to the group with a strong credit availability under the influence of factor X. We use maximum likelihood estimation for testing. It uses a probability model to maximize the probability of the observed sample data. Then, the loglikelihood function will be:

$$\begin{aligned} Ln\, L(\beta, \quad & \gamma_0, \gamma_1) = Ln[P(Y = 1|X|) \bullet P(Y = 2|X|) \bullet P(Y = 3|X|)] \\ & = Ln\, \phi(\gamma_0 - X'\beta) + Ln\, [\phi(\gamma_1 - X'\beta) - \phi(\gamma_0 - X'\beta)] + Ln\, [1 - \phi(\gamma_1 - X'\beta)] \end{aligned} \tag{6}$$

Using the maximum likelihood estimation method, we can get the parameter β, γ_0, and γ_1, that is, the influence of the explanatory variables (X) on the credit availability of farmers (Y).

4.2.2. Propensity Score Matching Model

The ordered probit regression model can only give us a general answer to the impact of human and social capitals on the credit availability of farmers. In particular, variables such as farmers' education, party membership, and cooperative membership, are all farmers' self-selections. These selections may

not be random, which may lead to some errors in the estimation of the ordered probit model. However, the propensity score matching model can effectively control the selection bias problem through a counterfactual estimation [41,42]. Therefore, for these important human and social capital variables, we used the propensity score matching model to test them again to obtain a more accurate result. Its basic principle is:

$$D_i = \begin{cases} 1, & Z_i\alpha + \mu_i > 0 \\ 0, & Z_i\alpha + \mu_i \leq 0 \end{cases} \tag{7}$$

$$Y_i = \begin{cases} Y_{1i}, & If \quad D_i = 1 \\ Y_{0i}, & If \quad D_i = 0 \end{cases} \tag{8}$$

where Z (Z ≠ X) represents the factors affecting the choice of the farmer, $D_i = 1$ represents the treatment group, $D_i = 0$ represents the control group, Y_{1i} represents the credit availability of the treatment group farmer i, and Y_{0i} represents the credit availability of the control group farmer i. The problem of selection bias is that under the influence of certain factors (Z), farmers cannot randomly choose to enter the control group or the treatment group. This leads to the general model estimation results not completely excluding the influence of other factors and provides the net influence ($Y_{1i} - Y_{0i}$) of the variable D.

Taking the cooperative membership of farmers as an example, for a farmer i participating in a cooperative organization (treatment group), Y_{1i} means the credit availability of farmer i, and Y_{0i} means the credit availability of farmer i if he does not participate in the cooperative organization. Then, the difference between the two (Y_{1i} and Y_{0i}) is the net influence of the cooperative membership on the credit availability of farmer i. However, in fact, Y_{0i} is not observable, so an approximate estimate of Y_{0i} needs to be found to obtain the net influence of the cooperative membership.

The basic idea of the propensity score matching estimation is as follows. First, the propensity score of each farmer is obtained according to the logit regression, that is, the probability of a farmer entering the treatment group under the influence of factor Z.

Second, for farmer i in the treatment group, according to a certain matching method (e.g., kernel matching and nearest-neighbor matching), we find a farmer j in the control group whose propensity scores are as equal or close to farmer i as possible. Thus, we can assume that the probability of farmers j and i entering the treatment group are the same or similar. Then, we take the Y_{0j} corresponding to farmer j as the matching estimator of Y_{0i}, that is, $\hat{Y_{0i}} = Y_{0j}$.

Finally, we can get the net influence (treatment effect) of a variable (D) on farmer i: $Y_{1i} - \hat{Y}_{0i} = Y_{1i} - Y_{0j}$. The average treatment effect (ATT) of the treatment group is:

$$ATT = E\left(Y_{1i} - \hat{Y}_{0i}\right) = E(Y_{1i} - Y_{0i}|D_i = 1) = E(Y_1|D_i = 1) - E(Y_0|D_i = 1) \tag{9}$$

4.3. Variable Definition and Descriptive Statistical Analysis

Dependent variable. The measurement of the farmers' credit availability was mainly based on the question, "Has there been any situation where your family's borrowing application was rejected or the borrowing amount obtained was less than the amount of the application?" This can reflect the degree of the farmers' credit availability. If the answer was "all borrowing applications were fully satisfied", this means that the farmers' credit availability was strong, and the value was 3. If the answer was "all borrowing applications were accepted, but the loan obtained was less than the requested amount", this means that the farmer's credit availability was general, and the value was 2. If the answer was "one or more borrowing applications were rejected", this means that the farmer's credit availability was weak, and the value was 1. We divided the credit availability of farmers into formal and informal credit availabilities. We referred to farmers' borrowing from banks, rural credit cooperatives, and other formal credit organizations as formal credit. Then, we referred to farmers' borrowing from relatives or friends as informal credit.

Independent variables. The independent variables selected in this study mainly included the characteristics of farmers' human and social capitals, as well as the personal and family characteristics of the householders.

Human capital. We mainly selected two variables to reflect the human capital of farmers: the education and health of householders. Based on the division method of the agricultural census in China, we divided the education level into values of 1–5, representing "never attended school," "primary school", "middle school", "high school", and "university", respectively. The measurement of the farmers' health was mainly based on the self-evaluation of farmers. The value was 1–5, representing "worse health", "bad health", "general health", "good health", and "better health", respectively.

Social capital. We divided the social capital of farmers into political relationship capital, organizational relationship capital, interpersonal relationship capital, and financial relationship capital. Among them, political relationship capital is mainly expressed by the political status of farmers, including the party membership and cadre status of farmers. Interpersonal relationship capital mainly used three questions: "How many brothers and sisters do you have?" "Do you think relatives and friends can be trusted?" and "Do you think anyone other than relatives and friends can be trusted?" The options of the latter two questions included "very untrusted", "not very trusted", "generally trusted", "relatively trusted", and "very trusted", which were assigned values of 1–5 respectively. Organizational relationship capital was mainly expressed by participation in cooperative economic organizations. Financial relationship capital was mainly expressed by the work industry of family members. If there were family members working in the financial industry, then the value was 1. If there were no family members working in the financial industry, then the value was 0.

Personal and family characteristics of householders. Referring to previous research, we selected householders' age, gender, marital status, outside working experience, family size, family per-capita income, and family wealth as the control variables.

In the estimation, the direct introduction of categorical variables may result in an inaccurate coefficient estimation and economic meaning. Therefore, for the four categorical variables—education, health, the trust of relatives and friends, and the trust of other people—we set eight dummy variables to make the estimation results more accurate, including "education1", "education2", "health1", "health2", "rela_trust1", "rela_trust2", "others_trust1", and "others_trust2". The definitions and descriptive statistics for each variable are shown in Table 1.

Table 1. Descriptive statistics of the selected variables.

Variables		Definition and Value	Mean	Standard Deviation
Dependent variables	Formal credit availability	Order variable: 1 if one or more formal borrowing applications are requested; 2 if all formal borrowing applications are accepted but not fully satisfied; 3 if all formal borrowing applications are fully satisfied.	2.57	0.73
	Informal credit availability	Order variable: 1 if one or more informal borrowing applications are requested; 2 if all informal borrowing applications are accepted but not fully satisfied; 3 if all informal borrowing applications are fully satisfied.	2.59	0.70
Human capital	Education1	Dummy variable: 1 if the farmer's maximal education level is middle school, and 0 otherwise.	0.48	0.50
	Education2	Dummy variable: 1 if the farmer's maximal education level is high school or above, and 0 otherwise.	0.14	0.34
	Health1	Dummy variable: 1 if the farmer's health is "general health", and 0 otherwise.	0.24	0.43
	Health2	Dummy variable: 1 if the farmer's health is "good health" or "better health", and 0 otherwise.	0.64	0.48
Social capital	Party membership	Dummy variable: 1 if the householder is a party member, and 0 otherwise.	0.11	0.31
	Cadre	Dummy variable: 1 if the householder is a village cadre, and 0 otherwise.	0.06	0.23
	Cooperative membership	Dummy variable: 1 if the householder is a cooperative member, and 0 otherwise.	0.03	0.18
	Siblings	Dummy variable: Number of brothers and sisters of the householder.	3.21	1.77
	Rela_trust1	Dummy variable: 1 if farmers think their relatives and friends are "generally trusted", and 0 otherwise.	0.24	0.43
	Rela_trust2	Dummy variable: 1 if farmers think their relatives and friends are "relatively trusted" or "very trusted", and 0 otherwise.	0.71	0.45
	Others_trust1	Dummy variable: 1 if farmers think other people are "generally trusted", and 0 otherwise.	0.47	0.50
	Others_trust2	Dummy variable: 1 if farmers think other people are "relatively trusted" or "very trusted", and 0 otherwise.	0.35	0.48
	Bank relatives	Dummy variable: 1 if the family has relatives working in the bank, and 0 otherwise.	0.01	0.09
Control variables	Age	Continuous variable: Age of household head (years).	53.39	10.65
	Male	Dummy variable: 1 if the householder is a male, and 0 otherwise.	0.92	0.28
	Married	Dummy variable: 1 if the householder is married, and 0 otherwise.	0.97	0.17
	Experience	Dummy variable: 1 if the farmer has working experience outside, and 0 otherwise.	0.30	0.46
	Family size	Continuous variable: Number of people residing in the household.	3.95	1.37
	Income	Continuous variable: Annual household income per capita(log).	9.01	0.75
	In-Ex ratio	Continuous variable: Household income/expenditure ratio.	0.77	1.33
	Wealth	Continuous variable: Household wealth(log).	10.44	1.27

5. Empirical Analysis

First, we used the ordered probit model to estimate the impact of human and social capitals on the formal and informal credit availability of farmers (see Table 4). Second, for some human and social capital variables with obvious self-selectivity, we made a counterfactual estimation with the propensity score matching model—a bias-corrected matching estimation. This could reduce the sample selection bias and provide the average treatment effect on the formal and informal credit availability of farmers. The results are shown in Table 5.

5.1. Sample Basic Characterization

The basic characteristics of sample farmers are shown in Table 2. The gender of householders is mainly male, accounting for 91.6% of the total sample. The age of the householders is between 21 and 101 years. Householders aged 40–60 years old account for 64.3% of the total sample. Most of the householders have a low education level; about 80.5% of these farmers have a primary or middle-high-school education level. The per capita income of most households (80.9%) is below CN¥ 15,000. These statistical characteristics (e.g., low education and low income) are roughly consistent with the basic situation of rural households in China. Consequently, the sample selection had a certain credibility.

Table 2. The basic characteristics of the surveyed farmers.

Variables	Options	N	Proportion (%)
Gender of householders	Male	2864	91.6
	Female	263	8.4
Age of householders	<30	40	1.3
	30–40	266	8.5
	40–50	970	31.0
	50–60	1041	33.3
	>60	810	25.9
Education of householders	None	182	5.8
	Primary school	1016	32.5
	Middle school	1500	48.0
	High school	389	12.4
	College or above	40	1.3
Household income per capita (¥)	<5000	769	24.6
	5000–10,000	1131	36.2
	10,000–15,000	630	20.1
	15,000–20,000	264	8.4
	>20,000	333	10.6

Table 3 shows that about 2792 sample farmers chose informal borrowing channels; the total rate was 89.3%. About 1036 sample farmers chose formal borrowing channels; the total rate was 33.1%. This indicates that farmers prefer to choose informal borrowing channels. The sum of farmers using formal and informal credit channels is greater than the total sample, because some farmers applied for both formal and informal borrowing (about 701 farmers).

Table 3. The credit situation of the surveyed farmers.

		Formal Channels		Informal Channels	
		N	Proportion (%)	N	Proportion (%)
Credit availability	Apply for borrowing	1036	33.1	2792	89.3
	All applications are fully met.	745	71.7	2008	71.9
	All applications are accepted, but not fully met.	138	13.3	427	15.3
	One or more applications are rejected.	153	14.7	357	12.8

Table 3 also shows the credit availability of farmers. About 69% of the sample farmers' borrowing applications were fully satisfied, about 16% of the sample farmers' borrowing applications were accepted but not fully met, and about 15% of the sample farmers' applications were rejected one or more times. This means that about 31% of the sample farmers' applications could not be fully met. There is still room for improvement in rural financial development in China. Furthermore, compared with informal credit, the probability of farmers being rejected by formal financial institutions increased significantly (14.7% > 12.8%).

5.2. Estimation Results

5.2.1. Ordered Probit Model Estimation Results

Some studies show that social capital had a significant impact on the health of residents [43]. In order to reduce the impact of multicollinearity between human and social capitals on the estimation results, we referred to the treatment of Ding et al. [44]. In the estimation, the model (2) and (5) only included human capital variables and control variables, and the models (3) and (6) only included the social capital variables and control variables. The estimation results are shown in Table 4. We can see from this result that R2 is very low. An important reason for the lower R2 is missing variables. The credit availability of farmers is not only related to the characteristics of the farmers themselves, but also to the characteristics of the lenders. In the model, we mainly examine the characteristics of the farmers themselves, and lack the characteristic data of the corresponding lenders. This may result in a lower R2 in our model. In addition, there are generally two purposes for using regression models. One is explanation, and the other is prediction. If you need accurate predictions, a lower R2 is not feasible. However, if you want to analyze the significance of the explanatory variables, a lower R2 is feasible. The purpose of our model is mainly to explain, not to predict. However, the R2 of the ordered probit model is low, and there may be some deviation in the parameter estimation. Thus, we used the PSM model to estimate again. We discussed the same conclusions of the two models in the result section of the ordered probit model. We discussed different conclusions after the PSM estimate.

The results showed that human capital had a positive impact on the formal credit availability of farmers, but that it had no significant impact on the informal credit availability of farmers (Table 4). Specifically, for formal credit, compared with farmers with bad or worse health (the control group), the dummy variables "health1" and "health2" had a significant positive impact on the formal credit availability of farmers. This indicates that improving farmers' health will play an important role in increasing the formal credit availability of farmers. This is consistent with our hypothesis. Healthier farmers have higher incomes and a stronger ability to make continuous payments, reducing the loan risk of banks. Compared with farmers with a primary or lower education level, the dummy variables "education1" and "education2" had a positive but insignificant impact on the formal credit availability of farmers. This is inconsistent with our hypothesis and the results of most scholars. It may be because the investment of farmers in education is influenced by many factors, such as family income. Some scholars believe that education is also related to the credit situation of families, and farmers with credit constraints always have a lower investment in education [45]. Therefore, there may be a degree of causality between education and family credit, causing endogenous problems. We will use the more accurate method of PSM for testing before discussing this further. For informal credit, only the dummy variable "health2" had a significant impact on the informal credit availability of farmers at the level of 10%, and the dummy variables "health1", "education1", and "education2" had no significant impact on the informal credit availability of farmers. As the saying goes, "birds of a feather flock together". People within the group have some similarities. Therefore, there may be little difference in the education level between friends. Borrowing between relatives and friends is based more on the social relationship formed by geographical and blood ties. However, the human capital of farmers is not particularly important to their relatives and friends.

Table 4. The estimation results of the ordered probit model.

Variables	Formal Credit Availability			Informal Credit Availability		
	(1)	(2)	(3)	(4)	(5)	(6)
Education1	0.037 (0.102)	0.055 (0.100)		−0.004 (0.059)	0.017 (0.057)	
Education2	0.017 (0.141)	0.130 (0.131)		−0.021 (0.085)	0.038 (0.081)	
Health1	0.408 *** (0.154)	0.418 *** (0.153)		0.068 (0.091)	0.075 (0.089)	
Health2	0.303 ** (0.144)	0.363 *** (0.141)		0.077 (0.086)	0.159 * (0.083)	
Party membership	0.063 (0.140)		0.079 (0.135)	−0.056 (0.100)		−0.057 (0.098)
Cadre	0.388 ** (0.172)		0.372 ** (0.172)	0.188 (0.128)		0.187 (0.128)
Cooperative membership	0.050 (0.195)		0.044 (0.197)	0.559 *** (0.187)		0.556 *** (0.187)
Siblings	0.069 ** (0.024)		0.066 *** (0.024)	0.033 ** (0.015)		0.033 ** (0.015)
Rela_trust1	0.177 (0.202)		0.186 (0.202)	−0.001 (0.125)		−0.003 (0.125)
Rela_trust2	0.283 (0.194)		0.299 (0.194)	0.407 *** (0.120)		0.407 *** (0.120)
Others_trust1	0.121 (0.123)		0.145 (0.123)	0.172 ** (0.072)		0.179 ** (0.071)
Others_trust2	0.393 *** (0.135)		0.415 *** (0.135)	0.345 *** (0.080)		0.352 *** (0.079)
Bank relatives	0.327 (0.419)		0.340 (0.422)	0.388 (0.348)		0.391 (0.346)
Age	0.002 (0.004)	0.006 (0.004)	0.000 (0.004)	−0.001 (0.003)	0.001 (0.003)	−0.002 (0.002)
Male	−0.227 (0.160)	−0.202 (0.158)	−0.172 (0.161)	0.079 (0.091)	0.085 (0.089)	0.082 (0.091)
Married	0.043 (0.251)	0.083 (0.265)	0.050 (0.253)	0.191 (0.152)	0.230 (0.146)	0.194 (0.151)
Experience	0.027 (0.095)	0.036 (0.092)	0.036 (0.095)	0.048 (0.058)	0.030 (0.057)	0.051 (0.058)
Family size	0.046 (0.033)	0.060 * (0.033)	0.043 (0.033)	−0.004 (0.019)	0.007 (0.019)	−0.003 (0.019)
Income	0.171 *** (0.058)	0.172 *** (0.058)	0.183 *** (0.057)	−0.010 (0.039)	0.002 (0.038)	−0.005 (0.038)
In_Ex ratio	0.106 (0.090)	0.134 (0.088)	0.108 (0.089)	0.034 (0.042)	0.038 (0.042)	0.034 (0.042)
Wealth	0.041 (0.035)	0.034 (0.035)	0.045 (0.035)	−0.006 (0.020)	−0.008 (0.020)	−0.006 (0.020)
No. of observ.	1021	1021	1021	2694	2694	2694
Pseudo R2	0.0392	0.0173	0.0344	0.0329	0.0030	0.0327
Wald chi2	68.30 ***	30.21 ***	60.75 ***	133.97 ***	11.72	132.30 ***

Notes: (1) Standard errors in brackets, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. (2) In the estimation, we removed the samples that answered "unclear" when measuring the trust of family and friends and of other people, so the number of observation values in the regression is not consistent with the observation values in the descriptive statistical analysis above.

The results also showed that social capital had a significant impact on the credit availability of farmers. Among them, interpersonal relationship capital had a significant impact on the formal

and informal credit availability of farmers. This is consistent with our hypothesis. However, the impacts of financial relationship capital on the formal and informal credit availability of farmers were all non-significant. This is inconsistent with our hypothesis and the conclusions of most previous authors. It may be because the financial relationship capital of our sample farmers is generally weak, and only a few farmers have relatives working in banks, resulting in the estimated results not being statistically significant.

Specifically, for formal credit, the estimation results of models (1)–(3) were relatively consistent. For political relationship capital, the variable "cadre" had a significant positive impact on the formal credit availability of farmers, while the variable "party membership" had a positive but insignificant impact on the formal credit availability of farmers. These results also support the findings of Xu and Yang [46]. This shows that political relationship capital has a positive impact on farmers' formal credit availability. For interpersonal relationship capital, the variables "siblings" and "others_trust2" had a significant positive impact on the formal credit availability of farmers, while the variables "rela_trust1" and "rela_trust2" had a positive but insignificant impact on the formal credit availability of farmers. For organizational relationship capital, the impact of the variable "cooperative membership" on the formal credit availability of farmers was not significant. This may be because the development of farmer cooperative organizations is still not perfect in China. Many cooperative organizations are just in the form of cooperatives and have no substantive operations, which reduces the trust of formal financial institutions in cooperatives. Therefore, whether farmers participate in cooperative organizations or not has no significant impact on the formal credit availability of farmers [8].

For informal credit, the estimation results of models (4)–(6) were also relatively consistent. The variables "cooperative membership", "siblings", "rela_trust2", "others_trust1," and "others_trust2" all had a significant positive impact on the informal credit availability of farmers. This shows that farmers with better organizational relationship capital and interpersonal relationship capital are more likely to obtain loans from their relatives and friends. However, the impact of political relationship capital on the informal credit availability of farmers was not significant. This is inconsistent with our hypothesis, and we will use the more accurate method of PSM for testing before discussing this further.

5.2.2. Propensity Score Matching Estimation Results

The propensity score matching model can only deal with binary variables in general. However, the variables of farmers' education, trust in relatives and friends, and trust in other people are not binary variables. For such variables, some scholars point out that we can perform pairwise matching between groups, select one group at a time, and match with the rest of the groups one by one [47,48]. For the education variable, we took farmers with primary school or lower education as the control group, farmers with middle school education as one treatment group, and farmers with high school or above education as another treatment group. Then, we matched the two treatment groups with the control group one by one. Similarly, for the two trust variables, we took farmers who selected "very untrusted" and "not very trusted" as the control group, farmers who selected "generally trusted" as one treatment group, and farmers who selected "relatively trusted" and "very trusted" as another treatment group. Then, we also matched the two treatment groups with the control group one by one. There are many methods for propensity score matching. We used the bias-corrected matching estimator to measure the average treatment effect on the treated (SATT) variables of human and social capitals. The estimated results are shown in Table 5.

Table 5. The estimation results of the propensity score matching model.

Variables	Formal Credit Availability			Informal Credit Availability		
	SATT	S.E.	Z value	SATT	S.E.	Z value
Education: middle school	0.114	0.072	1.58	−0.004	0.036	−0.11
Education: high school or above	0.210	0.081	2.58 ***	0.022	0.060	0.37
Party membership	0.031	0.075	0.41	−0.012	0.058	−0.20
Cadre	0.224	0.099	2.25 **	0.127	0.075	1.70 *
Cooperative membership	−0.031	0.109	−0.29	0.265	0.078	3.41 ***
Trust of relatives or friends: general trust	0.024	0.109	0.22	0.005	0.101	0.05
Trust of relatives or friends: more trust	0.313	0.112	2.79 ***	0.220	0.095	2.32 **
Trust of other people: general trust	0.136	0.089	1.52	0.155	0.053	2.94 ***
Trust of other people: more trust	0.296	0.098	3.03 ***	0.168	0.056	2.98 ***

Notes: In the matching of farmers' education, we took farmers with primary school or lower education as the control group. In the matching of the trust between relatives or friends, we took farmers who thought their relatives or friends were not trustworthy as the control group. Additionally, in the matching of the trust of other people, we took farmers who thought other people were not trustworthy as the control group. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In terms of human capital, unlike the estimation results of the ordered probit model, the education level of farmers ("high school or above") had a significant positive impact on their formal credit availability. This indicates that, compared with farmers with primary school or lower education, farmers with high school or above education are more likely to obtain loans from formal financial institutions. This is inconsistent with the results of the ordered probit model but more consistent with our hypothesis. This may be because the PSM estimate excluded the effects of other factors and obtained the net impact of education on the credit availability of farmers. Our analysis is also mainly based on the estimated results of PSM. Farmers with higher education levels have a stronger credit consciousness, repayment ability, and willingness. They are more able to gain the trust of formal financial institutions. Other estimation results were consistent with the ordered probit model. Overall, based on the estimation results of the ordered probit and PSM models, human capital had a significant positive impact on the formal credit availability of farmers. However, its impact on the informal credit availability of farmers was not significant.

In terms of social capital, unlike the estimation results of the ordered probit model, the cadre status of farmers also had a significant positive impact on their informal credit availability at a 10% level. This indicates that the cadre status of farmers is also beneficial to them for obtaining loans from relatives and friends. This may be because rural cadres are generally elected by farmers and usually have a high prestige and credibility in the rural group. Other estimation results were consistent with the ordered probit model. Overall, based on the estimation results of the ordered probit and PSM models, the interpersonal relationship capital and political relationship capital of farmers had a significant positive impact on the formal and informal credit availability of farmers. The organizational relationship capital only had a significant positive impact on the informal credit availability of farmers. However, the impacts of financial relationship capital on the formal and informal credit availability of farmers were all insignificant, which may be related to our sample selection. Only a few farmers had relatives working in the financial sector. Therefore, the sample matching results may not have been ideal, and we do not comment on this here.

6. Conclusions and Suggestions

Based on the CHIP2013 database, we estimated the impact of human and social capitals on the formal and informal credit availability of farmers with the ordered probit model and the PSM model. The basic conclusions are as follows.

First, for the borrowing channels, farmers preferred to choose an informal channel. For the credit availability of farmers, about 31% of the sample farmers did not receive full loans, which is similar to the findings of Yu and Zhou (25.8%) [49]. This indicates that there is still room for further improvement of rural finance in China.

Second, human and social capitals both had a certain positive impact on the formal credit availability of farmers, while for informal credit the impact of social capital was more significant.

The hypothesis that social capital has a significant positive effect on the formal and informal credit availability of farmers has been confirmed, but the hypothesis that human capital has a positive effect on the informal credit availability of farmers has not been confirmed. This may be because the informal borrowing we studied was mainly between relatives and friends, which is mainly based on the social relationship between them. The trust and prestige formed by the social relationship based on blood, kinship, and geography have a great influence on farmers' borrowing. In such a relationship, the impact of farmers' education or health is relatively weak. This shows that formal financial institutions not only pay attention to the human capital of farmers but also to their social capital to reduce the risk of lending, while informal lenders, that is, their relatives and friends, pay more attention to the social capital of farmers.

Third, specifically for human capital, the education and health level of farmers had a positive and significant impact on their formal credit availability. Farmers with a higher education level, especially with a high school or above education level, were more likely to obtain loans from formal financial institutions. For social capital, interpersonal relationship capital had a positive impact on the formal and informal credit availability of farmers. This indicates that more siblings and a higher trust among relatives, friends, and others can greatly help farmers obtain loans. Organizational relationship capital only had a significant positive impact on the informal credit availability of farmers. This may be because the mutual assistance and supervision of cooperatives make it easier for farmers to obtain loans from cooperative members, including relatives and friends. However, cooperative organizations are not fully recognized by formal financial institutions, and this has no significant impact on the formal credit availability of farmers. For political relationship capital, compared with the party membership of farmers, farmers' cadre status can give farmers greater prestige and better help them obtain loans. This may be because the cadre identity information of farmers is a kind of explicit information, while the party membership information of farmers is a kind of relatively implicit information. The behavior of village cadres is more constrained, and the cost of default is higher. However, the hypothesis that financial relationship capital has a positive impact on the formal and informal credit availability of farmers has not been confirmed. This may be because the financial relationship capital of farmers is generally weak. Fewer farmers have relatives working in banks. In other words, in the estimation process, the difference in independent variables is small, difficult to render statistically significant. Based on this, we do not overly discuss the impact of financial relationship capital on the credit availability of farmers.

Based on the above conclusions, we can state the following recommendations. For farmers, improving their human capital and social capital has a positive effect on their access to credit. For example, improving farmers' education level, health level, and their prestige, joining cooperative economic organizations, and strengthening a close relationship with relatives and friends have important positive effects on improving the credit availability of farmers. For the government, first, in rural finance more farmers prefer to choose informal borrowing channels, and the role of formal financial institutions needs to be further improved. Second, in terms of human capital, improving the health and education of farmers can help them obtain formal loans. In particular, popularizing high school or above education levels can enhance the formal credit availability of farmers. Third, regarding social capital, Dinh et al. [35] argued that it is difficult to put forward an effective policy recommendation to the government or banks that generally fosters social capital. Moreover, such policy measures may have some unexpected and unnecessary side effects. However, we contend that improving the participation of farmer cooperative organizations and their social recognition may be an important and effective way to improve the credit availability of farmers. Only through the joint efforts of the government and farmers themselves, can we effectively improve the credit availability of farmers.

We have studied the impact of farmers' education and health (especially health) on the credit availability of farmers. Our study improved the research framework of human capital on farmers' credit availability to a certain extent. However, whether there is an interaction between human capital

and social capital, and how the interaction between them affects the credit availability of farmers, also has some research value.

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The Role of External Support on the Implementation of Resource Efficiency Actions: Evidence from European Manufacturing Firms

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Abstract: This paper contributes to analyze the relationship between firms' recourse to different types of external support and adoption of environmental sustainability practices. To this aim, we consider both direct financial support and indirect support, in the form of advice and consulting services, upon which the firm relies on in its efforts to be more resource efficient. The empirical analysis uses data on 6595 manufacturing firms from 35 European countries, taken from the third and fourth waves of the Flash Eurobarometer survey "Small and Medium Enterprises, Resource Efficiency and Green Markets". Our empirical findings suggest that firms using external financing and external advice are more likely to implement greening investments and practices. Moreover, we provide strong empirical evidence that external support significantly contributes to increase the benefits from the adoption of resource efficiency actions in terms of production cost reduction. This study further contributes to the existing literature by highlighting the heterogenous effects of direct and indirect external support on the environmental sustainability actions of both SMEs and large firms.

Keywords: external support; environmental practices; resource efficiency; sustainable entrepreneurship; firm size

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1. Introduction

In recent years, increasing attention has been paid to the adoption of resource and energy efficiency practices by firms, also as a result of government policies aimed at supporting the implementation of environmental technologies and eco-innovations. Energy and resource efficiency is a key pillar of the European Union's long-term strategic vision and it is part of the Sustainable Development Goals approved by the United Nations in the Agenda 2030, with the aim to encourage a profound systemic shift to a more sustainable economy.

Firms' adoption of measures for a more responsible and efficient use of natural resources is important both for overcoming the problem of resource scarcity and waste management, and for incentivizing sustainable development and innovation towards a circular economy [1]. The increase in energy consumption, the need to reduce emission of greenhouse gases, the progressive depletion of natural resources and the dependence on energy from countries characterized by unstable political regimes have generated the need for eco-innovative solutions. It follows that firms are called upon to change their business model, taking into greater account the environmental and social values.

Firms' ability to integrate and align multiple forms of value (commercial, economic and financial values and environmental and social values) within their business models is a timely and important issue that affects not only firms' development but even the economic system as a whole. The challenges in this field are numerous, especially for small and medium enterprises (SMEs). This new development model is based on the resource efficiency in a logic of circularity, and on innovation in terms of eco-design, with the aim to reduce negative externalities on the environment since the design and development phases.

The general benefits deriving from eco-sustainable practices are diversified according to the characteristics of the intervention, the degree of circularity of production processes, the external environment in which the company operates, and the role of the company in the value chain. Currently, the most common resource efficiency measures among firms include: the environmental management systems aimed at saving water, energy and greenhouse gas emissions; the prevalent use of energy from renewable sources; the minimization of waste and sale of waste materials to another company; the reuse of materials.

Environmental investments require a strategic long-term vision: they do not represent exclusively a cost item for companies, but a central factor in acquiring a competitive advantage in the medium and long term, a better reputation and different strategic positioning. The European Commission has repeatedly stressed that in order to support firms in developing new resource-efficient technologies and solutions, it is crucial for access to financing; nevertheless, the context of technological and market uncertainties related to the eco-innovations may contribute to increase the difficulty in access to external funding by firms. Moreover, to attract investment in eco-innovations can be difficult, as they are often characterized by high risk and long-term returns [2–4].

There are several factors that may hamper or delay the adoption of resource and energy efficiency measures [5]. The literature has documented the existence of direct negative effects of financial barriers on the adoption of resource and energy efficiency practices [6,7]. For this reason, many targeted public financing programs have been proposed by both EU and non-EU countries, and a large set of financial instruments and services have been designed by financial intermediaries to support firms' investments. However, only in a few cases has the link between different types of external support and the adoption of resource efficiency practices been analyzed [8].

In this paper, we shed light on the relationship between the use of different types of external support and the adoption of eco-innovative practices by small and medium enterprises. To this aim, extending the analysis of Bodas-Freitas and Corrocher [8], we consider both direct financial support and indirect support in the form of advice and consulting services related to the adoption of resource efficiency practices. Furthermore, as a novel contribution to the literature, in this study, we assess the presence of firm-size heterogeneities in the effects of direct and indirect support on firms' engagement in the greening process. In fact, while the environmental behavior of small- and medium-sized enterprises has been extensively analyzed, that of large firms is still broadly unexplored. Our analysis relies on cross-sectional data from the third and fourth waves of the Flash Eurobarometer surveys "Small and Medium Enterprises, Resource Efficiency and Green Markets" [9,10]. In particular, our estimation sample consists of 6595 manufacturing firms from 35 European countries. The empirical analysis is carried out by means of a propensity score matching approach, which compares the effect of the treatment (in our case, the use of external support) between the subsamples of treated and untreated firms with similar observable characteristics. This methodology allows us to produce an estimate of the average additional effect of external support on the probability of adopting resource efficiency practices and on the benefits from the adoption, the so-called average treatment effect on the treated (ATET).

Our main results suggest that firms using external financial advice are more likely to implement greening investments and practices, including re-engineering and waste management actions. Moreover, we provide strong empirical evidence that external support significantly contributes to increase the benefits from the adoption of resource efficiency measures in terms of production cost reduction. This study further contributes to the existing literature by providing strong empirical evidence of the heterogeneous effects exerted by direct and indirect external support on different types of environmental practices of both SMEs and large firms. In this latter respect, our findings suggest that while SMEs' implementation of environmental practices strongly depends on both external financing and indirect support, large firms tend to rely more on internal financial resources and

mainly benefit from the recourse to external advice and consulting services to support their efforts to be more resource efficient.

The paper is structured as follows. Section 2 provides an overview of the background literature. Section 3 describes the data, while Section 4 illustrates the methodology. Section 5 presents and discusses the main results and Section 6 offers some concluding remarks and policy implications.

2. Literature Review

In the literature, there are many attempts to develop a taxonomy of the barriers to investments in energy and resource efficiency practices. Sorrell et al. [11] classify these barriers according to economic, organizational, or behavioral categories, observing that they may co-exist and overlap each other. Rentschler et al. [12] propose a taxonomy consisting in the following five categories: scarce information, low capacity, financial constraints, uncompetitive market structures and fiscal mismanagement. In particular, they observe how the theoretical assumptions of perfect and efficient markets are violated in practice, and how this results in investment barriers. Analogously, Jordan et al. [13] demonstrate that deficits in innovation culture, inter-firm cooperation along the value chain, finance, awareness and take-up of government funds limit the adoption of resource efficiency measures. They propose a policy mix, comprising government funding schemes, innovation agents and innovation laboratories, to support firms in implementing resource efficiency procedures.

Previous empirical studies have also focused attention on the role of external support on the adoption of different environmental practices. Bodas-Freitas and Corrocher [8] assess the impact of both direct financial support and indirect external support, in term of advice and consultancy, on the adoption of resource efficiency practices. They find that both types of external support positively affect the firm's implementation of resource efficiency measures and the cost-reduction benefits of adopting resource efficiency practices. They also point out that financial support has a direct effect on the benefits from the adoption, while the recourse to advice and consultancy support affects them indirectly, by supporting the implementation of complementary technological and managerial solutions. Accordingly, Hoogendoorn et al. [14] show that companies that receive external financial support are not only more likely to invest in practices related to production processes (greening processes), but they are also more likely to offer green products and services.

Firms recognize limited access to capital as one of the most common barriers to resource efficiency [12,15]. In particular, small and medium-sized enterprises experience greater difficulties in access to financing. These firms are typically characterized by scarce own funds and usually rely on bank loans than equity to finance their activity; moreover, the lack of collateral and the dependence by few clients may contribute to the perception of vulnerability and risk by financial intermediaries and limit the probability of advantageous funding conditions [16]. Furthermore, investments in eco-innovations and resource efficiency are characterized by high technical risks and longer-term returns, hence financial constraints are particularly relevant for these kinds of investments and may further contribute to affect firms' probability of experiencing liquidity constraints [2,17]. The adoption of energy and resource efficiency measures, even when it represents a profitable investment, has a crucial barrier in the lack of access to capital. Anderson and Newell [18] and Thollander et al. [19], among others, conclude that the initial investment costs negatively affect the adoption rate, especially for larger investments. Moreover, during periods of banking sector instability, as, for example, financial and economic crises, the restricted access to credit may further contribute to limit firms' resource efficiency investments [12].

To overcome financial constraints and capital–market imperfections, many public policy measures have been introduced with the aim to complement inefficient credit markets and provide SMEs with financial incentives and assistance supporting the innovation process [13,20]. Investment subsidies or soft loans can contribute to the dissemination of energy-efficiency measures in SMEs [7] and can increase access to finance for eco-innovative

activities. Access to public funds and incentives is considered effective for improving a firm's ability to introduce eco-innovations. In this respect, Ghisetti [21] shows the crucial role of governmental demand in shaping the direction and speed of environmental innovations in the manufacturing sector. Accordingly, Özbuğday et al. [22] provide evidence of a positive and statistically significant effect of resource efficiency investments on SMEs' growth performances and suggest that an effective policy that governments could adopt to boost green growth is to give public subsidies to support resource efficiency investments of SMEs operating in energy-intensive sectors.

According with the previous remarks, we thus posit our first research hypothesis:

Hypothesis 1 (H1). *Access to private and public external financing enhances firms' engagement in different types of environmental practices and improves the benefits from the adoption of greening processes.*

Both banks and institutional investors, as well as policy makers, thus exert a crucial role in mobilizing a large amount of funds and allocating them to long-term environmental or eco-innovative projects that are often characterized by immature technologies or complex technological systems [23]. On the other hand, it is worth remarking that the extent to which banks appreciate the potential profitability of resource efficiency projects also depend on a firm's ability to report efficiency practices and communicate the related opportunities [24]. In this sense, the lack of information on these technologies or the lack of specific expertise by firms are further important obstacles that may hamper their access to financial resources. Previous studies point out that more than half of the European SMEs recognize information constraints as an obstacle to improving resource efficiency [9,10,25] and that smaller enterprises have a greater perception of the barriers to energy efficiency than larger ones, discouraging them from adopting energy-efficient technologies and practices [26]. In addition to the knowledge gaps, SMEs' capabilities to implement new measures of resource and energy efficiency may be constrained by the lack of time, human capital, managerial/organizational factors, and informal management of sustainability issues [16,27]. Thus, external advice and consultancy may provide firms with the competencies necessary to implement resource efficiency actions, enhance the efficiency of these measures and allow sustainable innovations [28]. Accordingly, Horbach et al. [29] show that eco-innovative activities require more external sources of knowledge and information compared to other types of innovations; moreover, they confirm the central role of regulation and cost savings as motivations for eco-innovations. In addition to these knowledge gaps, SMEs are typically characterized by organizational rigidity that act as barriers to firm performance and have a significant impact on innovation capability [30]. Moreover, firms with strong business networks and easy access to knowledge and technology are more likely to conduct eco-innovation activities [23].

The pursuit of green growth requires direct financial investments and indirect forms of external support, involving both private and public actors. In particular, consultancy or other advice are aimed at filling organizational, knowledge and technical gaps, that can be provided by suppliers, consulting firms or public research institutions. Thus, while financial barriers result into low capital availability and low access to external funding opportunities and contribute to hamper firms' innovation and growth, the difficulty of identifying cost-effective resource efficiency projects represents an additional limit to the implementation of resource efficiency practices by firms. Thus, the recourse to both external funding and advice may significantly mitigate issues related to the scarcity of financial resources and the lack of expertise and knowledge, enhancing SMEs' ability to implement technologies and practices that can achieve savings in resources and production costs [8,29]. As observed by Ghisetti et al. [2], small firms face major difficulties in getting credit for their eco-innovation investments compared to large enterprises, which may have direct access to capital markets and have more developed skills and competencies to engage in environmental practices [14].

While the role of different types of external support on the environmental behavior of small and medium firms has been extensively analyzed, the effect on the greening processes of large enterprises still remains largely unexplored. Smaller firms are usually considered as lacking skills, knowledge and financial resources to implement environmental management systems [31,32], while larger enterprises are assumed to be more resourceful and proactive and so are more capable of enjoying the benefits deriving from the implementation of resource efficiency practices [33]. In this respect, openness to external sources of knowledge which could help small and medium firms to overcome the lack of internal capabilities and resources for the adoption of environmental activities [2]. Differences in strategic resource allocation patterns between small and large firms are also found to be related to firms' characteristics and organizational costs [34]. Moreover, Kalar et al. [35] pointed out that firms in the innovative stage of their organizational life-cycle are not only characterized by different resource efficiency strategies, but also have different external support needs than firms in the conservative stage. A further input for the environmental behavior of SMEs can derive from the "stakeholder perspective", according to which smaller firms are much more responsive to external pressure by stakeholders than large firms [14]. The relationship between stakeholder pressures and environmental strategy is found to vary with firm size [36]. In particular, SMEs pay more attention to achieve and maintain a good reputation, while large firms are better able to manage external pressures. On the other hand, as highlighted by Wong et al. [33], in many countries, large firms are often state-owned or subsidized by the government, so they could face governmental pressures for their involvement in environmental management.

Based on the discussion above, we posit and test the following two hypotheses:

Hypothesis 2 (H2). *Indirect external support, in the form of advice and consulting, facilitates the adoption of resource efficiency measures and increases the cost-reduction benefits from the adoption of such actions.*

Hypothesis 3 (H3). *The impact of alternative forms of external support on the extent and types of environmental practices is characterized by significant heterogeneity with respect to firm size.*

3. Data and Descriptive Analysis

3.1. Data Sources

To investigate firms' engagement in environmental practices, we rely on data from the Flash Eurobarometer survey "SMEs, resource efficiency and green markets" [9,10]. This survey is focused on SMEs and large firms operating in the Manufacturing, Retail, Services and Industry sectors in the 28 European Union Member States and other European and non-European countries. The survey provides detailed information on firms' investment and implementation of resource efficiency practices and use of different types of external support to introduce these measures, together with data on several firm-level characteristics. For the aims of our study, we combine cross-sectional data from two independent waves of the survey (the third and the fourth, referred, respectively, to years 2015 and 2017) and focus on manufacturing firms from 35 European countries (including both EU and non-EU states). The final estimation sample consists of a total of 6595 enterprises.

3.2. Outcome Variables

To assess firms' adoption of green processes, we consider several alternative measures. We first define a set of binary variables indicating which actions the firm is undertaking to be more resource efficient. In particular, we define 9 dummies equal to 1 if the firm has adopted actions to save water, save energy, use predominantly renewable energy, save materials, minimize waste, sell scrap material, recycle by reusing material or waste, design products that are easier to maintain or repair, and other resource efficiency measures. As in Bodas-Freitas and Corrocher [8], we sum these dummies to define alternative variables that count the number of resource efficiency practices implemented by the enterprise. We

first define a variable (*Resource Efficiency Actions*) counting the number of any resource efficiency measure adopted and taking values from 0 to 9. Then, we build two variables accounting for the different type of practices and define the variable *Re-engineering Actions* that counts the number of practices requiring process re-engineering (i.e., saving water, saving energy, using renewable energy, saving materials, and designing products easier to maintain/repair) and the variable *Waste Management Actions* that counts the number of practices related to waste management (i.e., minimizing waste, selling scrap material, recycling). As it can be noticed form Table 1, the number of resource efficiency actions implemented by the enterprises increases with firm size, according to the consideration that large firms have more resources to invest in greening processes. In particular, the number of re-engineering actions is equal to 2.459 in the subsample of SMEs, rising to 3.030 in that of large firms; analogously, the number of waste management actions varies from 1.693 for small and medium enterprises to 2.103 for large ones.

Table 1. Descriptive statistics.

	(1)	(2)	(3)
	Whole Sample	**SMEs**	**Large Firms**
(a) Outcome variables			
Resource Efficiency Actions	4.284	4.166	5.149
Re-engineering Actions	2.528	2.459	3.030
- Saving Water	0.500	0.477	0.682
- Saving Energy	0.699	0.680	0.851
- Using Renewable Energies	0.168	0.158	0.244
- Saving Materials	0.665	0.649	0.788
- Re-designing Products	0.330	0.319	0.417
Waste Management Actions	1.742	1.693	2.103
- Reducing Waste	0.679	0.664	0.800
- Selling Scrap Materials	0.494	0.471	0.679
- Recycling Materials	0.454	0.437	0.590
Other RE Actions	0.013	0.013	0.016
RE Investment	0.464	0.461	0.486
Production Costs Decreased	0.550	0.530	0.704
(b) Treatment variables			
Any External Support	0.276	0.253	0.445
External Funding	0.125	0.117	0.187
External Advice	0.192	0.173	0.331
External Funding and Advice	0.070	0.064	0.119
(c) Independent variables			
Age	30.694	28.924	44.470
Small	0.333	0.376	0.000
Medium	0.282	0.318	0.000
Large	0.114	0.000	1.000
Low turnover	0.471	0.522	0.077
Own financial resources	0.709	0.701	0.771
Own technical competencies	0.638	0.627	0.719
B2C Market	0.476	0.489	0.372
B2B Market	0.833	0.828	0.875
PA Market	0.243	0.246	0.218
2017	0.496	0.492	0.529

Notes: The table reports average values of the outcome, treatment and independent variables computed on the whole sample and on the subsamples of SMEs and large firms. Descriptive statistics are computed sample weights. **Source**: Own elaboration on Eurobarometer data.

We also consider firms' investment in resource efficiency as an additional proxy of involvement in greening processes and define a binary indicator (*Resource Efficiency Investment*) identifying firms that, over the last two years, invested at least 1% of their annual turnover to be more resource efficient. Even in this case, larger firms show a higher

average value of the *Resource Efficiency Investment* indicator (0.486) with respect to small and medium ones (0.461), demonstrating that large firms have a greater propensity to invest part of their turnover in greening processes.

Finally, in order to assess the benefits from the adoption of resource efficiency practices, we define the dummy variable *Production Costs Decreased*, which is equal to 1 if the undertaken resource efficiency actions have contributed to decrease production costs over the past two years. This variable highlights that those firms that have higher environmental awareness also experience higher cost savings. Coherently with previous results, large firms experience larger savings in production costs (0.704), while SMEs have a slightly lower value (0.530). In any case, it is evident how the adoption of energy efficiency practices produce significant benefits in terms of reduction of production costs.

3.3. Treatment Variables

In our empirical analysis, we aim at investigating the role of the external support in the form of financial funding and business/technology advice on different types of external support on firms' implementation of resource efficiency practices and on the benefits derived from the adoption of greening processes. Following Hoogendorm et al. [14] and Bodas-Freitas and Corrocher [8], we consider alternative proxies for a firm's recourse to external support for implementing resource efficiency measures. First, we define a dichotomous variable (*Any External Support*) indicating whether the firm has relied on any form of external support in its efforts to be more resource efficient. Then, we define two additional dummies to distinguish between the use of (public and private) external financial support (*External Funding*) and the use of (public and private) advice and consultancy (*External Advice*). Finally, we define a binary variable (*External Funding and Advice*) identifying those firms that use both types of external supports, in order to assess the presence of possible complementarities on the effect of external funding and consultancy on the adoption of resource efficiency measures.

From Table 1, we notice that 27% of the firms in our sample use any form of external support; this percentage is equal to 25% for SMEs and increases to about 45% for large enterprises. External advice is the type of support mainly used by both SMEs and large firms, while only 6% of SMEs and nearly 12% of large firms rely on the combined use of funding and advice. The differences in average values of the resource efficiency indicators by support type are presented in Table 2. These values are always positive and statistically significant, with the only exception of the residual category *Other RE Actions*, demonstrating that the positive impact of external support on the implementation of greening actions. The practices requiring process re-engineering present the highest values: they range from 43%, when we consider any type of external support to 73% when the firm uses both external funding and advice. In particular, the combined use of direct and indirect external support (column 4) highlights the greatest effect on all the types of resource efficiency actions. When we consider investments in resource efficiency practices, we highlight that the highest impact is exerted by access to external funding, demonstrating that this type of external support significantly contributes to boost firm investments in greening practices. Finally, the effect of the different types of external support on the reduction of production costs varies from 7.7 to 15.1%, with the highest impact exerted by the combined use of external financing and advice. These results demonstrate that the use of any type of external support contributes to the increasing benefits for firms and could represent an incentive for the adoption of greening actions.

Table 2. Differences in average values of resource efficiency indicators by external support.

	(1)	(2)	(3)	(4)
	Any External Support	**External Funding**	**External Advice**	**External Funding and Advice**
(a) Resource Efficiency Actions	0.762 ***	0.783 ***	1.027 ***	1.209 ***
(a1) Re-engineering Actions	0.434 ***	0.471 ***	0.577 ***	0.732 ***
- Saving Water	0.082 ***	0.090 ***	0.118 ***	0.175 ***
- Saving Energy	0.113 ***	0.110 ***	0.140 ***	0.213 ***
- Using Renewable Energies	0.091 ***	0.118 ***	0.102 ***	0.166 ***
- Saving Materials	0.063 ***	0.064 ***	0.106 ***	0.183 ***
- Re-designing Products	0.085 ***	0.089 ***	0.113 ***	0.169 ***
(a2) Waste Management Actions	0.329 ***	0.311 ***	0.456 ***	0.489 ***
- Reducing Waste	0.122 ***	0.103 ***	0.161 ***	0.221 ***
- Selling Scrap Materials	0.140 ***	0.150 ***	0.178 ***	0.246 ***
- Recycling Materials	0.067 ***	0.058 ***	0.116 ***	0.142 ***
(a3) Other RE Actions	−0.002	−0.001	−0.006	−0.010
(b) RE Investment	0.112 ***	0.143 ***	0.109 ***	0.147 ***
(c) Production Costs Decreased	0.077 ***	0.090 ***	0.098 ***	0.151 ***

Notes: The table reports (unconditional) differences in the means/proportions of the outcome variables between the subsamples of firms recurring and not recurring to the different types of external support measures considered. ***, ** and * denote significance of the differences in means/proportions at the 1, 5 and 10% levels, respectively. **Source**: Own elaboration on Eurobarometer data.

3.4. Independent Variables

As in Hoogendorm et al. [14] and Bodas-Freitas and Corrocher [8], we control for observable firm-level characteristics that might affect firms' decision to adopt environmental practices and to recur to external support. First, we control for firm age (in years) and size using binary indicators for *Small* (with 10–49 employees), *Medium* (with 50–249 employees) and *Large* (with 250 or more employees) enterprises (considering *Micro* firms with less than 10 employees as reference group). We also control for firm turnover by means of a dummy indicating firms with a turnover lower than 2 million Euro (*Low turnover*). Second, as a firm's decision to adopt resource efficiency measures depends not only on the external support received, but also on internal funds and competencies, we define two dummies (*Own financial resources* and *Own technical competencies*) to control whether the firm relies on its own financial resources and its own technical expertise to implement greening processes. Third, we control for the firm's market segment by means of three non-exclusive binary variables indicating whether the firm sells products or services directly to consumers (*B2C Market*), to other companies (*B2B Market*) and to public administrations (*PA Market*). Finally, we include survey year and country fixed effects, to control for heterogeneities in environmental practices and recourse to external support over time and across countries. Table A1 in the Appendix A reports complete variable definitions.

4. Methods

To assess the impact of external support on the firm's implementation of greening processes, we use a propensity score matching approach, which compares the effect of the treatment (i.e., the recourse to external support) in the subsamples of treated and untreated firms with similar observable characteristics. In particular, following previous literature [8,21,22], we focus on the additional effect of the external support on the adoption

of resource efficiency actions and use Kernel matching algorithms to estimate the average treatment effect on the treated (ATET). Formally, the ATET can be written as:

$$ATET = E(Y_1 - Y_0|D = 1) = E(Y_1|D = 1) - E(Y_0|D = 1) \quad (1)$$

where $D = 1$ indicates a firm's recourse to external funding and/or advice in its effort to be more resource efficient (treatment variable) and Y_1 and Y_0 represent the potential outcomes with and without treatment, i.e., the greening processes adopted by those firms that have recurred or have not recurred to external support, respectively. The ATET is the average treatment effect ($ATE = E(Y_1 - Y_0) = E(Y_1) - E(Y_0)$) computed on the subsample of treated units. The last equality in Equation (1) highlights the counterfactual nature of a causal effect. The first term, $E(Y_1|D = 1)$, is the average outcome of treated units, which is an observable quantity. The second term, $E(Y_0|D = 1)$, refers instead to the average outcome of treated units had they not been treated; this quantity cannot be observed and a proper substitute for it has to be chosen in order to estimate the ATET.

When selection to treatment is not random (as it is in the case of a firm's decision to recur to external support), the treatment D is not probabilistically independent from Y_1 and Y_0, giving rise to a selection bias and preventing proper identification of treatment effects. However, it is still possible to identify causal effects from observational data by assuming that the non-random assignment to treatment is driven by individual observable factors $\mathbf{x}$. Under selection on observables, the knowledge of $\mathbf{x}$ may be sufficient to identify the causal parameters, even in a case of non-random assignment. In particular, as discussed in Rosenbaum and Rubin [37], the condition of randomization is restored by means of the so-called *Conditional Independence Assumption* (CIA), stating that, conditional on $\mathbf{x}$, Y_1 and Y_0 are probabilistically independent of D: $(Y_1; Y_0) \perp D|\mathbf{x}$. When the interest is in measuring average effects, it is possible to rely on a weaker assumption, the so-called *Conditional Mean Independence* (CMI), assuming that $E(Y_1|D, \mathbf{x}) = E(Y_1|\mathbf{x})$ and $E(Y_0|\mathbf{x}, D) = E(Y_0|\mathbf{x})$. Assuming CMI, we obtain that:

$$ATET(\mathbf{x}) = E(Y_1|\mathbf{x}, D = 1) - E(Y_0|\mathbf{x}, D = 1,) = E(Y|\mathbf{x}, D = 1) - E(Y|\mathbf{x}, D = 0) \quad (2)$$

which shows that, by conditioning on $\mathbf{x}$, the $ATET(\mathbf{x})$ depends on observable quantities and it is thus correctly identified and no bias emerges. By averaging $ATET(\mathbf{x})$ over the support of $\mathbf{x}$, we can then obtain the global effect:

$$ATET = E_{\mathbf{x}}\{ATET(\mathbf{x})\} \quad (3)$$

implying that an estimation of the ATET can be obtained by the sample equivalent:

$$\hat{ATET} = \frac{1}{\sum_{i=1}^{N} D_i} \left\{ \sum_{i=1}^{N} D_i[\hat{m}_1(\mathbf{x}_i) - \hat{m}_0(\mathbf{x}_i)] \right\} \quad (4)$$

where $\hat{m}_1(\mathbf{x}_i)$ and $\hat{m}_0(\mathbf{x}_i)$ are consistent estimators of $E(Y|\mathbf{x}, D = 1)$ and $E(Y|\mathbf{x}, D = 0)$, respectively. Besides CMI, identification of average treatment effects (ATEs) also requires the *Overlap Assumption* (OA), which states that, for each unit, the probability to get treated given $\mathbf{x}$ (i.e., the *propensity score*) must be $0 < P(D = 1|\mathbf{x}_i) < 1$ (i.e., units with a given set of observable characteristics $\mathbf{x}$ have to belong to both the treated and untreated groups).

One of the most frequently used approaches to estimate average treatment effects under the assumption of selection on observables is Propensity Score Matching (PSM) [38,39]. In general, the basic idea of matching approaches is to determine a group of untreated units (*control group*) with similar values of the observable characteristics in $\mathbf{x}$ compared to those

of the treated units. Then, an estimate of the ATET can be obtained as the mean of the differences between the observed outcomes and the counterfactual values:

$$\hat{ATET}_M = \frac{1}{N_1} \sum_{i \in D_i = 1} \left(Y_{1i} - \hat{Y}_{0i} \right) = \frac{1}{N_1} \sum_{i=1}^{N} D_i \left(Y_{1i} - \hat{Y}_{0i} \right) \quad (5)$$

where $D_i = 1$ identifies the set of treated units and the counterfactual outcome $\hat{Y}_{0i}$ is equal to Y_i if $D_i = 0$ and to a weighted average of the observed outcomes for the untreated units j chosen as matches for the treated unit i, $\sum_{j|D=0} w_{ij} Y_j$, if $D_i = 0$.

Rosenbaum and Rubin [37] suggested to match units according to the propensity score $\pi(\mathbf{x}_i) = P(D = 1|\mathbf{x}_i)$, which is the conditional probability of receiving the treatment given the confounding variables $\mathbf{x}$. In fact, if the CIA holds, it follows that $(Y_1; Y_0) \perp D|\pi(\mathbf{x})$ and average causal effects can be thus estimated by conditioning on the propensity score $\pi(\mathbf{x})$ instead of $\mathbf{x}$ (*Unconfoundedness Property*), reducing the multidimensionality of $\mathbf{x}$ to a single scalar dimension. The propensity score also entails that $D \perp \mathbf{x}|\pi(\mathbf{x})$, which implies that, conditionally on $\pi(\mathbf{x})$, the treatment D and the observables covariates $\mathbf{x}$ are independent (*Balancing Property*). This property states that if $\pi(\mathbf{x})$ is correctly specified, then units stratified according to the propensity score should be indistinguishable in terms of their observable characteristics $\mathbf{x}$. Testing empirically the balancing property thus allows to assess whether the correct propensity score is being used.

The typical PSM procedure to compute ATEs consists of the following steps [40]:

(1) estimate a probit or logit model for the probability of receiving the treatment and compute the propensity score for each unit in the sample;
(2) choose an appropriate matching algorithm, using a specific distance metric based on the estimated propensity score, and then match treated units with untreated units;
(3) test the balancing property by comparing, for each covariate in $\mathbf{x}$, the mean of the treated with the mean of the controls selected by the matching algorithm used;
(4) if the balancing is satisfied, calculate average treatment effects, otherwise modify the probit/logit specification until the balancing is satisfied.

In our empirical analysis, we use a probit specification to model a firm's probability to recur to alternative types of external support, as a function of the independent variables presented in Section 3.4, and estimate the propensity score. Then, following Heckman et al. [41], we use an Epanechnikov Kernel matching algorithm with automatic bandwidth selection [42], which matches every treated unit with a weighted average of all control units with weights that are inversely proportional to the distance between treated and control units. After testing for balancing, we estimate the ATET using Equation (5) to assess the impact of external support on a firm's adoption of resource efficiency measures.

5. Results and Discussion

5.1. The Effect of External Support on Firms' Implementation of Resource Efficiency Practices

To calculate propensity scores, we estimate alternative probit models to evaluate a firm's probability to recur to different types of external support, as a function of the observable characteristics discussed in Section 3.4. Probit estimation results are reported in Table 3. Estimated coefficients show that firm size has a positive and statistically significant effect on the recourse to external support, while firm age has a positive and significant impact only for the recourse to external advice, but it is not statistically significant for the other types of support. Firms with a turnover lower than 2 million Euro have a lower probability to recur to external support, whereas the availability of own internal financial resources and technical competencies tend to foster the combined use of external funding and advice, rather than single forms of support. Furthermore, we find that the firm's market segment significantly affects its propensity to recur to the different types of external support. Finally, we provide evidence of significant heterogeneity in the recourse to external support both across countries and over time.

Table 3. Probit estimates of the propensity to recur to external support.

	(1)	(2)	(3)	(4)
	Any External Support	**External Funding**	**External Advice**	**External Funding and Advice**
Age	0.0008	0.0004	0.0017 **	0.0006
	(0.0008)	(0.0008)	(0.0008)	(0.0009)
Small	0.3095 ***	0.2388 ***	0.3110 ***	0.2595 ***
	(0.0530)	(0.0637)	(0.0610)	(0.0824)
Medium	0.5280 ***	0.4253 ***	0.5563 ***	0.5194 ***
	(0.0617)	(0.0723)	(0.0695)	(0.0900)
Large	0.8147 ***	0.5384 ***	0.7865 ***	0.5425 ***
	(0.0753)	(0.0869)	(0.0826)	(0.1070)
Low turnover	−0.1598 ***	−0.0637	−0.1687 ***	−0.1341 **
	(0.0457)	(0.0540)	(0.0505)	(0.0666)
Own financial resources	−0.1739 ***	−0.0406	−0.0430	0.1112 *
	(0.0399)	(0.0476)	(0.0437)	(0.0589)
Own technical competencies	−0.1881 ***	−0.0958 **	−0.0350	0.1452 **
	(0.0382)	(0.0449)	(0.0423)	(0.0572)
B2C Market	0.0551	0.1388 ***	0.0017	0.1551 ***
	(0.0426)	(0.0502)	(0.0470)	(0.0597)
B2B Market	0.1993 ***	0.1621**	0.1534 **	0.1604 *
	(0.0566)	(0.0673)	(0.0642)	(0.0836)
PA Market	0.0788*	0.1191 **	0.1123 **	0.1309 **
	(0.0457)	(0.0534)	(0.0496)	(0.0617)
2017	0.1513***	−0.0788*	0.1416 ***	−0.0035
	(0.0359)	(0.0425)	(0.0394)	(0.0507)
Intercept	−0.7398 ***	−1.2527 ***	−1.2111 ***	−1.9315 ***
	(0.1257)	(0.1441)	(0.1381)	(0.1789)
Country FE [*p*-value]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
N	6137	6137	6137	5955
Log-Likelihood	−3274.88	−2164.45	−2627.13	−1451.93
Pseudo R^2	0.0947	0.0646	0.1238	0.1063
Wald c^2 [*p*-value]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
% of Correctly Predicted	73.37	87.49	80.80	92.24

Notes: The table reports results obtained from probit estimation of the conditional treatment probability on all the covariates for the different types of external support measures considered. Bootstrapped (200 replications) standard errors are reported in parentheses. ***, ** and * denote significance of the parameters at the 1, 5 and 10% levels, respectively. **Source**: Own elaboration on Eurobarometer data.

Based on these probit estimations, we estimate propensity scores for each unit in the sample and we use an Epanechnikov Kernel matching algorithm, with automatic bandwidth selection and imposing common support, to match treated and untreated units and estimate average treatment effects. Table 4 presents the main results of the propensity score matching for the effect of the different types of external support on a firm's resource efficiency actions and investment behavior and on the benefits from the adoption of such actions (in terms of reduction in production costs) for the whole sample.

Table 4. Impact of external support on resource efficiency actions: ATETs for the whole sample of firms.

	(1)		(2)		(3)		(4)	
	Any External Support		**External Funding**		**External Advice**		**External Funding and Advice**	
	ATET		**ATET**		**ATET**		**ATET**	
(a) Resource Efficiency Actions	0.426	***	0.468	***	0.552	***	0.653	***
	(0.057)		(0.076)		(0.060)		(0.080)	
(a1) Re-engineering Actions	0.262	***	0.298	***	0.325	***	0.422	***
	(0.039)		(0.053)		(0.044)		(0.056)	
- Saving Water	0.067	***	0.068	***	0.093	***	0.091	***
	(0.015)		(0.022)		(0.019)		(0.025)	
- Saving Energy	0.073	***	0.070	***	0.079	***	0.086	***
	(0.012)		(0.015)		(0.013)		(0.016)	
- Using Renewable Energies	0.049	***	0.084	***	0.043	**	0.107	***
	(0.012)		(0.018)		(0.017)		(0.024)	
- Saving Materials	0.033	**	0.026	*	0.057	***	0.063	***
	(0.015)		(0.015)		(0.014)		(0.019)	
- Re-designing Products	0.039	***	0.051	***	0.053	***	0.075	***
	(0.015)		(0.019)		(0.019)		(0.025)	
(a2) Waste Management Actions	0.164	***	0.167	***	0.230	***	0.233	***
	(0.027)		(0.038)		(0.030)		(0.043)	
- Reducing Waste	0.069	***	0.057	***	0.080	***	0.080	***
	(0.012)		(0.018)		(0.013)		(0.017)	
- Selling Scrap Materials	0.071	***	0.084	***	0.088	***	0.106	***
	(0.014)		(0.021)		(0.016)		(0.023)	
- Recycling Materials	0.025		0.026		0.061	***	0.047	*
	(0.016)		(0.019)		(0.019)		(0.026)	
(a3) Other RE Actions	0.000		0.003		−0.002		−0.002	
	(0.003)		(0.004)		(0.003)		(0.003)	
(b) Resource Efficiency Investment	0.108	***	0.133	***	0.099	***	0.124	***
	(0.016)		(0.021)		(0.018)		(0.027)	
(c) Production Costs Decreased	0.060	***	0.068	***	0.070	***	0.076	***
	(0.016)		(0.020)		(0.017)		(0.024)	
Bandwidth	0.011		0.013		0.006		0.004	
Matched sample:								
N. treated	1695		766		1172		459	
N. controls	4441		5369		4961		5493	
Region of common support	[0.022, 0.777]		[0.015, 0.427]		[0.012, 0.699]		[0.005, 0.383]	
Matching quality indicators:	*Before*	*After*	*Before*	*After*	*Before*	*After*	*Before*	*After*
Pseudo-R2	0.095	0.001	0.065	0.001	0.124	0.001	0.106	0.002
Mean bias	9.9	0.8	8.6	0.8	12.8	0.8	13.5	1.1
Median bias	8.1	0.6	8.1	0.6	11.4	0.7	12.0	0.8
B	77.9	7.0	69.7	7.0	93.2	7.8	94.7	10.6
R	0.79	0.84	0.68	0.97	0.74	0.85	0.72	0.90

Notes: The table reports the ATETs of different types of external support measures on alternative indicators of resource efficiency actions and on the benefit from the implementation of RE actions (in terms of reductions in production costs), estimated on the whole sample of firms. The ATETs are computed using Epanechnikov kernel matching, with automatic bandwidth selection and imposing common support, performed using the Stata module *kmatch* by Jann [42]. Bootstrapped (200 replications) standard errors are reported in parentheses. Pseudo-R^2 is obtained from probit estimation of the conditional treatment probability on all the covariates on the matched sample. Mean bias and median bias are summary indicators of the distribution of the absolute standardized percentage bias for each covariate after matching. B and R are the standardized difference in the means and the ratio of the variances of the propensity scores between treated and untreated firms after matching, respectively. ***, ** and * denote significance of the ATETs at the 1, 5 and 10% levels, respectively. **Source**: Own elaboration on Eurobarometer data.

Before discussing the estimated treatment effects, we focus on assessing the quality of the matching. The indicators reported in the bottom part of Table 4 provide support to the effectiveness of the matching procedure in restoring balancing in the covariates. In particular, the values of pseudo-R^2 decrease substantially after matching and almost approach zero for all the models. Similarly, the mean and median values of the absolute standardized percentage bias are remarkably lower after matching. Additionally, the values of both the standardized difference in the means (Rubin's *B*) and the ratio of the variances (Rubin's *R*) of the propensity scores between treated and untreated firms after matching are always within the ranges suggested by Rubin [43] for a balanced distribution of covariates (i.e., less than 25 for *B* and between 0.5 and 2 for *R*), providing support to post-matching balancing. Finally, Figure 1 reports kernel density plots for the estimated propensity scores of treated and untreated units before and after matching. For the matched sample, the plots are almost indistinguishable, confirming that matching on the estimated propensity score has balanced the covariates. Overall, the evidence obtained suggests that there are no systematic differences in the distribution of observable characteristics between treated and untreated firms after matching.

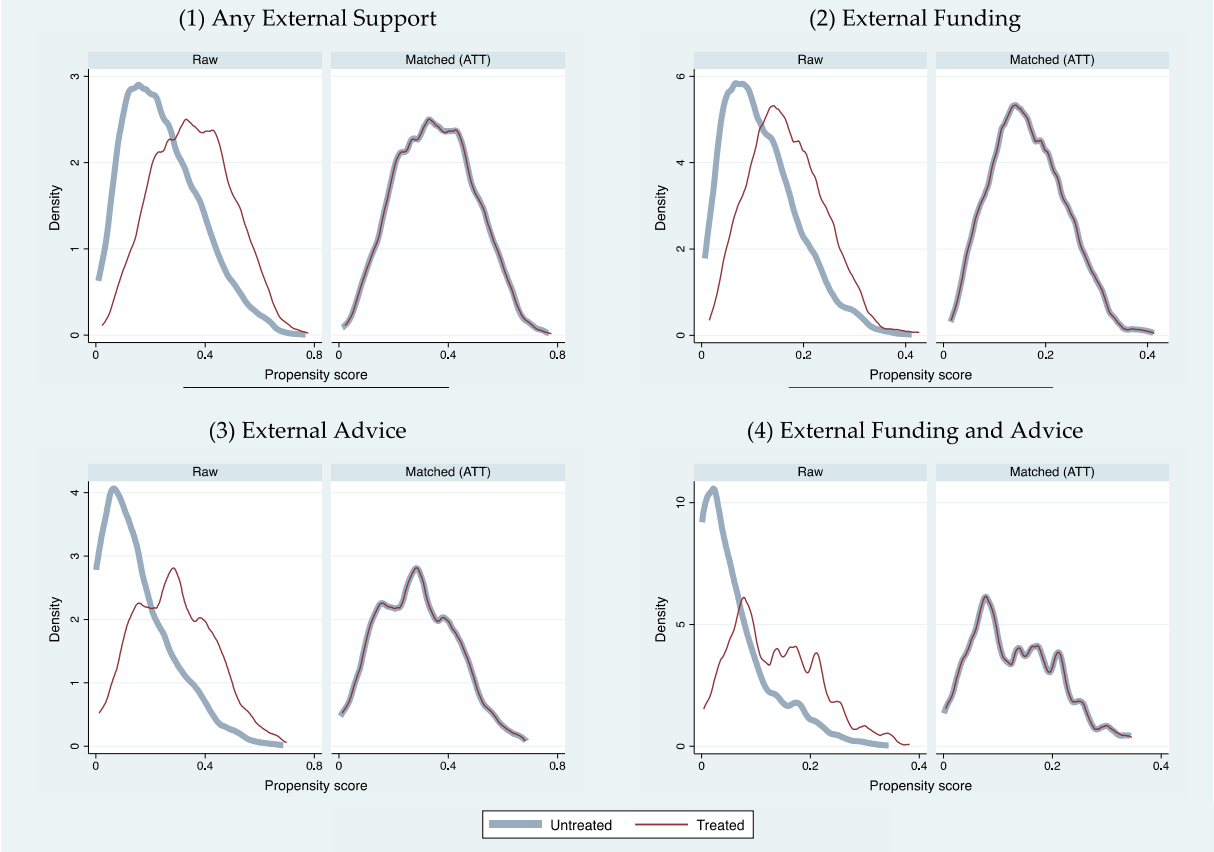

Figure 1. Propensity score distribution for treated and untreated groups before and after matching. **Source**: Own elaboration on Eurobarometer data.

Once we have ensured that the balancing property is satisfied, we estimate the average treatment effects on the treated (ATETs), measuring the additional effect of external support on the firm's engagement in greening processes (in terms of adoption and investment in resource efficiency practices) and on the benefits from the adoption of these processes (in terms of production cost reduction).

Coherently with the findings of Bodas-Freitas and Corrocher [8] and in line with our first hypothesis, empirical results show that the overall effect of external support is positive and statistically significant both on the adoption and on the benefits from the adoption of

green practices. The additional effect of external support observed among treated firms is always statistically significant at the 1 and 5% level, with the only exception of the effect on the residual category *Other RE actions* and on the *Recycling Materials* process, which is significantly affected only by the recourse to external advice and by the combined use of both direct and indirect external support. The estimated ATETs show that firms recurring to any type of external support adopt, on average, a number of resource efficiency actions 0.426 higher than those in the control group. This value further rises to 0.65 when we consider the combined use of external funding and advice. The effect of external support is higher for the adoption of re-engineering practices (0.262 and 0.653, respectively, for any external support and for the combined use of external funding and advice) than for the adoption of waste management practices (0.164 and 0.233). Moreover, the additional impact of indirect support in the form of advice and consulting on the number of practices implemented by the firm is always slightly higher than that of direct financial support. Focusing on the ATET of external support on the different resource efficiency practices, we notice that firms relying on any form of external support are about 7% more likely to implement actions to save water and energy (the ATETs are equal to 0.067 and 0.073, respectively), to reduce waste (0.069) and to sell scrap materials (0.071); these effects further increase to about 9–10% when we consider the combined use of external financing and advice. It is also worth remarking that for these four resource efficiency practices, indirect support has a significantly higher additional effect than direct financing support. Interestingly, the use of renewable energies emerges as the only practice for the implementation of which external financial support exerts a much larger effect than external consulting: firms relying on direct (public or private) financing are, on average, 8.4% more likely to use renewable energies than firms that do not use this type of external support.

As in Hoogendorm et al. [14], we also assess the impact of external support on firms' investment in resource efficiency practices. The estimated ATETs point out that, on average, firms that rely on any type of external support, are 10.8% more likely to invest at least 1% of their annual turnover in resource efficiency activities than firms in the control group. The estimated treatment effect rises to 13.3% for the recourse to direct financial support, pointing out the key role played by access to external support in boosting a firm's investment in greening processes.

With respect to the impact of external support on firms' performance, in line with the previous literature [7,8,26], firms using external support are from 6.0 to 7.6% more likely to experience cost savings in comparison to firms with similar characteristics that do not rely on external support. This evidence confirms our second hypothesis, providing strong empirical support to the significant role of both direct and indirect support not only in fostering firm adoption of resource efficiency actions and investment, but also in increasing the cost-related benefits of implementing resource efficiency practices.

5.2. Sensitivity Analysis: Firm Size and the Role of External Support on Greening Processes

In this section, we explore the presence of heterogeneous effects of external support on firms' engagement in greening processes according to firm size. Tables 5 and 6 show the results of the propensity score matching for the subsamples of SMEs and large firms, respectively. Empirical results fully confirm our third research hypothesis, according to which the role of alternative forms of external support on the implementation of different types of environmental practices significantly differs according to firm size.

Table 5. Impact of external support on resource efficiency actions: ATETs for the subsample of SMEs.

	(1)		(2)		(3)		(4)	
	Any External Support		**External Funding**		**External Advice**		**External Funding and Advice**	
	ATET		**ATET**		**ATET**		**ATET**	
(a) Resource Efficiency Actions	0.496	***	0.529	***	0.645	***	0.702	***
	(0.051)		(0.078)		(0.062)		(0.091)	
(a1) Re-engineering Actions	0.319	***	0.342	***	0.391	***	0.454	***
	(0.038)		(0.053)		(0.046)		(0.062)	
- Saving Water	0.074	***	0.068	***	0.098	***	0.095	***
	(0.017)		(0.021)		(0.020)		(0.028)	
- Saving Energy	0.084	***	0.077	***	0.092	***	0.083	***
	(0.013)		(0.018)		(0.014)		(0.021)	
- Using Renewable Energies	0.065	***	0.100	***	0.061	***	0.124	***
	(0.013)		(0.019)		(0.017)		(0.026)	
- Saving Materials	0.029	**	0.031	***	0.054	***	0.060	***
	(0.014)		(0.019)		(0.018)		(0.021)	
- Re-designing Products	0.067	***	0.066	***	0.086	***	0.093	***
	(0.016)		(0.022)		(0.020)		(0.028)	
(a2) Waste Management Actions	0.176	***	0.184	***	0.257	***	0.249	***
	(0.027)		(0.041)		(0.032)		(0.048)	
- Reducing Waste	0.067	***	0.054	***	0.077	***	0.077	***
	(0.014)		(0.019)		(0.014)		(0.019)	
- Selling Scrap Materials	0.083	***	0.088	***	0.112	***	0.104	***
	(0.016)		(0.022)		(0.018)		(0.027)	
- Recycling Materials	0.027	*	0.041	*	0.067	***	0.068	**
	(0.017)		(0.023)		(0.019)		(0.029)	
(a3) Other RE Actions	0.001		0.004		−0.002		−0.001	
	(0.003)		(0.004)		(0.003)		(0.004)	
(b) Resource Efficiency Investment	0.138	***	0.166	***	0.118	***	0.147	***
	(0.017)		(0.021)		(0.019)		(0.030)	
(c) Production Costs Decreased	0.068	***	0.060	***	0.087	***	0.054	**
	(0.018)		(0.023)		(0.018)		(0.027)	
Bandwidth	0.007		0.003		0.006		0.007	
Matched sample:								
N. treated	1368		630		927		373	
N. controls	4032		4770		4468		4860	
Region of common support	[0.016, 0.701]		[0.009, 0.380]		[0.012, 0.636]		[0.007, 0.345]	
Matching quality indicators:	*Before*	*After*	*Before*	*After*	*Before*	*After*	*Before*	*After*
Pseudo-R2	0.088	0.001	0.065	0.001	0.117	0.001	0.106	0.001
Mean bias	9.6	0.9	8.7	0.9	12.7	0.8	13.6	0.9
Median bias	8.1	0.5	7.6	0.7	11.9	0.6	11.8	0.6
B	75.3	8.5	70.3	7.4	91.5	7.6	95.4	7.7
R	0.78	0.99	0.63	0.97	0.74	1.02	0.76	0.89

Notes: The table reports the ATETs of different types of external support measures on alternative indicators of resource efficiency actions and on the benefit from the implementation of RE actions (in terms of reductions in production costs), estimated on the subsamples of SMEs. The ATETs are computed using Epanechnikov kernel matching, with automatic bandwidth selection and imposing common support, performed using the Stata module *kmatch* by Jann [42]. Bootstrapped (200 replications) standard errors are reported in parentheses. Pseudo-R^2 is obtained from probit estimation of the conditional treatment probability on all the covariates on the matched sample. Mean bias and median bias are summary indicators of the distribution of the absolute standardized percentage bias for each covariate after matching. B and R are the standardized difference in the means and the ratio of the variances of the propensity scores between treated and untreated firms after matching, respectively. ***, ** and * denote significance of the ATETs at the 1, 5 and 10% levels, respectively. **Source**: Own elaboration on Eurobarometer data.

Table 6. Impact of external support on resource efficiency actions: ATETs for the subsample of large firms.

	(1)		(2)		(3)		(4)	
	Any External Support		**External Funding**		**External Advice**		**External Funding and Advice**	
	ATET		**ATET**		**ATET**		**ATET**	
(a) Resource Efficiency Actions	0.062		0.350	*	0.369	**	0.627	***
	(0.146)		(0.217)		(0.168)		(0.222)	
(a1) Re-engineering Actions	−0.014		0.212		0.197	*	0.429	***
	(0.106)		(0.155)		(0.118)		(0.168)	
- Saving Water	0.027		0.091	*	0.095	**	0.152	**
	(0.043)		(0.056)		(0.050)		(0.064)	
- Saving Energy	0.023		0.029		0.042		0.053	
	(0.030)		(0.036)		(0.028)		(0.037)	
- Using Renewable Energies	−0.020		0.055		0.005		0.042	
	(0.044)		(0.057)		(0.046)		(0.069)	
- Saving Materials	0.032		0.048		0.090	***	0.123	**
	(0.034)		(0.043)		(0.035)		(0.051)	
- Re-designing Products	0.076	*	−0.012		−0.035		0.059	
	(0.047)		(0.065)		(0.052)		(0.073)	
(a2) Waste Management Actions	0.077		0.143		0.182	**	0.208	*
	(0.074)		(0.104)		(0.081)		(0.118)	
- Reducing Waste	0.067	*	0.068	*	0.086	***	0.091	**
	(0.032)		(0.038)		(0.032)		(0.039)	
- Selling Scrap Materials	−0.018		0.084		0.003		0.117	*
	(0.040)		(0.053)		(0.042)		(0.066)	
- Recycling Materials	0.028		−0.009		0.093	*	0.000	
	(0.044)		(0.060)		(0.050)		(0.075)	
(a3) Other RE Actions	−0.001		−0.005		−0.010		−0.010	
	(0.011)		(0.012)		(0.008)		(0.012)	
(b) Resource Efficiency Investment	−0.031		−0.029		0.002		−0.001	
	(0.045)		(0.055)		(0.050)		(0.076)	
(c) Production Costs Decreased	0.032		0.068		0.041		0.151	**
	(0.038)		(0.052)		(0.051)		(0.062)	
Bandwidth	0.017		0.018		0.025		0.021	
Matched sample:								
N. treated	318		136		243		88	
N. controls	409		561		476		534	
Region of common support	[0.159, 0.792]		[0.042, 0.613]		[0.027, 0.775]		[0.026, 0.640]	
Matching quality indicators:	*Before*	*After*	*Before*	*After*	*Before*	*After*	*Before*	*After*
Pseudo-R2	0.080	0.005	0.078	0.006	0.122	0.008	0.111	0.012
Mean bias	9.3	2.0	8.8	2.5	11.5	2.7	11.7	3.4
Median bias	8.1	1.4	6.0	2.0	9.1	1.8	10.1	2.0
B	68.8	17.0	71.0	17.4	86.7	20.6	87.8	19.6
R	0.86	1.45	0.95	0.90	0.61	0.94	0.96	0.64

Notes: The table reports the ATETs of different types of external support measures on alternative indicators of resource efficiency actions and on the benefit from the implementation of RE actions (in terms of reductions in production costs), estimated on the subsamples of large firms. The ATETs are computed using Epanechnikov kernel matching, with automatic bandwidth selection and imposing common support, performed using the Stata module *kmatch* by Jann [42]. Bootstrapped (200 replications) standard errors are reported in parentheses. Pseudo-R^2 is obtained from probit estimation of the conditional treatment probability on all the covariates on the matched sample. Mean bias and median bias are summary indicators of the distribution of the absolute standardized percentage bias for each covariate after matching. B and R are the standardized difference in the means and the ratio of the variances of the propensity scores between treated and untreated firms after matching, respectively. ***, ** and * denote significance of the ATETs at the 1, 5 and 10% levels, respectively. **Source**: Own elaboration on Eurobarometer data.

In the subsample of SMEs, the estimated ATETs remain positive and statistically significant (at the 1 and 5% level), confirming the estimation results obtained in the whole sample. For small and medium enterprises, coherently with Bodas-Freitas and Corrocher [8], direct financial support and indirect support in the form of advice and consulting significantly contribute to increase the number of green practices adopted, with estimated ATETs varying from 0.496 to 0.702. This result suggests that the two types of external support allow firms to overcome both the financial barriers hampering the acquisition of new equipment and technologies and the knowledge barriers related to lack of competencies and technical expertise necessary to implement resource efficiency practices. In particular, the combined use of external funding and advice exerts the largest effect on the number of re-engineering practices (0.454), while the external consultancy seems particularly important for waste management actions (0.257) and for the cost-related benefits from the adoption of resource efficiency measures. In this latter respect, those firms using external advice and consultancy are 8.7% more likely to experience a reduction in production costs compared to firms in the control group. Both types of external support also have a significant and positive impact on firm investment in greening processes: SMEs relying on direct and indirect support are about 11.8 to 16.6% more likely to invest at least 1% of their turnover to implement resource efficiency measures than similar SMEs not recurring to external support. As in the whole sample, external financing significantly contributes to increase the probability of resource efficiency investments of SMEs. Firms in the treated group have, on average, a 16.6% higher probability to invest in resource efficiency activities than firms in the control group. This probability increase is equal to 11.8% for those firms that receive external consulting and to 14.7% for those relying on both external financial and consulting.

Focusing on the subsample of large firms, most of the estimated ATETs lose their statistical significance, demonstrating that the additional effects of external support on the implementation of resource efficiency practices and on the benefits from the adoption are not particularly relevant. This evidence suggests that large firms tend to rely more on their internal resources for the adoption of green practices, having more financial resources to invest and better internal competencies and expertise. Specifically, for the subsample of large enterprises, external advice and consultancy is the type of support that contributes the most to the adoption of green practices, while direct financial support has an irrelevant impact on firms' engagement in greening processes. The impact of external advice strongly contributes to determine the significant effect of the combined use of direct and indirect support on the number of resource efficiency practices implemented by the firm. Large companies relying on both types of external support implement, on average, a number of resource efficiency measures 0.627 higher than those in the control group. As in the whole sample, the ATET is higher for the adoption of re-engineering practices (0.429) than for the adoption of waste management practices (0.208). It is also worth remarking that the combined use of external funding and advice significantly affects the cost-related benefits of adopting resource efficiency measures. Specifically, the estimated ATET indicates that larger firms relying on both direct and indirect support are, on average, 15% more likely to benefit from a reduction in production costs compared to larger enterprises in the control group.

6. Conclusions

This paper explores the impact of different types of external support on a firm's adoption of resource efficiency actions and investment behavior and on the benefits from the adoption of such actions (in terms of reduction in production costs). We rely on cross-sectional data from the third and fourth waves of the Flash Eurobarometer survey "SMEs, resource efficiency and green markets", focusing on 6595 SMEs and large manufacturing firms from 35 European countries.

We use a propensity score matching approach, which compares the effect of the recourse to external support in the subsamples of treated and untreated firms with similar observable characteristics. In particular, we focus on the additional effect of external

support on the adoption of resource efficiency actions and estimate the average treatment effect on the treated (ATET).

Our main results show that the overall effect of external support is positive and statistically significant, on both the adoption and the benefits from the adoption of green practices. Firms recurring to any type of external support implement, on average, a number of resource efficiency actions higher than those in the control group; the effect is particularly high for those firms that have jointly used external funding and advice. Even the probability to invest in resource efficiency activities is higher for those firms that can rely on external support, especially in the case of recourse to external financial support, demonstrating the relevance of external funding in boosting a firm's investments in greening processes. Moreover, the recourse to any form of external support fosters production cost savings, in particular, the simultaneous use of external financing and consultancy exerts a higher effect on the cost-related benefits.

The analysis on the subsamples of SMEs and large firms reveals significant heterogeneity in the impact of external financing and advice on environmental behavior. While the estimated ATETs for SMEs substantially confirm the results obtained in the whole sample, empirical results for large firms highlight that the additional effects of external support on the implementation of resource efficiency practices and on the benefits from the adoption are not particularly relevant. Large firms tend to rely more on their internal financial resources and expertise for the adoption of green practices. In particular, direct financial support has an irrelevant impact on firms' engagement in greening processes, while in the subsample of SMEs, it exerts a crucial role especially in boosting resource efficiency investments.

Our findings suggest that public policies, aimed at enhancing firms' involvement in greening processes, should be designed by taking into account firm size and different types of environmental practices. Specifically, for small and medium-sized firms, public and private financial support can directly improve the extent of resource efficiency investments, while external advice can contribute to integrate the lack of specific expertise and overcome the erroneous perception of environmental practices as an additional burden. On the other hand, the recourse to external advice and consulting services plays a particularly important role for large firms, enhancing the implementation of technological and managerial solutions that may improve the efficiency of environmental actions and encourage eco-innovation activities.

Our analysis has some limitations, mainly related to the data used in the empirical analysis, that need to be acknowledged. First, the cross-sectional nature of the data does not allow to fully control for unobservable heterogeneity at the firm level. At the same time, it prevents any attempt to investigate the intertemporal relationship between firms' implementation of resource efficiency practices and the recourse to direct and indirect support. Future analyses should exploit longitudinal firm-level data to estimate the average treatment effects of external support on firms' environmental practices and assess the validity of the evidence obtained in this study. The use of panel data will also allow to develop an intertemporal framework to analyze firms' environmental behavior. Furthermore, as pointed out by Hoogendoorn et al. [14], the available data do not allow to distinguish between stakeholder groups nor to identify the specific products or services offered by the firm. This prevents properly assessing stakeholders' influence and the effect of firm tangibility on the extent and types of environmental practices and on the related recourse to external support. Finally, our study provides first empirical evidence on the heterogenous effects of external support on the environmental practices of SMEs and large firms. Future research efforts are needed to shed additional light on these firm-size heterogeneities.

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Appendix A

Table A1. Variable definitions.

Variable	Definition
(a) Outcome variables	
Resource Efficiency Actions	Number of any resource efficiency actions adopted by the firm
Re-engineering Actions	Number of resource efficiency actions requiring process re-engineering (i.e., saving water, saving energy, using renewable energy, saving materials, and designing products easier to maintain/repair) adopted by the firm
- Saving Water	Equal to 1 if the firm has adopted actions to save water; 0 otherwise
- Saving Energy	Equal to 1 if the firm has adopted actions to save energy; 0 otherwise
- Using Renewable Energies	Equal to 1 if the firm has adopted actions to use predominantly renewable energy; 0 otherwise
- Saving Materials	Equal to 1 if the firm has adopted actions to save materials; 0 otherwise
- Re-designing Products	Equal to 1 if the firm has adopted actions to design products that are easier to maintain or repair; 0 otherwise
Waste Management Actions	Number of resource efficiency actions related to waste management (i.e., minimizing waste, selling scrap material, recycling) adopted by the firm
- Reducing Waste	Equal to 1 if the firm has adopted actions to minimize waste; 0 otherwise
- Selling Scrap Materials	Equal to 1 if the firm has adopted actions to sell scrap material; 0 otherwise
- Recycling Materials	Equal to 1 if the firm has adopted actions to recycle by reusing material or waste; 0 otherwise
Other RE Actions	Equal to 1 if the firm has adopted other resource efficiency actions; 0 otherwise
Resource Efficiency Investment	Equal to 1 if, over the last two years, the firm has invested at least 1% of their annual turnover to be more resource efficient
Production Costs Decreased	Equal to 1 if, over the last two years, the resource efficiency actions undertaken by the firm have contributed to decrease its production costs; 0 otherwise
(b) Treatment variables	
Any External Support	Equal to 1 if the firm has relied on any form of external support in its efforts to be more resource efficient; 0 otherwise
External Funding	Equal to 1 if the firm has relied on (public and private) external financial support in its efforts to be more resource efficient; 0 otherwise
External Advice	Equal to 1 if the firm has relied on (public and private) external advice and consultancy in its efforts to be more resource efficient; 0 otherwise
External Funding and Advice	Equal to 1 if the firm has relied on both (public and private) external financial support and external advice and consultancy in its efforts to be more resource efficient; 0 otherwise

Table A1. *Cont.*

Variable	Definition
(c) Independent variables	
Age	Firm age in years
Small	Equal to 1 if the firm has 10 to 49 employees; 0 otherwise
Medium	Equal to 1 if the firm has 50 to 249 employees); 0 otherwise
Large	Equal to 1 if the firm has 250 or more employees; 0 otherwise
Low turnover	Equal to 1 if the firm's turnover is lower than 2 million Euro; 0 otherwise
Own financial resources	Equal to 1 if the firm relies on its own financial resources to implement greening processes; 0 otherwise
Own technical competencies	Equal to 1 if the firm relies on its own technical competencies to implement greening processes; 0 otherwise
B2C Market	Equal to 1 if the firm sells products or services directly to consumers; 0 otherwise
B2B Market	Equal to 1 if the firm sells products or services to other firms; 0 otherwise
PA Market	Equal to 1 if the firm sells products or services public administrations; 0 otherwise
2017	Equal to 1 if the reference year of the survey is 2017; 0 otherwise

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The Impact of Mobile Money on the Financial Performance of the SMEs in Douala, Cameroon

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Abstract: Often financially excluded by the traditional banking system, small and medium-sized enterprises (SMEs) in many developing countries have found in mobile money services (MMS) a sustainable alternative. Despite its potential in propelling inclusive growth, the use and adoption of mobile money (MM) by SMEs has generally been low in developing countries, and one of the reasons has been limited data that supported its impact on financial performance. As a result, there was a need to investigate the impact of the mobile money payment and receipt services on the financial performance of the SMEs in Cameroon. This paper implemented a mixed research paradigm with data collected through the administration of a survey questionnaire and from one-on-one in-depth interviews. A sample of 285 SMEs responded to the survey, while 12 owners/managing directors were purposively selected to participate in the personal interviews. Version 25 of the Statistical Package for the Social Sciences (SPSS) software was used to analyse the quantitative data, while the qualitative data was analysed along themes. The results were, after that, triangulated for credibility reasons. The concluding findings indicated that the mobile money payment and receipt services contributed of the order of 73% of the total variance in the turnover of the SMEs in Douala after they had begun to use the technology. By confirming the positive relationship between the use of mobile money services and the financial performance of businesses, it is hoped that all the relevant stakeholders will see this as a possible solution to the financial challenges that SMEs face in developing economies.

Keywords: mobile money; SMEs; financial performance; payments and receipts; Douala, Cameroon

1. Introduction and Background

Small and medium-sized enterprises (SMEs) make significant contributions to driving the economies of a great many countries. They play a crucial role in socio-economic development by contributing to the creation of wealth, economic growth and employment [1,2]. A 2016 census of enterprises in Cameroon suggested that approximately 99.8% of the enterprises in the country are SMEs [3]. Furthermore, it was revealed that SMEs accounted for 72% of the permanent jobs generated in Cameroon [3]. Although they employ around 72% of the workforce in Cameroon and contribute approximately 35% of the GDP [4,5], very few are considered to be structurally and financially stable [6].

The SME sector of Cameroon comprises mainly (around 97%) sole proprietorship or family businesses [3]. It was further noted that approximately 85% of the managers of these SMEs were relatively poorly educated. Because of their structure and the managerial profile of their managers, SMEs tend to be highly cash-dependent [7–10]. Consequently, they are usually obliged to transact business with suppliers, to buy or pay for goods by travelling to their offices, which can entail considerable risk of theft or losing money. In the case of SMEs which have bank accounts, apart from the disadvantages of costs which are incurred by high bank charges, documentation and transport, owners are frequently required to queue for lengthy periods before they can obtain access to funds,

which makes it very difficult to exploit any unexpected opportunities which may arise for which funds are required [11]. Because the owners of many of the businesses are sole traders who operate in a very informal manner and the businesses are often staffed only by their owners and possibly one or two members of their families [12,13], they are often obliged to leave their businesses unattended for several hours in order to conduct transactions in a bank [11]. As a consequence, sales are lost, and their prospects for survival are severely compromised [14,15].

As it has become abundantly evident that to survive and achieve growth, SMEs in Cameroon need to streamline their procedures, reduce operating cost and eliminate unnecessary loss of time, the advent of the phenomenon of mobile money could not have been more fortuitous [16]. The system enables the SMEs to receive payments directly from customers and also to make payments directly to suppliers through mobile telephones [17], without being obliged to leave or close their premises for lengthy periods. Accordingly, it provides a viable means for people or SMEs who do not have access to bank accounts to make financial transactions with ease, have access to funds when they are needed, without incurring additional charges such as transport and opportunity cost, and significantly improve the performance of their businesses as a consequence [18,19].

According to Ngaruiya et al. [10], obstacles are inherent in the operations of SMEs. In the case of Cameroon, SMEs needs concerning financial liquidity and banking services are not sufficiently met by commercial banks for several reasons, including a lack of collateral, inadequate bookkeeping systems, and their often questionable viability in the eyes of financial institutions [20–22]. Besides, SMEs bank accounts are not cost-effective, owing to high bank charges and the transport costs which are incurred by travelling to banks to make transactions [10,23–25]. These unwieldy procedures have contributed to the performance of many SMEs in Cameroon stagnating, with low economic growth being but one of a host of adverse consequences. As SMEs comprise the majority of the businesses in the country and in the light of the disastrous effects which cumbersome banking procedures have on their performance, a strong case could be made for the use of mobile money as a means of enabling SMEs to streamline their operations. The platform will improve the mode of receipts and payments, the debt collection procedures which, in return, will enhance the liquidity and working capital management problems faced by the SMEs [23].

Although mobile money does not provide a panacea for all of the financial problems with which SMEs are faced, the benefits far exceed the disadvantages which are associated with adopting the system. Irrespective of whether the system is used in isolation or conjunction with a bank account, it stands to increase the sales of SMEs and reduce their operating costs, with both factors making positive contributions to improving their financial performance [10].

Although a considerable amount of research has been conducted concerning the effects which mobile money has had upon the performance of SMEs in Africa, particularly in Kenya, the topic has not been examined in Douala, Cameroon. The studies that delved in this area include Ngange and Beng [19] that studied the impact of mobile phone usage in economic development in Molyko. Covering a much bigger area, Ojong [26] looked at informal mobile remittances and socioeconomic factors in the North-West Region. Mwafise and Stapleton [27] examined the influence of social–technical and institutional factors on the effective uptake of mobile money electronic payments. Yet, none of the just-mentioned studies investigated the impact of the mobile money services on the performance of SMEs in Douala.

More so, this paper focused principally on the payment and receipt services. Consequently, this study aims to contribute to the mobile money literature on Cameroon by mainly assessing the impact of the mobile money payment and receipt services on the financial performance of the SMEs in Douala, Cameroon. The paper adopted the mixed research method to record and analyse quantitative and qualitative data. The individual methods were further triangulated to increase the credibility of results. In line with similar studies, such as Ngaruiya et al. [10], Mararo and Ngahu [11], Masocha and Dzomonda [18] and Higgins et al. [23], it is hoped that the findings of this paper will be useful to the relevant stakeholders in Douala, Cameroon.

The rest of the paper is structured as follows. A review of the literature related to mobile money, SMEs and the possible opportunities and challenges associated with the platform. After that, a discussion around the research design methodology, followed by discussions of findings. Finally, the conclusions, limitations of the study and recommendations were provided to the relevant stakeholders. Because of the boundaries of the study, suggestions for future research directions were pointed out.

2. Literature Review

2.1. Mobile Money and SMEs

Mobile money (MM) is a service which permits customers to obtain access to financial services employing cellular devices [28], by dialling Unstructured Supplementary Service Data (USSD) codes. USSD is a communications protocol for mobile communication technology which is used to send text between mobile telephones and an application programme in the mobile network, which does not require users to have access to the internet. Although the technological innovation is now available in many developing countries, its use is particularly widespread in countries in which it is difficult for many citizens to open bank accounts and/or access banking services [22,29]. It enables users to store, send and receive money without the transactions entailing the use of bank accounts [30].

Mobile money has disrupted the financial sector and the way of transacting. SMEs can now efficiently conduct financial transactions, anytime, and anywhere, without necessarily having a bank account [10,24,26,30]. This innovation can help to reach those who do not have access to banking services and thus improve financial inclusion [22]. Ngange and Beng [19] and Chimaobi and Chizoba [31] demonstrated that mobile commerce facilitates communication between users. The later scholars went further to show that the platform improves the efficiency of the business operations. Additional studies conducted respectively by Ngaruiya et al. [10], Higgins et al. [23] and Mbogo [25] proved that mobile money improves business networking, while Amponsah [21], Chimaobi and Chizoba [31] and Ngaruiya et al. [10] demonstrated that the technological innovation promotes a cashless economy. All these benefits taken concurrently will enhance the productivity, decrease the operating costs and thus improve the performance of the SMEs [10,18,32,33].

In the Economic and Monetary Community of Central Africa (CEMAC) region, which is heavily regulated, mobile money is still at an embryonic stage [29]. Mobile money services providers are bound to work with their partner banks to provide their services [30]. This seems to be common practice in many emerging economies, with some exceptions, like in Ghana, where, since 2015, the mobile network operators (MNOs) can now apply for licenses directly from the Central Bank [21]. Mobile network operators are telecommunication entities that provide services for mobile phone subscribers. Also, the mobile money services which are provided are limited by comparison with those which are available in East and West African countries [10,11,33]. In Cameroon, for instance, mobile money is used mainly to make purchases and send and receive money; saving and loan facilities are not yet provided [34,35].

The study identifies four significant platforms for mobile money services (MMS) in Cameroon, namely, MTN Mobile Money, Orange Mobile Money, Express Union Mobile Money and the recently launched Nexttel Possa. By contrast, there are only two service providers, namely, MTN and Orange Cameroon, also known as mobile network operators, which dominate the Cameroonian mobile money market and together account for 5.4 million registered users [36]. Orange, which has 2.8 million registered users, offers the following services: money deposits, money withdrawals, the sending and receiving of money transfers, a Visa card facility, the purchasing of insurance-related products, the transferring of funds between bank accounts and mobile money accounts, the purchasing of airtime and the payment of bills, university fees, transport tickets and school fees [35]. MTN, which has 2.6 million users, offers a similar range of services, with the exception of the Visa card facility, the purchasing of insurance-related products and the transferring of funds between bank accounts and

mobile money accounts [34]. According to FinMark Trust [22], the Cameroonian population comprised more than 14 million people who were 15 years of age or older in 2017. Combined with the figure of 12% citizens who hold bank accounts [29] and the average population growth of 2.7% in Cameroon between 2014 and 2017 [37], it appears that in the region of 1.7 million people held bank accounts, which amounts to around one-third of the 5.4 million registered users of mobile money during the same period. As mobile money is a relatively new phenomenon in Cameroon, it is highly significant that three times more Cameroonians have opened mobile money accounts than hold bank accounts. Similar findings were obtained in at least eight countries [38].

According to Rubini [39], SMEs are considered to be the backbone of most of the developed and developing countries across the globe. The term "small and medium-sized enterprises" is a broad one, and the specific defining attributes tend to vary among individual countries. The categorisation of enterprises with respect to their size on the basis of the numbers of workers which they employ, their annual turnover or capital assets entails fairly arbitrary assessments, which are often influenced by the prevailing business values of individual countries [10]. To cite an internationally accepted criterion, the Organisation for Economic Cooperation and Development classifies SMEs as businesses which do not employ more than 249 employees [1]. For practical purposes, having the number of employees as a defining criterion provides a useful comparative measure for assessing the sizes of businesses [1]. In Cameroon, the official definition is derived from the law No 2010/001 of 13 April, 2010 for the promotion of small- and medium-sized enterprises [40]. It holds that any company with an annual turnover (excluding tax) which does not exceed FCFA 1 billion and employs a permanent workforce of not more than 100 employees is considered to be an SME [41]. The FCFA is denomination of the common currency of 14 African countries which are members of the Franc Zone. As per their contribution into the economic and the social well-being across the globe [1,39], Cameroonian SMEs play a crucial role in achieving economic growth by contributing up to 72% of the national workforce [3] and approximately 35% of the GDP [4]. Despite their important responsibility, the majority in emerging countries face many difficulties, with the most important being that of financing [3,4,14,42]. In developing countries such as Ghana, Tanzania and Kenya, credit systems have been developed by MNOs which are based upon transactional histories of mobile money, which make it possible to grant microloans to SMEs [43]. In Cameroon, it is the State that made an effort by opening a bank for the SMEs in July 2015 [44]. However, even if the MNOs cannot offer microcredit in Cameroon, it is perceived by many scholars that the mobile money services facilitate the commercial dealings for SMEs [19,31]. According to Ngaruiya et al. [10] and Amponsah [21], the rapid diffusion of mobile money transfer is seen as a potentially vital tool for facilitating financial transactions. This indicates that the rapid adoption of mobile money Services is seen as a way to improve the financial functionality and hence the performance of the SMEs. For Pinem and Dwi [45], the performance of the SMEs can be measured by evaluating the sales growth, which remains one of the main determinants of SMEs performance [46]. The significance of the MMS seems to be mitigated in a good number of countries due to delays in telecommunication infrastructures [47]. Nevertheless, as demonstrated by Ngaruiya et al. [10], Masocha and Dzomonda [18], Higgins et al. [23], Mbogo [25], Chale and Mbamba [32] and Nyaga and Okonga [33]—in their respective studies, the platform has improved the financial performance of SMEs after they have begun to use it.

2.2. Opportunities

Apart from the role which the system has played in increasing rates of financial inclusion, businesses which adopt mobile money services benefit from a wide range of different advantages and opportunities [21]. Among the many other advantages which it provides is the ability to transfer money at a low cost within a branchless bank [10,33]. Evidence from studies carried out in Kenya and Ghana attest to how the use of MM ensures a seamless cash flow, easier and safer financial transaction for SMEs [10,21]. The concept of a cashless economy is enthusiastically promoted by many central banks throughout Africa [10,21,31]. Ngaruiya et al. [10] point out that the adoption of the system

has facilitated decision-making and the exchange of information, improved the ability of businesses to network successfully and increased the competitiveness of SMEs. The findings of a study which was conducted by Chimaobi and Chizoba [31] revealed that SMEs in Nigeria, which traded using mobile systems, were able to shorten their delivery times significantly. Both Ngange and Beng [19] and Chimaobi and Chizoba [31]—maintain that using mobile money services facilitates communication between users and improves relationships between buyers and sellers. Effective communication has also significantly reduced the effects of the phenomenon which is known as asymmetric information or information failure between users, which results from one user in a transaction having significantly more information on it than the other. Increasing the range of opportunities which are available to users via the platform would create added value for SMEs and enable them to reduce their operational expenses and, indirectly, improve their performance and growth [18,23,25,32,33]. Despite the immense opportunities which mobile money services provide to users, groups of factors continue to militate against their universal adoption.

2.3. Difficulties

The principal categories of factors which tend to discourage the universal adoption of mobile money services are mainly regulatory, infrastructural and those which arise from traditional perceptions [24,39,48–51]. Mobile money remains heavily regulated [24,39]. In some instances, stakeholders in the traditional banking sector tend to perceive the new system as a threat to the hegemony which they have maintained [24] and do not welcome the prospect of their services being superseded or supplanted by innovative contemporary ones [21]. The pressure which commercial banks are placing upon the central banks of their countries leave them with two possible courses of action: continue with the status quo and retard economic growth as a consequence of stifling the growth of SME sectors or liberalise and permit newcomers to the financial sectors of their countries to boost national economies by providing services which significantly increase the financial performance of SMEs [21,24,39,48]. Limited infrastructure has made it impossible to make mobile money services available to all of the members of the populations of some countries [42,47]. As has already been noted, cellular coverage tends to be low in many developing countries [49]. As it is particularly low in rural areas, many people are effectively denied access to the advantages which cellular technology provides [49]. Unstable networks and interrupted transmission oblige some users of mobile money services to travel to locations in which their networks are functioning normally to make transactions, thereby incurring additional costs and suffering considerable inconvenience [47]. According to Chimaobi and Chizoba [31], the erratic transmissions of energy by the power supplier also affect users of mobile money services adversely. During blackouts, it is impossible to make transactions (mobile signals blackout), and, in some instances, cellular devices are damaged beyond repair (electricity blackout). Significant numbers of members of the populations of developing countries tend not to trust modern technology and prefer to carry cash with them, owing to the degree of control over their transactions which they perceive that doing so provides [47]. For instance, it is not possible to request a refund or to stop a transaction which has already been validated in a mobile money transaction, while it is easy to do so in the case of cash payment in a supermarket. Moreover, in Pakistan, no matter the level of education, people still prefer to keep money at home [51].

2.4. Mobile Money Evolution in Cameroon

Mobile money was first launched in Cameroon in 2011. The Cameroonian subsidiaries of telecommunication leaders MTN and Orange pioneered the concept and officially launched it in 2012 [52]. The circumstances which prompted its launching were similar to those of most developing countries, particularly concerning the small numbers of members of the population who held bank accounts [29]. As had been the case in the other countries in which the concept had been launched, many households and SMEs in Cameroon had been effectively excluded from the traditional banking system and without access to funding in the formal sector [3,4,42].

Although the services which mobile money provides in Cameroon do not include financing now, its introduction had significantly increased the financial inclusion rate (29%) by 2017 [22], from 9%

in 2012 [53]. As a direct consequence, many citizens have been able to ply trades and launch startup enterprises, which have resulted in indirect employment for of the order of 5000 people [54]. The mobile money transactions which have accompanied this surge amount to in the region of FCFA 3500 billion in 2017, a figure which represents 17.5% of the GDP of Cameroon [53]. This represents an increase of more than 1000% from the FCFA 300 billion recorded in 2016 [53].

The introduction of mobile money has enabled Cameroonian households to incur reduced costs by saving and reduce the risk of loss and theft which had accompanied saving in the past [21,22,24,48]. As the mobile telephone penetration rate was 71% in 2014 [52], and that of holding bank accounts had been one of the lowest in the world at 12% [29], it is abundantly evident that mobile money could not have arrived in Cameroon at a more promising time. The mobile money service in Cameroon is provided through a partnership between commercial bank and mobile network operators (MTN Cameroon, Orange Cameroon, CAMTEL, and Nexttel) because only commercial banks are allowed to issue electronic money [30], and the mobile network operators own the telecommunication infrastructures and technologies to deploy the platform. This regulating arrangement of convenience is the status currently prevailing in Cameroon and will surely deter the significance of the MM in the long run.

Although its importance is affected by factors related to regulation, infrastructures and customs, Mobile Money appears to be the solution to the multiple problems, namely, liquidity, means of payments, debt collection, working capital and financing faced by SMEs. Its adoption and usage in their day-to-day activities have had a positive impact on their performance, as shown by many scholars.

3. Research Design and Methodology

This study opted for the pragmatism paradigm. The positivism and interpretivism philosophies were adopted in order to collect data from SMEs in "Mboppi" and "Central" markets. The researcher elected to make use of both quantitative and qualitative research methods in this study to obtain as complete an understanding as possible of the research problem and to make effective use of any converging information which the quantitative and qualitative studies generated. The strategy also enabled the researcher to perform a rigorous evaluation of the reliability of the findings by using the qualitative findings to corroborate the results which the survey questionnaire generated through triangulation.

3.1. Sampling Technique

In this study, the researcher was unable to determine, with an acceptable degree of exactitude, how many of the SMEs which qualified for selection in the two markets were using mobile money services to make and receive payments. Also, the criteria concerning the periods for which the SMEs had been operating and the numbers of employees which they had made it even more difficult to identify and obtain access to potential participants. Using simple random sampling would have entailed an unacceptable degree of difficulty, been excessively time-consuming and entailed expense which the researcher could not afford.

Polit and Beck [55] explain that sampling is a method of choosing a portion of a target population to represent the population as a whole in the respects in which particular researchers are interested in the purposes of their studies. The researcher elected to use nonprobability sampling to select participants who were readily identifiable as fulfilling the criteria for inclusion in the research sample and drew upon their knowledge of local SMEs to locate other potential participants through snowball sampling [55,56].

Mindful that qualitative phase seeks to understand better the underlying reasons and motivations rather than to quantify and generalise to a broader population, it is inappropriate to use random sampling techniques [57]. The participants for the in-depth interviews were purposively selected from among the respondents to the questionnaire based on their sales turnover, to obtain a research sample whose members represented SMEs whose turnover ranged from the minimum to the maximum levels and also adequately served those with intermediary levels of turnover. The survey questionnaire was

administrated over 12 weeks, between November 2018 and January 2019; while in-depth interviews took around six weeks, from February to March 2019.

3.2. Sampling Size

Conscious of many restrictions including time, finance and limited access and the fact that the population as a whole is too large to work with, the researcher was not able to collect or analyse data from the entire population. As Dudovskiy [58] maintains that a sample size of twelve is sufficiently large for a qualitative study of a homogeneous population, the researcher selected to conduct twelve in-depth interviews.

For the quantitative component, the researcher encountered a considerable amount of difficulty in determining an optimal sample size for the administration of the survey questionnaire, in the absence of official statistics concerning the numbers of the SMEs which were making use of mobile money services in the two markets, and even more difficulty in identifying SMEs which had been operating for two years or more. Consequently, the researcher elected to use the formula which Cochran [59] developed to calculate the size of the research sample for the quantitative study: $n_0 = \frac{Z^2pq}{e^2}$, where n_0 is the sample size, Z^2 is the abcissa of the normal curve that cuts off an area α at the tails ($1-\alpha$ equals the desired confidence level, e.g., 95%), e is the margin of error, p is the projected percentage of a characteristic which is to be found in a population and q is $1-p$. The value of Z is found in the statistical tables which contain the area under the normal curve [60].

Following the application and the computation of the Cochran's formula [59] at a confidence level of 95%, a margin error of 5% and a standard deviation of 50%, the researcher obtained a sample size of 384 for the quantitative phase of the study. The sample size of 384 was considerably greater than those who had been used in similar studies which have been conducted in countries in which the use of mobile money services is widespread. The researcher calculated an average sample size of 228 by consulting the literature pertaining to the studies which had been conducted by Ngaruiya et al. [10], Mararo and Ngahu [11], Higgins et al. [23] and Nyaga and Okonga [33]. After having given due consideration to the relatively new status of the mobile money industry in Cameroon, the relatively limited adoption of money market services in Cameroon by comparison with Kenya, the relatively short lifespans of many SMEs in Cameroon [6] and the constraints which time and financial considerations imposed, the researcher decided upon a sample size of 250 for the quantitative study. To compensate for any unusable questionnaires and to ensure that the final sample size was as close to 250 as possible, the researcher distributed a total of 300 questionnaires evenly among potential respondents in both markets. After he had collected and sorted the completed questionnaires, it emerged that 285 were usable, of which 142 had been completed by respondents in the Central Market and the remaining 143 by respondents in the Mboppi market. As the 285 completed questionnaires significantly exceeded the initial target figure of 250, it was likely that the credibility of the findings would be substantially increased.

3.3. Measures Taken to Ensure the Credibility of the Findings

Although it is not possible to eliminate the possibility of the findings of research studies lacking credibility, researchers need to take all reasonable measures to do so [58]. Credibility refers to the extent to which accounts which are provided by researchers are plausible and appropriate, particularly concerning the degree to which their findings accord with the perceptions of the participants in their studies [55]. Credibility is predicated upon the criteria of reliability and validity to evaluate the quality of research.

3.3.1. Reliability

According to Dudovskiy [58] and Asoba [61], reliability refers to the consistency with which particular research instruments generate data. Consequently, the reliability of the findings of a study is assessed in accordance with the likelihood that other researchers would be able to generate similar

findings under the same conditions and using the same research techniques. As such, the reliability of the findings of this paper was ensured by pilot testing both the survey questionnaire and the interview guide and by subsequently corroborating the findings of the quantitative study with those which were obtained from the face-to-face in-depth interviews.

3.3.2. Validity

According to Polit and Beck [55], validity can be defined as the degree to which a research instrument measures what it is intended to measure. From a slightly different standpoint, Dudovskiy [58] evaluates the validity of findings as a measure of the degree to which the requirements of a particular scientific research methodology have been adhered to during the process of generating research findings. In both instances, it is evident that validity is a measure of accuracy. Creswell [62] explains that in mixed methods research, the findings from quantitative studies are used to validate those of qualitative studies and vice versa. As this study employed a mixed methods research design, the findings from the administration of the survey questionnaire were validated against those which the in-depth interviews generated.

4. Findings and Discussions

4.1. Results of the Quantitative Phase

4.1.1. Monthly Levels of Turnover in FCFA Before and After the Adoption of Mobile Money Services

Figure 1 depicts the levels of monthly turnover, which the respondents claimed on behalf of their SMEs before and after they had elected to make use of mobile money services. The ranges into which their respective levels of turnover fell are summarised in Table 1. The results in Table 1 denote that the average turnover of the SMEs in Douala increased by 0.44, almost 12%, after they have begun using mobile money services. It can be seen in Figure 1 that before they elected to make use of mobile money services, 69 out of 285 SMEs had achieved monthly turnovers of from FCFA 200,001 to FCFA 500,000, the figures rose to 75 after they had done so. Also, the numbers of SMEs which achieved monthly turnovers of more than FCFA 1 million rose from forty, before the adoption of mobile money, to sixty, after having done so, which represents an increase of 50%. The findings of a study which was conducted by Ngaruiya et al. [10] in Kenya were essentially similar to those of this study in these respects.

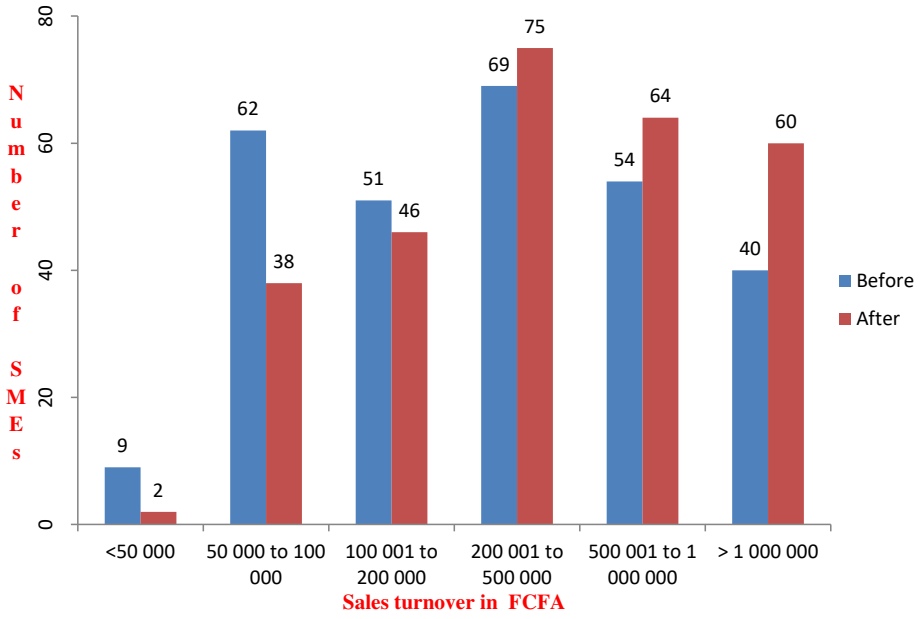

Figure 1. Monthly turnover figures in FCFA before and after the adoption of mobile money services (MMS) (Source: authors).

Table 1. Average levels of monthly turnover before and after the adoption of MMS.

		Monthly Turnover in FCFA before the Adoption of Mobile Money Services	Monthly Turnover in FCFA after the Adoption of Mobile Money Services
N	Valid	285	285
	Missing	0	0
Mean		3.76	4.20

Source: authors.

4.1.2. Perceptions of the Respondents of Mobile Money and Mobile Money Services

Figure 2 depicts the distributions of the responses of the respondents according to a 5-point Likert scale concerning their perceptions of mobile money and mobile money services. A significant majority (67%) of the respondents either agreed or strongly agreed that it was affordable and straightforward to register a mobile money account. A similar majority (65%) either agreed or strongly agreed that mobile money transactions were safe, while (54%) either agreed or strongly agreed that mobile money service providers were reliable. By contrast, the majority (130) either disagreed or strongly disagreed that using mobile money services to make and receive payments had significantly influenced the turnover of their businesses, while ninety-two respondents chose to record neutral responses, by comparison with a total of sixty-three who either agreed or strongly agreed with the statement. The perceptions of the respondents were significantly skewed towards either negative or neutral responses to the statement that their sales had increased after they had begun to make and receive payments by means of mobile money, as they accounted for 196 of 285 responses. The spread of responses to the statement that the adoption of mobile money services to make and receive payments had improved their cash flow was similar, although an even larger group of 107 recorded neutral responses. There was a significant consensus of 242 respondents who either agreed or strongly agreed that mobile money payments and receipts reduced transport costs, while 198 either agreed or strongly agreed that they reduced the cost of transactions. A further 133 either agreed or strongly agreed that they reduced opportunity costs, while 184 either agreed or strongly agreed that they were more cost-effective than the services of banks.

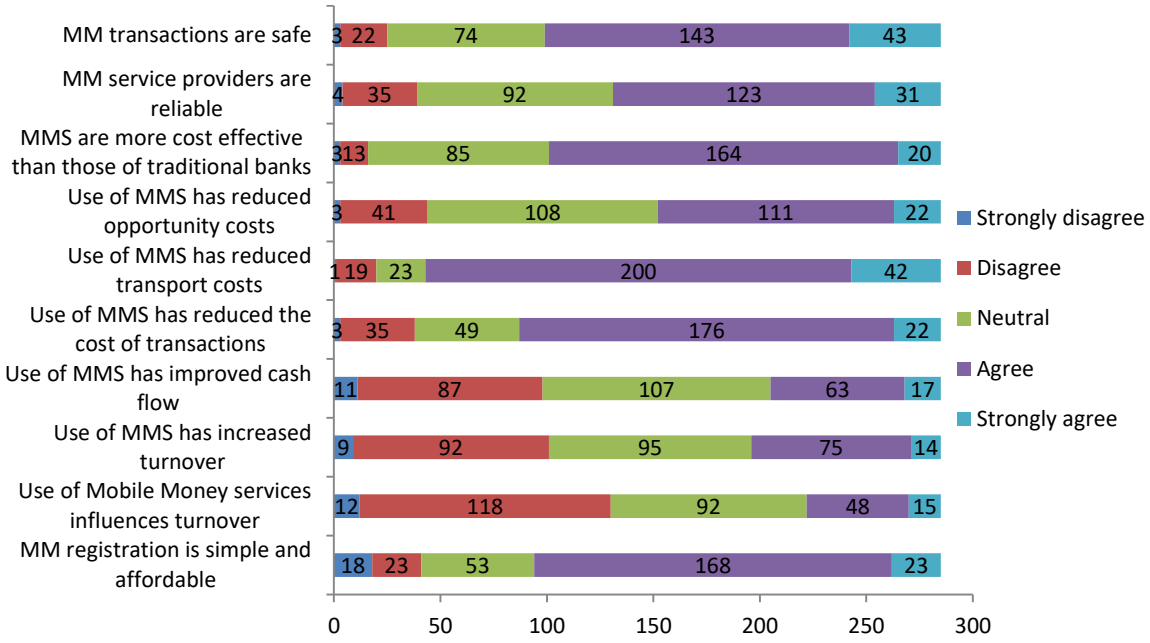

Figure 2. Perceptions of the respondents of Mobile Money (MM) and Mobile Money services (Source: authors).

4.1.3. Evaluation of the Perceived Impact of Mobile Money Payments and Receipts on the Financial Performance of SMEs in Douala

The researcher identified nine variables from the data to form a reliable scale against which to assess the influence of Mobile Money and Mobile Money services upon the financial performance of the SMEs whose representatives responded to the survey questionnaire. The researcher evaluated their reliability by using the SPSS version 25 software to determine a Cronbach alpha score for each before commencing with the analysis to test the hypotheses in the study. The nine variables, along with their respective Cronbach alpha scores, are summarised in Appendix A, Table A1. As Goforth [63] explains, Cronbach's alpha α scores need to be at least from 0.65 to 0.8 if they are to denote significance. The alpha coefficient noted in Table 2 is 0.659, which suggests that the items exhibit a reasonable degree of internal consistency concerning reliability. Reliability refers to the consistency with which particular research instruments generate data and is assessed by the likelihood that other researchers would be able to generate similar findings under the same conditions and using the same research techniques [58,61].

Table 2. Reliability analysis.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. of Items
0.659	0.646	9

Source: authors.

After that, Pearson's correlation analysis was conducted. For the purposes of performing the analysis, the variables have been recoded as follows: YE for years for which the SMEs of the respondents had been in existence, BA for does your business hold a bank account? AY for number of years since the adoption of MMS, MMSCETB for MMS are more cost effective than the services of traditional banks, MMSIT for using Mobile Money services influences turnover, TBA for monthly turnover before the adoption of MMS, TAA for monthly turnover after the adoption of MMS, NOPDS for number of Mobile Money payments per day to suppliers, EDU for levels of educational attainment and BS for business sectors in which the SMEs of the respondents operated. As can be seen in Table 3, the values of the correlation coefficient (r) for correlations between the variables which were regressed ranged from 0.149 to 0.834. The values reveal that there were correlations between all variables and turnover, with the exceptions of BA, EDU, and BS. It can be drawn from Table 2 that there was a significant and robust correlation at the 1 percent level between monthly turnover before the adoption of Mobile Money services and afterwards. Although there were correlations with all of the other significant variables, they were relatively weak. It was meaningful to note that the strong positive relationship between the variables TBA and MMSCETB—which was reflected in the value of 0.191 at the 1 percent level, dropped sharply after the adoption of Mobile Money services. This finding suggests that although many of the respondents may have believed before they started to use Mobile Money to make and receive payments that the availability of a more cost-effective system would increase their turnover, their perceptions changed after they started to use the system. It is also significant that the strength of correlations increased after the adoption of Mobile Money services for the variables YE, MMSIT and NOPDS. It is possible to infer from them that as the turnover of the SMEs increased over time, their increasing numbers of payments to suppliers per day also increased their turnover, thereby contributing to perceptions of Mobile Money transactions increasing turnover. This scenario also emerged from the findings of earlier studies which were conducted by researchers such as Ngaruiya et al. [10], Higgins et al. [23] and Nyaga and Okonga [33] -. Once the correlations had been determined between the independent and dependent variables, the researcher elected to investigate the proportion of variance in the dependent variable accounted for by the independent variables using the regression analysis. The R-square value of 0.733 in the model summary in Table 4 suggests that taken together, the independent variables explained of the order of 73 percent of the total variance in the turnover of SMEs in Douala after the adoption of Mobile Money services. From this

finding, it would appear that the independent variables which have been cited collectively constitute a credible predictor of financial performance for SMEs in Douala.

Table 3. Correlation analysis.

		YE	BA	AY	MMS CETB	MMSIT	TBA	TAA	NOPDS	EDU	BS
YE		1	0.023	0.237 **	0.048	−0.130 *	0.149 *	0.173 **	−0.012	−0.159 **	−0.133 *
BA		0.023	1	−0.080	0.055	−0.095	−0.039	−0.108	−0.154 **	−0.052	0.066
AY		0.237 **	−0.080	1	0.001	−0.012	0.189 **	0.143 *	0.243 **	−0.141 *	−0.011
MMSCETB		0.048	0.055	0.001	1	0.059	0.191 **	0.064	−0.135 *	−0.006	0.047
MMSIT	Pearson	−0.130 *	−0.095	−0.012	0.059	1	0.232 **	0.285 **	0.053	0.083	0.075
TBA	Correlation	0.149 *	−0.039	0.189 **	0.191 **	0.232 **	1	0.834 **	0.179 **	0.100	0.048
TAA		0.173 **	−0.108	0.143 *	0.064	0.285 **	0.834 **	1	0.266 **	0.113	0.040
NOPDS		−0.012	−0.154 **	0.243 **	−0.135 *	0.053	0.179 **	0.266 **	1	−0.005	0.061
EDU		−0.159 **	−0.052	−0.141 *	−0.006	0.083	0.100	0.113	−0.005	1	0.165 **
BS		−0.133 *	0.066	−0.011	0.047	0.075	0.048	0.040	0.061	0.165 **	1

**. Correlation is significant at the 0.01 level (two-tailed). *. Correlation is significant at the 0.05 level (two-tailed). Years in existence (YE), Does your business hold a bank account? (BA), Years since adoption of MMS (AY), MMS more cost-effective than services of traditional banks (MMSCETB), MMS influences turnover (MMSIT), Monthly turnover in FCFA before adoption of MMS (TBA), Monthly turnover in FCFA after adoption of MMS (TAA), Number of payments per day using Mobile Money (NOPDS), Levels of educational attainment (EDU), Business sectors in which the SMEs of the respondents operated (BS). Source: authors.

Table 4. Model summary[b] of regression analysis.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	0.856 [a]	0.733	0.727	0.699	0.733	127.113	6	278	0.000	1.995

[a] Predictors: (Constant), Number of payments per day using Mobile Money (NOPDS), Years in existence (YE), MMS influences turnover (MMSIT), MMS more cost-effective than services of traditional banks (MMSCETB), Years since adoption of MMS (AY), Monthly turnover in FCFA before adoption of MMS (TBA). b. Dependent Variable: Monthly turnover in FCFA after the adoption of MMS (TAA). Source: authors.

From the regression findings which appear in Table 5 and after substitution of coefficients ($\beta \ldots$) and variables (Y *and* $X \ldots$) onto the generic regression equation ($Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X6$), the researcher obtained the following function:

$$Y = 1.098 + 0.108\ X1 - 0.123\ X2 - 0.154\ X3 + 0.152\ X4 + 0.752\ X5 + 0.243\ X6 \quad (1)$$

where Y is the dependent variable (turnover after adoption of Mobile Money), X1 the independent variable 1 (years of existence), X2 the independent variable 2 (years since adoption of MMS), X3 the independent variable 3 (Mobile Money services are more cost-effective than services of traditional banks), X4 the independent variable 4 (MMS influence turnover), X5 the independent variable 5 (monthly turnover before adoption of Mobile Money) and X6 the independent variable 6 (number of payments to suppliers per day using Mobile Money).

Table 5. Regression coefficients [a] table.

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Correlations		
	B	Std. Error	Beta			Zero-order	Partial	Part
(Constant)	1.098	0.320		3.427	0.001			
Years of existence	0.108	0.041	0.086	2.638	0.009	0.173	0.156	0.082
Years since the adoption of MMS	−0.123	0.072	−0.057	−1.702	0.090	0.143	−0.102	−0.053
MMS more cost-effective than services of traditional banks	−0.154	0.059	−0.083	−2.598	0.010	0.064	−0.154	−0.081
MMS influence turnover	0.152	0.045	0.108	3.345	0.001	0.285	0.197	0.104
Monthly turnover in FCFA before adoption of MMS	0.752	0.032	0.801	23.639	0.000	0.834	0.817	0.733
Number of Payments per day using Mobile Money	0.243	0.066	0.121	3.676	0.000	0.266	0.215	0.114

[a] Dependent variable: monthly turnover in FCFA after the adoption of MMS (TAA). Source: authors.

The findings which are summarised in Table 5 confirm those which appear in Table 3, in that all of the independent variables apart from MMSCETB correlate positively with the turnover after

the adoption of Mobile Money. All of the independent variables, apart from years since adoption, are significant at the 5 percent level. It needs to be emphasised that the findings suggest that a unit increase in the monthly turnover of SMEs in Douala before the adoption of Mobile Money to make and receive payments should result in a 75 percent increase in their financial performance after the adoption of the system, ceteris paribus. They also reveal that unit increases in the numbers of payments to suppliers per day and the perception that Mobile Money services are more cost-effective than those of traditional banks result in an increased coefficient value of 0.243 and a decreased one of −0.154, respectively, for the independent variables if the coefficients for other variables are kept constant.

4.2. Results of the Qualitative Phase

Has the adoption of Mobile Money Services to make and receive payments improved your business operations?

The question of whether the adoption of Mobile Money to make and receive payments had improved the operations of the interviewees drew mixed responses as shown in Figure 3, with 58 percent perceiving an improvement while the remaining 42 percent did not. In the words of interviewee A:

"There is no change. I am still making more or less around the same turnover. The only advantage I may acknowledge is that it makes it unnecessary for me to leave my business premises."

This response confirmed that convenience was a motivating factor for the adoption of Mobile Money to make and receive payments. As interviewee D explained,

"The majority of my customers use Mobile Money services, especially those outside of Douala. Mobile Money services have improved my operation and made it very fluid. Now, people can pay for goods from wherever they are in Cameroon and receive them."

It needs to be emphasised that improved business operations are likely to result in increased sales turnover, a definitive indicator of both growth and financial performance. The overall finding displayed in Figure 3 was that the acknowledgement of seven of the twelve interviewees that the adoption of Mobile Money for payments and receipts had improved their business operations represented an acknowledgement that doing so had improved the financial performance of their businesses.

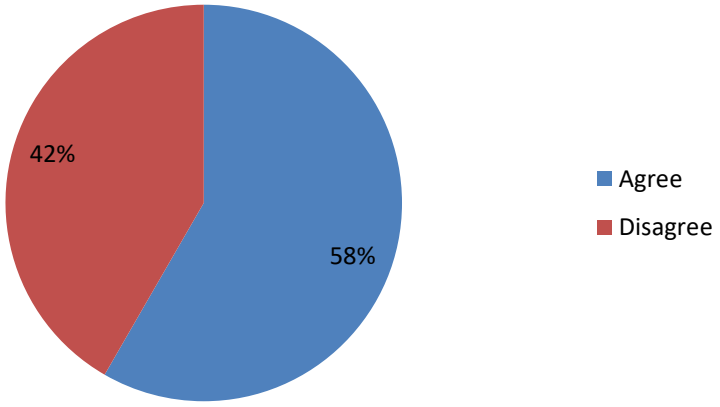

Figure 3. Perceived impact of the Mobile Money Services on the business operations (Source: authors).

4.3. Triangulation of Results from Both Phases

The triangulation process helps to confirm the interpretations which researchers have made of their data [62,64]. The findings which were obtained from the personal interviews in the qualitative study were used to validate those which emerged from the administration of the survey questionnaire in the quantitative study. Figure 4 is a schematic representation of the procedures which the researcher followed to triangulate the main findings from both phases. From the results, it can be concluded that the mobile money payment and receipt services have impacted on the financial performance of the SMEs in Douala, Cameroon after they had begun to use the platform.

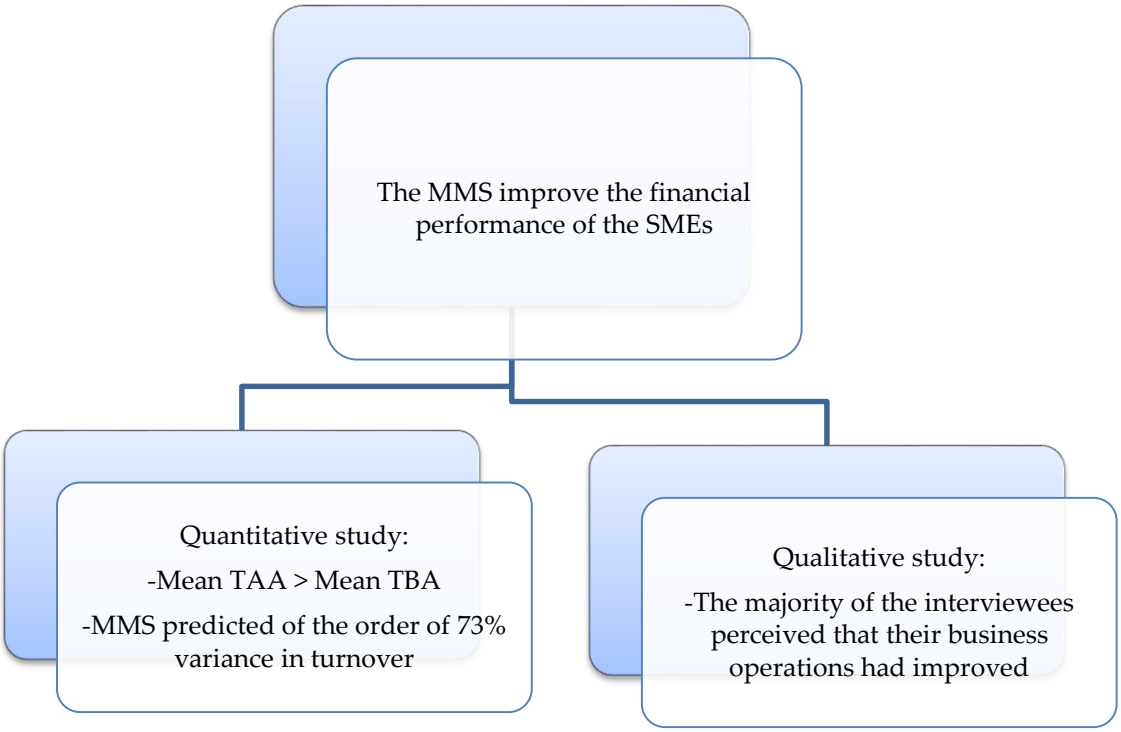

Figure 4. Triangulation of findings (SMEs: small and medium-sized enterprises. Source: authors).

5. Conclusions and Recommendations

Over the past decade, Mobile Money has improved financial inclusion in several developing countries but has also improved the way of life of many households and the business operations of many SMEs. The Mobile Money services merits could be used to address some of the difficulties faced by the SMEs in Douala, Cameroon. Mindful of these advantages and the growing uptake of the platform in Douala, the researchers investigated the impact of the mobile money payment and receipt services on financial performance. Taken collectively, the independent variables predicted 73% of the variance in sale turnover of the SMEs that participated in the study after they had begun to use Mobile Money services. In line with the literature, it can be concluded that the adoption of Mobile Money services exerted a significantly positive influence on the financial performance of the SMEs in this study. A finding which could plausibly be generalised at least to the two markets in Douala in Cameroon in which the study was conducted.

Considering the principal sources of difficulty which the participants identified with respect to the effective running of their businesses, and the perceived role of SMEs in economic growth, one would recommend firstly that the SMEs in Douala should make full use of Mobile Money services given its potential to improve financial performance. Secondly, that the government should investigate the feasibility of promulgating laws that would make Mobile Money service providers licensed financial institutions, as this would significantly reduce their operating costs and enable them to make their services more accessible to users. The partnerships which Mobile Money service providers have with commercial banks at present entail considerable expense and prevent them from making their services more affordable. Thirdly, the paper recommends that the government should encourage SMEs to make Mobile Money transactions through appropriate tax incentives. Finally, the government, through the Ministry of Small and Medium-sized Enterprises, Social Economy, and Handicrafts as one of its chief regulators, should provide support to the SME sector in the form of policies that facilitate an environment which is conducive to economic growth. Commercial banks must be encouraged to provide financial assistance to SMEs, even if doing so necessitates the government assuming responsibility for loans which are made to SMEs which have been assessed as being viable.

6. Limitations of the Study and Future Research Directions

One of the principal limitations concerned the researcher being obliged to rely upon the subjective assessments of the respondents to the survey questionnaire and interviewees on the influence of Mobile Money on their turnover. The accuracy of the findings would improve significantly if the researcher had access to informal financial records and could observe the levels of turnover from the numbers of sales which were transacted before and after the adoption of Mobile Money in a longitudinal study. Also, it needs to be conceded that reducing the initial sample size of 384, which had been calculated through the formula of Cochran [59], to 285 could have altered the findings. Using growth for turnover as the sole determinant of the increased financial performance of the SMEs without investigating the influence of other factors could have constituted another limitation. The statistical analysis of the data did not include a normality test, and only significant variables were used in the inferential analysis. The degree to which the findings could be generalised to other target populations could also be limited unless the business practices of the SMEs concerned are very similar to those in the two markets in Douala.

To enhance the generalisability and credibility of the findings, further investigations on the topic in Cameroon should prioritise the use of quantitative methodologies. Additionally, for future research, turnover should be based upon recorded sales, even if the methods which are used to record sales are informal. Given that the paper relied on the use of cross-sectional data, further studies should benefit from the longitudinal survey. Finally, as the independent variables which were identified as contributing to variance in sales turnover were found to predict of the order of 73% of the variance, those which could predict the remaining 27% could be investigated in future studies.

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Appendix A

Table A1. Reliability scores for each variable.

Variables	Cronbach's Alpha Score
Use of Mobile Money services influences turnover	0.609
Use of MMS has increased turnover	0.596
Use of MMS has improved cash flow	0.603
Use of MMS has reduced the cost of transactions	0.639
Use of MMS has reduced transport costs	0.659
Use of MMS has reduced opportunity costs	0.659
MMS are more cost effective than those of traditional banks	0.668
MM service providers are reliable	0.614
MM transactions are safe	0.626

Source: authors.

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Article

Do CSR Ratings Affect Loan Spreads? Evidence from European Syndicated Loan Market

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Abstract: We investigate whether corporate social responsibility (CSR) ratings affect the syndicated loan spreads paid by European listed firms. By performing ordinary least squares (OLS) pooled regressions on a sample of 1101 syndicated loans granted to European companies, we find evidence that borrowers' CSR ratings have a significant impact on loan spreads. However, the relationship between CSR ratings and loan spreads is quite complex. Low CSR-rated firms pay higher loan spreads than better CSR-rated firms, but high CSR ratings are not always rewarded by lenders. The benefits of a high CSR rating level are significant only for firms located in countries that pay great attention to sustainability issues. Overall, our work provides a key to reconciling the mixed results obtained in the empirical literature, as we find evidence of a significant lack of homogeneity within the European Union countries regarding the relationship between CSR performance and the cost of debt financing.

Keywords: corporate social responsibility; CSR rating; bank loan spread; European syndicated loan market

1. Introduction

The topics of corporate social responsibility (CSR) and sustainable growth have been investigated by the academic research for many years. Recently, the aforementioned themes have also entered the agenda of the policymakers, at least in the European Union. In late 2016, the European Commission established the EU High-Level Group on Sustainable Finance (HLEG) to help develop an overarching and comprehensive EU roadmap on sustainable finance. In its final report, released in January 2018, the HLEG argued that "the primacy of banks among lenders in assessing the credit risk of individual loans makes them particularly important for financing the origination of sustainable assets and for lending in support of the transition to a more sustainable economy" [1] (p. 67). In addition, in May 2020, the European Banking Authority (EBA) released a document defining the guidelines on loan origination and monitoring. In this document the EBA states that institutions "should take into account the risks associated with ESG factors on the financial conditions of borrowers" [2] (p. 26). A final unequivocal statement of political will is provided by the priorities set out by Ursula von der Leyen in the *Political guidelines for the next European Commission 2019–2024* [3].

Given these premises, we aim to investigate the relationship between the cost of bank loans and corporate social performance (CSP) in the European context. Understanding the attitude of banks toward the CSP of their borrowers allows us to draw important implications both for policymakers and for firms' managers. If banks do not consider CSP in the assessment of borrowers' credit risk, or, even worse, if banks apply greater spreads to borrowers with better CSP, then companies will be less inclined to bear the costs of CSR engagement. On the other hand, if banks reward borrowers who exhibit better CSP with lower loan spreads, then the managers of borrower firms will receive clear

indications about the investment policies to be set in the long term, and at the same time, they will be able to more easily justify the increase in costs originating from CSR engagement.

Our study aims to verify whether CSR ratings, a measure of CSP provided by a specialized rating agency, affect syndicated loan spreads charged to European listed firms. Our results suggest that banks consider CSR rating levels when they assess borrowers' creditworthiness. We find that CSR ratings are on average negatively related to loan spreads. However, by decomposing the average effect, we show that this relationship is more complex. Unlike existing studies investigating the European context [4–6], we explicitly examine potential nonlinearities in the relationship between CSR rating and the cost of debt financing, and we find that the country's environmental, social and governance (ESG) performance significantly affects the CSR rating–loan spread link. In high ESG-rated countries, a firm's loan spread declines as its CSR rating improves. In low ESG-rated countries, there seems to exist a U-shaped relationship between CSP and cost of debt financing: both high and low CSR-rated firms pay higher spreads than those with median CSR ratings. This implies that high CSR ratings do not automatically lower firms' credit risk. Our results also hold considering potential endogeneity issues, lender characteristics, borrower's credit quality, and crisis periods.

Our work fits into the literature that investigates the relationship between CSP and corporate financial performance (CFP). The literature on this topic is large (for a review, see Brooks & Oikonomou [7]), but only a limited stream of studies investigates the impact of CSP on firms' credit risk. Moreover, most available studies are focused on US firms [8–11] and find weak evidence that greater CSP leads to decreases in credit risk and credit spreads. The results obtained by examining US firms cannot be mechanically extended to European capital markets. Looking at the problem through the lens of institutional theory and the Varieties of Capitalism (VoC) theory, we know that the institutional context affects CSR activities and CSP [12]. Furthermore, in the US market-based system, companies are able to raise capital through large and liquid securities markets. In the credit-based system of Continental Europe, companies face rather thin capital markets and meet their financial needs mainly through bank loans. A study by the European Commission revealed that only 1498 of the more than 50,000 companies with assets over 10 million euros had access to the bond market [13]. Given that the European financial system is predominantly bank-based, banks are the key player to consider when investigating whether a borrower's CSR commitment can offer any contribution to the reduction of credit risk. The few articles investigating the relationship between CSP and credit risk in the European market are focused on the bond market [4,5]. Therefore, the relationship between CSP and the cost of bank debt in the European context is still largely unexplored.

To the best of our knowledge, the only study that includes European companies in an international sample of syndicated loans is Hoepner et al. [6], although their sample includes only 195 loans granted to European borrowers. The authors claim to find no conclusive evidence that firm-level sustainability influences the interest rates charged to borrowing firms by banks. Moreover, their findings do not support the view that the country's sustainability rating moderates the CSP–loan spread link. Unlike Hoepner et al. [6], we find evidence of a significant relationship between CSP and the cost of bank debt, although this relationship is not uniform throughout the European countries, but is conditional on the borrower's country ESG rating. In line with Stellner et al. [5], we claim that the benefits resulting from CSR investments are context driven. A detailed knowledge of the cross-country differences affecting the CSP–CFP link is particularly important to understand how banks reward CSP when they evaluate the creditworthiness of their borrowers.

In addition, banks not only play a dominant role in the European financial system, but they also differ significantly from other economic agents. Given their continuous monitoring activity and long-term customer relationship with firms, banks are considered "quasi-insiders" of firms. Therefore, banks can assess firms' creditworthiness better than other entities. This element allows us to analyze how more informed lenders evaluate borrowers' CSP.

We emphasize that the loan market may incorporate CSR information differently than the bond market. There has been a remarkable increase in sustainable investing. Sustainable investing is an

investment approach that considers CSR-related factors in portfolio management. According to the Global Sustainable Investment Alliance [14], investors representing over half of all professionally managed assets in Europe adopt some form of screening based on sustainability filters. Given the increase in sustainable investing, bonds issued by socially responsible companies may be, at least in part, purchased by investors who do not make their investment decisions on the basis of mere economic convenience. Since many fund managers must consider the CSR commitment of firms issuing bonds in order to comply with their investment mandate, firms engaged in CSR could have a stable advantage in terms of greater demand in the bond market. In contrast, this benefit could be more uncertain in the syndicated loan market because lender banks are not contractually required to consider firms' CSR engagement. Thus, in line with the existing literature [8], we assume that banks have no social agenda to promote.

Our study offers several contributions. First, we contribute to the debate on the CSP–CFP relationship by adding insights about the information that lenders take into account when they decide which loan spread to charge to their borrowers. Our findings provide support for a significant relationship between CSP and CFP. However, CSP remains a second-order determinant of loan spreads compared to credit ratings and other financial and accounting variables.

Second, we provide empirical evidence of the CSP–credit risk link in the European market, which is characterized by a different institutional context with respect to the markets investigated until now by the existing literature, mainly focused on the US market. Our study fills this gap and provides evidence that CSR ratings significantly affect the cost of bank debt.

Third, our results highlight the importance of cross-country heterogeneity to depict a comprehensive picture of the CSP–CFP relationship in the European context. We document that the European Union cannot be considered as a homogeneous area, because we find that the cross-country differences in the attention to ESG issues affect the relationship between CSP and the cost of debt financing. These results are undocumented for European firms in the CSR literature, and they are partially at odds with findings from the U.S. context [15].

Finally, we provide evidence of significant nonlinearities in the CSP–CFP relationship. These findings are consistent with the view that country awareness and sensitivity toward ESG issues may be able to constrain companies from making excessive and wasteful investments in CSR.

Overall, our work provides a key to reconcile the contradictory results obtained from literature with reference to the European firms.

The remainder of the paper is organized as follows. Section 2 reviews the related literature. Section 3 presents the research hypotheses. Section 4 describes the data and methodology. Section 5 shows our main results. Section 6 refers to the robustness checks and additional results. Section 7 provides a discussion of our results. Finally, Section 8 concludes.

2. Literature Review

There has always been some skepticism among practitioners and researchers about the value of CSR. For practitioners, a signal of a changed attitude about the role of CSR comes from the following [16]: "Beyond the attempt to deceive customers and regulators, the [Volkswagen] scandal also highlights the failure of traditional valuation models—such as discounted cash flow—to capture the full range of risks companies face today. It also underlines the potential benefit of assessing companies with alternative data sets that highlight environmental, social, and governance (ESG) signals, flagging risks that traditional analytical tools aren't designed to identify".

Although the skepticism toward CSR has not completely disappeared, there is now a growing body of literature that identifies numerous positive effects of CSR commitment. CSR investments may become competitive advantages for firms, because they allow companies to build internal resources by improving their reputation and customer loyalty [17,18]. By engaging in CSR, firms can improve relationships with their stakeholders [19], resolve conflicts between various groups of stakeholders [20], and be less exposed to legal, reputational, and regulatory risks relating to controversial or irresponsible activities [9].

At the same time, CSR investments may be perceived as a signal of superior management skills [21]. CSR may likely lead to better economic and financial performance, because it is also connected to trustworthiness, integrity, non-opportunistic behavior, and the moral character of a firm [6].

The existing literature has proposed two different hypotheses explaining the CSP–CFP link: the *risk mitigation view* and the *overinvestment view* [8]. Under the *risk mitigation view*, superior CSP is regarded as a factor that improves the risk profile of a company. Companies that invest in CSR are able to strengthen their relationships with key stakeholders and to build internal resources and intangibles that provide stability and a buffer in times of downturn and should result in lower cash flow volatility. The better risk profile and the greater ability to repay the principal at maturity are rewarded by lenders with a lower spread charged to the borrower company [5]. Under the *overinvestment view*, investors regard investments in CSR as a waste of scarce resources. Excessive costs for handling the various relations with a high number of stakeholders may increase complexity and reduce profitability, leading to higher borrowing costs.

A growing literature focuses on the effect of only one dimension (environmental, social, or governance) of CSP on credit risk. See, for example, Nandy and Lodh [22]; Chava [23]; Kim et al. [24]; Cui et al. [25]. These studies are linked to our work, but we adopt a broader perspective, investigating the relationship between CSR ratings (the overall CSR performance) and loan spreads. Several studies find empirical evidence supporting the *risk mitigation hypothesis* by examining the impact of CSP on firms' financing costs. El Ghoul et al. [26] document that the cost of equity is lower for US firms with better CSR scores. In examining the impact of CSP on bond spreads and the ratings of US firms, Oikonomou et al. [9] show that CSP is negatively but weakly related to systematic firm risk, and that corporate social irresponsibility is positively and strongly related to financial risk. Jang et al. [27] find that higher ESG scores can help lower the cost of funding for the bond issuers of relatively small Korean firms. Salvi et al. [28] investigate the international bond market. They find that superior CSP strengths are associated with lower credit spreads, while a higher number of CSP-related controversies leads to an increase in the cost of corporate bonds. Truong and Kim [29] analyze the U.S. credit default swap market and show that CSR activities reduce credit risk in the long run more than in the short run. Gangi et al. [30] find that CSP has a significantly negative influence on the firms' risk of financial distress. In line with the risk mitigation view, Bae et al. [11] provide evidence that CSR matters to the pricing of US loan contracts, and that the absence of scrutiny by credit rating agencies exacerbates the lenders' negative view in case of poor CSP. Bouslah et al. [31] find that the impact of CSR dimensions on firms' risk is not uniform, and that, in general, the relation between firms' risk and CSR strengths and concerns is more significant for more transparent firms (included in the S&P 500 index) than for more opaque companies (not included in the S&P 500 index). Ge and Liu [32] show that the disclosure of better CSP leads to lower yield spreads. In addition, they document that firms with weaker CSP do not pay significantly different yield spreads than firms that do not disclose CSR information. Stellner et al. [5] find only weak evidence that superior CSP results in reduced credit spreads in the European corporate bond market. Moreover, they show that the relationship between CSP and credit risk is conditional on a country's ESG performance.

Compared to the above mentioned studies, the *overinvestment hypothesis* offers an alternative view, drawn from the agency theory. Under this view, a higher CSR engagement pushes firms' investments over the optimal level. From the shareholder perspective, by engaging in CSR activities, firms divert resources from the maximization of shareholder wealth [33,34]. At the same time, CSR activities may increase firms' fixed costs and the volatility of earnings, leading to an increase in firms' default risk [35].

In addition, given the existence of principal–agent conflicts of interest, managers can use CSR activities to improve their own reputation at the expense of shareholders [36]. In this view, CSR investments can be assimilated to other agency costs, such as the purchase of unnecessary corporate jets [8,37]. Other researchers, drawing from neoclassical economic theory, argue for a negative relationship between CSP and CFP. These authors contend that responsible firms are at a competitive disadvantage compared with their unresponsive peers [38–40].

Consistent with the *overinvestment hypothesis*, Menz [4] finds that CSP is positively related to European corporate bond spreads, but this relationship appears only weakly significant. Goss and Roberts [8] show that CSP leads to an economically modest decrease in loan spreads applied to US public firms. However, they find evidence of a positive relationship between CSR investments and loan spreads applied to low-quality borrowers, because the agency costs associated with sustainable investments are greater for these firms. Baran and Zhang [41] show that the yields of newly issued bonds are greater for firms included in the KLD 400 Index. Hoepner et al. [6] do not detect a significant link between CSP and syndicated loan spreads and document that particular dimensions of CSR even appear to lead to greater loan spreads. Finally, Bae et al. [15] find evidence of a non-linear effect of CSR investments on debt financing costs in a sample of US firms.

Our study presents important elements of novelty compared to previous studies, which are focused on the European context [4,5] or investigate some international samples that include European companies [6,23]. Unlike the above mentioned studies, we hypothesize that the European context is not a homogeneous area, and we prove the existence of nonlinearities in the relationship between CSP and loan spreads in the European area.

3. Hypothesis Development

3.1. Do CSR Ratings Affect Loan Spreads?

The risk mitigation view and the overinvestment view offer the theoretical background to verify whether CSR ratings affect the cost of bank loans.

Lenders take into account potential risks that may negatively affect the borrowers' financial performance. In this respect, lenders may be concerned about the likelihood that CSR-related issues (e.g., a corporate scandal or a negative environmental event) increase default risk and jeopardize the ability of the borrower to repay his debts. Under a broader perspective, as Bae et al. [11] point out, CSR engagement may reduce conflicts of interests between managers and stakeholders. If the conflict-resolution hypothesis holds, then CSR engagement reduces agency costs and conflict of interests among various stakeholders, including lenders. Thus, under the risk mitigation view, we expect that:

Hypothesis 1a (H1a). *CSR ratings are negatively related to loan spreads.*

On the contrary, lenders may consider a firm's CSR engagement from the perspective of a principal–agent relationship between managers and shareholders: CSR investments waste corporate resources and thus make borrowers more vulnerable to adverse economic conditions. The competitive disadvantage hypothesis (neo-classical economic theory) reaches the same conclusions. Under the previous views, lenders charge higher spreads to high CSR performers borrowers. If this is the case, consistent with the overinvestment view, we can propose an alternative hypothesis:

Hypothesis 1b (H1b). *CSR ratings are positively related to loan spreads.*

However, the previous hypotheses could only provide a first approximation of the actual relationship between CSR ratings and loan spreads. Bae et al. [15] combine the risk mitigation hypothesis with the overinvestment hypothesis, suggesting a non-linear relationship between CSP and loan spreads. Building on previous theoretical studies, they hypothesize an optimal level of CSR investments that maximize profits, while also satisfying the demand for CSR of the other stakeholders. The optimal level of a firm's CSR investments is that required to fully insure the firm's risky assets against loss, so CSR investments beyond this level would impose additional costs without producing any insurance benefits. The authors provide evidence of a U-shaped relationship between CSP and debt financing costs for a sample of U.S. bank loans. Similar findings are reported by Ye and Zhang [42] for Chinese firms.

We too hypothesize a nonlinear relationship between CSP and loan spreads, but we assume a different relationship from that of Bae et al. [15]. Several studies find evidence that CSP has a mitigating effect on stock price crash risk [43] and on downside risk [44,45]. From a theoretical point of view, the previous literature argues that CSR investments can reduce a firm's risk exposure through insurance-like protection by generating moral capital among stakeholders. The creation of moral capital (and other intangible, internal resources) acts as insurance-like protection when negative events occur, preserving shareholder value. We emphasize that lenders, compared to shareholders, are more averse to downside risk. As a result, lenders may be less willing to penalize high CSP levels than shareholders. In addition, we have already clarified (see Introduction) that the results provided by Bae et al. [15] for the US market cannot be mechanically extended to other institutional contexts. In this respect, further confirmation comes from Utz [43], who examines the predictive power of CSP for both idiosyncratic risk and stock crash risk in an international sample and finds mixed results. In the Asia-Pacific sample, high CSP increases crash risk, in accordance with the overinvestment hypothesis. On the contrary, in the European sample, there is no evidence of a U-shaped relationship between CSP and idiosyncratic risk.

Building on the above-mentioned studies, we may hypothesize that better CSR ratings lower loan spreads but at a decreasing rate. High CSP may increase firms' fixed costs or create a competitive disadvantage. However, the high aversion of lenders to downside risk, together with the existence of specific institutional or cultural factors affecting the European context, may counteract the increase in a firm's fixed costs, preventing a positive relationship between loan spreads and CSR ratings. In light of previous consideration, we propose an additional hypothesis:

Hypothesis 1c (H1c). *Loan spreads are not a strictly decreasing function of CSR ratings: as the CSR rating increases, the loan spread function should first be decreasing and then should become approximately flat.*

In any case, to further validate our hypothesis, we will also control for a potential U-shaped relationship in our sample.

3.2. Does Country ESG Performance Affect the CSR Rating–Loan Spread Link?

The institutional theory argues that the national institutional and economic environment influences the likelihood that companies will assume CSR compliant behavior [46,47], and that variation in CSP across firms is explained by variation in national-level institutions [12]. Cai et al. [48] document the role of other country factors, besides national institutions, that explain CSP, such as differences in stages of economic development, the cultural dimension, factors associated with the political system (e.g., corruption, civil liberty, and political rights), as well as the education and labor system characteristics. Following this line of reasoning, Hoepner et al. [6] outline that issues such as climate change, resource scarcity, population growth, and ageing have deep economic repercussions, and that ESG macro-themes have a growing importance in the valuation of every asset class and type of financial contract. They find that a higher country sustainability rating is associated with lower costs of bank loans and argue that the sustainability framework of the home country "act[s] as a shield for the borrower firm, protecting it from the operational and reputational hazards occurring from systemic social and environmental challenges and, ultimately, reducing its default risk" [6] (p. 161). Stellner et al. [5] show that the relationship between CSR engagement and EU firms' credit ratings and bond spreads depends significantly on the CSP of the country where the company is established. They argue that CSP leads to lower credit risk only if the CSR efforts of firms are rewarded in the environment in which they are embedded. In particular, the authors find that greater CSR efforts lead to greater benefits for companies whose CSP mirrors that of their home country.

Given the potential effect of countries' sensitivity to CSR issues, we hypothesize that the impact of CSR ratings on syndicated loan pricing may be affected by the home country ESG rating of the borrower. Lenders should reward borrowers whose high CSR rating mirrors the home country ESG performance.

Conversely, in countries with low ESG performance, high CSR ratings may bring lower benefits to the borrower or may be associated with higher borrowing costs. Moreover, low CSR-rated firms should pay higher loan spreads regardless of the country ESG rating. Indeed, potential lenders could hardly ignore issues related to poor CSP (e.g., problematic relationships with consumers, employees, and other stakeholders) both in high and low ESG-rated countries.

Overall, we expect that in high ESG-rated countries, the loan spread is a decreasing function of CSR rating. On the contrary, in low ESG-rated countries, we expect to find evidence consistent with a U-shaped relationship between loan spread and CSR rating. Therefore, we formulate our second hypothesis:

Hypothesis 2 (H2). *In high ESG-rated countries, firms pay lower loan spreads as their CSR rating improves. In low ESG-rated countries, high or low CSR-rated borrowers pay higher loan spreads compared to median CSR-rated borrowers*.

4. Data and Methodology

4.1. Sample and Data

Our sample consists of syndicated loans granted to listed non-financial firms established in EU member states during the 2006–2015 period.

We use LPC's DealScan database to collect information on individual loans, including: the loan closing date, the loan spread over Libor (incorporating any annual or facility fees paid by the firm), maturity, seniority status, purpose, and type. We also retrieve from LPC's DealScan database the information on the borrower, including its sector of activity, and the lending syndicate, including the identity and the role of banks in the loan syndicate.

For each firm, we retrieve CSR ratings from Thomson Reuters ASSET4. The ASSET4 database covers more than 6000 companies around the world, enabling us to investigate the European context. ASSET4 ratings have a reputation for being among the most diligent and trustworthy sources of CSR data [5,30,43]. ASSET4 assigns a score to each company considering four pillars: environmental, social, corporate governance, and economic. These four pillars have approximately 750 individual data points, which are combined into 280 key performance indicators (KPIs). Then, these KPIs are structured into 18 categories within the four pillars. ASSET4 provides a score for each pillar and an equal-weighted rating, which indicates the overall CSR score. Each score is calculated by equally weighting and z-scoring all underlying data points and comparing them against all companies in the ASSET4 universe. The final score is expressed as a percentage and is therefore a relative measure of performance.

We retrieve data on ESG country ratings from Bloomberg. Bloomberg provides an overall score for more than 170 countries and an individual score in the dimensions of environmental, social, strategic governance and economics that matches the four categories provided by ASSET4.

We use Datastream to collect information on firms' balance sheets. We match firms in LPC's DealScan to Datastream, using the company name and ISIN code, to extract firms' accounting information. After the matching, our dataset consists of 1727 loans granted to 483 firms. It is worth noting that, in our sample, approximately 60% of borrowers have a CSR rating, while only 40% of borrowers have a credit rating. This comparison highlights the relevance gained by CSR ratings for European listed firms.

Finally, after excluding from our dataset the companies without a CSR rating, our final sample includes 1101 loans granted to 297 firms.

4.2. Methodology

4.2.1. Measuring CSP

Measuring CSP is a challenging task involving the assessment of a broad range of economic, environmental, governance, and social factors [49]. Existing studies have adopted a remarkable

variety of different CSP measures [50]. More recently, several studies have measured CSP by adopting the assessments provided by social rating agencies. Following these studies, we measure CSP by employing Thomson Reuters ASSET4 ratings (described in Section 4.1). We are aware that any CSP measure involves unavoidable elements of subjectivity. However, we underline that, in contrast to measures specifically built for a single research work, a rating provides a CSP measure that is public and available to the entire financial community.

According to the economic theory, rating agencies perform at least two main functions: signaling and monitoring. For example, credit rating agencies signal to investors the creditworthiness of the issuer of a financial security (signaling), and, after the security issuance, they continue to monitor the issuer (monitoring). Similarly, social rating agencies signal and monitor CSP.

The literature notes that sustainability commitments are difficult to verify. Consumers, investors, and other external stakeholders are not able to verify the sustainability claims made by companies, because they do not have access to relevant information [51]. Reliable third party institutions, which are able to gather the needed information, may become important players [52].

We do not claim that CSR ratings are the best possible way to measure CSP. More simply, we aim to verify whether CSR ratings affect banks' loan pricing decisions. Again, we can find an analogy between CSR ratings and credit ratings. It is well known that the credit rating is not the only possible measure for assessing creditworthiness, and that the rating alone is not able to explain the level of credit spreads paid by different borrowers. However, it is generally recognized that credit ratings provide the market with economically relevant information. Furthermore, CSR ratings enjoy a significant difference compared to credit ratings. The latter are widely used in financial regulation, and economic agents are in some way obliged to take the credit rating into account in their decisions. In contrast, CSR ratings have not, to date, been subject to regulatory use. Consequently, economic agents can freely decide whether to consider the CSR rating, without being conditioned by regulation.

It must also be recognized that CSR ratings suffer from many shortcomings [53,54]. Windolph [52] highlights several undesirable properties of CSR ratings described in the literature: lack of standardization, lack of credibility of information, bias, lack of transparency, and lack of independence. Chatterji et al. [55] document a surprising lack of agreement across social ratings from six well-established raters. The authors claim that low convergence of social ratings remain even when they adjust for explicit differences in the definition of CSR held by different raters.

These problems do not invalidate our analysis. If our research hypotheses were verified, we could state that the ASSET4 rating provides information relevant for the pricing of the syndicated loans. This result, if proven, would not exclude that different CSR rating measures may provide other relevant information not captured by ASSET4 ratings.

Social raters began releasing their assessments only recently, especially when compared to the longstanding experience of credit rating agencies. Over time, market forces will select rating agencies, allowing only those agencies able to provide economically relevant information to survive [56].

4.2.2. CSR Rating and Loan Spread

To test our research hypotheses, we perform ordinary least squares (OLS) pooled regressions, treating the facilities in each deal as different loans. Consistent with the literature (e.g., [8]), we focus on cross-sectional differences, because most firms have only a few different observations. It is worth noting that we consider a sample of loans observed at their origination. Most firms have received just few loans during our sample period. As we treat the facilities in each deal as different loans, most borrowers often receive multiple loans at the same date, and subsequently they no longer appear in our sample. For the same reason, we have just one observation for several borrowers. Given the sample characteristics, we do not adopt firm fixed effects or other panel techniques. However, we perform additional tests to address self-selection bias and potential endogeneity and reverse causality issues (see Appendix A).

Our base regression model is described in Equation (1):

$$LnSpread_{i,t} = \beta_0 + \beta_1 CSR_{i,t-1} + \beta_2 B_{i,t-j} + \beta_3 L_{i,t} + \beta_4 X_{i,t-j} + \varepsilon_{i,t} \quad (1)$$

The dependent variable is the logarithm of the all-in-drawn spread of the loan granted to the *i*-th firm at the loan closing date *t*. Since borrowers are unlikely to receive loan spreads lower than LIBOR, the spread variable may be characterized by a positive skewness. Thus, we use a log-transformed spread to mitigate this potential bias.

The vector *CSR* includes alternative key explanatory variables used in our estimates. To test *H1a* and *H1b*, we use the variable *EW Rating*, which is the CSR equal-weighted rating of the *i*-th firm in the year preceding *t*. A negative and significant coefficient of *EW_Rating* would imply that banks charge higher loan spreads to firms with lower CSR ratings than firms with higher CSR ratings. The opposite is true if the *EW_Rating* coefficient proves to be positive and significant.

To test our hypothesis *H1c*, we introduce the following variables: *HighEWRating*, which is a dummy variable that is equal to 1 if the CSR equal-weighted rating of the *i*-th firm in the year preceding *t* is in the highest tertile of the empirical distribution; and *LowEWRating*, which is a dummy variable that is equal to 1 if the CSR equal-weighted rating of the *i*-th firm in the year preceding *t* is in the lowest tertile of the empirical distribution. Then, in Equation (1), we replace *EW_Rating* with *HighEWRating* and *LowEWRating*. This distinction allows us to verify whether the negative relationship between CSR ratings and loan spreads is not strictly decreasing. To further test *H1c*, we drop *HighEWRating* and *LowEWRating*, and, following Bae et al. [15], we estimate Equation (1) by adding the quadratic term EW_Rating^2. If the coefficient of this variable proves to be significant, our hypothesis would not be confirmed.

4.2.3. Control Variables

Following the existing literature on syndicated loan spreads, we develop our model by including three vectors of control variables [57,58]. The vector *B* includes *Borrower Variables* to consider firms' accounting information (*Size*, *CashFlow*, *ROS*, *IE_Revenue*, *Leverage*), market-based data (*MTBV*, *Stock_StdDev*), and industry (*Industry*). In addition, we consider the role of credit ratings. Previous studies emphasize that CSR-related risk factors may affect credit ratings [5,10,59,60]. If credit ratings fully incorporate CSR-related information that is relevant for lenders, then we will observe a non-significant impact of CSR ratings when we include borrowers' credit ratings in our model. Therefore, we introduce the variable *Risk_Weight*, which indicates the risk weight assigned to the *i*-th firm under the Basel II standardized approach. To calculate *Risk_Weight*, we convert the borrower's rating into a risk weight by adopting the weighting scale used in the Basel framework. *Risk_Weight* takes values from 0 to 1.5. High values of this variable indicate a greater credit risk of the borrower. This approach offers two advantages: (i) it allows us to convert an ordinal risk measure (rating) into a cardinal measure (risk weight), and (ii) it allows us to assign a risk weight (equal to 1) to unrated firms [61].

In Loan Variables, the vector L, we consider loan characteristics: Maturity, Secured, Covenant, Purpose, Type, Seniority, and Loan_Concentration. Following Goss and Roberts [8], we use Loan Concentration as a proxy for the strength of the relationship between the bank and the borrower. In our robustness tests, we specifically address this point considering the potential impact of relationship banking effects (Appendix A).

Finally, we use the vector *X* to control for the stock index return of the country where the *i*-th firm is established over the three months preceding *t* (*Sov_Stock_Ret*), the *i*-th firm's home country sovereign rating (*Sov_Rating*), the loan reference rate value (*Ref_rate*), and year dummies (*Year dummies*). In vector *X*, we also include a set of variables to control for country effects. To achieve this goal, we follow the varieties of capitalism (VoC) approach, which suggests that the different models of the economic system adopted by each country affect the national financial market [62–64]. Comparative analysis of

capitalism is based on an identification of a set of key institutional areas: (i) product market competition; (ii) the labour market; (iii) the financial intermediation sector (regarding the financial intermediation sector, the cluster classification considers, inter alia, the following variables: sophistication of financial markets, stock ownership concentration, creditor rights protection, importance of institutional investors, degree of banking concentration, and importance of banks in firms' investment funding) and corporate governance; (iv) social protection; and (v) the education sector. Countries exhibit significantly different features in each of these areas, and institutional complementarities define the different domestic models of capitalism. According to the VoC approach [64], EU countries can be clustered into five different models of capitalism: liberal market economies (*Lme*), liberal-like market economy (*LLme*), coordinated market economies (*Cme*), state-dominated market economies (*Sd*), and hybrid market economies (*Hy*). Therefore, to identify the capitalism model of the *i*-th firm's home country, we introduce a dummy variable for each cluster. In alternative versions of our models, we have replaced VoC dummies with country fixed effects, obtaining qualitatively similar results. Results unreported for space considerations are available from the authors.

In the Supplementary Material (hereafter SM) we report in Table S1 the complete list of variables used in our study and their relative sources.

4.2.4. The Role of the ESG Country Rating

To test our hypothesis *H2* we perform two different regression analyses. First, we drop *EW Rating* in Equation (1), and we reintroduce the dummy variables that divide our sample into tertiles (*HighEWRating* and *LowEWRating*). Then we add the following variables: (i) *HighESGCountry*, which is a dummy variable equal to 1 if the ESG rating assigned by Bloomberg to the *i*-th firm's home country in the year preceding *t* is above the average of the sample, (ii) the interaction variable *HighEWRating·HighESGCountry*, and (iii) the interaction variable *LowEWRating·HighESGCountry*. In this way, we consider six groups of firms: (1) high-rated firms located in low ESG-rated countries; (2) firms with median CSR ratings located in low ESG-rated countries; (3) low-rated firms located in low ESG-rated countries; (4) high-rated firms located in high ESG-rated countries; (5) firms with median CSR ratings located in high ESG-rated countries; (6) low-rated firms located in high ESG-rated countries. Our benchmark group includes firms with median CSR ratings established in countries with lower ESG rating (group (2)).

Consistent with *H2*, we expect that: (a) firms in group (1) and (3) pay higher spreads than firms in group (2); and (b) firms in group (6) pay higher spreads than firms in group (5), which, in turn, pay higher spread than firms in group (4).

To better investigate potential nonlinearities in the relationship between CSR ratings and loan spreads, we run a second regression analysis splitting our sample into high ESG-rated and low ESG-rated countries. Then, we add in Equation (1) the quadratic term of *EW Rating*. In order to confirm *H2*, we should find that in low ESG-rated countries the coefficient of EW_Rating^2 is positive and significant. In contrast, in high ESG-rated countries, our hypothesis will be confirmed whether (i) the coefficient of EW_Rating^2 is negative and significant and (ii) the interpolating parabola is a decreasing function in the domain of *EW Rating*.

5. Results

5.1. Sample Characterization

In Table 1, we report the distribution of loans included in our sample by country. We also indicate the percentage distribution, the mean all-in spread, and the mean amount. We observe that firms included in our sample are established in 17 EU member states.

Table 1. Distribution of syndicated loans by country.

Country	No. of Loans	Perc. of Loans	Mean All-In Spread (Basis Points)	Mean Loan Amount (Millions of Euro)
Austria	21	1.91%	71.96	676.33
Belgium	26	2.36%	174.42	519.12
Cyprus	7	0.64%	179.29	404.84
Czech Republic	11	1.00%	240.18	286.65
Denmark	7	0.64%	161.07	186.75
Finland	16	1.45%	172.81	832.52
France	180	16.35%	113.56	1489.01
Germany	175	15.89%	121.64	2412.15
Greece	2	0.18%	375.00	742.50
Ireland	21	1.91%	183.57	688.36
Italy	70	6.36%	150.76	2203.56
The Netherlands	64	5.81%	189.16	1146.51
Poland	15	1.36%	173.00	818.77
Portugal	18	1.63%	191.28	1810.02
Spain	128	11.63%	157.52	1585.67
Sweden	24	2.18%	224.17	695.66
United Kingdom	316	28.70%	196.43	1037.62
Total loans	1101	100.00%	160.29	1428.90

Table 2 shows the summary statistics for the main variables used in the regression models.

Table 2. Summary statistics.

Variable	No. of Obs.	Mean	Median	Std. Dev.
LnSpread	1101	4.71	4.83	0.91
EW_Rating	1101	0.72	0.83	0.25
HighEWRating	1101	0.34	0.00	0.47
LowEWRating	1101	0.33	0.00	0.47
HighESGCountry	1101	0.58	1.00	0.49
Size	1101	16.05	15.97	1.54
CashFlow	1101	0.09	0.08	0.07
ROS	1101	0.15	0.12	0.19
IE_Revenue	1101	0.03	0.02	0.04
Leverage	1101	0.64	0.65	0.16
MTBV	1101	2.63	2.05	2.63
Stock_StdDev	1101	0.29	0.26	0.15
Risk_Weight	1101	0.91	1.00	0.24
Maturity	1101	52.99	60.00	25.49
Secured	1101	0.23	0.00	0.42
Covenant	1101	0.10	0.00	0.30
Loan_Concentration	1101	−1.26	−1.04	0.96
Sov_Stock_Ret	1101	0.01	0.02	0.11
Sov_Rating	1101	20.62	22.00	2.70
Ref_rate	1101	1.53	0.88	1.63
NWC	1658	0.04	0.03	0.16
OpInc	1658	0.07	0.07	0.06
RET	1658	0.16	0.14	0.22
EW_Rating_Lag	988	0.70	0.81	0.26
Relationship	12,610	0.72	1.00	0.44
Share	12,546	0.08	0.05	0.08
NumLenders	12,610	19.57	19.00	9.86

Notes: The sample consists of 1101 loans granted to listed non-financial firms established in EU member states during the 2006–2015 period.

We checked the correlations among variables, and we can affirm that the correlations do not represent a concern for our estimates (please see Table S2 in Supplementary Materials).

5.2. The Impact of CSR Ratings on Loan Spreads

In Table 3, we report the estimates obtained by testing our alternative hypotheses *H1a* and *H1b* (the complete results are reported in Supplementary Materials in Table S3). We find that the CSR rating level of the borrower has a significant impact on loan spreads. In particular, the negative sign of the *EW Rating* coefficient suggests that an increase in the CSR rating of 10 scores reduces by about 4.2% the average loan spread applied to borrower firms (our study is focused on the overall CSP, measured by the CSR rating. However, we also verified whether firms' scores in each CSR pillar (economic, environmental, social, and governance) have a different impact on loan spreads. The results obtained for each pillar do not significantly differ from those obtained for *EW_Rating*. Results are reported in Appendix B). Therefore, consistent with *H1a*, our results suggest that lenders: (i) take into account CSP when they assess borrowers' creditworthiness and (ii) seem to positively evaluate borrowers' CSR efforts.

Table 3. The impact of CSR ratings on loan spreads.

	(1)
EW_Rating	−0.416 ***
	(0.078)
Borrower Variables	YES
Loan Variables	YES
Country and other control variables	YES
Observations	1101
Adjusted R-squared	0.676

Notes: Robust standard errors are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

We find plausible results for our control variables. Regarding the variables included in the vector *B* (*Borrower Variables*), size, cash flow, burden of interest expenses, leverage, market-to-book value, and the borrower's stock return have a significant impact on loan spreads. The signs of the coefficients are those expected and in line with the literature. We also observe that greater values of *Risk_Weight* lead to greater spreads. Since *EW_Rating* remains also significant controlling for credit rating levels, we can confirm that credit ratings do not fully include CSR-related information and that lender banks consider CSR information also in the presence of credit ratings.

Regarding the variables included in the vector *L* (*Loan Variables*), we note that the priority structure, as expected, has a highly significant impact on the loan spread. In addition, collateral and covenant clauses are associated with greater spreads, because these clauses are generally included in loan contracts for riskier borrowers.

For the third vector of variables (*X*), we note that higher sovereign ratings lead to lower loan spreads. Our results show that, compared to our control group (*CME*), borrowers belonging to the LME countries paid greater loan spreads. This finding is consistent with the VoC literature, which agrees that in the financial markets of LME countries, competitive pressures are higher and that financial transactions are priced according to purely market mechanisms. In contrast, in CME countries, competitive pressures are moderate, financing channels are based mostly on informal relations and on reputational factors, and the relations between banks and companies tend to be long-lasting. The coefficients of the remaining clusters (*LLme*, *Hy*, and *Sd*) are not significant.

Overall, notwithstanding the statistical significance of *EW_Rating*, we emphasize that the importance of CSR ratings in the syndicated loan pricing process appears relatively limited after controlling for firm and loan characteristics. When we remove the variable *EW_Rating* from our model, the adjusted R-squared decreases from 67.6% to 66.7%, indicating that the marginal explanatory power

of the borrower's CSR rating level is approximately equal to 0.9%. By comparison, if we remove *Risk_Weight* from our model, the adjusted R-squared declines from 67.6% to 63.9%, which indicates a marginal explanatory power of the borrower's credit rating level of 3.7% (results unreported for space considerations are available from the authors). Therefore, the incremental explanatory power of CSR ratings is approximately a quarter of that of credit ratings. This result suggests that CSP is considered by lenders, but it remains a second-order determinant of loan spreads compared to credit ratings and other financial and accounting variables.

Overall, our results are consistent with *H1a.* However, as we anticipated in Section 3.1, the actual relationship between *Ew_Rating* and loan spread could be more complex, so our first regression model may not tell us the whole story.

5.3. High and Low CSR Ratings

In this section, we report the results obtained for our hypothesis *H1c.* Table 4 shows in column 1 the results of Equation (1) obtained by replacing *EW_Rating* with *HighEWRating* and *LowEWRating*. In this case, the control group consists of firms with median CSR ratings.

Table 4. The different effects of high and low CSR ratings on loan spreads.

	(1)	**(2)**
HighEWRating	−0.040	-
	(0.042)	
LowEWRating	0.140 ***	-
	(0.043)	
EW_Rating	-	−0.360
		(0.338)
EW_Rating^2	-	−0.503
		(0.292)
Borrower Variables	YES	YES
Loan Variables	YES	YES
Country and other control variables	YES	YES
Observations	1101	1101
Adjusted R-squared	0.671	0.675

Notes: Robust standard errors are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

We observe that *LowEWRating* has a significant positive impact on loan spreads, while the coefficient of *HighEWRating* is not significant. These findings are consistent with *H1c*, confirming the diminishing marginal benefits of CSR ratings, and offer some additional insights to *H1a*. Banks charge to low-rated firms a loan spread that is 14% higher on average than that applied to those with better scores. In contrast, high-rated firms do not benefit from a reduction in loan spreads significantly greater than firms with median CSR ratings.

Column 2 shows the results obtained by adding, in Equation (1), the quadratic term EW_Rating^2. As the coefficient of this variable is not significant, we can exclude that the relationship between CSR ratings and loan spreads is quadratic.

5.4. ESG Country Sensitivity

In this section, we investigate whether the country ESG rating moderates the impact of firm's CSR rating on loan spread. To this end, we performed a first regression analysis by identifying six groups of firms (Section 4.2.4): groups (1)–(3) include firms located in low ESG-rated countries with, respectively, high, median, and low CSR rating; groups (4)–(6) include firms located in high ESG-rated countries with, respectively, high, median, and low CSR rating.

Table 5 shows the results of Equation (1) estimated by introducing the variables described in Section 4.2.4. In the reported results, firms with median CSR ratings located in low ESG-rated countries (group (2)) are the control (omitted) group.

Table 5. The impact of CSR ratings on loan spreads considering ESG country ratings.

	(1)
HighEWRating	0.117 *
	(0.064)
LowEWRating	0.143 **
	(0.063)
HighESGCountry	0.011
	(0.061)
HighEWRating·HighESGCountry	−0.267 ***
	(0.083)
LowEWRating·HighESGCountry	0.005
	(0.085)
Borrower Variables	YES
Loan Variables	YES
Country and other control variables	YES
Observations	1101
Adjusted R-squared	0.675

Notes: Robust standard errors are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Our findings depict a complex relationship between the CSR rating and the loan spread when the ESG rating of a firm's home country is taken into account.

First, we examine the spread charged to firms located in low ESG-rated countries (group (1)–(3)). The positive coefficient of *HighEWRating* indicates that better CSR ratings are associated with greater loan spreads if the borrower is located in a low ESG-rated country. Firms in group (1) pay 11.7% more than those in group (2). In addition, the positive coefficient of *LowEWRating* indicates that the spread applied to firms with lower CSR ratings in low ESG-rated countries (group (3)) is 14.3% greater than that charged to companies in the control group (group (2)).

Our findings suggest that in low ESG-rated countries, both high and low CSR-rated firms pay higher spreads than those with median CSR ratings. These results are consistent with the hypothesis suggesting a U-shaped relationship between CSP and the cost of debt in countries less interested in ESG matters.

Second, we analyze the cost of syndicated loans for firms located in high ESG-rated countries (groups (4)–(6)). Given that the coefficient of *HighEWRating·HighESGCountry* is significant and negative, the average loan spread applied to high-rated firms located in high ESG-rated countries (group (4)) is 15% (0.117–0.267 using the estimates of Table 5) lower than that charged to firms in group (2) (our control group). In contrast, we observe that the coefficient of *HighESGCountry* is not significant. This implies that the loan spread charged to firms with median CSR ratings established in high ESG-rated countries (group (5)) is not statistically different than that applied to firms with median CSR ratings located in low ESG-rated countries (group (2)). Finally, since the coefficient of *LowEWRating·HighESGCountry* is not significant, the spread applied to low-rated firms in high ESG-rated countries (group (6)) is not statistically different than that applied to low-rated firms in low ESG-rated countries (group (3)). Therefore, the cost of syndicated loans for firms in group (6) is about 14% greater than that for firms in the control group (group (2)).

Summing up, in high ESG-rated countries: (a) the loan spread charged to firms in group (6) is higher than that charged to firms in group (2), which pay a loan spread statistically similar to that charged to firms in group (5); (b) the loan spread charged to firms in group (4) is lower than that charged to firms in group (2) and to firms in group (5) also. These results suggest that in high ESG-rated

countries, there is no evidence of firms' overinvestment problem, since in these countries the loan spread declines as the CSR rating improves.

To control for potential nonlinearities in the relationship between CSR rating and loan spread, we run additional estimates by splitting our sample into two sub-samples: high ESG-rated countries and low ESG-rated countries. Then, we estimate Equation (1) by introducing the quadratic term EW_Rating^2. Results reported in Table 6 allow us to provide additional insights. We find evidence of significant nonlinearities in both sub-samples. However, our results depict a divergent relationship between the CSR rating and the loan spread in the two sub-samples. Indeed, we observe that the sign of the quadratic term coefficient is negative for the first group (column 1) and positive for the second one (column 2), suggesting that the relationship between the CSR rating and the loan spread can be described by a function that is concave downward for high ESG-rated countries and concave upward for low ESG-rated ones. These results explain why we were not able to detect a U-shaped relationship between CSP and CFP when we investigated our whole sample (see Section 5.3 above).

Table 6. Evidence of nonlinearities in the impact of CSR ratings on loan spreads in high and low ESG-rated countries.

	(1)	**(2)**
	HighESGCountry	*LowESGCountry*
EW_Rating	0.569	−2.089 ***
	(0.485)	(0.489)
EW_Rating^2	−0.874 **	1.403 ***
	(0.424)	(0.419)
Borrower Variables	YES	YES
Loan Variables	YES	YES
Country and other control variables	YES	YES
Observations	642	459
Adjusted R-squared	0.716	0.657

Notes: Robust standard errors are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Figure 1 displays the relationship between the predicted values of *LnSpread* (based on the coefficients reported in Table 6) and *EW_Rating* for both groups of countries. In high ESG-rated countries we observe that firms with a low CSR rating, between 0 and about 33 (the maximum value of the function based on the coefficient reported in column 1 of Table 6), pay approximately the same spread. For firms with a score higher than 33, the loan spread declines as the CSR rating improves, consistent with the risk mitigation view.

In contrast, in low ESG-rated countries, there is a U-shaped relationship between CSR ratings and loan spreads. The spread on loans declines as the firm CSR rating improves until an optimal level of the CSR score, equal about to 74 (the minimum value of the function based on the coefficient reported in column 2 of Table 6). After this threshold, the loan spread rises as the CSR rating improves, implying that there is evidence of firms' overinvestment problem in this group of countries.

Evidence obtained from the cross-country analysis allows us to highlight the role played by the national institutional context in shaping the link between CSP and CFP. Consistent with the institutional perspective, companies mirror their domestic institutional environment by reflecting the actions of the government, market, and civil society. Financial rewards for CSP are linked to the types of corporate behavior sought by society.

In low ESG-rated countries, our findings are consistent with the existence of an optimal level of CSP from the risk mitigation perspective. Lenders positively evaluate firms' engagement in CSR up to the optimal level, because it mitigates firms' exposure to substantial legal, reputational, operational, and financial risks. Hence, CSR engagement would serve as an insurance mechanism against harmful, risk-inducing events. Beyond that optimal level, lenders evaluate the borrower's commitment in CSR

as a waste of the company's resources, because the proactive attitude of companies toward CSR issues does not respond to the requests made by national institutions or by the community.

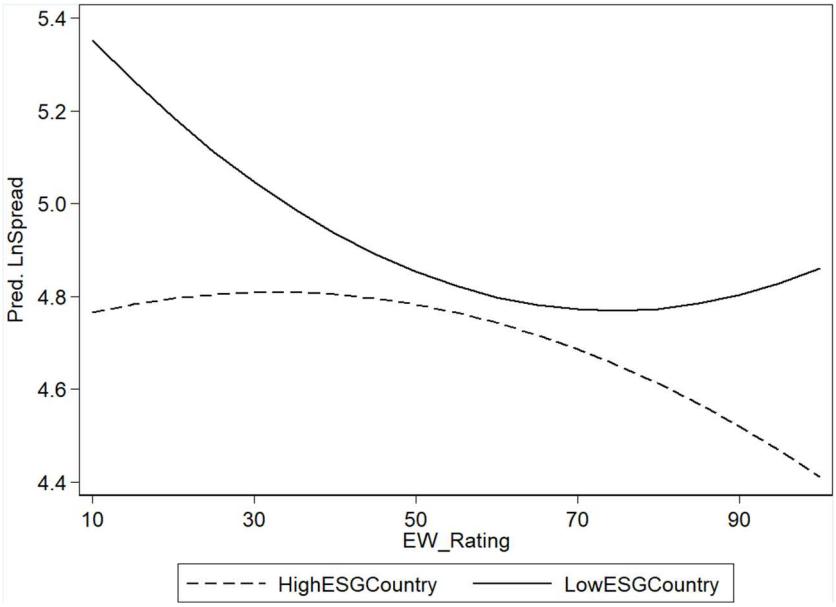

Figure 1. The relationship between the predicted values of loan spreads and CSR ratings in high and low ESG-rated countries.

The previous findings are consistent with those reported by Bae et al. [15], who claim to find a U-shaped relationship between CSR investments and the cost of bank loans in the US context. However, the Bae et al. [15] results do not hold in European high ESG-rated countries. In these countries, lenders positively evaluate CSP as a factor that, all other things being equal, reduces the borrower's riskiness. This positive assessment persists even when the borrower shows high CSP levels. High CSP values are not perceived by banks as a waste of resources. This means that there is no evidence of overinvestment in high ESG-rated countries, where the proactive attitude of companies toward CSR is not penalized.

Our findings can be explained by considering that in countries that show high sensitivity toward CSR issues, companies are encouraged by the institutional context and by the community to pursue a CSR engagement that outpaces the mere risk coverage perspective. At the same time, the high level of awareness and sensitivity of the community toward sustainability issues reduces the risk that management may invest in CSR only for its own interest to improve its own reputation at expense of shareholders.

Overall, our results suggest that (i) the European Union cannot be considered as a homogeneous area, because the cross-country differences in the attitude toward ESG issues affect the relationship between CSR ratings and the cost of debt financing; and (ii) consistent with *H2*, the benefits of high CSR ratings are associated with lower loan spreads only if the borrowers' CSR efforts are rewarded in the environment in which they are embedded. Moreover, in high ESG-rated European countries, the relationship between CSP and the cost of debt financing is consistent with the risk mitigation view; (iii) in low ESG-rated European countries, there seems to be an optimal level of CSR investments. Hence, firms with very high or low CSP are subject to a higher cost of debt, compared to firms with median CSP.

Finally, estimates reported in Tables 5 and 6 allow us a better understanding of the results obtained for the whole sample (hypothesis *H1c*). The relationship observed for the entire sample (first decreasing and then approximately flat) is the result of the mixed impact that the CSR rating exerts on the cost of debt in the different European Union countries: (a) in high ESG-rated countries firm's loan spread declines as the firm CSR rating improves; (b) in low ESG-rated countries there is a U-shaped

relationship between CSR rating and loan spread. To the best of our knowledge, the previous results are undocumented for European firms in the CSR literature.

6. Robustness Checks and Additional Results

In Appendix A, we address potential endogeneity issues by employing an instrumental variable approach and a Heckman selection model. Finally, we control for the potential relationship banking effect and for the heterogeneity of lender banks. In Appendix B, we report some additional results. First, we verify whether firms' scores in each CSR pillar have a different impact on loan spreads. Second, we test whether the impact of CSR ratings is moderated by firm credit quality. Finally, we verify whether the impact of CSR rating changes in crisis times.

7. Discussion

Our results outline a complex picture of the relationship between CSR ratings and loan spreads. The previous studies offer mixed findings on the link between CSP and credit risk in the European context. Unlike existing studies investigating the European context, we explicitly examine potential nonlinearities in the relationship between CSP and the cost of debt, and we find evidence of a significant lack of homogeneity within the European Union. Bae et al. [15] find a U-shaped relationship between CSR investments and debt financing costs in a sample of syndicated loans issued by U.S. firms. We confirm Bae et al. [15] results just for low ESG-rated European countries, whereas in high ESG-rated countries, we find evidence consistent with the hypothesis that a firm's loan spread declines as the firm's CSR rating improves. The existing literature (among others, Utz [43] and Stellner et al. [5]) has clearly proved that the link between CSP and debt financing costs is highly country specific. Our results offer further confirmation to the hypothesis that, for what concerns the link between CSP and the cost of debt, the relationships observed in the US context do not necessarily hold in the European context. Our findings are undocumented in the existing literature concerning the debt financing cost of European firms. Evidence of nonlinearities in the relationship between CSP and CFP is provided also by Utz [43], who finds a U-shaped relation between CSP and idiosyncratic risk in the United States and in the Asia-Pacific region. For what concerns the European context, Utz [43] finds that European firms have their maximum idiosyncratic risk at a very low level of the CSP score. Beyond that level, a higher score always reduces the idiosyncratic risk. However, Utz [43] treats European firms as a homogeneous sample and does not control for any country specific variable.

In order to compare our results with the existing literature, below we focus our attention on studies whose sample include European firms. Menz [4] shows that companies with better CSP face, respectively, higher spreads for their corporate bonds and a higher cost of debt. The observed differences in the results may be due to several factors (e.g., differences in sample and/or methodology). We emphasize that, first, the adopted CSP indicator may have a limited explanatory power, as acknowledged by Menz himself. Second, the time period investigated by Menz ends in 2007. Given that social raters have gained increasing attention in recent years, the relevance of CSR ratings could have considerably changed over the last years. Third, Menz studies a sample including credit-rated firms only, while in our sample only 40% of companies have a credit rating. Fourth, the European corporate bond market suffers from significant liquidity problems. As far as we know, the author does not control for variations in the liquidity premium paid by corporate bonds in his sample. Fifth, the author does not take into account the impact that the national institutional context exerts on the domestic financial markets. In contrast, we control for the different models of capitalism. In this way, we are able to account for the different institutional context in each cluster, and we find that companies' credit risk is affected by the characteristics of the domestic financial market. Finally, unlike us, Menz does not investigate whether the country ESG performance moderates the CSP–credit risk link.

Our results are more in line with those of Stellner et al. [5]. These authors find some evidence that superior CSP results in lower credit risk in the European corporate bond market, although the statistical significance of their results is rather weak. However, we recall that less than 3% of medium and large

European companies have access to the corporate bond market. In contrast, almost all European companies have access to bank financing, and our findings show that banks consider the CSR rating in their loan pricing decisions. In line with our results, Stellner et al. [5] find support to the hypothesis that countries ESG performance moderates the CSP–credit risk relationship and that superior CSP is rewarded with lower bond spreads only if it is recognized by the environment. Compared to Stellner et al. [5], our study offers significant additional insights. Our results provide a more complete picture, as we prove the existence of nonlinearities in the relationship between CSR and loan spreads in low ESG-rated countries, and we are able to highlight the differences between high and low ESG-rated countries in the European context.

Particular attention is required for the findings of Hoepner et al. [6], who examine the syndicated loan market based on a sample that includes borrowers belonging to 28 different countries located in different geographical regions: America (excluding the United States), Asia, Europe, and the United States. They find no conclusive evidence that firm-level sustainability influences the interest rates charged to borrowing firms by banks. The differences between their results and ours may be due to several factors. For example, we note that Hoepner et al. [6] may not take properly into account the impact the national institutional context exerts on loan spreads. Although they include in their models the country's sustainability rating, they control for different national institutional contexts only by means of a dummy that distinguishes developing countries from developed countries. This methodology may not take properly into account the heterogeneity across countries. Country ESG performance is affected by national institutions, but at the same time, these institutions directly affect the cost of the loan. For example, in line with the existing literature, we claim that the legal protection that a country's legal system grants to creditors may significantly affect the cost of bank debt. The legal protection of creditors' rights is not at all considered in a country sustainability rating. In contrast, we take into account the previous variable by clustering countries into different groups according to the VoC approach.

Furthermore, unlike Hoepner et al. [6], we present a cross country analysis, splitting our sample into high ESG-rated countries and low ESG-rated countries. It is only through this analysis that we are able to identify the differences between the two groups of countries and adequately grasp the impact of the CSR rating on the cost of bank debt.

Finally, with regard to the loan characteristics, Hoepner et al. [6] only control for the maturity of the loan, omitting other variables relevant to pricing (collateral, covenants, seniority, and loan type). These variables significantly affect loan spreads in our models, in line with the existing literature.

8. Conclusions

This study examines the impact of CSR ratings on syndicated loans spreads charged to European listed firms. We find that the CSR rating level affects loan spreads, as lower CSR ratings are on average associated with significantly higher spreads. However, the relationship between these two variables is quite complex. Looking at the whole sample, companies in the highest tertile of the CSR rating distribution do not pay significantly lower spreads than companies in the median tertile. A more detailed investigation allowed us to verify that the home country ESG rating sharply affects the relationship between CSR ratings and loan spreads. In summary, first, low CSR ratings levels are generally penalized with higher spreads by lenders. Second, high CSR rating levels lead to lower loan spreads only for companies located in countries with a high sensitivity to ESG issues. Third, in low ESG-rated countries, firms with high or low CSR rating pay higher loan spreads compared to firms with median CSR rating, providing evidence of a U-shaped relationship between CSR ratings and loan spreads. These results are consistent with the overinvestment view beyond an "optimal threshold" of CSR engagement.

Our results also suggest that CSR ratings are second-order determinants of loan spreads, which are taken into account only after "traditional" firm's fundamentals (i.e., accounting data and credit ratings).

Our findings have significant implications for managers, firm's stakeholders, and legislators. Poor CSP, "certified" by low CSR ratings, leads to greater borrowing costs. However, the efforts and the investments needed to gain high CSR ratings are rewarded only if the company operates in contexts that pay attention to CSR-related matters. Knowing the relationship between CSR-related activities and credit spreads helps managers make appropriate strategic investments in CSR activities. In addition to managers, lenders and outside investors can also rely on the CSP–cost of debt link to assess the firm's future credit health. Unfortunately, firms do not automatically benefit from high CSR ratings. The link between CSP and CFP is conditional on other important variables, some of which are beyond the control of firm's managers (e.g., the home country sensitivity to ESG issues).

Overall, our results suggest that CSR ratings could be a particularly useful tool for less informed stakeholders, such as consumers and retail investors who are interested in evaluating and comparing the CSP of different companies. From this perspective, the CSR rating may also improve firm's accountability and allow cross-company comparisons. Third-party external verification provided by specialized rating agencies enhances the reliability of CSR-related activities, inasmuch as it helps to bridge the credibility gap between the company's self-laudatory CSR communication and less informed stakeholders.

For what concern policymakers, our study offers some support for the vision of the European Parliament, mentioned in Section 1. However, the road ahead to support the transition to a more sustainable economy seems still very long. Given the lack of homogeneity detected in the European context, policy makers should be aware that a uniform legislation on CSR matters could have a mixed impact on the financial performance of companies located in different European Union countries. Mandatory investments in CSR do not necessarily create value for all EU companies. At present, low ESG-rated countries seem to value a high commitment in CSR as a luxury that companies cannot afford. At the same time, we doubt that law could enforce investors to reward a firm's CSR engagement. In order to achieve the objectives of the European Commission, apart from legislative measures, we believe it is necessary to promote several initiatives that support a change in the cultural attitude toward CSR and sustainability issues. Unfortunately, this is a challenging and time consuming process.

Supplementary Materials: The following are available online at http://www.mdpi.com/2071-1050/12/18/7639/s1, Table S1: Variables description. Table S2: Correlation matrix. Table S3: The impact of CSR ratings on loan spreads. Table S4: Variable description. Table S5: The impact of firm's scores in each CSR pillar on loan spreads.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A. Robustness Tests

In the following sections, we address potential endogeneity issues by employing an instrumental variable approach and a Heckman selection model. Finally, we control for the potential relationship banking effect and for the heterogeneity of lender banks.

Appendix A.1. Instrumental Variable Approach

To address potential endogeneity and reverse causality issues, we estimate Equation (1) considering the impact of *EW_Rating* on loan spreads by employing an instrumental variable (IV) approach. To this end, we instrument *EW_Rating* with *EW_Rating_Lag*, which is the lagged CSR rating of the *i*-th firm from 3 years before *t*.

In line with Goss and Roberts [8], we assume that this instrument is valid. We exclude that our instrument is weak, because high CSR rating levels are obtained after several years of CSR efforts and

should be more persistent than financial performance indicators. Thus, the current CSR rating level of the borrower should be significantly affected by the lagged CSR rating level. The first-stage F-test statistic is equal to 57.71, which is significantly above the "rule of thumb" threshold of 10. Therefore, the F-test confirms the significance of our instrument.

In addition, we also assume that our instrument is exogenous. The CSR scores assigned to firms 3 years before the loan closing date, in fact, should be unlikely to affect the loan spreads applied in *t*. Consequently, the instrument should not affect loan spreads other than through its correlation with the current CSR rating level of the borrower. Table A1 reports the estimates from the second-stage IV regression (we observe a reduction in observations because not all CSR-rated borrowers also had a CSR rating three years before *t*). The results confirm that the instrumented variable *EW_Rating* has a significant negative impact on loan spreads. Consequently, these estimates mitigate endogeneity concerns.

Table A1. The instrumental variable regression.

	(1)
	IV
EW_Rating	−0.342 ***
	(0.129)
Borrower Variables	YES
Loan Variables	YES
Country and other control variables	YES
Observations	988
Adjusted R-squared	0.671

Notes: Robust standard errors are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Appendix A.2. Heckman Selection Model

Since firms choose their levels of engagement in CSR activities, self-selection bias may represent a potential concern for our analysis. To address this issue, we adopt a Heckman [65] approach. To this end, we expand our sample by including also loans registered in LPC's DealScan to European listed companies without CSR ratings. Our new dataset consists of 1727 loans granted to 483 companies.

The first-stage selection equation is a probit model where the dependent variable is a dummy equal to 1 if the *i*-th firm has a CSR rating. To identify the selection equation, in line with Goss and Roberts [8], we add *NWC*, *OpInc*, and *RET*, which are, respectively, the ratio of net working capital, operating income, and retained earnings to total assets. In addition, we also include in the selection equation all variables included in the vector *B* (*Borrower Variables*), *Sov_Rating*, VoC dummies, and year dummies.

We calculate the inverse Mills ratio from the selection equation and we include it (variable *Lambda*) in the loan spread equation (Equation (1)), to control for selection bias. Table A2 shows the results of this test (we observe a loss of 26 observations due to some missing in the time series of *NWC*, *OpInc* and *RET*). The inverse Mills ratio is significant, suggesting potential self-selection effects. However, the coefficient of *EW_Rating* is not affected by the inclusion of *Lambda*, supporting our findings.

Table A2. The Heckman selection model.

	(1)
	Heckman
EW_Rating	−0.422 ***
	(0.080)
Lambda	−0.296 ***
	(0.073)
Borrower Variables	YES
Loan Variables	YES
Country and other control variables	YES
Observations	1075
Adjusted R-squared	0.679

Notes: Robust standard errors are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Appendix A.3. Potential Relationship Banking Effects and Lender Characteristics

Our findings could be driven by the potential effects of the relationship between banks and borrowers. Since customer relationships generate private information to banks about their clients, previous relationships between banks and their borrowers could lead to lower borrowing costs [58,66].

To address this issue, we consider as "relationship lenders" the arrangers that were at least in one syndicate of a loan granted to the same borrower before the current loan. We focus on arranger banks because they assess borrower quality, negotiate loan contract terms, and only then do they invite and coordinate participant banks [67]. Following previous studies [57,68], we consider each facility multiple times to capture the differences across arrangers if there are multiple arranger banks in the same syndicate.

To control for previous relationship banking effects, we include in our model the variable *Relationship*, which is a dummy variable equal to 1 if the arranger was in a syndicated loan granted to the *i*-th firm prior to the current loan in the investigated period (Following Goss and Roberts [8], in our previous estimates we have indirectly controlled for potential relationship banking effects by including the variable *Loan_Concentration*. The variable *Relationship* allows us to take directly into account this potential factor, which could significantly affect loan spreads [69]).

In addition, we control for lender and syndicate characteristics by including *Share*, which indicates the share of the loan to the *i*-th firm held by each arranger; and *NumLenders*, which is the number of lenders in the syndicate. Finally, we include bank fixed effects. Table A3 shows the results. As expected, previous relationships with the same lenders lead to lower loan spreads. However, the coefficient of *Relationship* is rather small. This is not surprising, because the literature finds that the previous relationship produces greater benefits for unlisted companies than for listed ones [58,66]. It is worth noting that our sample includes only listed companies.

We find that the share of the loan held by arrangers is positively related to loan spreads. In fact, the loan share concentration is generally positively related to the borrowers' risk, because arrangers frequently hold a greater stake in the loan if the borrower requires more intense monitoring [66,70].

More lenders in the syndicate are associated with greater loan spreads. We underline that in our sample, the number of lenders is positively related to the number of foreign banks in the syndicate. Therefore, the positive coefficient of *NumLenders* may be due to the expansion of the set of creditors to less-informed investors, such as foreign banks, which, consistent with Sufi [71], may require a greater spread to participate in the loan syndicate.

Finally, since the coefficient of *EW_Rating* remains significant and negative and our main findings remain unchanged, we can confirm that our results hold also controlling for relationship banking effects and other lender and syndicate characteristics.

Table A3. The impact of CSR ratings on loan spreads taking into account lender bank characteristics.

	(1)
EW_Rating	−0.361 ***
	(0.026)
Relationship	−0.020 *
	(0.011)
Share	0.830 ***
	(0.100)
NumLenders	0.005 ***
	(0.001)
Bank FE	YES
Borrower Variables	YES
Loan Variables	YES
Country and other control variables	YES
Observations	12,546
Adjusted R-squared	0.752

Notes: Robust standard errors are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Appendix B. Additional Results

In the following sections, we report additional results. First, we verify whether firms' scores in each CSR pillar have a different impact on loan spreads. Second, we test whether the impact of CSR ratings is moderated by firm credit quality. Finally, we verify whether the impact of CSR ratings changes in crisis times.

Table S4 in Supplementary Materials shows the complete list of variables used in Appendix B. Table A4 provides summary statistics of the variables used in Appendix B.

Table A4. Summary statistics.

Variable	**No. of Obs.**	**Mean**	**Median**	**Std. Dev.**
Ec_Score	1101	0.67	0.75	0.27
Soc_Score	1101	0.74	0.84	0.25
Env_Score	1101	0.70	0.82	0.27
Gov_Score	1101	0.61	0.68	0.26
HighZscore	822	0.33	0.00	0.47
LowZscore	822	0.33	0.00	0.47
Small	1101	0.10	0.00	0.30
Crisis	1101	0.32	0.00	0.47

Notes: The sample consists of 1101 loans granted to listed non-financial firms established in EU member states during the 2006–2015 period.

Appendix B.1. The Impact of Different CSR Pillars

To verify whether firms' scores in each CSR pillar have a different impact on loan spreads, we introduce the following variables: *Ec_Score*, *Soc_Score*, *Env_Score*, and *Gov_Score*, which represent the ASSET4 scores in each pillar (economic, social, environmental, and governance) of the *i*-th firm in the year preceding t. Then, we replace *EW_Rating* by alternatively inserting in Equation (1) each of the previous variables. We get four different models whose results are presented in Table A5 (the complete results are reported in Supplementary Materials in Table S5). We observe that all scores are significantly and negatively related to loan spreads, suggesting that better scores lead to lower firms' borrowing costs. An increase in each CSR dimension of 10 scores reduces the average loan spread applied to borrowers by 2.2% for the economic pillar, 4.2% for the social pillar, 4.1% for the environmental pillar, and 1.4% for the governance pillar, respectively. Therefore, banks also appear to positively evaluate firms' efforts in each CSR dimension.

The analysis of the individual scores offers further insights. *Ec_Score* is highly significant, but its coefficient is about half compared to the *Soc_Score* and *Env_Score* coefficients. We believe that the reduced impact of the economic score on the loan spread can be explained by considering that lenders are able to obtain most of the economic data using traditional accounting information derived from the annual report. Furthermore, we highlight that, in line with the existing literature, in the regression analysis we include several variables (e.g., *ROS*, *IE_Revenue*, etc.) that are able to capture some relevant economic information affecting syndicated loan spreads. However, the high significance of the *Ec_Score* coefficient shows that the information provided by the CSR economic score is appreciated by the lenders, and it is perceived as supplementary to other economic information of strict accounting derivation. The economic pillar combines key performance indicators (KPIs) based on wider economic information. For example, *Ec_Score* includes measures about a company's capacity to improve its margins by the use of advanced cost/risk management techniques, or a company's management commitment and effectiveness toward generating sustainable and long-term revenue growth, while maintaining a loyal client base through satisfaction, programs, and avoiding anti-competitive behaviors and price fixing.

Table A5. The impact of firm's scores in each CSR pillar on loan spreads.

	(1)	(2)	(3)	(4)
Ec_Score	−0.223 ***	-	-	-
	(0.072)	-	-	-
Soc_Score	-	−0.420 ***	-	-
	-	(0.079)	-	-
Env_Score	-	-	−0.406 ***	-
	-	-	(0.078)	-
Gov_Score	-	-	-	−0.143 *
	-	-	-	(0.076)
Size	−0.131 ***	−0.110 ***	−0.105 ***	−0.136 ***
	(0.018)	(0.018)	(0.018)	(0.017)
Borrower Variables	YES	YES	YES	YES
Loan Variables	YES	YES	YES	YES
Country and other control variables	YES	YES	YES	YES
Observations	1101	1101	1101	1101
Adjusted R-squared	0.670	0.675	0.675	0.668

Notes: Robust standard errors are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Focusing on the *Soc_Score* and *Env_Score*, we note that the two coefficients present a high significance and magnitude. These results can be explained by considering that the social and environmental pillars offer important information to lenders not captured by traditional financial information. Furthermore, the performance levels in the environmental and social dimensions signal the company's commitment to CSR dimensions that may originate important levels of risk. Several corporate scandals (e.g., Bayer, Volkswagen, etc.) have repeatedly shown that bad performances in the environmental and social dimensions can expose companies to significant losses and negative market assessments. It is not surprising that the attention and sensitivity of the lenders is mainly focused on these two pillars.

The reduced significance and the magnitude of the *Gov_Score* coefficient do not surprise. This result could be explained considering that lenders have other sources available to derive information on governance, especially for large companies such as those included in our sample. However, the information provided by the governance score seems not to be superfluous. Lenders appreciate the information provided by the governance score for a broader assessment of the risk levels of their borrowers. Our result can be explained considering that the corporate governance pillar includes several measures about a company's systems and processes, which ensure that its board members and executives act in the best interests of its long term shareholders. It reflects a company's capacity,

through its use of best management practices, to direct and control its rights and responsibilities through the creation of incentives, as well as checks and balances in order to generate long term shareholder value.

Finally, we note that in all estimated models, our control variables maintain the signs and the statistical significance discussed in the main text.

Appendix B.2. CSR Ratings and Creditworthiness

Previous studies found that the creditworthiness of the borrower could significantly moderate the link between CSR ratings and loan spreads [8]. We argue that, given the same CSR rating, low credit quality firms pay greater loan spreads than high credit quality firms. We distinguish two cases that lead to the same conclusion. First, if the CSR rating is low, having a low creditworthiness has a multiplicative effect on the risk of the borrower. In this case, the borrower is exposed to significant CSR-related risks in addition to "traditional" financial risks. Second, if the CSR rating is high, CSR investments made by low quality firms are not rewarded by lenders. In fact, since less creditworthy firms have fewer available resources than safer ones, proactive engagement in CSR and greater discretionary investments may be perceived by lenders as a costly diversion of scarce resources.

To verify whether the impact of CSR ratings is moderated by firm credit quality, we identify less creditworthy firms by alternatively adopting three sets of variables. First, we rely on the z-score, an accounting measure that indicates the probability of firms' bankruptcy. Z-scores are calculated using firms' quarterly data over the past 3 years following Santos and Winton [72]:

$$Z = \frac{1}{S_r}\left[\frac{1}{n}\sum_{j=1}^{n}\frac{2\tilde{\pi}}{A_j + A_{j-1}} + \frac{1}{n}\sum_{j=1}^{n}\frac{E_j + E_{j-1}}{A_j + A_{j-1}}\right]$$

where π is the firm's profits, A is its assets, E is its equity, and S_r is the estimated standard deviation of r, the firm's return on assets.

We introduce in Equation (1) two dummy variables: *HighZscore* and *LowZscore*. These variables are equal to 1 if the z-score of the *i*-th firm in the year preceding *t* is, respectively, in the highest or in the lowest tertile of the empirical distribution. We interact *EW_Rating* with *HighZscore* and *LowZscore*, respectively. We expect to find that higher CSR ratings lead to lower spreads mainly for safer firms (higher z-scores).

Second, we rely on the dummy variable *Secured*. Empirical evidence has demonstrated that lenders demand security mainly from low-quality borrowers [73]. Thus, we add in Equation (1) the interaction variable *EW_Rating·Secured*. We expect that, given the same CSR rating, secured loans are charged with higher spreads.

Third, we identify riskier firms by relying on their size. Holding all else equal, smaller firms are generally considered riskier than larger ones, because they are less transparent and more financially constrained. Thus, we replace the variable *Size* in Equation (1) with *Small*, which is a dummy variable equal to 1 if the *i*-th firm's total assets in the year preceding *t* are lower than the tenth percentile of the sample. We underline that, since small firms do not have generally access to the syndicated loan market, the majority of firms in our sample are large. Therefore, we have adopted a low threshold to identify smaller firms. Moreover, we include in our model an interaction between *EW_Rating* and *Small*. A positive and significant coefficient of the interaction variable would imply that, given the same *EW_Rating*, low quality borrowers pay higher spreads than high quality borrowers.

We highlight that the interaction between *EW_Rating* and *Small* allows us to capture the effect of the firm's size on the impact of CSP on loan spread. In particular, we are able to verify whether, all other things being equal, the impact of CSP on loan spread changes for small companies compared to large ones.

Column (1) of Table A6 shows the results of Equation (1) estimated by interacting *EW_Rating* with *HighZscore* and *LowZscore* (We observe a reduction in observations due to data availability). Our control

group consists of firms with median *Zscore*. We observe that *EW_Rating·HighZscore* has a negative impact on loan spreads, while the interaction variable *EW_Rating·LowZscore* is positively correlated with *LnSpread*. This implies that the impact of CSR ratings on loan spreads significantly depend on the probability of default of the borrower. Riskier firms (lower z-scores) always pay higher loan spreads than the control group, given the same CSR rating level. In contrast, safer firms (higher z-score) pay lower loan spreads compared to the control group. Therefore, our findings suggest that banks reward greater CSR efforts mainly when the credit risk of the borrower is low, whereas CSR investments of riskier firms may be perceived as a costly diversion of scarce resources.

Column (2) of Table A6 shows the results of Equation (1) estimated by interacting *EW_Rating* with *Secured*. The interaction term *EW_Rating·Secured* shows a positive impact on loan spreads and counteracts the negative coefficient of *EW_Rating*. An increase in the CSR rating of 10 scores reduces by about 5% the average spread on secured loans and by about 2.1% that on unsecured loans. These results confirm that the negative relationship between CSR ratings and loan spreads is weaker for riskier firms (i.e., those that receive secured loans).

Table A6. CSR ratings and the firm's creditworthiness.

	(1)	**(2)**	**(3)**
	Z-score	*Secured*	*Small*
EW_Rating	−0.214	−0.487 ***	−0.656 ***
	(0.145)	(0.082)	(0.083)
HighZscore	0.184	-	-
	(0.143)		
EW_Rating·HighZscore	−0.334 *	-	-
	(0.190)		
LowZscore	−0.118	-	-
	(0.145)		
EW_Rating·LowZscore	0.377 **	-	-
	(0.180)		
Small	-	-	−0.200
			(0.125)
EW_Rating·Small	-	-	0.448 **
			(0.222)
Secured	0.213 ***	0.061	0.253 ***
	(0.055)	(0.119)	(0.050)
EW_Rating·Secured	-	0.280 *	-
		(0.164)	
Borrower Variables	YES	YES	YES
Loan Variables	YES	YES	YES
Country and other control variables	YES	YES	YES
Observations	822	1101	1101
Adjusted R-squared	0.685	0.676	0.665

Notes: Robust standard errors are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Finally, in column (3), we report the results of Equation (1) estimated by replacing *Size* with *Small* and by adding the interaction *EW_Rating·Small*. We observe that the coefficient of the interaction variable is positive and significant. An increase in the CSR rating of 10 scores reduces by about 6.6% the average loan spread for larger firms and by about 2.1% that for smaller ones. Therefore, the firm's size moderates the relationship between CSR ratings and loan spreads. This result suggests that, given the same CSR rating, smaller firms pay higher loan spreads.

Overall, these findings suggest that the benefits of better CSR ratings are lower for riskier firms. These results may be interpreted as an additional confirmation that CSR ratings are second-order determinants of loan spreads, which are taken into account only after traditional financial factors.

Appendix B.3. Crisis

The time frame considered in our analysis includes two periods of major crises, the great financial crisis and the sovereign debt crisis, which have heavily affected the European economic system.

Existing literature finds evidence of a greater increase in loan spreads for European companies during the global financial crisis and the euro area sovereign debt crisis [74]. At the same time, we expect that, all other things being equal, in crisis periods, lenders are less sensitive to information related to the borrower's CSP, and they assign greater importance to the borrower's financial data. If this is true, we should observe a lower impact of the CSR rating on loan spreads in crisis periods.

To consider the potential impact of crisis periods on loan spreads we include in Equation (1) the variable *Crisis*, which is a dummy variable equal to 1 in crisis periods of the European economy. To determine crisis periods, we rely on the chronology of turning points for Europe identified by the OECD [75]. Consequently, the periods from February 2008 to June 2009 and from August 2011 to February 2013 are considered crisis periods. In contrast, we consider other periods as non-crisis periods.

Column (1) of Table A7 shows the results of Equation (1) estimated by replacing year dummies with the variable *Crisis*. As expected, the positive sign of *Crisis* suggests that, on average, banks raise loan spreads in crisis times. Moreover, in line with previous results, we find that an increase in the CSR rating of 10 scores reduces by about 3.4% the average loan spread applied to borrowers.

Table A7. The impact of CSR ratings on loan spreads considering crisis periods.

	(1)	**(2)**
EW_Rating	−0.342 ***	−0.378 ***
	(0.082)	(0.089)
Crisis	0.321 ***	0.228 *
	(0.041)	(0.117)
EW_Rating·Crisis	-	0.125
		(0.149)
Borrower Variables	YES	YES
Loan Variables	YES	YES
Country and other control variables	YES	YES
Year Dummies	NO	NO
Observations	1101	1101
Adjusted R-squared	0.622	0.622

Notes: Robust standard errors are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

To verify whether the impact of CSR ratings on loan spreads changes in crisis times, we run the previous regression by adding in our model an interaction variable between *EW_Rating* and *Crisis*. Column (2) of Table A7 shows these estimates. We observe that the coefficient of *EW_Rating·Crisis* is not significant. However, we note that the significance of *EW_Rating* remains unchanged. Thus, our results show that crisis periods do not significantly affect the impact of CSR ratings on loan spreads. Lenders continue to positively evaluate borrowers' CSR efforts also in these periods.

In light of these results, we can confirm the validity of our main findings taking into account the potential effects of crisis periods.

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Wealthy Private Investors and Socially Responsible Investing: The Influence of Reference Groups

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Abstract: Sustainable development requires a shift from traditionally invested assets to socially responsible investing (SRI), bringing together financial profits and social welfare. Private high-net-worth individuals (HNWIs) are critical for this shift as they control nearly half of global wealth. While we know little about HNWIs' investment behavior, reference group theory suggests that their SRI engagement is influenced by their identification with and comparison to reference groups. We thus ask: how do reference groups influence the investment behavior of SRI-oriented HNWIs? To answer this question, we analyzed a unique qualitative data set of 55 semi-structured interviews with SRI-oriented HNWIs and industry experts. Our qualitative research found that, on the one hand, the family serves as a normative reference group that upholds the economic profit motive and directly shapes HNWIs to make financial gains from their investments at the expense of social welfare. On the other hand, fellow SRI-oriented HNWIs serve as a comparative reference group that does not impose any concrete requirements on social welfare performance, indirectly influencing SRI-oriented HNWIs to subordinate social concerns to financial profits. Our scholarly insights contribute to the SRI literature, reference group theory, and practice.

Keywords: high-net-worth individuals (HNWIs); qualitative research; reference group theory; socially responsible investing (SRI)

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1. Introduction

A shift from traditionally invested assets to socially responsible investing (SRI), broadly defined as the integration of environmental, social, and governance (ESG) considerations into investment practices, is a crucial driver of sustainable development [1]. Millionaires and billionaires, i.e., private high-net-worth individuals (HNWIs), hold a vital role in this shift. The United Nations calculated that investments of USD2.5 trillion per year are missing to finance sustainable development [2]. Thereby, the wealthy top 1% of the world's population controls about USD 191.6 trillion as of 2020, nearly half of global wealth [3]. It is crucial to understand the investment behaviors of HNWIs to mobilize this substantial source of capital for sustainable development.

To understand whether private investors engage in SRI, the literature tends to put a higher emphasis on proving the financial profitability of SRI (see [4–6]) than, for example, its positive impact on social welfare [7,8]. However, since SRI brings together financial profits and social welfare, sustainable investing goes well beyond the question of whether or not SRI is more profitable than traditional investing [6,9–13]. Still, many investors are attracted to SRI due to social welfare reasons (e.g., [14–16]). Consequently, the profitability debate around SRI only partially solves the issue of knowing little about sustainable investors [16,17] and SRI-oriented HNWIs [18,19]. To gain deeper insight into the investment

behaviors of SRI-oriented HNWIs, we need to understand their individual dealings with both social welfare issues and financial gains in their SRI investments.

A reference group theory perspective suggests that the individual investment behavior of SRI-oriented HNWIs is fundamentally influenced by the groups for which the wealthy private investor has a membership. The reference group theory operates on the principle that individuals always orient themselves to others, as their attitudes, values, and self-appraisals are shaped by their identification with and comparison to reference groups [20]. To establish or maintain individual identification with the reference group, individuals behave, believe, and perceive as the group does [21]. There are two types of reference groups [22–24]. Normative reference groups establish and enforce specific standards which can be considered as norms. Comparative reference groups serve individuals as a point of reference in making evaluations or comparisons without the evaluation of the individual by others in the reference group [23].

Hence, from a reference group theory perspective, SRI-oriented HNWIs' identification with and comparison to a respective reference group significantly influences whether, how, and to what extent they bring together financial profits and social welfare in their investments. Thus, while the influence of normative and comparative reference groups is central to our understanding of the investment behavior of SRI-oriented HNWIs, previous research has not yet addressed this issue. Consequently, our knowledge of HNWIs committed to SRI remains underdeveloped. The main objective of our study is to develop this knowledge, and we thus ask: how do reference groups influence the investment behavior of SRI-oriented HNWIs?

To answer this question, we adopt a qualitative research strategy. Such a strategy is advantageous for developing our knowledge of the investment behavior of SRI-oriented HNWIs because qualitative research supports the generation of novel insights "at a level of detail and nuance that can be difficult or impossible to achieve using only quantitative methods" [25] (p. 637). We conducted semi-structured interviews with 42 SRI-oriented HNWIs and 13 experts who consult with them and closely monitor the SRI market. Based on our analysis of this unique empirical data, we develop a framework to explain how different reference groups influence the investment behavior of SRI-oriented HNWIs. Our framework indicates that, on the one hand, the family serves as a normative reference group that holds up economic profit striving and directly influences HNWIs towards generating financial profits in their investments at the expense of social welfare considerations. On the other hand, fellow SRI-oriented HNWIs serve as a comparative reference group that places little emphasis on accountability for social issues and indirectly influences SRI-oriented HNWIs to subordinate social welfare issues to financial gain.

Our research makes two contributions to the literature. First, we add to SRI research by providing insights into the hitherto little-researched SRI engagement of wealthy private investors (e.g., [16]). Our framework explains that SRI-oriented HNWIs prioritize financial gains at the expense of social welfare because they are encouraged by reference groups to use their wealth to achieve economic profits, even though they already have immense wealth. Second, we contribute to reference group theory, which suggests different reference groups based on differentiating between a normative and a comparative function of a reference group (e.g., [23]). We show that normative and comparative reference groups can coexist but that the normative reference group suppresses the comparative reference group in conflict. This finding implies different spheres of influence of normative and comparative reference groups.

We proceed by presenting existing SRI research on HNWIs and, on this basis, problematizing the lack of knowledge on the influence of reference groups on the investment behavior of SRI-oriented HNWIs. We then outline our research context and method and present the results of our study. On this basis, we develop a framework of how reference groups influence the investment behavior of SRI-oriented HNWIs. We finish by discussing the implications for the literature, some practical implications, the limitations of our study, avenues for further research, and a conclusion.

2. Theoretical Background

2.1. Socially Responsible Investing (SRI) and High-Net-Worth Individuals (HNWIs)

Socially responsible investing (SRI) integrates environmental, social, and governance (ESG) issues into investment practice and closely links to sustainable development [26,27]. The peculiarity of SRI, especially compared to traditional investing, is that it combines two different and potentially conflicting logics: while the market logic has the primary characteristic of the pursuit of financial profit, the social welfare logic is grounded on communitarianism, altruism, the fulfillment of social needs, and the solving of social misery (see [6]). Regarding the segment of private SRI-oriented investors, some studies address their characteristics, motivations, and barriers and provide comparisons with non-SRI investors (e.g., [28–32]). Among private investors, those with discretionary investable assets of more than USD 1 million, defined as high-net-worth individuals (HNWIs), are of particular interest [33]. While as of 2020, HNWIs represent 1.1% of the world's population, they hold 46% of global household wealth [3] and can thus contribute significantly to the growth of SRI. HNWIs tend to be interested in incorporating SRI aspects, such as climate change, into their investment decisions, as they "are typically long-term investors whose aim is to preserve capital for the next generations to come" [33] (p. 7). Moreover, HNWIs are in the position where they can invest along with their personal interest because they "have access to investments that are normally closed to smaller retail investors, and the freedom to move funds quickly without having to perform the extensive due diligence required by institutional investors" [33] (p. 7).

To understand whether private investors engage in SRI, the academic literature puts a higher emphasis on the ability to prove the financial profitability of SRI (see [4–6]) than, for example, its positive impact on social welfare [7,8]. However, since SRI brings together financial profits and social welfare [6], sustainable investing goes well beyond the question of whether or not SRI is more profitable than conventional investing, as, evidently, "there are more nuanced issues at stake than just profits" [9] (p. 360) (see also [10–12]). Similarly, Revelli [34] (p. 711) critically notes that in the course of the efforts around the mainstreaming of SRI, "the original goal of 'making good'" has transformed "into a quest for profitability".

Addressing profitability can only help us understand to a limited extent whether investors are committed to SRI, as many investors are attracted to SRI due to altruistic motives [15,16]. For example, a study by Barreda-Tarrazona, Matallin-Saez, and Balaguer-Franch [14] shows that although diversification and return are essential drivers of SRI investment, private investors, who embrace SRI, tend to invest in SRI funds even when the return differential is negative. In their review of the SRI literature, Renneboog, Ter Horst, and Zhang [35] conclude that prior research suggests that SRI investors are willing to accept suboptimal financial profits to contribute to social welfare. The latter research supports the rising voices of scholars questioning the "business case" justification and associated profit maximization arguments for socially responsible business practices (e.g., [36,37]) and SRI (e.g., [6,34]). Juravle and Lewis [38] confirm this by showing that investors often do not engage in SRI because of cognitive patterns and normative belief systems. They note that even experienced investors are susceptible, for example, to herd behavior or fads and are guided in their investment behavior by the belief of the incompatibility of financial profit and social welfare.

Consequently, the profitability debate around SRI can only partially solve the circumstance of still knowing little about sustainable investors [16,17] and SRI-oriented HNWIs [18,19]. In contrast, a deeper insight into the investment behavior of SRI-oriented wealthy private investors requires that we go beyond this very debate and understand how HNWIs deal with social welfare issues and financial profits in their SRI investments. The point here is to consider that the individual investment behavior of SRI-oriented HNWIs is always shaped by the group in which the wealthy private investor has a membership. Therefore, we introduce the reference group theory, which points out that individuals

orient themselves to others, so-called reference groups, and thus individual thinking and acting are fundamentally shaped by others.

2.2. Reference Group Theory Perspective on the Investment Behavior of SRI-Oriented HNWIs

Generally, a reference group has been defined "as a group, collectivity, or person taken into account by an actor and used in such a manner that he identifies himself and uses the group, collectivity, or person as a basis for self-evaluation and as a source of his personal values and goals" [39] (p. 68). As this definition suggests, reference group theory builds on the assumption that human beings desire the feeling of oneness with groups [21]. Such non-formalized memberships give people the confidence that the appropriate strategies to manage one's life are befitting and valid [20]. To obtain this group identity, one needs to behave, believe, and perceive as the group does [20,21,40,41] and socialize oneself to what one perceives to be the group's norms [42]. Consequently, an individual's attitudes, values, and self-appraisals are influenced by the identification with and comparison to reference groups [20]. This includes articulating and reasoning things important to oneself so that others will accept these explanations of what constitutes important [20]. Hence, the reference group influences the behavior of individuals due to anticipation of the responses of the group [43].

Reference group theory distinguishes between normative and comparative reference groups [22–24]. Normative reference groups are groups where individuals are motivated to establish or maintain acceptance. To reach that goal, individuals keep their attitudes in conformity with what they perceive to be the consensus of opinions (norms) among their reference group [20,23]. Here, the group establishes and enforces specific standards which can be considered as norms. Consequently, the normative function of a reference group is that it provides individuals with a basis for forming goals and values and expects them to comply with the goals and values of their reference groups [39]. Values are normative beliefs that guide human actions, as they specify "the things that are worth having, doing, and being" [44] (p. 356; see also [45]). Values are particularly central in normative contexts when, as in the case of SRI, it is a matter of conceptualizing the respective possibilities and limits in reconciling economic and social aspects [46].

On the other hand, comparative reference groups serve individuals as a point of reference in making evaluations or comparisons [23]. In a comparative reference group, the evaluations of the individual by others in the reference group are irrelevant. The group serves as a standard or checkpoint that the individual uses to make judgments [23]. The comparative function of a reference group thereby provides a frame of reference that an individual uses for self-evaluation, thus resulting in either a satisfactory or unsatisfactory view of oneself [39]. From a reference theory perspective, SRI-oriented HNWIs seek non-formalized membership in groups to gain the confidence that their investments are befitting and valid. In doing so, SRI-oriented HNWIs align their attitudes and behaviors toward investment with what they think the respective reference group expects of them. For example, in the case of other wealthy private investors, we would assume that HNWIs make economic success observable through their investment activities and behavior to maintain "social prestige" or "social status" within the group [47–49]. Financial profit would signal that the individual HNWI is adapting to what she or he thinks is necessary for membership in the reference group (in this case, other HNWIs).

Also, HNWIs regularly discuss their investment decisions with family members [18], suggesting that this group may serve as a basis for HNWIs' self-assessment and personal values and goals. At the same time, SRI-oriented HNWIs are, of course, also influenced by other like-minded HNWIs. In this reference group, one would assume that members hold up and demand not only financial profit but at least equal claims regarding social welfare and expect that group members meet these standards. Hence, by contributing to social welfare through investments, an individual HNWI portrays that she or he behaves, believes, and perceives as the group of other SRI-oriented HNWIs does.

Unfortunately, there is no research on how reference groups influence HNWIs' SRI engagement, even though the literature suggests that they would fundamentally influence how SRI-oriented HNWIs deal with social welfare issues and financial gains in their investments. Hence, our knowledge of the investment behavior of HNWIs committed to SRI remains limited, and our research correspondingly asks the following question: how do reference groups influence the investment behavior of SRI-oriented HNWIs?

3. Methods

We apply a qualitative inductive research design to gain detailed insights into how reference groups influence the investment behavior of SRI-oriented HNWIs. Because of the nascent nature of theory in the context of SRI-oriented HNWIs (see, e.g., [18]), it is necessary to take a qualitative approach that ensures a "methodological fit" with our research endeavor [50]. For example, Bettis et al. [25] (p. 637) have indicated qualitative approaches as essential tools to generate new insights that document phenomena "at a level of detail and nuance that can be difficult or impossible to achieve using only quantitative methods" (see also, [51]).

3.1. Sampling Strategy and Data Collection

We use a purposeful sampling strategy aimed at gathering information-rich data sources "from which one can learn a great deal about issues of central importance to the purpose of the inquiry" and that provide "insights and in-depth understanding rather than empirical generalizations" [52] (p. 230). In contrast to approaches such as random sampling, purposeful sampling implies that the selection of data sources runs parallel to the data collection [53]. Simultaneously selecting and collecting the data increases the possibility of generating novel concepts and identifying theoretical relationships with information that either substantiates them or provides divergent examples [54].

We collected our data in the form of 55 semi-structured interviews with HNWIs and industry experts between 2015 and 2019 with the help of wealth owner networks in Europe and the United States. These interviews lasted, on average, 30 min, were recorded, and were fully transcribed. We interviewed 42 SRI-oriented HNWIs with different cultural backgrounds and sources of wealth creation (see Table 1). In the course of these interviews, we asked them about the role of wealth in society, their thoughts around considering ESG criteria in their investments, and their assessment of the importance of SRI for sustainable development. Our questions also addressed their understanding of SRI, the barriers they face, the values and beliefs they hold, and their expectations. Expectations included broader ideas such as overall visions and hopes for the SRI market and particular aspects such as financial return and social welfare contribution regarding their own SRI engagement.

Table 1. Overview of informants and some background information.

No.	Code	Type of Informant	Age	Male	Nationality	Country of Residence	Profession	Wealth Range	Highest Degree
1	HNWI 1	Wealth Owner	26–35	Male	Brazil	USA	Manager	>USD 1 Bn	Master
2	HNWI 2	Wealth Owner	26–35	Male	US	USA	Private investor	>USD 1 Bn	Master
3	HNWI 3	Wealth Owner	26–35	Female	UK/Lebanese	UK	n.a.	USD 100 M–1 Bn	n.a.
4	HNWI 4	Wealth Owner	26–35	Male	Canadian	USA	Private investor	USD 20 M–100 M	n.a.
5	HNWI 5	Wealth Owner	26–35	Male	Italian	UK	Private investor	USD 20 M–100 M	Master
6	HNWI 6	Wealth Owner	26–35	Male	US	USA	Private investor	USD 20 M–100 M	n.a.
7	HNWI 7	Wealth Owner	26–35	Male	UK	UK	n.a.	USD 20 M–100 M	n.a.
8	HNWI 8	Wealth Owner	26–35	Female	Dutch	UK	n.a	USD 100 M–1 Bn	Master
9	HNWI 9	Wealth Owner	26–35	Female	Swiss	Switzerland	Student	>USD 1 Bn	Master
10	HNWI 10	Wealth Owner	26–35	Male	Belgian	Switzerland	Investor	n.a.	n.a.
11	HNWI 11	Wealth Owner	26–35	Male	Swiss	Switzerland	Finance professional	n.a.	Master
12	HNWI 12	Wealth Owner	26–35	Female	Netherlands	UK	Manager	USD 100 M–1 Bn	Master
13	HNWI 13	Wealth Owner	26–35	Female	Sri Lanka	USA	n.a.	n.a.	Master
14	HNWI 14	Wealth Owner	26–35	Male	German/Autrian	Germany	Finance professional	>USD 1 Bn	Master
15	HNWI 15	Wealth Owner	26–35	Female	US	USA	Finance professional	n.a.	Master
16	HNWI 16	Wealth Owner	n.a.	Male	n.a.	Australia	n.a.	n.a.	n.a.
17	HNWI 17	Wealth Owner	60+	Female	US	USA	Private investor	n.a.	n.a.
18	HNWI 18	Wealth Owner	n.a.	Male	n.a.	n.a.	n.a.	n.a.	n.a.

Table 1. *Cont.*

No.	Code	Type of Informant	Age	Male	Nationality	Country of Residence	Profession	Wealth Range	Highest Degree
19	HNWI 19	Wealth Owner	n.a.	Nonbinary	n.a.	n.a.	n.a.	n.a.	n.a.
20	HNWI 20	Wealth Owner	n.a.	Nonbinary	n.a.	n.a.	n.a.	n.a.	n.a.
21	HNWI 21	Wealth Owner	60+	Male	USA	USA	Private investor	USD 100 M–1 Bn	PhD
22	HNWI 22	Wealth Owner	n.a.	Male	n.a.	n.a.	n.a.	n.a.	n.a.
23	HNWI 23	Wealth Owner	60+	Female	US	USA	Private investor	n.a.	n.a.
24	HNWI 24	Wealth Owner	n.a.	Female	n.a.	n.a.	n.a.	n.a.	n.a.
25	HNWI 25	Wealth Owner	26–35	Female	Netherlands	UK	Private investor	USD 100 M–1 Bn	Master
26	HNWI 26	Wealth Owner	26–35	Male	US	USA	Private investor	n.a.	Master
27	HNWI 27	Wealth Owner	26–35	Male	US	USA	Private investor	n.a.	n.a.
28	HNWI 28	Wealth Owner	26–35	Female	German	Germany	Private investor	>USD 1 Bn	Master
29	HNWI 29	Wealth Owner	26–35	Male	Italian	UK	Private investor	USD 20 M–100 M	Master
30	HNWI 30	Wealth Owner	36–45	Male	German	Germany	Finance professional	>USD 1 Bn	Bachelor
31	HNWI 31	Wealth Owner	26–35	Male	German/Greek	Germany	Private investor	>USD 1 Bn	Master
32	HNWI 32	Wealth Owner	26–35	Male	US	USA	Private investor	n.a.	n.a.
33	HNWI 33	Wealth Owner	45–60	Female	n.a.	n.a.	n.a.	n.a.	n.a.
34	HNWI 34	Wealth Owner	45–60	Male	Norwegian	Norway	Private investor	n.a.	n.a.
35	HNWI 35	Wealth Owner	n.a.	Female	n.a	n.a	Private investor	n.a	n.a
36	HNWI 36	Wealth Owner	26–35	Female	Italy	USA	n.a	>USD 1 Bn	Master
37	HNWI 37	Wealth Owner	n.a.	Female	n.a.	n.a.	n.a.	n.a.	n.a.
38	HNWI 38	Wealth Owner	26–35	Female	Dutch	UK	n.a.	n.a.	Master
39	HNWI 39	Wealth Owner	45–60	Male	Italian	Italy	Private investor	>USD 1 Bn	n.a.
40	HNWI 40	Wealth Owner	26–35	Male	Syrian	Lebanon	Finance professional	USD 20 M–100 M	n.a
41	HNWI 41	Wealth Owner	26–35	Male	USA	USA	Private investor	>USD 1 Bn	n.a.
42	HNWI 42	Wealth Owner	26–35	Female	Mexico	Mexico	Private investor	USD 100 M–1 Bn	n.a.
43	Expert 1	Manager	n.a	Male	USA	USA	Finance professional	n.a.	n.a.
44	Expert 2	Advisor	45–60	Female	UK	UK	Advisor	n.a.	Master
45	Expert 3	Manager	36–45	Male	German	Switzerland	Finance professional	n.a.	Master
46	Expert 4	Manager	36–45	Female	Chinese	China	Finance professional	USD 100 M–1 Bn	Master
47	Expert 5	Manager	26–35	Male	n.a	USA	Manager	n.a.	n.a.
48	Expert 6	Researcher	36–45	Male	German	Switzerland	Researcher	n.a.	PhD
49	Expert 7	Manager	36–45	Male	USA	USA	Foundation manager	>USD 1 Bn	n.a.
50	Expert 8	Manager	n.a	n.a	n.a	USA	Foundation manager	>USD 1 Bn	n.a.
51	Expert 9	Advisor	45–60	Male	US	USA	Investment advisor	n.a.	n.a.
52	Expert 10	Manager	36–45	Male	German	Germany	Finance professional	>USD 1 Bn	n.a.
53	Expert 11	Manager	45–60	Male	n.a.	USA	Finance professional	n.a.	n.a.
54	Expert 12	Manager	45–60	Female	US	USA	Investment advisor	n.a.	Bachelor
55	Expert 13	Researcher	26–35	Female	German	Germany	Researcher	n.a.	Master

We adopted a range of measures to enhance the reliability of our interview data. We posed "courtroom questions" [55] (p. 41) by asking SRI-oriented HNWIs the same questions to reduce self-reported biases. This technique helps to avoid speculation and enhances the reliability of the informants' responses. As is standard in qualitative research (e.g., [56]), we granted anonymity to all informants to elicit candid responses [55]. Furthermore, we interviewed 13 experts who regularly consult with SRI-oriented HNWIs and closely monitor the SRI market, including advisors, managers, and researchers. This data was relevant for triangulating the interview data gained from the wealthy private investors.

Table 1 provides an overview of all our informants. The table typifies the informants into wealth owners and industry experts, with the latter further subdivided into advisors, managers, and researchers. In addition, the table includes information on each interviewee's age, gender, nationality, country of residence, profession, approximate wealth, and highest academic degree.

3.2. Data Analysis

We used grounded theorizing and, more specifically, the "Gioia methodology" [57] to analyze our interview data. The Gioia methodology helps analyze interview data in the context of individuals concerned with social and environmental issues in a business context (see, e.g., [58]). This methodology is tailored to qualitative inductive inquiry and comprises three levels of abstraction [57].

The first-order analysis is about processing the raw interview data to identify a primary set of codes. We classified those codes into different groups of descriptions that

our informants provided. This initial assessment provided insights into what SRI-oriented HNWIs consider the prevalent problems that modern societies face and the potential ways to solve them, from political actions to philanthropy and sustainable investing. We have learned what role private wealth plays in this discussion, what opportunities wealthy persons have for adding to social welfare, and what responsibility they ascribe to themselves in this context. Moreover, we obtained preliminary knowledge of what role fellow HNWIs and their family members play in their SRI engagement. The result of this initial stage of analysis were several first-order category codes.

We then engaged in a second-order analysis. We analyzed additional data and studied the literature to incrementally move from the first-order insights toward more theoretical second-order themes. We continuously iterated back and forth between data and literature and gradually developed theory [59]. At this stage, we particularly noticed that SRI-oriented HNWIs see wealth as a cause and solution for societal problems and feel personally responsible to society. Furthermore, we learned how the latter use SRI to make financial profits, what their families expect from them, and how SRI-oriented HNWIs try to meet these exact expectations. Moreover, we realized the importance of their peers with whom they share the same values, goals, and visions. The importance of like-minded wealthy private investors and families prompted us to review the literature on reference theory in-depth, stimulating a related oscillation between theory and empirical data. The result of this analysis was a set of second-order themes.

We processed additional data to identify the interaction between key constructs on the highest level of analysis leading to aggregate dimensions. More specifically, we categorized raw data, linked first-order categories to second-order themes, and aggregated them into third-order dimensions. The result was five aggregate dimensions: first, using one's own fortune to promote social welfare; second, using one's own fortune to generate financial profits; third, one's family sets profit-oriented norms; fourth, proving one's profit to conform with family norms; and fifth, other SRI-oriented HNWIs provide confirmation.

Throughout the data analysis, we ensured intercoder reliability. To this aim, we used the data analysis software NVivo. This software helps organize large amounts of qualitative data and provides the basis for performing data analysis in a team. The authors held regular meetings to cross-check the coding and ensure the development of the same understanding of the emerging categories, moving from open coding over more theoretical categories to aggregate dimensions. Figure 1 shows our data structure and, thereby, provides an overview of the three levels of abstraction in line with the Gioia methodology. In this vein, the figure depicts our inductive reasoning process from empirical raw data in the form of first-order categories over second-order themes to more abstract theoretical categories in the form of aggregate dimensions.

In the following findings section, and according to conventions in qualitative research (e.g., [60]), we offer power quotes throughout the text and, per subsection, provide additional interview data supporting our empirical analysis in Tables 2–11.

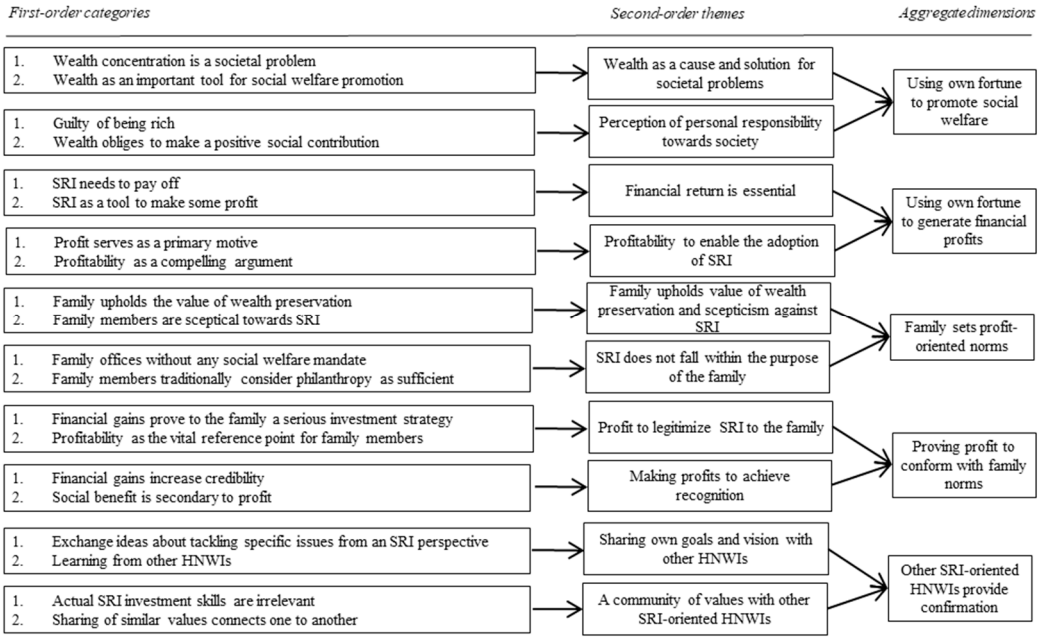


Figure 1. Data structure.

4. Findings

We structure the empirical results as follows: first, we outline how HNWIs use their own fortunes to promote social welfare. Second, we show that they use their fortunes to generate financial profits. Third, we depict how the family sets profit-oriented norms. Fourth, we demonstrate that SRI-oriented HNWIs engage in proving profit to conform with family norms. Finally, we present how other SRI-oriented HNWIs provide confirmation.

4.1. Using Own Fortune to Promote Social Welfare

When asked about their motives for SRI, HNWIs often pointed out that they strive to use their fortune to promote social welfare. In the following, we will discuss two aspects of our data supporting this insight.

Wealth as a cause and solution for societal problems. Wealth has an essential role in society in that it functions equally as a cause of and solution to societal problems such as inequality. Firstly, many HNWIs describe wealth as the cause by pointing out that *wealth concentration is a societal problem*. One informant (HNWI 12), for example, problematizes wealth concentration by arguing that "wealth distribution is definitely something that I adhere to" in my investment decisions because "I just feel like opportunities are a little bit skewed at this point." Further, the wealth owner problematizes wealth concentration by contrasting it with an equal society that is much more beneficial for all involved, as it ensures equal opportunities, i.e., "a much more balanced society is extremely beneficial for all".

Secondly, HNWIs emphasize that ample financial resources may serve to tackle social problems. One wealth owner (HNWI 16) illustrates *wealth as an important tool for social welfare promotion* by the example of an investment strategy aimed at combating climate change and all its resulting societal consequences. According to this informant, investing wealth through this strategy serves "to bend emissions and create opportunities to generate land that we are able to move back towards a healthy planet." In this regard, the strategy goes far beyond combating climate change by securing that "people are going to be less hungry, be better fed, have better sanitation, and all those things that potentially come with making better use of the resources we have".

In sum, our empirical analysis of the interview data shows that HNWIs see wealth as both a cause of and an opportunity to solve societal problems. On the one hand, HNWIs localize the concentration of wealth as the cause of the unfair distribution of opportunities

in society; on the other hand, they describe wealth as the central means of solving current social problems, such as the unfair distribution of resources. In Table 2, we provide further evidence of wealth as a cause and solution for societal problems.

Table 2. Wealth as a cause and solution for societal problems.

Interview Sample	1st Order Concepts	2nd Order Themes
HNWI 1: I think the cause back then [that] was already very deep in me was social inequality. Now we know the data, like the 85 richest people in the world, they constitute more wealth than the bottom 3.5 billion people. (. . .) This bothers me very much. HNWI 4: I think that yes, definitely income and equality is a major issue. I think that these are just the natural laws of compounding, that people who make money in the past have a far easier time of making money in the future (. . .). HNWI 19: And we want to join with other people (i.e., other HNWIs) who have a vision that is similar to ours, a world citizenry with a much more economic distribution of resources when individuals are treated with dignity. HNWI 33: In my personal capacity as an impact investor, a member of (wealth owner network), a member of the (wealth owner) Club, and my entire portfolio of investments is in projects and investments that help address that inequality.	Wealth concentration is a societal problem. Wealth as an important tool for social welfare promotion.	Wealth as a cause and solution for societal problems.

Perception of personal responsibility towards society. The interviewed HNWIs deal in detail with the connection between wealth and the potential responsibility that comes with it and how this very connection affects them personally. Firstly, HNWIs often mentioned the issue of being *guilty of being rich*. For example, after being asked by the interviewer about the fairness debate around inherited wealth and first-generation wealth and how the respective generation and the family as a whole deal with this debate, one informant (HNWI 2) responded that "we know [about the fairness debate around inherited wealth], and it's something that my mom, I think, makes a big effort of reminding us about." Furthermore, the informant explicitly points out the feelings of guilt that come along with being wealthy: "but yes, I do think there's a big element of unfairness there".

Secondly, our data on HNWIs suggest that wealth obliges one to make a positive social contribution. The interviewees clearly express a personal desire to do something about the inequality in today's world and the lack of social mobility. This includes straightforward measures such as the intention to redistribute financial resources but also to use one's own capital to promote projects that increase social mobility. One wealth owner (HNWI 25) clarifies this further by pointing out that "there's this fundamental discomfort with the inequality that exists in the world" and that driving the investment of wealth "at the portfolio level but also the deal level is this sense of how can we create more equality in the world".

To summarize, the interviewed HNWIs see themselves, primarily because of their wealth, as bearing a personal responsibility to society. This sense of personal responsibility is based both on feelings of guilt, which originate from their own wealth, and on the conviction that wealth obliges one to solve social problems such as the increasing inequality

between the rich and the poor. In Table 3, we provide further evidence of the perception of personal responsibility towards society.

Table 3. Perception of personal responsibility.

Interview Sample	1st Order Concepts	2nd Order Themes
HNWI 32: Honestly, guilt does kind of play into a factor, but I honestly wonder if guilt and empathy are a combined emotion in some ways to say that, "I have so much and I feel compelled to do something about it".	Guilty of being rich.	Perception of personal responsibility.
HNWI 5: So, to me, I think it's what you said yesterday about the fact that you inherit the wealth and you have this feeling of like I don't deserve it I think that is very applicable for sure.		
HNWI 32: But then also to just feel the weight of the world and know that you have a means to do something about it.	Wealth obliges one to make a positive contribution.	
HNWI 4: I would say that there is quite a lot of sympathy in the family for environmental causes.		

4.2. Using Own Fortune to Generate Financial Profits

The interviewed SRI-oriented HNWIs expressed that they aim to use their own fortune for generating financial profits, as evidenced by the profit orientation of their sustainable investment activities. We found two aspects supporting this insight that we will detail in the following.

Financial return is essential. HNWIs generally regard SRI as a financial instrument that not only has a positive social impact but also generates an economic return. Firstly, this circumstance is shown by the aspect that *SRI needs to pay off*. One wealth owner (HNWI 34) illustrates the importance of making money with SRI by the example of impact investing, which can be understood as a synonym of SRI. This informant notes that people "confuse it [impact investing] with philanthropy" while instead "impact investing is about making a positive impact and make a lot of money".

Secondly, HNWIs often consider their sustainable investing activities as a way of making a financial profit. Hence, wealthy sustainable investors see *SRI as a tool to make some profit*. For example, the following informant (HNWI 1) clarifies the importance of earning money as follows: "The argument is that we don't want to lose money [with SRI]. We don't want this to be an expense. We want to earn money, make investments that are profitable".

In conclusion, our analysis indicates that the interviewed HNWIs conceive SRI as an investment vehicle to contribute to society and generate financial profits. In each case, financial gain is emphasized, for example, when HNWIs point out that SRI should help "make a lot of money" and serve as a tool to generate a financial surplus. In Table 4, we provide further evidence that financial return is essential.

Profitability to enable the adoption of SRI. Profitability has often been expressed under the umbrella of building the field of sustainable investing. Many wealthy private investors mention the need to prove the established idea that SRI should be as equally profitable as traditional investments. This is, firstly, because HNWIs suggest that *profit serves as a primary motive*. One wealth owner (HNWI 31) points out that "the thesis of impact investing is that you can achieve the same returns." Moreover, the informant states that the confirmation of this thesis is critical for whether investors go into impact investing at all: "at the performance of portfolios, there's very little evidence. (. . .) If you say that to people, they'll be like, 'hell no, I'm not putting that money into impact'".

Secondly, the interviewed SRI-oriented HNWIs consider *profitability as a compelling argument* to encourage the adoption of sustainable investment practices by third parties. One interviewed HNWI (HNWI 32) explains this by the case of convincing the board of their own family office to adopt SRI: "I had to look at it from the perspective of where can I get some wins, where can I get the leverage going. And it's honestly just about proving that we can make market returns or better".

Table 4. Financial return is essential.

Interview Sample	1st Order Concepts	2nd Order Themes
HNWI 11: Interviewer: How important would be financial return in impact investments? Interviewee: If it's an investment, it's an investment; we want returns.	SRI needs to pay off.	Financial return is essential.
HNWI 8: Interviewer: What is the financial return that you personally expect from impact investing compared to traditional investing? Interviewee: The exact same.		
HNWI 11: Interviewer: But they also engage if it would only be ethical reason? Interviewee: No, definitely not as much. Because I guess when you move bigger lump sums proportionately to what you have, you want to have a financial return on it.	SRI as a tool to make some profit.	
HNWI 15: I would like to invest in things and help others understand the notion of (. . .) choosing [investments] wisely that do good so you can do good and do well, that's part of impact, but for me, it also means really doing well profitably and then proving that concept.		

In sum, the analysis of the interview data suggests that HNWIs consider the financial profitability of SRI relevant for establishing the field of sustainable investing and for promoting its adoption among wealthy private investors in particular. This insight is grounded on the circumstances that profit motives dominate the investment behavior of HNWIs and that profitability is the most compelling argument for adopting SRI or not. In Table 5, we provide further evidence of profitability to enable the adoption of SRI.

4.3. Family Sets Profit-Oriented Norms

Families and their members who surround the HNWIs set profit-oriented norms that the wealthy sustainable investors interviewed perceive as standards and expectations they must adhere to. Below, we detail two aspects of the insight that families demand financial profit and claim this demand toward SRI-oriented HNWIs.

Family upholds the value of wealth preservation and skepticism against SRI. HNWIs repeatedly mention the relevance of their family members for their investments. Firstly, their *family upholds the value of wealth preservation* that is an essential guideline for them. Our data suggest, at least in the context of investing, that wealth preservation is the most prominent value in wealthy families. For example, in response to whether there are any particular values or principles regarding financial investments that the HNWI has adopted from their own family, the informant (HNWI 15) mentions values related to "wealth preservation" that many wealthy families have to "set up expectations for family members in order to access funds".

Secondly, the interviewed HNWIs repeatedly point out that *family members are skeptical towards SRI*. Families are often unfamiliar with the underlying idea of SRI, of combining financial investment with a positive social and environmental contribution, and therefore cannot imagine how this would work. One wealth owner (HNWI 8) further explicates this skepticism by "an added level of skepticism that the family office brings whenever we put forth something with the knowledge that it is impact." This informant locates this

skepticism in the technical terms and expressions associated with impact investing, as "they (family office members) themselves put an added level of skepticism on the investments we put forward because of the impact investment terminology".

Table 5. Profitability to enable the adoption of SRI.

Interview Sample	1st Order Concepts	2nd Order Themes
Expert 4: Because I think on this case that I think is a good vision to have and that the vision that I think we all have people, who want to build this (SRI) field. But realistically in order to get there, especially talking about changing the modern portfolio theory, then, for one thing, we really need to show them that the returns exist.	Profit serves as a primary motive.	Profitability to enable the adoption of SRI.
HNWI 25: I think it's all a journey. When I started out, I was very much still trying to just prove that you can do impact investments. And so initially, the first couple of deals we did, I was very much focused on getting market-rate return for these types of impact investments.		
HNWI 17: I think when they will be able to publish that the 100% members from [wealth owner network] in their first ten years had an average return of 8% across their portfolios or whatever it is. That's probably the biggest contribution we can make to the field of impact investing is to provide reassurance.	Profitability as a compelling argument.	
HNWI 25: I think it's all a journey. When I started out, I was very much still trying to just prove that you can do impact investments. And so initially, the first couple of deals we did, I was very much focused on getting market-rate return for these types of impact investments.		

In conclusion, our informants emphasize that their families uphold the value of wealth preservation and skepticism against SRI. On the one hand, such wealth preservation provides the interviewed HNWIs with a basis for their value formation and presents a critical normative framework against which they align their investment behavior. On the other hand, families are skeptical about SRI and the associated sustainable investment behaviors because, according to the HNWIs interviewed, their family members are often unacquainted with SRI. In Table 6, we provide further evidence of the issue that the family upholds the value of wealth preservation and skepticism against SRI.

SRI does not fall within the purpose of the family. HNWIs themselves often face the circumstance that their family does not see the point of linking their financial investments to socially and environmentally positive contributions. Firstly, this circumstance can be explained by the fact that there usually are *family offices without any social welfare mandate*. The following statement by a wealth owner (HNWI 15) illustrates that most family offices lack any mandate for making a positive social or environmental contribution as part of their investment activities: "I know many family offices, and I always ask if they have an impact mandate or something, and a lot of them still don't".

Secondly, SRI-oriented HNWIs mentioned that their families often uphold that they already are engaged in philanthropic activities and therefore do not see any need for SRI. Hence, *family members traditionally consider philanthropy as sufficient*. The extent to which this very attitude can hinder SRI illuminates an informant (HNWI 6) who is appropriately committed to such investments outside the family and its wealth because family members only focus on philanthropy, as explicated by the family foundation: "they (family members) have a very traditional sort of foundation setting. (. . .) So the foundation is purely about giving philanthropic capital, not capital but the income generated from it".

To sum up, the analysis points towards the circumstance that HNWIs' families do not see why striving for financial returns should link to a positive societal contribution. This insight reflects the fact that family offices, officially entrusted with managing the family's assets, traditionally do not have a social welfare mandate. Moreover, the circumstance that family members traditionally consider philanthropy to be sufficient, where any economic activity is usually separated from social welfare engagement, supports the insight that SRI does not fall under their families' purpose. In Table 7, we provide further evidence that SRI does not fall within the purpose of the family.

Table 6. Family upholds wealth preservation and skepticism against SRI.

Interview Sample	1st Order Concepts	2nd Order Themes
HNWI 5: Like my sister, for example, she is in the same position as me since there's only the two of us, she for some reason, doesn't care much. (. . .) Maybe she doesn't understand the investment aspect fully, but she's a lot more cautious. She's like, no, I've seen certain portfolios that we had losing crazy amounts of money during the crisis and all that. I want to make sure that I'm going to have enough for my children.	Family upholds the value of wealth preservation.	Family upholds the value of wealth preservation and skepticism against SRI.
HNWI 5: I mean, in a way, you feel it would be an injustice if having benefited from this wealth, then you wouldn't leave some to pass along to your children, especially coming from a southern European background, but again it's all about expectations.		
HNWI 24: I find the impediment the greatest impediment to me personally deploying the capital at the rate that I would like to, and the level that I would like to is because my partner, who's also part of the decision-making process, is not in lockstep with me yet.	Family members are skeptical towards SRI.	
HNWI 10: I always believe if you say something and the people they don't get it, they become defensive, and they don't get in the first step. Then whatever else you tell them, it's a waste of time, and effort, and energy. And I have reached out to different people. I've talked about the topic. I have seen resistance from my siblings often		

4.4. Proving Profit to Conform with Family Norms

Our data shows that HNWIs are engaged in proving the economic profitability of SRI to conform with family norms, suggesting that a "good" investor is an economically successful investor. This, however, differs from the above-described striving for financial return in that HNWIs primarily aim for economic profit to prove their conformity with family norms. We detail the two aspects related to this insight below.

Profit to legitimize SRI to the family. HNWIs often mention financial success as a source of legitimacy. Firstly, the informants said that *financial gains prove to the family a serious investment strategy*. For example, an interviewed HNWI (HNWI 15) explicates how generating financial returns built the necessary approval from the family hedge fund for adopting an SRI strategy: "my hedge fund, this email I got was, 'oh it (SRI) sounds just like charities, and no problem, you can be on the board'". However, this wealth owner seeks to demonstrate that SRI is not charity, but allows for the generation of financial gains, to convince family members that SRI is a serious investment strategy: "they (members of the family hedge fund) approached me to be on the board, but it's actually not okay like I

want people to realize that it can be very profitable, and it is important for me to generate returns so that again you can prove this concept".

Table 7. SRI does not fall within the purpose of the family.

Interview Sample	1st Order Concepts	2nd Order Themes
HNWI 28: The head of our family office doesn't believe in global warming. I don't know where I should start to try to make him understand other basics. HNWI 38: A big barrier for me personally was navigating the family dynamics and being able to convince others of impact investing (i.e., SRI). Because that was very essential for my own journey and able to employ capital was to get my end from the family office to be able to do so. And so it was one of definitely 110 my biggest and earliest barriers related to impact investing.	Family offices without any social welfare mandate.	SRI does not fall within the purpose of the family.
HNWI 1: They would say, "We have the corporate foundation. You don't need to create something to pursue social impact. Just go there, and do an internship in the corporate foundation". HNWI 37: In Canada especially, the landscape of philanthropy is changing. Making general contributions in the same that our parents did. Like some of the organizations that we work with specifically, they have a really strong base of individual supporters, but when you look at the demographic, those are people who are much older.	Family members traditionally consider philanthropy as sufficient.	

Secondly, our interview partners render financial return and the proof of *profitability as the vital reference point for family members* and a known and appreciated measure for assessing individuals within the family. Suppose the individual HNWI can provide evidence that an investment decision generates enough profit. In that case, influential family members, such as the grandfather, acknowledge this as sufficient to let the individual (i.e., in our example here, the grandchild) proceed with their own ideas. It thus justifies the position of a capable, independent decision-maker. This is illustrated in the following statement by a wealth owner (HNWI): "I decided to talk to my grandfather, and I told him that I wanted to work with education and that it was something that would change the world. The only thing that he said was, 'but how are you going to pay your bills?'".

In a nutshell, the interviewed HNWIs indicate that they use financial success as a source for legitimizing SRI to their family members. This approach is explained on the one hand by the circumstance that HNWIs draw on economic profits to prove a serious investment strategy; for example, to receive approval from their family hedge fund for adopting an SRI strategy. On the other hand, financial success is the vital reference point for assessing family members and thus for whether an individual family is considered appropriately competent to invest the family capital in SRI. In Table 8, we provide further evidence of financial success as a means of legitimization within the family.

Making profits to achieve recognition. SRI-oriented HNWIs strive to gain recognition as investors, for example, from their families, by making financial profits. Firstly, next-generation wealth owners born into their societal position point out that they need to find ways to show that their actions are credible. A ubiquitous way to achieve this goal is profit because *financial gains increase credibility*. One interviewed HNWI (HNWI 5) describes the

importance of bringing proof to the family as a financially successful investor using the following comparison: "you're expected to shape your life so that you can become a good steward (of your inherited wealth), versus, 'oh I have this, great, I just found out, so I don't have to work as hard, I don't have to find a job, I can just rely on my family'". Thus, recognition in the family is obtained by distinguishing oneself as a financially successful steward of inherited wealth.

Secondly, because wealthy sustainable investors often consider making profits essential for achieving recognition, they usually suggest that the *social benefit is secondary to profit*. HNWIs often do not show their ambition to prove the impact case of SRI to meet the initial intention of a social or environmental purpose. One interviewed HNWI (HNWI 31) illustrates this by pointing out that the measurement of any positive social or environmental impact merely distracts from the central goal of making a financial profit: "this whole discussion about impact measurement, I think, is diverting maybe too much resources from thinking about how to make this financial success first". Hence, in the case of SRI engagement, the social benefit is systematically subordinated to financial profit.

Table 8. Profit to legitimize SRI to the family.

Interview Sample	1st Order Concepts	2nd Order Themes
HNWI 27: I haven't really proven myself to be quite the rock star yet. It's got to take some time to prove that it (SRI) is a viable strategy. And so again, I would qualify this as our testing period.	Financial gains prove to the family a serious investment strategy.	Profit to legitimize SRI to the family.
HNWI 32: But in terms of a first step forward and getting the board at large for most (family) members are over 50 years old, saying, "We can see that we're going to get our traditional return on capital. We're going to get our 3–5× and our private equity. And we're going to stick with something that we understand in terms of performance metrics and standard fund composition as a way of building confidence".		
HNWI 31: I think the issue is that you need to prove, or at least in my case I'm a next-gen, that you need to prove that this (particular SRI activity) is profitable.	Profitability as the vital reference point for family members.	
HNWI 15: I guess what I'm trying to say is the same way to get the real gatekeepers onboard (i.e., prove profitability) or do the same way for me to get my family on board which would be a proof of concept.		

In summary, our analysis of the interview data suggests that SRI-oriented HNWIs strive to gain recognition as investors from their family members by making financial profits. This insight is evidenced first by HNWIs aligning their investments primarily with financial performance to make their actions more credible, and second by making the measurement of any positive societal impact secondary to proving financial performance. In Table 9, we provide further evidence for the role of making profits to achieve recognition.

4.5. Other SRI-Oriented HNWIs Provide Confirmation

The HNWIs in our data frequently pointed out other SRI-oriented HNWIs whom they admire and who serve as a reference for them. We detail two aspects related to this insight in the following.

Sharing one's own goals and vision with other HNWIs. Our informants often praise the community of other SRI-oriented HNWIs and how they thrive on being surrounded by like-minded private investors who share their goals and visions. Firstly, other SRI-oriented HNWIs are necessary for a wealthy sustainable investor to *exchange ideas about tackling specific issues from an SRI perspective*. An investment advisor (Expert 12) who regularly consults with HNWIs further elaborates on this very issue by pointing out the relevance of "a community of like-minded investors". Such a community allows SRI-oriented HNWIs "to deep-dive into a specific issue area" and how to "tackle that from a sustainable investing standpoint".

Table 9. Making profits to achieve recognition.

Interview Sample	1st Order Concepts	2nd Order Themes
HNWI 16: I think if that's the case, then we just need to continually hold firm on that and educate people and demonstrate to people why it's important to apply these more rigorous standards because ESG and CSR and social responsibility, etc. haven't achieved the () outcomes we've needed to achieve.	Financial gains increase credibility.	Making profits to achieve recognition.
HNWI 15: It's more on if I do something and it works (financially), then you know you have something to show for it and can get back to me in substantiating the case.		
HNWI 30: I think (social impact measurement) is overrated, and it's a waste of time and money to measure the impact.		
HNWI 28: I think it will become less and less important. And people will go back to just looking at the financial numbers, unfortunately. I actually also think that that's not 100% bad. That just means that you have to make sure that the (social) impact is integrated in the business model. Therefore the better the business is doing, the higher the (social) impact as well. And that approach we had with another investment we did where we said automatically the more basically product that's produced, the better this product is making XYZ as an impact.	Social benefit is secondary to profit.	

Secondly, our informants frequently emphasize the importance of *learning from other HNWIs*. One HNWI (HNWI 25) explains the importance of learning from others in the context of a global network of impact investors as "being part of a more global community of impact investors was extremely helpful." According to the informant, this worldwide network of SRI-oriented HNWIs derives its importance, particularly in representing a community, "from that you can learn".

To sum up, the interviewed HNWIs point out the relevance of sharing their goals and visions with other SRI-oriented wealthy private investors. This relevance stems from the fact that like-minded investors provide an individual HNWI with the opportunity to share ideas on approaching specific issues from an SRI perspective and learn more about SRI from other HNWIs. In Table 10, we provide further evidence for the role of sharing one's own goals and vision with other HNWIs.

A community of values with other SRI-oriented HNWIs. In contrast to their families, other HNWIs do not demand anything from our informants. While family members claim their demands for a financial profit, other SRI-oriented HNWIs do not make any demands, either in terms of economic gain or contribution to social welfare. Firstly, this becomes evident by the circumstance that *actual SRI investment skills are irrelevant* to participation.

One wealth owner (HNWI 26) accordingly points out that every HNWI is welcome to the community of SRI-oriented HNWIs regardless of where the person is on the SRI journey: "it's very nice to be welcomed by a group that says, 'if you want us to support you on your journey,' that term is used a lot, the impact journey that we're on here". Thereby, it is more about experiencing the journey toward making a positive social impact with a group of like-minded SRI-oriented HNWIs than actually about achieving the goal of creating a positive impact. "I don't feel as pressed to come up with something perfect, but rather to have a full journey with a group of like-minded individuals" (HNWI 26).

Table 10. Sharing goals and vision with other HNWIs.

Interview Sample	1st Order Concepts	2nd Order Themes
HNWI 28: I think the most important thing for me is meeting with peers and (. . .) realizing you're not alone in this fight against advisers that technically you pay, but they tell you what to do. That's been of great help to see. Because it's almost embarrassing to talk about these problems because people think you're crazy that you have this strange direction of power. HNWI 23: I'm a very active impact investor and have been for a long time. One of the things that come up regularly is who else is in this field or who else is in this investment? I'm always searching, (. . .) I just wanted (. . .) to influence the field more broadly (. . .) and for my peers within the (impact investor network) community. For all of us to be able to share that to be able to inspire more people to move their capital this way. So both something that was directly useful for me but also something to help inspire others and especially for my fellow [impact investor community] members but beyond that, to make that more accessible to people.	Exchanging ideas about tackling specific issues from an SRI perspective.	Sharing own goals and vision with other HNWIs.
HNWI 38: As soon as I actually joined, it's been mostly through the relationships that I've been able to build with other impact investors (. . .) It's really been the relationships with other impact investors and learning program. HNWI 12: Building up that impact investing community around you keeps you motivated, keeps you busy with deal flow, or just kind of helps you further along as well in the impact investing space and the thinking space. I guess it's all kind of related to those two networks that we've been part of. But I don't want to undervalue their contribution to my sister's and I journey.	Learning from other HNWIs.	

Secondly, our informants frequently mentioned that *sharing similar values connects one to another*. One informant (HNWI 10) clarifies the importance of being surrounded by like-minded HNWIs who share the same goals and visions and how such a community serves as a source for inspiration and support because "you will feel alone, and also, you will not be able to scale if you are alone (. . .). And here comes a certain belief, that of conviction." The shared set of values among SRI-oriented HNWIs creates a sense of community, which is a crucial source of guidance for the individual wealth owner. In fact,

according to the same informant, "it's always important to be a part of a community that you share with a grandiose ambition".

In conclusion, our analysis of the interview data indicates that other SRI-oriented HNWIs serve as a community of values that does not impose concrete requirements on an individual HNWI, neither in terms of financial gain nor of positive social impact. Namely, on the one hand, whether an individual HNWI has SRI skills and thus actual knowledge of how to link economic and social aspects is irrelevant to belonging to the community of SRI-oriented HNWIs. On the other hand, as a community of values that does not impose any concrete requirements on an individual HNWI, it is mainly about sharing the same goals and visions. In Table 11, we provide further evidence of a community of values with other SRI-oriented HNWIs.

Table 11. A community of values with other SRI-oriented HNWIs.

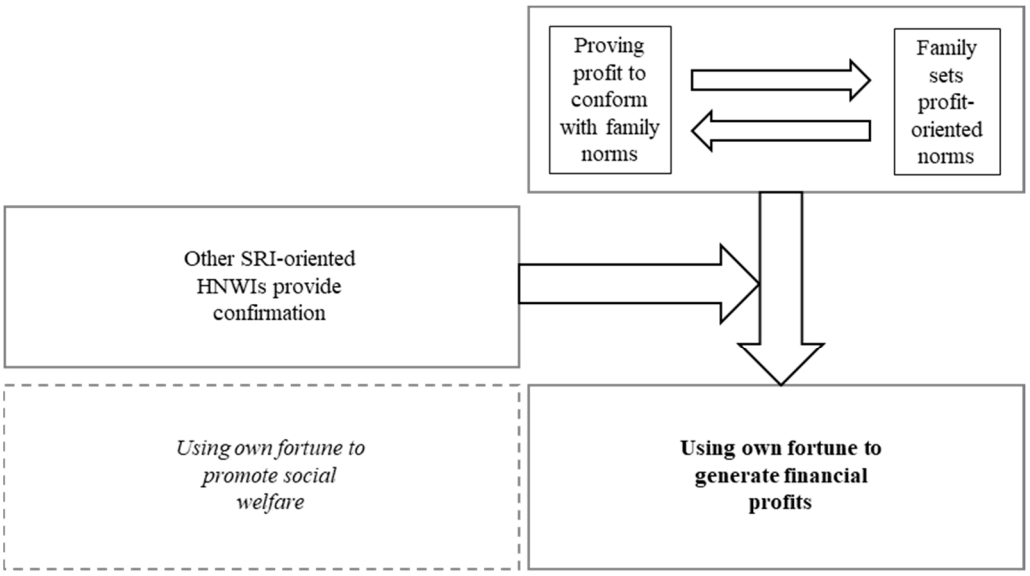
Interview Sample	1st Order Concepts	2nd Order Themes
HNWI 24: And make it very clear out of the gate, from the time you sign-up to be a member that no question is too small or too silly. And that everyone is at their own stage of their journey, some of us being beginners, or those others potentially being pioneers and everything in between. And it just showed up with your authentic cells and eating it, with your curiosity of mine and interesting, deploying your assets into the areas that thematically, regionally, and otherwise are right for you.	Actual SRI investment skills are irrelevant.	A community of values with other SRI-oriented HNWIs.
HNWI 26: And also, to be around a group of people who have been successful in business before and are using their returns exits, or from stock, or whatever. And now they're at a different phase of their life where I'm coming at it from a very young perspective. I don't have a massive career, unlike a lot of these individuals do.		
HNWI 24: I will say the social element of the [impact investor network] community is very important to me because I know that (. . .) those that I'm talking to have similar values, if not similar areas of interests or reasons of interest, but we all believe in a better financial market that delivers more benefit than extracts to both people and planet.	Sharing similar values connects one to another.	
HNWI 26: Being a part of the (impact investor network) is a great way to build momentum in that space and to be around like-minded individuals who have the same perspective.		

5. Discussion

5.1. The Influence of Reference Groups on the Investment Behavior of SRI-Oriented HNWIs

While we know little of the investment behaviors of SRI-oriented HNWIs, reference group theory suggests that such behavior is centrally dependent on their identification with and comparison to a respective reference group. For this reason, we have set the objective of developing knowledge on the influence of reference groups on the SRI engagement of HNWIs. Based on an inductive qualitative investigation of 55 semi-structured interviews with HNWIs and industry experts, we developed a framework to explain how reference groups influence the investment behaviors of SRI-oriented HNWIs. Our framework indicates that the family directly influences and other SRI-oriented HNWIs indirectly influence

SRI-oriented HNWIs towards generating financial profits in their investments at the expense of social welfare considerations. On the one hand, the family serves as a normative reference group that upholds the economic profit motive and directly urges HNWIs to make financial gains from their investments at the expense of social welfare. On the other hand, other SRI-oriented HNWIs serve as a comparative reference group that shares the same values but does not impose any concrete requirements on social welfare performance. This indirectly influences SRI-oriented HNWIs to subordinate social concerns to financial profits. Figure 2 provides an overview of our explanations.



Notes: **Main orientation of SRI-oriented HNWIs' investments in bold font**; *marginalized orientation of SRI-oriented HNWIs' investments in italic font*; reference group-related influences in regular font.

Figure 2. How reference groups influence the investment behavior of SRI-oriented HNWIs.

Our framework shows that SRI-oriented HNWIs are open to the idea of combining social welfare and economic aspects in their investments (see the two boxes with dashed and solid lines at the bottom of Figure 2). On the one hand, they intend to use their own fortune to promote social welfare. SRI-oriented HNWIs regard wealth both as a cause for the imbalance between rich and poor and a solution to overcome this very inequality. The latter explains the personal responsibility HNWIs ascribe to contributing to social welfare by placing their wealth into SRI. On the other hand, HNWIs intend to use their own fortune to generate financial profits. They regard financial return as essential, considering SRI as a financial vehicle to contribute to social welfare but also to make an economic profit. Moreover, HNWIs argue that financial gain serves the cause of SRI, considering profitability as a prerequisite for spreading SRI amongst mainstream investors.

However, while SRI-oriented HNWIs are open to the idea of combining social welfare and economic aspects in their investments, they strive towards making a financial profit at the expense of social welfare considerations even though they already hold great fortune (see the box with the solid line at the bottom of Figure 2). The influence of two particular reference groups explains this profit-oriented investment behavior of wealthy private investors.

First, a push-and-pull effect between the family setting profit-oriented norms and the HNWIs proving profit to conform with family norms directly promotes SRI-oriented HNWIs' ventures for financial return (see the box at the top right and the corresponding vertical arrow in Figure 2). The push consists of the family that serves as a normative reference group [23], setting profit-oriented norms that wealthy sustainable investors perceive as standards and expectations they must adhere to. Family members tend to have

traditional investor mindsets, suggesting that lent or invested capital needs to generate financial profits to compensate the risk that the investor takes by giving the money away. From this normative group's perspective, the only reasonable explanation for taking such a risk is a financial profit. Consequently, the family upholds the value of wealth preservation and skepticism against SRI and suggests that SRI does not fall within the purpose of the family. The pull is that SRI-oriented HNWIs strive for financial profit to conform with the norms of their families, upholding the importance of economic profits. They try to make profitable investments to legitimize SRI to their family members and to achieve their recognition. However, by these activities, SRI-oriented HNWIs reinforce and further consolidate family norms, countering the underlying idea of SRI, which brings together financial profits and social welfare (e.g., [6]).

Second, other SRI-oriented HNWIs provide confirmation and thereby indirectly promote SRI-oriented HNWIs' ventures for financial profits (see the box in the middle and the corresponding horizontal arrow in Figure 2). These like-minded individuals allow SRI-oriented HNWIs to share goals and vision with their peers and serve as a community of shared values. Within this group, an SRI-oriented HNWI finds validation for own ideas of using financial capital for social welfare and acceptance that the consideration of ESG criteria is appropriate and reasonable. In this vein, other SRI-oriented HNWIs build a comparative reference group, as they serve as a standard or checkpoint which the individual uses to make judgments [23]. However, this reference group does not enforce any standards, as can be seen, for example, in that actual SRI investment skills are irrelevant for membership. Consequently, those judgments are decoupled from the investment behavior of SRI-oriented HNWIs. For this reason, the comparative reference group has at least an indirect positive effect on profit-oriented investing by reinforcing the influence of the normative reference group on the profit-seeking of SRI-oriented HNWIs.

5.2. Contributions to the Literature

Our study adds to SRI research. To achieve sustainable development, we need a shift of traditionally invested assets into SRI. HNWIs hold a vital role in this shift, controlling nearly half of global wealth [3]. However, we know little about wealthy sustainable investors [16,17] and SRI-oriented HNWIs [18,19]. To understand whether, how, and to what extent HNWIs engage in sustainable investing, we need to go well beyond whether or not SRI is more profitable than traditional financing because the former brings together financial profits and social welfare [6,9]. We showed that SRI-oriented HNWIs use their fortune to generate economic gains at the expense of social welfare in their investments and unpacked the reasons behind their profit-oriented investment. While they support the idea of mobilizing their wealth to promote social welfare, they let this goal fall short because of reference groups that encourage them to use their wealth to generate financial profits, even though they already hold great fortune. The insight that the SRI engagement of HNWIs is, in effect, primarily profit-driven due to the direct influence of family members and the indirect effect of other SRI-oriented HNWIs, suggests that such engagement could contribute less to social welfare and more to further boosting wealth inequality. This finding is accentuated by the COVID-19 pandemic, which has again exacerbated existing wealth inequalities [61].

We further contribute to the reference group theory literature. As mentioned above, the literature differentiates two types of reference groups [22–24]. While normative reference groups establish and enforce standards considered norms, comparative reference groups serve individuals as a point of reference in making evaluations or comparisons without the evaluation of the individual by others in the group. By focusing on how different reference groups influence the investment behaviors of SRI-oriented HNWIs, we can comparatively show how different reference groups each affect the profit and welfare orientation of wealthy investors. This lets us derive an exciting finding for reference group theory. In the case of conflict, normative reference groups suppress the beliefs, values, and perspectives of the comparative reference groups. Suppose that the reference group does not enforce its

values or does not even seek to do so. In that case, this space is occupied by a reference group that does, while the comparative reference group at least indirectly supports the standards of the normative reference group. This insight implies the different spheres of influence of normative and comparative reference groups. In addition, understanding how different reference groups influence values, which then, in turn, shape the investment behaviors of SRI-oriented HNWIs, echoes the relevance of values for studying contexts where, as in the case of SRI, it is a matter of conceptualizing the interactions between economic issues and social aspects [46,62].

5.3. Contributions to Practice

The knowledge gained into the influence of reference groups on the investment behaviors of SRI-oriented HNWIs demonstrates that it is critical for market participants to be highly aware of the specific social setting that their HNWI clients or constituents are in when they receive their messaging. That is because the social setting in that moment will serve as a critical contextual aspect in determining what types of arguments about SRI—financial or social welfare arguments—will resonate more or be more helpful for HNWIs to move ahead with an investment decision. More specifically, in a shared ownership setting, as in families, financial arguments are more likely to support an investment decision. In contrast, social welfare arguments are more likely to support an investment decision in the setting of an SRI-interested HNWI community.

For the managers and members of communities of SRI-interested HNWIs, our findings suggest that to drive the primary goal of social welfare more effectively and to overcome the dominance of the financial performance-seeking of other family members, it might be crucial to put more specific emphasis within their community on the actual achievement of social goals, to drive more specific goal-setting in that regard, or to set certain standards and minimum requirements within their community.

Our research insights point out that mobilizing private wealth, at scale, for a positive social impact requires a deep understanding of the underlying social contexts that HNWIs are embedded in and which substantially influence their investment decision-making. Specifically, for the crucial intermediaries of banks and SRI funds, our findings indicate that to mobilize private wealth into SRI products, it is relevant for financial intermediaries to carefully consider and shape the social settings in which their HNWI communication activities occur. Depending on the settings of their specific activity, either financial or social welfare arguments might impede, rather than support, unlocking the substantial latent demand for their SRI products. It is these social setting considerations, and them not being considered carefully, that so far might have been the crucial stumbling block for SRI in private wealth management.

5.4. Limitations and Future Research

Our research is not without limitations—many of which are linked to its qualitative nature (see [63]). However, we believe that it opens up a broad range of future research opportunities that can add nuance and clarity to the possibilities and limitations of HNWIs' contribution to a shift of traditionally invested assets into SRI and the influence of different reference groups in this process. Our qualitative research strategy allowed for more accurate insights into the context of SRI-oriented HNWIs' investment behaviors, which would have been challenging to obtain through quantitative approaches. However, this also means that qualitative research develops generalizations that "are often less parsimonious because of the large number of variations possible and the difficulty of predicting which ones will occur and why" [64] (p. 703). Future research could use a quantitative method to test the generalization of our study statistically and enrich the boundary conditions of our work—for instance, linked to geographic or personal aspects.

While our data allowed us to theorize the influences of different reference groups on the investment behavior of SRI-oriented HNWIs, more research is needed to examine the gradual transition of these influences and potential shifts in them over time. Longitudinal

studies could further decipher the temporal dynamics behind the influences of reference groups on individual investment behaviors and any measures individual investors take to counter the influence of third parties. Examining the influence of such groups over different points in time could explain how and why a particular group manages to assert itself over others, what the associated influence strategies are, and why they are particularly assertive with the respective investors. Such research could also reveal whether, how, and why investors evade the influence of third parties and what the respective preconditions are for escaping the influence of a particular reference group (e.g., social embeddedness, individual strategies against influence). In addition, future research could examine the individual capabilities of private investors who positively impact social welfare through their investments, even in a context where financial gain is preferred over social welfare engagement.

6. Conclusions

A reference group theory perspective suggests that SRI-oriented HNWIs' investment behavior is shaped by their identification with and comparison to reference groups. To close the existing knowledge gap regarding HNWIs' SRI engagement, we adopted a qualitative interview approach to examine how reference groups influence the investment behaviors of SRI-oriented HNWIs. We found that the family members of SRI-oriented HNWIs form a normative reference group that prioritizes financial returns and directly shapes HNWIs to subordinate social concerns to financial profits. Our study also indicated that fellow SRI-oriented HNWIs serve as a comparative reference group that does not impose any concrete requirements on social welfare performance, indirectly influencing SRI-oriented HNWIs to generate financial gains from their investments at the expense of social issues. Our scholarly insights contribute to the SRI literature and reference group theory and have practical implications.

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Doing Good or Avoiding Evil? An Explorative Study of Depositors' Reasons for Choosing Social Banks in the Pre and Post Crisis Eras

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Abstract: The global financial crisis is expected to be of great relevance for social banks' growth of deposits. However, it is still unclear why depositors choose social banks in general, and how the global financial crisis has affected depositors' choice of social banks. The present paper thus explores a comprehensive set of reasons for choosing social banks, the individual relevance of reasons, as well as differences before and after the global financial crisis. Data was collected through a survey of five social banks, interviews with nine industry experts, and an online survey with 108 social and 413 conventional depositors. Using content analysis, a multi-level system of reasons for choosing social banks was identified, which refers to the social banks' "good" and conventional banks' "evil" characteristics. Based on a frequency analysis of codings per category, reasons with potential superior relevance for depositors' decision-making were explored. A comparison with reasons for choosing conventional banks imply that depositors' reasons for choosing social banks differ from those for choosing conventional banks in general. The results also indicate that the global financial crisis might have helped social banks' growth by attracting new customer target groups, who chose social banks because of conventional banks' "evil" characteristics.

Keywords: content analysis; ethical banking; global financial crisis; hierarchical cluster analysis; inductive category development; in-depth interviews; social banking; socially responsible investment

1. Introduction

Financing sustainable projects through customer deposits has played a minor role in the Socially Responsible Investment (SRI) universe and is primarily offered by a few specialised banks [1], which are called social, sustainable, or ethical banks. However, the deposits of these social banks have grown massively in recent years [2–5]. The global financial crisis is considered to be significant to the rise of social banks [6–8]. However, even one decade later, the relevant literature has not offered a sound explanation for how the global financial crisis has affected depositors' choice of social banks. In the light of the current COVID-19 pandemic and its (expected) impact on the global economy, a sound explanation of the impact of the global financial crisis on the growth of social banks could give valuable insights into current and future crises. One reason for this lack of evidence might be the remaining uncertainty about depositors' reasons for choosing social banks in general. Previous research has assumed that private customers hold deposits with social banks to give their money real meaning, to receive an extra stream of utility, and to reinforce their pro-social identity by financing social business projects [7–9]. However, Höhnke and Homölle [10] show that social banks' placement of assets alone cannot explain depositors' choice of social banks and argue that other reasons for choosing social banks must exist. The relevant literature has offered neither a comprehensive overview of depositor reasons for choosing social banks nor an analysis of the individual relevance of reasons for depositor

decision-making. As a consequence, social depositor decision-making remains a black box. The lack of a sound explanation of past growth prevents the sound prediction of future growth, bringing about massive uncertainty and poorer decisions for all manner of decision makers.

Social banks will not be able to set their expansion strategy in motion efficiently (e.g., proactively hire new employees or open new branch offices). In the light of the current global COVID-19 pandemic, missing insights on the impact of the global financial crisis on depositors' choice of social banks prevent a sound assessment of whether the pandemic could lead to a second boom in social bank deposits or e.g., to a bank-run threat.

In recent years, some conventional banks have started to adopt social banking principles. In this context, it is expected that the future growth of the social banking movement might be carried by conventional banks that have turned into social banks [10]. However, it seems reasonable to expect that a significant transformation process of the banking industry requires sufficient evidence of customer needs and decision-making.

It remains unclear whether social banks' growth has been a short-term sugar hill or the beginning of a sustainable regime shift in the commercial banking industry, comparable to those of the organic grocery industry over the past two decades. Consequently, standard-setters and policy makers will not be able to monitor or support this potential development into a more sustainable financial industry by creating appropriate (legal) frameworks, such as transparency requirements.

The lack of evidence regarding depositors' reasons for choosing social banks and the impact of the global financial crisis on depositors' choices could thus lead to missed opportunities, undetected threats, inefficient management, and a lack of political support. The purpose of this paper is thus to identify (1) a comprehensive set of depositor reasons for choosing social banks, (2) the individual relevance of these reasons for the choice of social banks, and (3) the development of social depositor reasons over time. This will be used to shed some light on the impact of the global financial crisis on social banks' growth.

Against this background, the present study comprises a mixed-method explorative research approach. A comprehensive set of depositors' reasons for choosing social banks was explored by creating a structured multi-level system of categories (reasons), using content analysis based on data collected via surveys with five social banks, as well as nine interviews with industry and academic experts. The individual relevance of these reasons was investigated with a frequency analysis based on data from an online survey of 108 social and 413 conventional depositors. To explore the variety of depositor reasons for choosing social banks, the development of customer groups in social banks was observed. Depositors were classified using a hierarchical cluster analysis based on the self-stated and classified reasons for choosing social banks from the 108 social depositors.

Based on this consecutive empirical research design, this paper seeks to make the following contributions to the existing literature: (1) extend the spectrum of depositor reasons for choosing social banks, (2) increase the understanding of known reasons, (3) identify the main reasons of social depositors, (4) differentiate these reasons from those for choosing conventional banks, and (5) create an initial empirical-based explanation for the impact of the global financial crisis on social banks' growth of deposits. These contributions will help to unlock the black box of social depositor decision-making, and in turn explain the growth of social banks in the aftermath of the global financial crisis.

The remainder of the paper is structured as follows: Section 2 gives a brief overview of the basic concept of social banking, social banks' growth, and depositor reasons for choosing social banks. Sections 3–5 deal with a comprehensive set of depositor reasons for choosing social banks, the individual relevance of these reasons for the choice of social banks, and the development of social bank customer groups over time. Section 6 presents potential limitations, implications, and avenues for further research. The paper ends with a summary and conclusion.

2. Literature Review

While most of the scientific literature on SRI has focused on institutional investors in capital markets (e.g., [11–13] for a literature overview), only a few studies have contributed to private (retail) investors of SRI funds (e.g., [14–17]), and even fewer to the field of SRI on credit markets, such as social banking and social depositors.

Social banks, also known as ethical, green, sustainable, or alternative banks [18–20], are financial intermediaries that run a commercial banking business with the objective of creating a social or environmental impact while making sufficient profits for banks' going concern [5]. Social or environmental value is not created by social banks themselves, but rather by the entities that are funded by them [8,20,21]. For this purpose, social banks primarily collect savings to distribute loans [8,19], resulting in high deposits-to-assets and loans-to-assets ratios [7]. As most conventional banks do not offer sustainable saving products [1], social banks dominate the sustainable credit market, which shows great potential for further growth by attracting further depositors [22].

Social banks differ from conventional banks particularly in their asset placement, level of transparency (concerning the placement of assets), and the possibility of customer participation [8,23]. The placement of assets of social banks is characterized by their non-application of speculative activities and the self-limitation of their use of funds [8,19,23]. Some social banks merely invest in projects that create social or environmental value (impact investing strategy). Other social banks do not invest in projects that create a social or environmental harm, but in all other projects providing a positive or neutral impact (exclusion strategy) [10]. Publicly disclosed investment criteria define which projects have a negative impact, such as nuclear energy, genetic manipulation, animal testing, pornography, drugs, and armaments [23,24], or a positive impact, such as organic farming, renewable energy, sociaL businesses, and fair trade products [8,23,25,26].

Social banks show transparency regarding the social and environmental impact of their investments to a greater degree than conventional banks [23]. Most social banks disclose at least aggregated information about their fund usage. Some social banks even disclose all of their distributed loans and securities under management in detail [8,23]. Stakeholders are thus able to monitor the suitability of their investment preferences with their social bank's placement of assets. Social banks thus remove the barrier between depositors and borrowers, whereas both groups are kept separated and anonymous in conventional banking [8].

Some social banks go one step further, extending customer participation by allowing depositors to choose the fields their funds are used for. Furthermore, depositors can obtain a reduction in interest rates if their funds are used for projects of their choice [8,27].

The relevant literature on social banking provides two approaches to explain the choice of social banks, primarily referring to the differences between social and conventional banks. First, with reference to Akerlof and Kranton's [28] theory of how identity (a person's sense of self) affects economic outcomes (such as saving behaviour), Cornée and Szafarz [7] argue that private customers hold deposits with social banks to receive an extra stream of utility and reinforce their social identity. In this vein, social depositors show a greater preference for sustainable buying behaviour, social return, transparency, and participation, and place less importance on financial return than conventional depositors [22]. Bayer et al. [29] show that a reduced economic benefit generally discourages conventional depositors from switching to a social bank, indicating that social depositors might be a special customer group.

Second, Höhnke and Homölle [10] argue that the choice of social banks could also be a rejection of conventional banks, reflecting that "bad" events, personal action, or traits have a stronger impact on behaviour than "good" ones [30,31]. Social depositor preference for transparency and participation might come from negative experiences with conventional banks.

As customer groups may consist of a mixture of sub-groups with different motives, both (or more) explanations for depositors' choice of social banks could be equally valid. Comparing these approaches to the set of reasons for choosing banks in general reveal that both explanations for choosing social

banks might be unique. Bayer et al. [29] collected a set of 15 bank selection criteria for depositors' choice of (conventional) banks from the relevant literature and formed four clusters based on content-related commonalities (see Table 1). It remains unclear whether some of the bank selection criteria could also be of relevance for depositors' choice of social banks. The relevant literature does not offer an overview of reasons for choosing social banks that enables a differentiated analysis of customer behaviour and customer groups.

Table 1. Clustered Criteria for Choosing Conventional Banks.

No.	Cluster	Bank Selection Criteria
1	Convenience	Location of ATMs and bank branches
2		Branch opening hours
3		Parking facilities
4		Display of counters
5		Disposal of electronic services
6	Economic benefit	Fees
7		Charges
8		Rates of interest
9	Reputation	Recommendations
10		public image
11	Service quality	Speed of service
12		Responsiveness
13		Reliability
14		Offering of incentives
15		Competence of employees

Source: Own table; based on the literature review and clustering of Bayer et al. [29].

Over the past two decades, social banks' deposits have shown annual growth rates of up to 30% [2–4]. Deposits in German social banks grew from €1.474 billion to €7.273 billion between 2007 and 2017, reflecting a relative growth of 493% over one decade [10]. The global financial crisis of 2007/2008 is expected to be of great importance for social banks' growth [6–8]. However, the literature has not offered an appropriate explanation for how the financial crisis has helped social banks' growth. It thus remains unclear whether social banks' growth was a short-term sugar hill or a sustainable regime shift in the commercial banking industry.

3. Depositor Reasons for Holding Deposits with Social Banks

Since a comprehensive overview of depositor reasons for choosing social banks is lacking in the relevant literature, a multi-level system of reasons (categories) will be explored in this section. This category system increases the basic understanding of depositors' decision-making and will help subsequent research by providing an initial, empirically derived set of depositor reasons.

3.1. Data Collection

The most intuitive data sources for exploring a multi-level system of depositor reasons for choosing social banks are the depositors themselves. However, as both subsequent analyses (Sections 4 and 5) are based on depositor data only, the multi-level system of reasons is built based on data from market experts in the first place and reviewed based on data from social depositors in Section 4.3.1. This dual approach enables the most resilient fundament for this consecutive study setting. Interviews with industry experts and academics, as well as a survey of social bank board members, are used to build the system of categories. Based on their experience, market knowledge and overviews, experts were expected to describe a wide range of reasons (including rare ones), as well as the internal structure of these reasons, by grouping reasons that frequently come along with one another, for example.

Expert statements on the motives of customers are expected to be largely free of social desirability and to provide a high degree of discrimination among categories.

In-depth interviews were used to collect data from industry experts, researchers, and customer account managers of social banks (see [32,33] for comparable approaches in the SRI and banking context). Nine experts were interviewed between October 2017 and January 2018. At the beginning of the interviews, interviewees were asked to describe the individual experience that qualifies them to report upon depositor reasons for choosing social banks. The sample of interviewees is described in Table 2, including the participant's relevant work experience, to soundly answer the following five questions:

1. Why do depositors choose a social bank (or your bank)?
2. Are these reasons of equal relevance for depositors' choice, or are some more important?
3. Do these reasons differ between customer groups?
4. Which of these reasons is currently the most important one?
5. Have these reasons changed over time?

Table 2. Relevant work Experience of Interviewees.

No.	Job Title	Relevant Work Experience
1	Customer account manager	Four years in customer account management for a German social bank
2	Head of customer account management	Five years in customer account management for a German social bank
3	Senior customer account manager	Nine years in customer account management for a German social bank
4	Investment advisor	One year in investment advisory (for retail customers) for a German social bank
5	Managing director/Board member	Managing director and board member of a topic related association
6	Board member/Researcher	Board member of a topic related association; Research on social banking (several publications)
7	Researcher/Manager	Co-founder and Manager of a topic related association; Ph.D. thesis on social banking
8	Researcher/Board member	Research on social banking (several publications); Board member of a European social bank; Advisory board member of a topic related association
9	Researcher	Ph.D. thesis on social banking; Several studies on social banking in cooperation with a topic related association

To ensure that the construction of the interview guideline did not limit the answers, interviewees were able to add any relevant information at the end of the interview.

Board members of German-speaking social banks also received a survey that (i.a.) included two questions concerning why depositors chose social banks: "Why do depositors choose your bank?" and "How have these reasons changed over time?" The survey was sent out to the executive offices of seven German-speaking social banks in November 2017. These social banks were selected based on the scientific literature [8,22,23] and the membership lists of relevant international associations, such as the Global Alliance for Banking on Values (GABV) [34], the Fédération Européenne des Banques Ethiques et Alternatives (FEBEA) [35], and the Institute for Social Banking (ISB) [36]. In this paper, social banks do not comprise confessional or church banks (just as in [23,24]), since the enormous growth reported (e.g., by [2–4]) refers to non-confessional social banks. Five social banks took part in the survey, representing approximately 92% of all the deposits of German-speaking social banks.

3.2. Methodology

Based on data from the interviews and the survey, content analysis was used to build a multi-level system of categories regarding depositor reasons for choosing social banks. Content analysis is a research method that objectively and systematically identifies specific characteristics in textual data,

in order to identify, for example, the intentions or attitudes of individuals [37]. Content analysis is a common research method in the fields of CSR in the banking industry and in sustainable investing for analysing verbal or textual data from various sources, such as bank websites, annual reports, interviews with experts, or surveys [1,38–41].

Because of the lack of evidence for the variety of depositor reasons for choosing social banks and the resulting explorative setting of this study, inductive category development (see [42] for an introduction) was used to build the categories. The entire interview material, as well as the social banks' answers to the surveys, were cut down to statements that may describe depositors' reasons for choosing social banks, using a small unit of analysis and creating a first list of relevant statements. Manual coding was preferred to automatic coding due to the explorative setting of this study and potential divergence of vocabulary between different expert groups (see [41] for a comparable argumentation). Even though manual coding is expected to decrease reliability (in terms of consistency and reproducibility) and transparency in the coding process [37,41], manual coding is supposed to provide more complexity and separation-precision among categories, since computerised word count strategies are generally unable to capture context and linguistic devices sufficiently [43]. Furthermore, automated coding (computerised word count strategies) requires a sound understanding of the research subject (e.g., based on theory or sufficient empirical findings to define the set of search terms). As this explorative study initially aims to identify the set of reasons for choosing social banks, the basic understanding of the research subject is too limited to use automated coding.

Following Mayring's [42] process proposal of inductive category development, the categories were first created by the author based on around 35% of the data set. For this purpose, data from five randomly selected interviews and surveys was processed. The subsample included two social bank employees, one employee of a related association, one researcher, and one survey, thus providing a reasonable diversity of data sources. Each category had a simple but accurate name, description, and representative example. Afterwards, the entire list of statements was processed to develop the full (unstructured) set of depositor reasons for choosing social banks. In accordance with Mayring [42], two independent coders, without specific knowledge of the topic "social banking", were trained to check the author's coding. Both coders assigned the statements to the set of categories built, using category names, descriptions, and examples. Based on these coding results, the inter-coder reliability was calculated.

To structure the set of categories built, the interview material was examined again for statements that could describe a super-ordinated structure (main categories). Additionally, mid-level categories were built based on topic-specific commonalities of categories, further increasing the clarity of the system. To check the reliability of the structuring process, two independent coders assigned all the categories to the structured system of main and mid-level categories.

The entire study, including the data collection, processing, and analysis, was executed in German, since all the coders, interviewees and social banks come from German-speaking countries. Results cannot therefore be driven or influenced by translation-based issues.

3.3. Results

Based on material from nine interviews and five banking surveys, 81 statements concerning depositors' reasons for choosing social banks were identified. These statements were assigned to 19 categories, with a minimum of one and a maximum of 13 codings. Some statements were assigned to more than one category. For instance, the statement " ... I give my money to a bank that supports local things or the real economy ... " were assigned to the categories "Preference for investments in the real economy" and "Preference for investments in local or regional projects" (see Table 3). It is assumed that the term "investments in the real economy" means investments (loans and securities) in companies from the primary, secondary, and tertiary sectors of the economy, but not investments in synthetic financial assets, such as financial derivatives.

Table 3. Depositors' Reasons for Choosing Social Banks.

Category Name	Category Description Category Includes Statements that Address …	No. of Codings
Rejection, disappointment and mistrust towards conventional banks and the financial system	… a general rejection of conventional banks, as well as incidences that lead to rejection, disappointment or mistrust of conventional banks or even the entire financial system.	13
Preference for social and environmental investments	… depositors' preference for concrete social or environmentally friendly fields of investments or a general preference for using money in a positive manner.	12
Shared values	… a base of shared values between depositors and social banks, as well as depositors' preference for the social banks' principles, characteristics and actions.	11
Rejection of specific fields of investments	… depositors' rejection of specific fields of investments, as well as a general rejection of social or environmental harmful investments.	7
Consulting and service	… the (good) quality of social banks' consulting and services, as well as the satisfaction of customer needs and wishes.	6
Transparency of investments	… depositors' preference for transparency in investments, meaning in particular the desire to know how customer money is used.	5
Perceived relevance of banks for the society and environment	… the general understanding by depositors that banks have an impact on the environment and society, as creditors and investors in the economy.	4
Comprehensive product range	… the range of social banks' products and services, but not the service quality itself.	3
Trust in social banks	… depositors' trust in social banks, but not the mistrust in conventional banks.	3
Engagement outside the banking business	… depositors' preference for social banks which engage outside their original banking business, such as political debates, support of social projects or sustainable education.	3
Conditions (interest and costs)	… attractive cost conditions, as well as an appealing interest rate.	3
Recommendation	… recommendation of third persons about specific characteristics of social banks or social banks in general.	3
Rejection of speculative trading	… a general rejection of banks' speculative activities, as well as of specific speculation activities, such as food speculation.	2
Preference for investments in the real economy	… depositors' preference for the use of their deposits for investments in real companies and not for investments in financial instruments.	2
Rejection of profit maximisation	… depositors' rejection of businesses that solely serve a bank's profit maximisation, as well as profit maximisation as a bank's main aim.	1
Option to choose preferred fields of investments	… the possibility of depositors to directly choose in which fields their deposits should be used.	1
Preference for local or regional investments	… the preference for using deposits for investments in local or regional companies.	1
Friends or family members are depositors of social banks	… friends or family members that are depositors of social banks, but not their recommendation.	1

Two statements were assigned to the category "Knowledge of the existence of social banks". Hereinafter, it was expected that knowledge of the existence of social banks was a mandatory requirement for the choice of a social bank. This category is thus excluded from the list of reasons. However, earlier findings have highlighted the relevance of informational deficits concerning the existence or meaning of social banking as core barriers for customers to switch to social banks [3]. Therefore, the exclusion of this category should not reduce the expected importance of an increase in public knowledge of social banks for their growth in deposits. It is instead expected that "Knowledge of the existence of social banks" is one core driver for an increasing number of decision-making depositor processes. However, this study aims to describe the factors of the decision-making itself, rather than the quantity of decisions made. Table 3 thus shows the remaining 18 categories, including a description of the category and the number of codings per category.

Based on the assignment of statements by two independent coders, an intercoder reliability of 80.77% was revealed. Comparing this result to Landis and Koch's [44] benchmarks for Cohens Kappa, the intercoder reliability is "substantial", and close to "almost perfect". Moreover, both coders assigned at least one statement per category consistently with the author, indicating a reliable identification of reasons based on the present data set.

The reasons identified include several categories that have already been addressed by scholars, such as the relevance of social banks' investment selection or transparency [22,23]. However, the findings revealed a higher degree of precision among these well-known reasons. For instance, at least seven categories directly refer to the relevance of the investment selection. The set of categories also includes reasons that have not been addressed in the literature on social banking so far, such as "Engagement outside the banking business" or "Conditions (interest and costs)".

To increase the degree of exploration regarding depositors' reasons for holding deposits with social banks, the unstructured set of reasons is transferred into a structured multi-level category system, providing insights into the content-related relations among categories. Three interviewees gave insights into the internal structure of depositor reasons for choosing social banks. The following statements come from a private customer account manager of a German social bank, a board member of a topic related association (with scientific background in the field of social banking), and a researcher in the field of social banking.

Interviewee 3:

"[. . .] does the customer wants to get away (from something) or does the customer wants to get towards (something). In recent years, I have seen that customers want to get away from something; that they are unsatisfied with their (current) situation. [. . .] I started to work here at the beginning of the bankruptcy of Lehmann Brothers (2008), and from that point on our very strong growth began. [. . .] (In the past,) I think that there were more customers who thought more about the 'towards'. [. . .] We have talked a lot here (in the bank) in recent years about how this has changed, and I conclude that we have just spread to a wider spectrum (of customers). [. . .] we started to address other people who had not dealt with a sustainable bank eight or nine years ago."

Interviewee 6:

"[. . .] there are people who try to do something positive with their money, to create something meaningful, and there are (other) people who at least do not try to create damage or hand over their money to the bad banks. However, there is certainly a group of people who are interested in both. [. . .] You have to distinguish between old and new customers. For new customers, it is more an avoidance of conventional banks (which are seen as evil) towards positively-perceived banks. [. . .] Currently, it is more a strategy of avoidance as a consequence of the financial crisis. [. . .] At the beginning of the social banking movement, the need to do something positive in a specific sector was maybe stronger."

Interviewee 9:

"I would say that there are two main motives. Some (customers) are social-environmental oriented [. . .]. And for many others, it was a protest against big banks and how they deal with money. [. . .] Especially

for people who switched after 2008, many thought about that (to switch to a social bank) because of the financial crisis."

Expert statements indicate that social bank depositors belong to one of two groups: people who try to create something positive (for society and the environment) by choosing a social bank ("towards"), and people who try to avoid harm by leaving a conventional bank for a social bank ("get away"). Based on this logic, all 18 reasons identified in the previous sub-section are assigned to reasons that primarily describe the avoidance of conventional banks ("get away") or reasons that primarily indicate depositors' preference for social banks' characteristics ("towards"). These two groups of reasons define the primary structuring logic and thus the root categories of the category system. Fourteen reasons were assigned to the root category "towards". These 14 categories were additionally assigned to four topic specific mid-level categories, in order to increase clarity and ease the accessibility of the category system. The remaining four reasons were assigned to the root category "get away". Because of the low number of "get away" reasons, no mid-level categories were built (see Table 4).

Table 4. System of Categories.

Root Categories	Mid-Level Categories	Categories
Get away reasons Includes all categories that refer to depositors' rejection of conventional banks.		(1) Rejection of specific fields of investments (2) Rejection of speculative trading (3) Rejection, disappointment and mistrust towards conventional banks and the financial system (4) Rejection of profit maximisation
Towards reasons Includes all categories that refer to depositors' preference for social banks' characteristics.	**Investment practices** Includes all categories that refer to social banks' investment practices.	(5) Option to choose preferred fields of investments (6) Preference for local or regional investments (7) Preference for social or environmental investments (8) Preference for investments in the real economy (9) Transparency of investments
	Product and service arrangement Includes all categories that refer to social banks' arrangement of products and services.	(10) Conditions (interest and costs) (11) Comprehensive product range (12) Consulting and service (13) Trust in social banks
	Customer-Bank relationship Includes all categories that refer to the characteristics of the relationship between social banks and their depositors.	(14) Shared values (15) Perceived relevance of banks for the society and environment (16) Engagement outside the banking business
	Customer-Customer relationship Includes all categories that refer to the relationship between two (or more) depositors of social banks.	(17) Friends or family members are depositors of social banks (18) Recommendation

A comparison of the 18 reasons identified with the "ordinary" bank selection criteria (see Table 1) reveals high accordance. Most of the "Convenience", "Economic benefit", "Reputation", and "Service quality" aspects are included in the mid-level categories "Product and service arrangement" and "Customer-Customer relationship" (even if the level of aggregation is higher in the categories developed). These findings partially indicate that depositors have comparable reasons for choosing social and conventional banks, even if the spectrum of reasons for choosing social banks seems to be larger. Therefore, it is of great importance to investigate the individual relevance of reasons for choosing (social) banks to understand the real differences (or commonalities) in choosing social and conventional banks appropriately.

To ensure the reliability of the assignment to the root categories, two independent coders were asked to assign all reasons to the root and mid-level categories. In total, both test candidates assigned 97.22% of the categories to the category system, as shown in Table 4. One coder assigned "Consulting and Service" to the mid-level category "Customer-Bank Relationship" instead of "Product and Service Arrangement". The high accordance of category assignment shows the clarity and accessibility of the category system.

4. Individual Relevance of Reasons for Choosing Social Banks

The individual relevance of the 18 reasons for choosing social banks will be explored in this section. In this vein, depositors' reasons for choosing social banks are compared to those for conventional banks, to explore the differences between both groups. The identification of reasons with greater relevance, as well as of differences for choosing social and conventional banks, extend the implications of the previous section and provide relevant insights for the sound characterisation and differentiation of banks' customers.

4.1. Data Collection

An online survey of social and conventional depositors was used to collect the data required. The online survey was built using Questback (Unipark) software and distributed over personal and institutional networks and mailing lists, among others, including a German (mid-sized) university and the Institute for Social Banking, in January and February 2018. In July 2018, two German social banks promoted the survey via social media.

Respondents were asked to indicate which type of bank they hold deposits with. The survey differentiated between "social banks" and four types of conventional banks, including "church banks", "cooperative banks", "savings banks", and "private banks" (without using the term "conventional bank"). For each type of bank, respondents were able to name and describe multiple reasons in a text field, answering the question: "Why did you choose your bank?" Depositors were also asked to indicate the year in which they opened their account. In total, 108 social and 413 conventional depositors took part in the survey. The 413 conventional depositors held 463 accounts with conventional banks (four accounts with "church banks", 82 accounts with "cooperative banks", 183 with "savings banks", and 194 with "private banks"). The socio-demographic characteristics of both samples are presented in Table 5.

Table 5. Socio-Demographic Characteristics of the Samples.

Variables	Social Depositors (n = 108)		Conventional Depositors (n = 413)	
	n	%	*n*	%
Gender				
Female	45	43.7%	187	46%
Male	58	56.3%	217	54%
Age (years)				
Under 20	1	0.9%	21	5%
20–29	27	25.5%	225	54%
30–39	33	31.1%	99	24%
40–49	18	17.0%	21	5%
50–59	22	20.8%	29	7%
60 or older	5	4.7%	18	4%
Highest educational achievement				
No school qualifications, or still at school	0	0.0%	1	0%
Secondary modern school qualification	0	0.0%	1	0%
Secondary school certificate	8	7.7%	15	4%
University entrance qualification	30	28.8%	161	40%
University degree	60	57.7%	183	45%
Doctorate	6	5.8%	45	11%

Table 5. *Cont.*

Variables	Social Depositors (n = 108)		Conventional Depositors (n = 413)	
	n	%	n	%
Size of place of residence (number of residents)				
Up to 5000	12	11.5%	31	8%
5000–20,000	10	9.6%	14	3%
20,001–50,000	8	7.7%	18	4%
50,001–500,000	38	36.5%	297	74%
More than 500,000	36	34.6%	43	11%
Individual net income (in €)				
Up to 500	5	4.8%	70	18%
500–1000	12	11.5%	117	29%
1001–1500	17	16.3%	56	14%
1501–2000	21	20.2%	47	12%
2001–3000	28	26.9%	72	18%
3001–4000	16	15.4%	15	4%
More than 4000	5	4.8%	20	5%

Using Chi-Squared-Tests, a comparison of Sample 1 (social depositors) with the sample of Krause and Battenfeld's [22], which contains 2896 social depositors, reveals that both samples differ significantly (at least on a significance level of $p \leq 0.05$) for the "Highest educational achievement", "Size of place of residence", and "Individual net income". A visual inspection of observed and expected frequencies revealed the deviations that might explain these differences. Sample 1 does not include depositors with lower educational backgrounds at all, but depositors with a "University entrance qualification" to a higher degree. Inhabitants of small towns (20,001–50,000 inhabitants) seem to be slightly underrepresented, while inhabitants of larger cities (50,001–500,000) are overrepresented. For "Individual net income", a larger proportion of depositors with higher (but still middle-class) incomes were found than expected. Some of these differences might be explained by the time differences in data collection. Krause and Battenfeld's [22] sample was collected in 2011, while the data used in this study was collected in 2018. It is quite possible that depositors with higher education backgrounds increased their incomes over a period of seven years, explaining the slightly higher depositor incomes in the present sample. Sample 1 thus might not appropriately represent social depositors with lower educational backgrounds, from smaller towns, and with lower incomes. However, since social depositors are generally expected to be highly educated, live in urban rather than in rural areas, and have middle-class incomes [22], the sample is expected to reflect the majority of social depositors appropriately.

With exception of the "Highest educational achievement", sample 2 (conventional depositors) shows an appropriate distribution of socio-demographic characteristics for a comparison group in an explorative setting. The sample does not include sufficient participants with lower educational backgrounds. However, since social depositors are generally more highly educated [22], social depositors are compared with their direct peers.

4.2. Methodology

Before the individual relevance of reasons for choosing social banks is analysed, the category system created in Section 3 (as fundament of the subsequent analyses) is reviewed based on the depositor data. Afterwards, using frequency analysis as a method of content analysis [42], two comparisons were conducted to explore the individual relevance of reasons for choosing social banks. Frequencies of codings per category of social depositors were compared with each other to identify reasons of superior relevance. The frequencies of codings per category were then compared between those of social and

conventional depositors, in order to explore whether reasons for choosing a bank are of relevance for social depositors exclusively, or for the choice of banks in general.

Combining both qualitative and quantitative elements of analysis, content analysis enables the achievement of different objectives in one study, such as the creation of categories, the individual relevance of categories, and the variation of categories (factors) over time, based on frequencies of coding [42,45]). Majoch et al. [41] use content analysis in a comparable research approach to explore why investors sign the "Principles for Responsible Investment". They used "descriptive statistics (based on textual data) to demonstrate the importance of each factor and how it changed over time" [41] (p. 729).

To process the data from the online survey, depositors' self-stated reasons for choosing a bank were assigned to the category system developed in Section 3.3. As depositors were directly asked about their individual reasons for choosing their bank, no pre-selection of statements or data preparation was required. Gray et al. [46] usually recommend using one sentence as unit of analysis. However, if answers are weakly structured, multiple sentences or each participant's answer in total are reasonable alternatives. Both single words (e.g., "costs") and more complex answers (multiple sentences) could describe depositors' reasons for choosing social banks properly. Therefore, the unit of analysis is defined as the depositor's entire statement.

Since the category system was developed for social depositors' reasons for choosing social banks exclusively, not for the choice of conventional banks, it might not include all the relevant categories. However, as shown in Section 3.3, the 18 reasons identified accord to a high proportion with the 15 conventional bank selection criteria presented in Table 1. It is therefore expected that all the relevant categories of conventional depositors' statements can be included. Nevertheless, statements that do not fit into the existing categories were collected for individual analyses. The initial coding of depositor reasons was executed by the author. Two independent coders assigned all the answers to the categories, to check the reliability of the initial coding.

4.3. Results

4.3.1. Review of the Category System

One hundred and eight social bank depositors answered the question concerning their individual reasons for choosing a social bank. The minimum codings per participant was one, and the maximum was five. Statements that have story-telling characteristics, such as "I got to know about ecological banks and switched directly", did not lead to a coding in the category system. However, none of the non-coded statements indicated a lack of reasons in the existing set of categories, supporting the completeness of the category system.

Depositors' answers led to 185 codings in 16 categories of the category system (see Table 6). The categories "Preference for local or regional investments" and "Preference for investments in the real economy" did not receive a coding. Both were allocated to the mid-level "Investment practices" category. Zero codings (from depositors) in a category did not necessarily indicate an overly extensive number of categories, but rather the minor relevance of these particular reasons (see Section 4.3.2). In this vein, a comparison of the number of expert codings reveals that both of these reasons also received just one or two codings from experts. As only two categories received zero codings from depositors, the category system does not seem to be inefficiently overloaded with needless categories either.

The individual intercoder reliability for social depositors' statements only was calculated, indicating an "almost perfect" (82.28%) accordance of the assignment of social depositor reasons. Since three coders allocated 82.28% of all codings to the same category, the clarity and accessibility of the system also seems to be appropriate. To summarise, the results indicate that the category system created based on data from experts seems to be complete, not overloaded, clear, and easy to access. The system of categories is thus expected to be able to build an appropriate foundation for the subsequent analyses.

Table 6. Variation of Codings per Category over Time.

Category	Social Banks		All Conventional Banks		Coop. Banks		Savings Banks		Private Banks	
Get away reasons	**52**	**28%**	**30**	**4%**	**5**	**4%**	**6**	**2%**	**19**	**7%**
Rejection of specific fields of investments [a]	30	16%	0	0%	0	0%	0	0%	0	0%
Rejection of speculative trading [a]	6	3%	1	0%	0	0%	1	0%	0	0%
Rejection, disappointment and mistrust towards other banks […] [a,b]	15	8%	29	4%	5	4%	5	2%	19	7%
Rejection of profit maximisation	1	1%	0	0%	0	0%	0	0%	0	0%
Towards reasons	**133**	**72%**	**664**	**96%**	**123**	**96%**	**269**	**98%**	**272**	**93%**
Investment practices	**75**	**41%**	**21**	**3%**	**11**	**9%**	**10**	**4%**	**0**	**0%**
Option to choose preferred fields of investments [a]	4	2%	0	0%	0	0%	0	0%	0	0%
Preference for local or regional investments	0	0%	13	2%	4	3%	9	3%	0	0%
Preference for social or environmental investments [a]	52	28%	6	1%	6	5%	0	0%	0	0%
Preference for investments in the real economy	0	0%	1	0%	0	0%	1	0%	0	0%
Transparency of investments [a]	19	10%	1	0%	1	1%	0	0%	0	0%
Product and service arrangement	**11**	**6%**	**458**	**66%**	**65**	**51%**	**158**	**57%**	**235**	**81%**
Conditions (interest and costs) [a]	6	3%	205	30%	32	25%	46	17%	127	44%
Comprehensive product range [a]	1	1%	189	27%	22	17%	79	29%	88	30%
Consulting and service [a]	4	2%	64	9%	11	9%	33	12%	20	7%
Customer-Bank relationship	**42**	**23%**	**34**	**5%**	**18**	**14%**	**13**	**5%**	**3**	**1%**
Trust in bank [b]	2	1%	12	2%	2	2%	7	3%	3	1%
Shared values [a]	33	18%	15	2%	14	11%	1	0%	0	0%
Perceived relevance of banks for the society and environment [a]	5	3%	0	0%	0	0%	0	0%	0	0%
Engagement outside the banking business	2	1%	7	1%	2	2%	5	2%	0	0%
Customer-Customer relationship	**5**	**3%**	**151**	**22%**	**29**	**23%**	**88**	**32%**	**34**	**12%**
Friends or family members are depositors [a,b]	1	1%	144	21%	28	22%	87	32%	29	10%
Recommendation	4	2%	7	1%	1	1%	1	0%	5	2%
Total	185	100%	694	100%	128	100%	275	100%	291	100%

Notes: [a] Chi-Squared-Tests (or Fisher's exact test respectively) show significant differences in codings per category between social and conventional depositors on a level of at least $p \leq 0.01$; [b] Category name was adjusted to the wider spectrum of bank types.

4.3.2. Identification of the Relevance of Reasons

A comparison of reasons for choosing social banks revealed that five categories clearly had more codings than the others. These categories are: "Preference for social and environmental investments" (28% of codings), "Shared values" (18%), "Rejection of specific fields of investments" (16%), "Transparency of investments" (10%), and "Rejection, disappointment and mistrust towards conventional banks and the financial system" (8%) (see Table 6). Provided that "within content-analytical category systems, registration of how often a category occurs (frequency of coding) may give added weight to its meaning and importance" [42] (p. 41), the larger numbers of codings in these five categories might indicate a higher relevance for depositors' choice of social banks.

The numbers of codings from experts support this assumption. All five categories are among the six most-stated reasons by experts (see Table 3). These findings support previous assumptions that social banks' investment selection is the most relevant reason for the choice of social banks. However, the findings also reveal the relevance of other reasons, such as "Shared values" or the "Rejection, disappointment and mistrust towards conventional banks and the financial system".

"Rejection of profit maximization", "Preference for local or regional investments", "Preference for investments in the real economy", "Comprehensive product range", "Trust in social banks", "Engagement outside the banking business", and "Friends or family members are depositors of social banks" had only zero to two codings from social depositors, indicating a limited relevance to depositors' choice of social banks. A comparison of these coding results with the numbers of codings from experts (see Table 3) shows that these categories also received comparably low numbers from experts, supporting the expected minor relevance for depositor decision-making. However, it does not seem to be reasonable to expect that the majority of social depositors do not trust social banks, but rather seems to be a matter of course for most depositors. A low number of codings could thus also be an indicator of implicit reasons, which cannot be collected appropriately in this qualitative research design.

4.3.3. Comparison of Reasons for Choosing Social and Conventional Banks

The comparison of social and conventional bank depositors reveals further insights that are relevant to the identification of the relative relevance of reasons for choosing social banks. In total, 413 conventional depositors answered the questionnaire, leading to 694 codings in the category system. Statements that do not answer the question appropriately were excluded from category allocation. Twelve statements were not able to be categorised, describing reasons not included in the system of categories. However, these statements reflect just 1.7% of all codings from conventional depositors and very special cases, such as "being an employee of the bank" or "inheritance". Therefore, it is expected that the focus of the category system on social depositors does not infringe the reliability of this comparison. The number of codings from church bank depositors was too low for further analysis (4 accounts with 7 codings) and was thus excluded from the following argumentation. Based on the assignment of (all) statements by two independent coders, an intercoder reliability of 88.88% was calculated, indicating an "almost perfect" accordance [44]. This high level of accordance most likely results from the high number of very clear statements from conventional depositors concerning the categories "Conditions (interest and costs)", "Comprehensive product range", "Consulting and service", and "Friends or family members are depositors [...]".

The coding results directly support the importance of "Convenience", "Economic benefit", "Reputation" and "Service quality" to conventional depositors' bank selection. Sixty-six percent of all codings from conventional depositors were categorised in the mid-level category "Product and service arrangement" (see Table 6). Besides low fees, higher rates of interest, and the access to ATMs and bank branches, friends and family members are important reasons for the choice of conventional banks, especially for customers of cooperative and savings banks. In total, an average of 87% of the statements from conventional depositors were clustered in "Product and service arrangement" and "Friends or family members are depositors", indicating a very concentrated spectrum of reasons for

choosing conventional banks. By contrast, just 7% of statements from social depositors were allocated to these categories. While 92% of all codings from social depositors were allocated to "get away" reasons, "Investment practices", and "Customer-Bank relationship", cooperative banks received just 27%, savings banks 11%, and private banks 9% of all codings in these categories. These findings indicate that the reasons for choosing social banks might basically differ from the reasons for choosing conventional banks. Chi-Squared-Tests (or Fisher's exact tests, for expected cell frequencies below 5) show that the codings per category differ significantly between social and conventional depositors in twelve of the eighteen categories, including all categories that seem to be predominantly relevant for social or conventional depositors (see Table 6).

In summary, the findings indicate that five reasons for choosing social banks might be of greater relevance for depositors' decision-making, and that these reasons differ from reasons for choosing conventional banks. While conventional depositors might choose banks due to the "Product and service arrangement" or friends and family members, social depositors seem to predominantly choose social banks due to "Rejection of specific fields of investments", "Rejection, disappointment and mistrust towards conventional banks and the financial system", "Preference for social or environmental investments", "Transparency of investments", and "Shared values". The identification of important and unique reasons for choosing a social bank provides a qualitative characterisation of the customers.

5. Development of Social Bank Customer Groups

The global financial crisis is considered to be significant to the rise of social banks [6–8]. However, it remains unclear how the global financial crisis has affected depositors' reasons for choosing social banks and social banks' growth (of deposits). Two of the expert statements in Section 3.3 imply that the global financial crisis might lead to an extension of social banks' customer target groups, who differ in their reasons for choosing social banks. The development of social bank customer groups over time will thus be explored in this section. The exploration of customer group development could provide an initial, empirically derived explanation for social banks' growth in the aftermath of the global financial crisis. Furthermore, the findings could support social banks' marketing by identifying discriminative communication strategies for specific customer target groups.

5.1. Methodology

Data needed for the formation of customer groups comes from the 108 social depositors described in Section 4.2. Depositors are classified using Ward's hierarchical cluster analysis, with squared Euclidean distances based on the binary coded self-stated reasons (18 categories). Cluster analysis is an explorative research method that has frequently been used in economic research to classify people or objects, such as customer target groups [47,48], enabling institutions to create discriminative marketing strategies [49]. The purpose of the present cluster analysis is the identification of few and homogeneous clusters of depositors. Therefore, the number of clusters is determined by the lowest number of highly homogenous and discriminative clusters. In this vein, the elbow method is used to identify a suitable number of clusters. After classification, each clustered depositor was recorded in a timeline of account opening dates, enabling a visual inspection of the variation in customer groups (clusters) over time.

5.2. Results

In total, six clusters of depositors were identified based on the binary coded reasons for choosing a social bank. Table 7 shows the distribution of depositors to the clusters, as well as the constellations of reasons that characterise the clusters.

Table 7. Customer Groups of Social Banks.

Cluster Name	No. of Depositors (No. of Codings)	Coding Categories in Cluster	Proportion of Codings in Cluster	Proportion of Depositors with Coding in Cluster
Value centred	32 (49)	Preference for social or environmental investments	12%	19%
		Conditions (interest and costs)	10%	16%
		Shared values	51%	78%
		Other: 2, 3, 4, 11, 12, 13, 15, 18	26%	-
Impact investment centred	22 (24)	Preference for social or environmental investments	92%	100%
		Other: 2, 16	8%	-
Transparency centred	16 (35)	Rejection of specific fields of investments	9%	19%
		Preference for social or environmental investments	26%	56%
		Transparency of investments	46%	100%
		Other: 5, 10, 14, 18	20%	-
Impact and exclusion mix	10 (27)	Rejection of specific fields of investments	37%	100%
		Option to choose preferred fields of investments	11%	30%
		Preference for social or environmental investments	37%	100%
		Other: 2, 9, 13, 15	16%	-
Conventional bank rejection mix	11 (23)	Rejection, disappointment and mistrust towards conventional banks [. . .]	48%	100%
		Preference for social or environmental investments	17%	36%
		Consulting and service	9%	18%
		Other: 9, 14, 16, 17	26%	-
Exclusion centred	17 (27)	Rejection of specific fields of investments	63%	100%
		Rejection of speculative trading	6%	18%
		Rejection, disappointment and mistrust towards conventional banks [. . .]	6%	18%
		Other: 7, 12, 14	8%	-

Five of the six clusters are characterised by one or two reasons, which were stated by each depositor of the cluster. Only the "Value centred" cluster shows a slightly wider distribution of reasons. However, since approximately 80% of depositors included stated "Shared values" as a reason for choosing a social bank, the cluster seems to be characterised sufficiently in this explorative context, even though some residuals might be included. An increase in the number of clusters led to the exclusion of these residuals, but to the creation of very small clusters. Figure 1 illustrates the proportions of "towards" and "get away" reasons among the six clusters. Three clusters predominantly consist of "towards" reasons and one cluster of "get away" reasons. The remaining two clusters show a strong mix of "towards" and "get away" reasons.

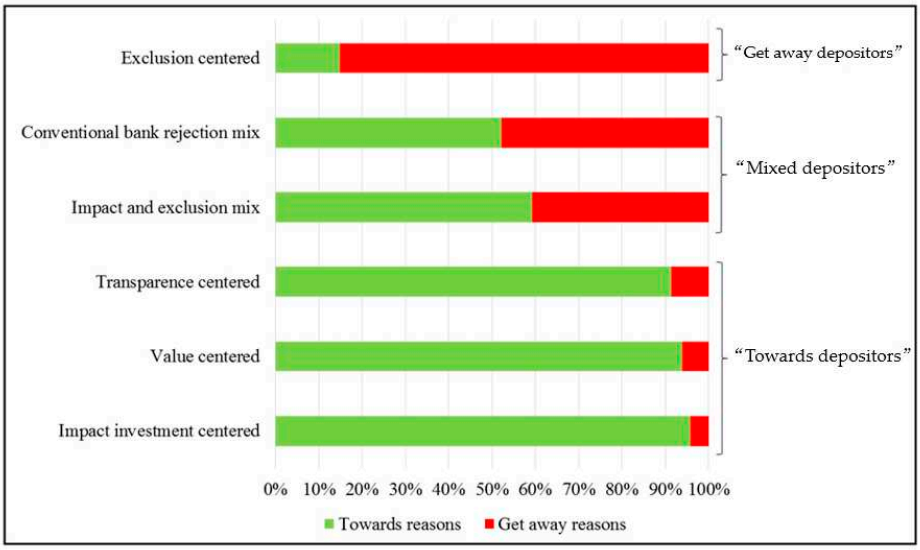

Figure 1. Distribution of Codings in Depositor Clusters.

The classification of social depositors allows for an inspection of the development of customer groups over time. Figure 2 shows the number of depositors per customer group between 2000 and 2019. As explained in Section 4.2, customers were classified based on their categorised reasons for choosing social banks. Cumulated numbers of depositors are used to show customer group proportions for each year. To ease the accessibility of the figure, the three "towards depositor" clusters are illustrated in variants of green, "mixed depositors" in yellow and orange, and "towards depositors" in red.

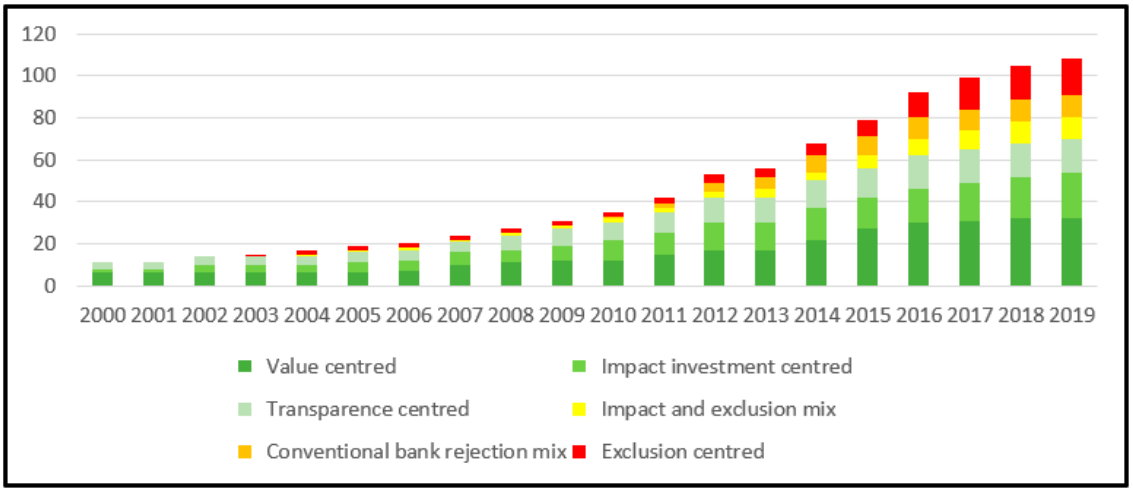

Figure 2. Development of Social Banks' Customer Groups (Cumulated 2000–2019).

Until 2002, only "towards depositors" (all three clusters) were found in the present sample, supporting expert's expectation that "at the beginning of the social banking movement, the need to do something positive in a specific sector was maybe stronger" (see Section 3.3). However, the development of "Value centred", "Impact investment centred", and "Transparency centred" customers (approximately 65% of all depositors in 2019) implies that the growth of social banks' deposits might not merely be caused by the increase of "mixed" and "get away customers", but by the (absolute) increase of "towards customers" as well.

In 2003 and 2004, the first "Exclusion centred" and "Impact and exclusion mix" customers were found, indicating that negative push effects from conventional towards social banks had already appeared before the global financial crisis of 2007. Social depositors' rejection of negative investments thus does not seem to have originally been triggered by the global financial crisis. However, the proportion of "Exclusion centred" and "Impact and exclusion mix" customers in the sample had grown up to 25% by 2019, illustrating a strong relative increase of relevance for the growth in the deposits of social banks.

The first "Conventional bank rejection mix" depositors were found in 2010. Their proportion in the sample had grown up to approximately 10% by 2019. These findings indicate that the global financial crisis might have triggered a new customer group to switch to a social bank. This customer group is predominantly characterised by the "Rejection, disappointment and mistrust towards conventional banks and the financial system", which could suit a crisis explanation for the growth of social banks.

In summary, it seems that the proportion of "get away customers" has been increasing since 2007, indicating that the global financial crisis might helped social banks' growth through depositors who choose social banks because of conventional banks' "evil" characteristics. However, two-thirds of the depositors in the sample are clustered in one of three "towards customer" groups, which all grew until 2019 as well, indicating that the shift from "towards" to "get away" (or "mixed") customers might not be as strong as expected. The global financial crisis thus might be not the only factor that supported social banks' growth over the past years. If the crisis had an effect on social banks' deposit growth, the present results may indicate mixed effects on the "get away" and "mixed customer" groups. While the development of "Exclusion centred" and "Impact and exclusion mix" customers might "merely" have been boosted by the global financial crisis, "Conventional bank rejection mix" depositors could really have been triggered by this intervention. These findings create an initial, empirically derived explanation for some social banks' growth in the aftermath of the global financial crisis, and a sound characterisation of customer groups that enable social banks' marketing departments to set discriminative communication strategies.

6. Discussion

6.1. Research Implications

This study explored 18 depositor reasons for choosing social banks and transferred this set of reasons into a structured, multi-level category system that refers to social banks' "good" and conventional banks' "evil" characteristics. Several of these reasons have been unknown or inaccurately described until now. Previous research on (conventional) depositor bank choices provided 15 reasons in total [29]. The present findings enlarge this set of reason by multiple new aspects, in particular regarding social and environmental issues. In light of increasing sustainability awareness, these aspects could also be relevant for conventional banks in the future. The few previous research attempts at investigating depositors' choice of social banks [10,22,29] predominantly focus on reasons that refer to (expected) core differences to conventional banks: asset placement, level of transparency (concerning the placement of assets), and the possibility of customer participation [8,23]. The present results add multiple important reasons, such as "Shared Values" or "Rejection, disappointment and mistrust towards conventional banks and the financial system". While previous studies have expected social banks' placement of assets to be one of the main reasons for choosing social banks [7–10,22],

the present results specify this general assumption by identifying at least seven dimensions (categories) of this reason, allowing for a much more specific investigation of customer preferences. Five reasons were identified as being of more potential relevance to depositor decision-making. These reasons for choosing social banks seem to differ from those for choosing conventional banks in general. This study provides the first comprehensive comparison of bank selection reasons for social and conventional depositors. The observation of customer group development over time indicates that the global financial crisis might have helped social banks' growth of deposits by an extension in customer groups that choose social banks because of conventional banks' "evil" characteristics. While previous studies stated that the global financial crisis is relevant to social banks' growth [6–8], no study has yet provided an approach to explaining how the financial crisis has affected social banks growth. These findings have diverse implications.

The exploration of a comprehensive set of depositor reasons enables subsequent research to investigate reasons for choosing social banks in a more comprehensive way. In particular, the findings have paved the way for (1) a conjoint analysis in an experimental setting to investigate the relative importance of the 18 reasons for choosing social banks and (2) more comprehensive comparisons of social and conventional depositors' preferences, including the 18 reasons.

The set of reasons indicates that some depositors may choose social banks because of social banks' "good" characteristics, others because of conventional banks' "evil" characteristics. Especially in industries such as commercial banking, where a switch from one to another bank is associated with high costs [50], a negative push effect (towards social banks), for instance caused by the financial crisis, is considered to be of vital importance. This assumption finds theoretical backup in consumer behaviour research on the negativity bias, considering that a "bad" event, such as a global financial crisis, has a stronger impact on behaviour than "good" ones [30,31]. Subsequent research is thus encouraged to investigate the effect of negative interventions on customer behaviour in the light of high switching barriers. Since Bayer et al. [29] argue that emotional charging of the topic of social banking could increase depositor demand for social banks, it would be of great interest to see whether "get away" reasons could overcome intention behaviour gaps by creating sufficient emotional charge.

The investigation of the development of customer groups indicates that the global financial crisis might extend social banks' customer target groups by "Conventional bank rejection mix" depositors. The relation of a banking-centred financial crisis with the "Rejection, disappointment and mistrust towards conventional banks and the financial system" seems to be generally comprehensible. Interestingly, the findings further reveal that "Exclusion centred" and "Impact and exclusion mix" customers appeared before the global financial crisis, indicating that the global financial crisis does not seem to be the originally trigger for these customer groups. Since both groups have grown massively over the past one and a half decade, the global financial crisis could "only" be a relevant booster. However, the "get away" reasons that characterise both clusters fit the characteristics of the global financial crisis insufficiently. The crisis was driven by profit-orientated speculation on structured financial products in the US housing market, not by banks' investments in specific fields like nuclear energy, fossil fuels, or weapons. However, both customer groups are predominantly characterised by the "Rejection of specific fields of investments". If the global financial crisis really had an effect on the growth of these customer groups, it must thus be a mediated effect. The global financial crisis could have led to a stronger discourse concerning banking preferences among depositors. Based on this, depositors might find a better match for their preferences with social banks. Subsequent research should thus investigate the complex relation of crisis characteristics with depositors' choice of social banks, using structural equation models in an experimental research setting.

Since the banking industry-centred global financial crisis seems to had a direct and (potentially) mediated effect on depositors' choice of social banks, it is not expected that the current COVID-19 pandemic and its economic impact will lead to a comparable boost in new deposits for social banks based on customer decisions that have not been forced. Unlike the global financial crisis, the current crisis does not have its roots in the general issues of the global financial system, including banks.

It does not seem reasonable to expect that private depositors will start to rethink their choice of bank during times at which issues other than sustainability (in banking) dominate public debate. However, if some conventional banks do go bankrupt due to the consequences of the COVID-19 pandemic, their depositors will be forced to choose a new bank. This might lead to a short-term increase in social depositors, because depositors could be forced to "pay" the high transaction cost of switching to a new bank anyway. If such cases do appear, subsequent research attempts should investigate this new stream of depositors to give valuable insights into the effect of lower switching costs on depositors' choice of social banks, based on real market data.

Due to the explorative character of this study, it remains unclear to which proportion social depositors consist of "get away", "mixed", and "towards" customers. Since the global financial crisis could have different effects on social bank customer groups, the concrete impact of the global financial crisis on social banks' entire growth also remains unclear. To quantify a crisis effect, subsequent research is encouraged to investigate the proportion of social banks' customer groups, using larger samples in quantitative settings.

6.2. Practical Implications

The practical implications of the present study are of relevance for social banks' marketing and for conventional banks, which aim to adapt the principles of social banks. Social banks still have growth potential [22]. Bayer et al. [29] identified several factors, which discourage potential depositors from selecting a social bank. These factors are a lack of information, limited pressure in the social context, weak moral intensity, and economical sacrifices. The authors suggest that more factual information and emotional charging of social banking could increase depositor demand for social banks. The present results help social banks' marketing identify appropriate topics for creating contemporary, factual information and emotional charging for specific customer target groups.

While cooperative, savings, and private banks all seem to compete for cheapest fees, highest rates of interest, and most attractive range of products and services, social banks attract depositors with exclusive reasons. Social banks are thus able to concentrate on their unique selling propositions that are hard to claim by competitors, such as their investment selection, the high level of transparency, or applied examples of their values.

The findings show that "get away customers" have also switched to social banks in recent years. The distinction from economic (mis-) behaviour that may be associated with conventional banks, such as speculative trading, pure focus on profit maximisation, and investments with negative impact, thus still seems to be a relevant topic for social banks' communication strategies. As switching banks is associated with high costs for the depositor [50], push reasons with emotional charging through illustrating absence of social and environmental harm might be of great relevance for initiating customer action.

Höhnke and Homölle [10] showed that some social banks merely invest in projects with a positive social or environmental impact (impact investment strategy), whereas other social banks only exclude negative projects (exclusion strategy). The present results indicate that "Preference for social and environmental investments" and "Rejection of specific fields of investments" are of relevance for depositors' choice of social banks. Both investment strategies attract relevant customer groups. However, while the first type of social banks necessarily fulfil the preferences of "Impact investment centred", "Impact and exclusion mix", and "Exclusion centred" customers, the second type might attract "Exclusion centred" customers only. Attracting customers through the misbehaviour of competitors does not seem to be a self-determined and sustainable long-term strategy. Social banks, which conduct the exclusion strategy, are thus encouraged to pay special attention to other important reasons for choosing social banks, such as "Transparency of investments" and "Shared values", in order to extend their customer target groups.

Besides implications for existing social banks, the present results provide relevant implications for (former) conventional banks, which started to adopt the principles of social banks. In recent

years, three (formerly) conventional banks in Germany started to adopt investment criteria for their selection of financial assets, comparable to those of social banks (Raiffeisenbank Holzkirchen-Otterfing in 2014, Evenord-Bank in 2015, and Deutsche Kreditbank in 2019). Höhnke and Homölle [10] conclude that the future growth of the social banking movement could be carried by the transformation of conventional banks. The present results are the first overview of a comprehensive range of depositor reasons for choosing social banks and are thus a benchmark for adapting conventional banks. The present findings support the importance of investment selection criteria for the choice of social banks, since "Preference for social and environmental investments" and "Rejection of specific fields of investments" are considered to be more important for social depositors. However, "Shared values", "Rejection, disappointment and mistrust towards conventional banks and the financial system", and "Transparency" seem to be of great importance to social depositors as well, since all three reasons are the predominant character of three customer groups, which form approximately 55% of the present sample. These findings indicate that the transformation process from a conventional to a social bank, which attracts the entire spectrum of customer groups, could be much more complex than "just" introducing investment criteria. Therefore, based on the identification of reasons for choosing social banks, adapting conventional banks are encouraged to develop and disclose (1) a clear mission statement that presents the bank's core objectives and values, (2) precise investment criteria to describe the bank's selection of investments, and (3) information about their use of funds to prove compliance of their objectives and values with the work applied.

6.3. Limitations

Four out of nine experts in this study were private customer account managers of social banks. Furthermore, five managers of social banks took part in the banking survey and answered the question concerning depositor reasons for choosing social banks. In total, 64% of the sample were employees or managers of social banks, which could lead to a positivity bias. However, a comparison of experts' answers show that 13 out of 18 categories were also addressed by independent academic and market experts. The additional five categories that were merely addressed by employees or managers of social banks were "Recommendation", "Engagement outside the banking business", "Option to choose preferred fields of investments", "Consulting and service", and "Conditions (interest and costs)". Since each of these categories actually received two to six codings from depositors as well (see Table 6), the selection of experts does not seem to infringe upon the reliability of results.

Depositor answers could be biased by the time between their choice of a social bank and their participation in the online survey (recency bias). The "oldest" social depositor opened his bank account in 1970 and answered the survey in 2018. Depositor answers could thus reflect their current personal perspective (affected by different events over time) more than their original reasons for choosing a social bank. However, the potential bias is not expected to infringe upon the results in general. Assuming the reputation of conventional banks and the entire financial industry have suffered over the past two decades, e.g., because of the global financial crisis [51–53], a time-related bias would most likely lead to a greater amount of codings in the "get away" reason categories, even if depositors initially chose social banks for "towards" reasons. As shown in Table 8, only a few "get away" reasons were coded in the pre-crisis group, indicating a low potential of time-related bias in the answers.

Instead, approximately 48% of depositors in the crisis and post-crisis groups (representing approximately 34% of the sample) stated at least one "get away" reason, indicating a higher potential of a time-related bias. However, sufficient "get away" reasons were also found in the last years of the observation. If depositors who opened a bank account short before participating in the online survey stated "get away" reasons, a time-related bias does not seem to drive the rise of "get away" reasons in the aftermath of the global financial. Furthermore, the coding results of depositors' self-stated reasons basically accord with experts' expectations concerning the development of depositor reasons for choosing social banks (see Section 3.3.).

Table 8. Variation of Codings per Category over Time.

Category	All		Until 2007		Since 2008	
Get away reasons	**52**	**28%**	**4**	**11%**	**48**	**32%**
Rejection of specific fields of investments	30	16%	3	9%	27	18%
Rejection of speculative trading	6	3%	1	3%	5	3%
Rejection, disappointment and mistrust towards [. . .]	15	8%	0	0%	15	10%
Rejection of profit maximisation	1	1%	0	0%	1	1%
Towards reasons	**133**	**72%**	**31**	**89%**	**102**	**68%**
Investment practices	**75**	**41%**	**17**	**49%**	**58**	**39%**
Option to choose preferred fields of investments	4	2%	1	3%	3	2%
Preference for local or regional investments	0	0%	0	0%	0	0%
Preference for social or environmental investments	52	28%	11	31%	41	27%
Preference for investments in the real economy	0	0%	0	0%	0	0%
Transparency of investments	19	10%	5	14%	14	9%
Product and service arrangement	**11**	**6%**	**2**	**6%**	**9**	**6%**
Conditions (interest and costs)	6	3%	1	3%	5	3%
Comprehensive product range	1	1%	1	3%	0	0%
Consulting and service	4	2%	0	0%	4	3%
Customer-Bank relationship	**42**	**23%**	**12**	**34%**	**30**	**20%**
Trust in social banks	2	1%	0	0%	2	1%
Shared values	33	18%	11	31%	22	15%
Perceived relevance of banks for the society and [. . .]	5	3%	1	3%	4	3%
Engagement outside the banking business	2	1%	0	0%	2	1%
Customer-Customer relationship	**5**	**3%**	**0**	**0%**	**5**	**3%**
Friends or family members are depositors of social banks	1	1%	0	0%	1	1%
Recommendation	4	2%	0	0%	4	3%
Total Number of Codings	185	100%	35	100%	150	100%
Number of Depositors	108		24		84	

The classification of social bank customer groups was based on the binary coded reasons of social depositors. This simple data structure does not provide information about the individual priority of reasons. The present cluster analysis assumed equal relevance for all the stated reasons of a depositor. This assumption might lead to the incorrect classification of depositors and, in turn, to an infringement on the results. Generally, a very simple form of cluster analysis and data structure was used in the present study. Due to binary coded variables and the relatively small sample size, a split-sample or two-step analysis (see e.g., [47,49]) was not conducted. As a consequence, other cluster analyses using more complex data, such as socio-demographical, behavioural, or market data, could lead to the formation of different customer groups. However, the results of cluster analyses as an explorative method are generally driven by the context and aim of the analysis. Furthermore, the comparison of depositor reasons before and after the global financial crisis (see Table 8) lead to similar implications, indicating that the classification of customers does not seem to be infringed upon by the simple form of cluster analysis.

All the experts and depositors stem from German-speaking countries (and social banks). The results thus might be limited to the German and Swiss social banking market. However, this potential limitation does not reduce the implications of the results, due to the explorative character of the study. A comparative analysis concerning the development of social banks and their depositors in different countries is lacking in the relevant literature. The exploration of depositor reasons, the individual relevance of reasons, and an initial, empirically derived explanation for social bank growth of deposits provides the foundation for subsequent quantitative-comparative research approaches, which aim

to identify differences among international social banks and their customers. For the creation of this explorative foundation, the German-speaking social banking market seems to be a good choice. German social banks increased their deposits from €1.474 billion to €7.273 billion (a 493% increase) between 2007 and 2017 [10], indicating a good fit between the sample selection and the focus on social banks' growth in the aftermath of the global financial crisis.

7. Summary and Conclusions

The aim of the present paper was to identify (1) a comprehensive set of depositor reasons for choosing social banks, (2) the individual relevance of the reasons found, and (3) the change of depositor reasons over time, in order to shed some light on the impact of the global financial crisis on social banks' growth of deposits.

Based on data collected from surveys with five social banks, interviews with nine industry experts, and an online survey of depositors, 18 reasons for choosing social banks were identified, which can be divided into two groups: first, reasons that address social banks' "good" characteristics (so-called "towards reasons"); and second, reasons that address conventional banks' "evil" characteristics (so-called "get away reasons"), indicating that push and pull effects are of relevance for the choice of social bank. Five potentially more important reasons were identified, such as "Shared values" or "Transparency of investments". Furthermore, these five reasons seem to generally differ from the reasons for choosing conventional banks. An observation of customer groups over time indicated that the global financial crisis might extended social banks' spectrum of customer groups through depositors that were pushed to social banks because of their rejection of conventional banks.

These findings contribute to research on social banking in multiple ways. Several reasons for holding deposits with social banks that have either gone unknown or been inaccurately described were identified. While few previous studies on depositors' choice of social banks have mostly concentrated on a small spectrum of factors, such as transparency and sustainable investing in general [10,22,29], the present findings provide a wider and more precise spectrum of potential reasons for choosing social banks. Furthermore, an initial qualitative evaluation of the individual relevance of social depositor reasons is provided. Earlier studies have already addressed the relevance of the global financial crisis for social banks' growth [6–8]. However, no studies have provided an explanation for how the global financial crisis has affected the choice of social banks. The present results indicate a potential extension of social bank customer groups, creating a first behavioural explanation for social banks' growth in deposits that paves the way for multiple avenues for further explanatory research on the impact of the global financial crisis on social banks' growth. In particular, to quantify the impact of the financial crisis on social banks' growth in deposits, as well as their potential for further growth, subsequent research attempts are supposed (1) to further assess the relative relevance of depositor reasons, (2) to quantify the proportions of customer groups, and (3) to investigate the complex structure of behavioural factors for "get away customers" choosing social banks. Based on these findings, it will be possible to assess whether social banks' growth of deposits is just a short-term sugar hill or a sustainable regime shift in the commercial banking industry. The findings also support social banks' marketing by the identification of relevant and contemporary factual information for diverse customer groups. Furthermore, three interdependent social banking features were identified that seem to be of relevance for the transformation from a conventional into a social bank.

The findings also provide practical implications for social banks and conventional banks that aim to adapt principles of social banks. The exploration of the reasons, their individual relevance, and change over time supports social banks' marketing by the identification of relevant and contemporary factual information for diverse customer groups. Furthermore, the present results enabled the identification of three interdependent social banking features that might be of relevance for conventional banks. These insights on the impact of the global financial crisis on depositors' choice of social banks enable a cautious assessment of this very topical issue. The economic crisis that will result from the current COVID-19 pandemic is not expected to have a comparable impact on the growth of social bank deposits.

Finally, based on the identification of depositor reasons for choosing social banks and their differences to their reasons for choosing conventional banks, it is thought that the choice of social banks might be based on wholly unique reasons. The global financial crisis seems to have affected social bank growth in recent decades through an extension of customer target groups.

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Risk-Intolerant but Risk-Taking—Towards a Better Understanding of Inconsistent Survey Responses of the Euro Area Households

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Abstract: The sustainable development of the EU internal market for retail financial services is based on the rules of 'suitability', 'know your client', and 'know your product'. The rules ensure that financial institutions (including banks) offer retail clients only products and services that are adequate to their purposes and preferences, including risk tolerance. Our study, however, concerns households for which the above rules are not valid, since they declare risk aversion and possess risky assets. According to the European Union Markets in Financial Instruments Directive and Regulation (MiFID II and MiFIR), the inconsistent information they provide within survey questions should classify them to more compound suitability assessment procedures. In the study, we use nationally representative data for 16 euro area countries from the second wave of the Eurosystem Household Finance and Consumption Survey. Using logit regression, we identify sets of socio-demographic and socio-economic characteristics conducive to the possession of risky assets by risk-averse households in individual countries. To assess their similarity, we use the hierarchical taxonomic method with Ward's formula. The results of the study showed that risky assets were primarily possessed by risk-averse households that were characterised by high income, including from self-employment, and reference persons having a university degree and at least 55 years of age. The significance of their other characteristics was mainly shaped at the national level. The clear similarity of sets of the characteristics was confirmed only for a few pairs of countries. The information inconsistency that may result from erroneous self-assessments of being risk-averse was recognised in all countries and most often concerned high-income households with reference persons being males with a university degree. In 11 countries, the reason for this inconsistency could also be the inadequacy of assets held, also among senior households. The results provide insights for practitioners and policy. Identification of households providing inconsistent information to financial institutions, with the recognition of its reasons based on easily verifiable characteristics, may prove helpful in suitability assessments. The results confirming the similarity of household profiles requiring special attention between countries may be useful for entities operating cross-border. Due to the collection of information on risk aversion based on the single question self-classification method, conclusions regarding the restrictions of its use should also be considered relevant. In turn, policy implications may relate to consumer protection, since significant fractions of risk-averse households indeed participate in risky assets. Moreover, in selected countries, the risk-averse senior households were recognised as susceptible to making wrong investment decisions.

Keywords: risk tolerance; risk aversion; risk-taking; MiFID II; MiFIR; suitability assessment; households; risky financial assets; financial institutions; financial advisory; portfolio management

1. Introduction

Risk tolerance influences a wide range of households' financial decisions. Its significance for portfolio choices has been emphasised in Article 25 of Directive 2014/65/EU (MiFID II) and Articles 54 and 55 of Commission Delegated Regulation 2017/565 (MiFIR), which promote the 'suitability', 'know your client' and 'know your product' rules within the EU [1,2]. The rules emphasise the need for an in-depth assessment of retail clients' risk tolerance and ensure that they are provided only with products meeting their investment objectives and preferences. Risk tolerance and portfolio choices are the focus of interest of practitioners and researchers. In financial institutions, including personal advisory and portfolio management entities, they relate to individual cases [3–5], while in research studies they relate to entire populations [6,7] or specified subsets of individuals or households [8,9]. In all cases, information about self-assessed risk attitudes and asset participation is often collected within survey instruments, which are expected to provide up-to-date, accurate, and complete data.

Aiming at the uniform and consistent application of the MiFID II in the EU member countries, the European Securities and Markets Authority (ESMA) draws attention to the limited reliability of information derived from survey questions and the need for its re-examination [10]. It recognises the constraints of self-assessed risk tolerance, if not counterbalanced by objective criteria, as well as questions in batteries regarding portfolio components. Moreover, the ESMA signalises the inconsistency of survey information provided by particular types of respondents, e.g., those who are unwilling to take any risk but have ambitious investment objectives. This may occur if a self-assessed risk attitude is untrue or asset selection incorrect due to the respondent's narrowed understanding of characteristics and risks related to financial products and a shortage of investment experience. According to the ESMA guidelines, knowledge of the socio-economic and socio-demographic features of retail clients, such as, for instance, their marital status, family situation, age, employment situation, or liquidity needs may help recognise information inconsistency under the suitability assessment.

A single question self-classification is one of the methods of estimating individuals' and households' risk attitudes. It is based on the following question with four possible answer variants: 'Which of the following statements comes closest to describing the amount of financial risk that you (and your husband/wife/partner) are willing to take when you save or make investments?

1. Take substantial financial risks expecting to earn substantial returns,
2. Take above average financial risks expecting to earn above average returns,
3. Take average financial risks expecting to earn average returns,
4. Not willing to take any financial risk.

The question has been widely applied in nationally representative surveys, which allow concluding about general or particular subjective risk attitudes within a specific population, with outcomes discussed in the literature related to consumer finance. This method has been used by both researchers and practitioners [11–17].

Our study is devoted to particular households residing in 16 euro area countries that assess themselves as unwilling to take any risk (risk-averse) but hold risky financial assets in their portfolios. The inconsistent information they provide within survey questions should classify them to more compound suitability assessment procedures under MiFID II and MiFIR. Our study aims to profile these households according to their socio-demographics and socio-economics, i.e., to describe the primary providers of information for the purposes of re-examination in individual countries. The problem we analyse can be referred as to a gap between a subjective and objective risk attitude of a household, since the response to the single question is based on self-assessment, and risky asset participation discloses existing risk exposure [12,18–20]. We are particularly interested in recognising the possible causes of the information inaccuracy, which can be declaring untrue risk aversion or holding inadequate financial assets, as well as in the profiles of households to which they can be assigned. As the single question self-classification was commonly used, this study also aims to recognise its limitations when applied to specified types of respondents. The paper seeks to answer the following research questions:

- Due to the focus of our study on a specified subgroup of households declaring risk aversion, first, a question should be asked about which socio-demographics and socio-economics determine the likelihood of declaring risk aversion by households in the euro area countries?
- Regarding the discussed information inconsistency, which of the socio-demographics and socio-economics determine the likelihood of possession of risky financial assets by households that declare risk aversion? In other words, which household characteristics can be considered as favouring the occurrence of the considered inconsistency of information in the countries analysed?
- Due to the adoption of the common regulatory frames and guidelines related to MiFID II and MiFIR, to what extent are the profiles of households affected by the information inconsistency similar among the euro area countries?
- Since there are two possible causes for information inconsistency, can we conclude at the country level for which households the incorrect self-assessment of risk aversion is the most probable cause, and for whom it is the participation in inadequate (risky) assets?
- The single question self-classification is a simplified method of estimating households' risk attitudes. Regarding this, for which households may the usefulness of this method be limited?

The discussed information inconsistency can be identified in most of the euro area countries. According to the second wave data of the Eurosystem Household Finance and Consumption Survey (HFCS), in domestic populations, up to 35% of households which declare unwillingness to take any financial risk hold risky financial assets.

Our study extends the existing research line of inquiry regarding risk tolerance and risk behaviour, particularly their incoherence, including its causes and consequences. In contrast to previous studies which examine the gap between the subjective risk tolerance and objective risk tolerance within their whole ranges, we focus solely on the risk-averse households holding risky financial assets in portfolios, for which the consequences of the aforementioned gap might be the most severe. It should be noted that current knowledge about the causes and consequences of the gap is modest. The same can be concluded about the socio-demographic and socio-economic profiles of households which undervalue their own risk tolerance and overexpose to financial risk. Moreover, few studies relate to the EU populations, but if they do so, they rely on data for specific groups of retail investors, like the clients of selected financial institutions [12,18]. The data we use are nationally representative, thus giving an insight into the euro area populations, and allowing to draw conclusions about their similarities and dissimilarities regarding the issues analysed. Such an approach is currently desired due to the re-regulation of the markets for retail financial services, not only in the EU but globally.

The results of our study have implications for practice and policy. The knowledge about households which provide inconsistent information and should be treated with utmost caution may aid professionals to remain compliant with MiFID II and MiFIR. Since the new regulatory environment has been implemented, they are obliged to recognise the constraints of retail clients prior to offering them financial products and services. Our findings seem to be useful for entities operating internationally since we identify the countries regarding which a suitability assessment can be based on similar procedures. The policy implications refer to the issues of consumer protection as a significant part of households are self-reliant, i.e., they make financial decisions on their own and are excluded from the suitability assessment [21]. The prevalence of such households which are overexposed to financial risk (risk-averse but prone to making wrong choices) may lead to social problems under financial market stress. Thus, it is essential to know if the self-classification approach offers, in fact, an accurate gauge of risk-taking propensities that helps in decision making.

The remainder of the paper is organised as follows: Section 2 contains an overview of the theory and literature related to households' financial risk tolerance and behaviour. Section 3 presents the methodology. Section 4 describes the HFCS data applied in the study. Section 5 contains the results of empirical analysis and discussion. Section 6 contains conclusions.

2. Theoretical Background and Literature Review

2.1. Theory

Financial risk tolerance can be defined as the maximum amount of uncertainty that someone is willing to accept when making a financial decision [22] or the willingness to engage in a financial behavior in which the outcomes are uncertain with a possible identifiable loss [23]. It is the inverse of an economic term of risk aversion derived from household preferences [24–26]. Risk aversion refers to a hesitancy to accept a choice that has an uncertain payoff when an alternative choice with a more certain outcome is available [26]. The concept of risk aversion was developed by Pratt [27] and Arrow [28] with the use of normative models of rational choice describing how people ought to make decisions under uncertainty.

The first economic theory which we should recall is the expected utility theory which relates to links between risk aversion and risk behaviour. It assumes in its basic form that consumers are rational, and their risk preferences remain constant under uncertainty [29]. For this reason, consumers are expected to make the same choices regardless of the situation or event which has occurred [30,31]. Optimal behaviour under uncertainty is possible only under the assumption that risk-averse individuals should maximise expected utility, which is a function of outcomes related to the wealth or income levels [32]. Pratt [27] and Arrow [28], providing the measures of risk aversion with the coefficients of absolute and relative risk aversion. The first one can be used for global comparisons of risk aversion, e.g., among individuals, with the assumption that a person with higher absolute risk aversion for every prospect may be assessed as more risk-averse. This measure may also be considered as local under the assumption that an individual with a higher absolute risk aversion will always have a higher risk premium for small bets. A relative risk aversion is, in some sense, independent of wealth levels, since the coefficient measures the willingness to accept bets being a proportion of the current wealth [32].

The expected utility theory was extended within the modern portfolio theory [33], which relates to the optimality of portfolios consisted solely of risky assets. This approach of mean-variance assumes that risk-averse investors with diversified portfolios maximise their satisfaction (referred to as utility) by maximising their portfolios' returns for a given risk level. Thus, they should take the additional risk only if returns associated with the risk are high. With the increasing significance of liquidity needs, theorists began to draw attention to portfolios consisting of both risky and risk-free assets. Tobin [34] identified an investor's risk attitude as a determinant of the optimal portfolio choice from the set of efficient portfolios consisting of both asset categories. Thus, self-assessed risk attitudes became essential for proper allocational decisions between risk-free and risky assets. In this approach, greater risk tolerance results in the choice of higher volatility, which is compensated for by a higher expected return [35]. This paradigm can be, in some sense, visible in MiFID II and MiFIR, as the recognition of clients' risk attitudes conditions further financial asset recommendations.

However, as an increasing number of studies were signalling the incompatibility between what consumers should do and what they actually do, the rationality of investors' choices was being questioned, as well as the ability of normative models to explain actual investment choices [29,36–43].

The new approach to risk attitudes was enhanced with behavioural finance and psychosocial aspects. The descriptive prospect theory incorporated risk-seeking in the domain of losses in the analyses. According to Kahneman and Tversky [41], the carriers of value or utility were changes of wealth, rather than final asset positions that included current wealth. Within this theory, the utility function was defined over gains and losses separately, and a probability weighting function converted the underlying probabilities of the lottery into subjective probabilities [44]. The significance of perceptions and judgments for decision making became expressed in the assumption of the dependence of a person's risk tolerance on how a situation or event is framed. Della Vigna [45] found that consumers demonstrate risk aversion when they are asked to make a choice in which the outcome is framed as a gain, and risk-seeking when the choice is framed as a loss. More orientation toward behavioural finance, psychology and sociology can be recognised in theory assuming the significance of feelings triggered

by the situation and risky choice for the decision-making process. In Loewenstein, Weber, Hsee and Welch's risk-as-feelings hypothesis, emotional reactions to risky situations often differ from reasoned assessments and directly influence investment behavior [46,47].

As we have presented, knowledge about the links between financial risk tolerance and financial risk behaviour has a broad theoretical framework, related not only to the economy and finance, bus also psychology and sociology. Regarding our study, the significance of prospect theory with its subjective input may be recognised, however, only when considered jointly with a sociological theory of family development. The similarity of the concepts of a household and a family should be noted here [48]. Two aspects of the theory of family development make the prospect theory useful for understanding how the family (household) and demographic variables affect risk tolerance. The first aspect is the assumption that all choices are considered in relation to one's accumulated wealth position, with wealth increasing risk tolerance. The other is the premise of the variation of losses and gains and the perception of losses to be more important than gains in individual decision-making regarding risk-taking behaviour. Both theories relate to the probabilities of events which are useful for explaining individuals' propensity for financial risk. The theory of family development does it through the adoption of socio-demographics and socio-economics for the purposes of family profiling [49]. It recognises the changes in role expectations in the family over time which are a function of changes in a family membership, individual developmental needs, and direct societal expectations [49]. According to this theory, families form their expectations and behaviours on the basis of their stage requirements confirmed in their characteristics. Moreover, family stages have stochastic qualities that introduce life uncertainties that may influence current and future behaviour and decisions [50]. Features like gender, age, marital status, having dependents, and income level may thus alter the context for assessing potential gains and losses in an investment situation. The measures of subjective and objective risk tolerance we apply in the study can also be referred to the theory; however, to a limited extent. The single question self-classification has its roots in the economic theory, but households' perceptions of own risk attitude may remain under the influence of the current situation or insufficient information [30]. The same dependence may occur regarding the measure of financial risk behaviour, which in our study is a simplified behavioural measure and refers to the occurrence of risky assets in portfolios [51].

2.2. Literature

We based our research on existing literature related to both subjective financial risk tolerance and financial risk behaviour. Regarding the aim of the study, particularly essential for us were findings related to:

- risk tolerance measures, including their limitations, if applied in research studies,
- the role of socio-demographics and socio-economics for the formation of households' perceptions and behaviours related to the financial products and services,
- inconsistencies between the subjective and objective risk tolerance, and household characteristics that determine their occurrence.

Risk tolerance estimations may be based on respondents' self-assessments of risk attitudes (subjective measure) or investment behaviours reflected in portfolio composition (objective measure). The reliability of risk tolerance measures depends on how free they are from measurement error and consistent from one use to another [16,52]. Regarding the single question, opinions are ambiguous. Grable and Lytton [16] indicate its limitation resulting from incomplete coverage of the spectrum of financial risk tolerance. Despite it, they find this method closely linked to investment choices and sufficient in explanatory studies, as long as researchers are aware of its limitation. Kimbal, Sahm and Shapiro [53] emphasise the problem of subjective wording of the single question, like 'substantial', 'above average', and 'average', which may be differently interpreted by respondents. Schooley and Worden [17] recognise the additional weakness, which is the lack of possible declaration of 'the willingness to take less-than-average financial risk', which, in their opinion, makes respondents choose risk

aversion. Grable and Schumm [54] describe the reasons for the popularity of the single question among researchers, such as a common belief in its high degree of face validity and similar reliability to longer risk scales, lack of alternative risk-tolerance questions in national surveys, or only a few alternatives to national finance databases. Regarding objective measures, their advantage is intrinsic validity, as the risk attitudes are evidenced in the natural environment [55]. Still, their weak side is limited control over contextual variables, such as liquidity needs, financial constraints, or market expectations, which influence behaviour beyond risk tolerance [56]. Moreover, Hanna, Gutter, and Fan [30] indicate an obvious limitation of the assessment of risk tolerance based on portfolio composition, which is the fact that not all households hold financial assets.

Vast studies are dedicated to socio-demographics and socio-economics determining financial risk tolerance in both approaches. These characteristics stand out from others, like latent psychological and behavioural biases, by their availability in nationally representative databases, and easy recognisability and verifiability at household level. The *age of a respondent* is one of the commonly recognised socio-demographic determinants. Generally, risk tolerance is concluded to decrease with age, but this relationship may not be linear [7,57–59]. Younger investors are more tolerant, since they have time to recover from losses. Yao, Sharpe, and Wang [6] and Bakshi and Chen [60] find risk tolerance declining along with the investment horizon, leading to shifting wealth holdings toward less risky assets. Opposed to general findings, Grable [61] concludes that there is a positive relationship between the age and risk tolerance of investors. Several studies recognise the inconsistencies between age and risk tolerance, and age and actual risk-taking. Finke and Huston [62] and Chang, DeVaney and Chiremba [15] find that older investors declare lower risk tolerance but tend to invest more aggressively than the young ones. *Gender* differences are also well documented in the literature and lead to an assumption that males are more risk-tolerant and take more risks than females do [15,25,61,63–65]. However, Roszkowski and Grable [16] argue that women may underestimate their risk tolerance, while men tend to overestimate it. Despite these findings, Bucciol and Miniaci [7] do not identify gender as a significant characteristic. Investors' *level of education* is recognised as a determinant positively influencing respondents' self-assessed risk tolerance and risk-taking, since more formal education makes it easier to assess the risk-return trade-offs [15,61,66]. *Wealth* and *income* are two related factors that are hypothesised to positively influence risk tolerance [7,15,22,61,67–69]. Regarding wealth, its significance indeed may not be so evident. On the one hand, wealthy individuals may afford to incur losses on risky investments, and their accumulated wealth may reflect high risk tolerance. On the other hand, however, the impoverished may perceive risky investments as a lottery and be more willing to bear the risk associated with a given payoff. Vissing-Jorgensen [70] argues that wealthy households own more risky assets because they can overcome market requirements, such as entry costs (advising fees) and a minimum value of an investment. Similar conclusions refer to income levels [70,71]. It should be noted that *the status on the labour market* matters for the risk tolerance as well. The self-employed distinguish themselves by higher declared risk tolerance [72] and greater risky asset allocation [73]. However, private business risk may crowd out participation in risky financial assets [74]. Many studies discuss the significance of *the marital status* of an investor; however, it should be noted that the estimated risk tolerance of a couple may reflect combined preferences [9]. Previous results find singles generally more risk-tolerant than married people [69,75], but select studies identify an opposite effect [61] or do not identify significant differences at all [68]. The results of a study by Jianakoplos and Bernasek [65] extend the above and find that single women are less risk-tolerant than single men. Less attention is paid to the *household size*, measured by the number of adult members and dependent children. Large households are found to be more conservative in their risk attitudes, since their size negatively influences the wealth per capita and positively the committed expenditure-to-wealth ratio. Furthermore, they are more exposed to the risk of the random needs of family members [74,76]. *Credit constraints* may also influence households' portfolio choices, not favouring the possession of risky assets [77,78].

The existing literature also discusses the relationship between subjective and objective financial risk tolerance; however, relatively little attention is paid to the EU populations in this regard. In most studies, this issue is examined in a similar manner, by adopting a model with an objective (subjective) risk tolerance measure as the dependent variable and a set of independent variables consisting of a subjective (objective) risk tolerance measure and at least one socio-demographic or socio-economic feature. It should be emphasised that still little is known about the factors commonly favouring the inconsistency of subjective and objective risk tolerance. Some researchers, like Chang, DeVaney, and Chiremba [15], Finke and Huston [62], and Schooley and Worden [17], agree that people who declare a willingness to take financial risk are more involved in risky assets than those who are risk-averse. Hallahan, Faff, and McKenzie [69] analyse the gap in a more sophisticated way. They explain the relations between investors' subjective and objective risk tolerance in conjunction with their portfolio choices. However, they define objective risk tolerance as a feature based on responses to detailed questions. They find it broadly consistent with the subjective (self-declared) risk tolerance within the single question. The results also allow to draw conclusions about the rationality of individuals' investment choices due to their compliance with both risk attitudes. The consistency of subjective risk tolerance and risk-taking is also examined by Gutter, Fox, and Montalto [79], who recognise it among 66% of households. However, select studies confirm an evident gap between what respondents say about their risk tolerance and what they have in portfolios. A study by Jianakoplos [80] recognises a significant fraction of respondents who self-assess as less risk-tolerant but hold considerable portions of risky assets. Even larger incoherence is presented in the study of Kannadhasan [81], described by the regression coefficient at the level of 0.107. The heterogeneity of results obtained so far for different countries encouraged us to conduct the study for an almost entire euro area. Although the countries we consider became similar due to their membership in the EU and adoption of the single currency, they still remain different in many dimensions, including cultural, institutional, structural, and macroeconomic, which affect not only households' wealth, but also their perceptions and behaviours.

Despite the noticeable discussion about the discrepancies between the declared risk tolerance and portfolio composition, little is known about their causes—whether they result from wrong self-assessments or unsuitable asset holdings. Both reasons should be taken into account since, as we explained earlier, the measures of subjective and objective risk tolerance have specific shortcomings. Based on data concerning German consumers, Ehm, Kaufmann, and Weber [18] find the phenomenon of enlarged commitment in risky assets of less risk-tolerant individuals, caused by inadequate portfolio choices rather than an inability to assess own risk attitude. In turn, the findings of Martin [19] for the US population and Moreschi [20] for clients of select financial institutions lead to conclusions about individuals' inability to assess risk attitude being a primary reason. Marinelli, Mazzoli and Palmucci [12] recognise two types of gaps on the basis of data for the clients of an Italian bank, i.e., arising from wrong self-assessments (related to over- and undervaluation) and incoherent portfolio composition (related to over- and underexposure to risk). However, this is the only research we have found which provides the results referred to socio-demographics and socio-economics of individuals affected by the gap resulting from a particular cause. Marinelli, Mazzoli and Palmucci [12] recognise male investors, homeowners, and heavy savers as being characterised by a lower self-assessment gap, in contrast to married people. On the other hand, wealthy individuals with a shorter investment horizon and less debt show a smaller portfolio composition gap. Generally, people who display cautious economic behaviour, such as homeowners, savers, and those not indebted, are recognised as more consistent in their financial risk-tolerance expressions.

3. Methodology

In the study, we applied a logit regression model. In general, regression modelling allows to determine what factors, and in what way, influence the studied phenomenon expressed as numbers in a dependent variable. If this variable is the so-called 'latent' variable, but ultimately expressed in a

dichotomous way (dummy), then probability models including the logit model are suitable regression models [82]. Therefore, using various household characteristics, we modelled specific 'propensities' of households considered to be important for the purposes of the study. This model can take the following form:

$$log\frac{P_i}{1-P_i} = \beta_0 + \sum_{j=1}^{k} \beta_j x_{ij}, \quad (1)$$

where $P_i = P(y_i = 1)$, and x_{ij} represents the value of the j-th independent variable for the i-th household.

The study was conducted for each of the countries in three stages. Since it concerns households self-assessed as risk-averse, the first stage covered all surveyed households and provided an answer to the following question: *which socio-demographics and socio-economics determine the likelihood of declaring risk aversion by households in the euro area countries?* We used the model (1) with the dichotomous dependent variable *R_averse*. We assigned the value of 1 to households declaring aversion to risk, and 0 to the others. Therefore, among statistically significant independent variables, one could distinguish:

1. Stimulants of the studied phenomenon referring to those socio-economic characteristics that favoured declaring a lack of risk appetite. In households distinguished by such characteristics, the declared aversion to risk should be considered relatively frequent;
2. Destimulants of the studied phenomenon referring to the characteristics limiting the likelihood of declaring risk aversion. Therefore, among households displaying these characteristics, the belief in risk intolerance should be considered relatively rare.

The detailed results obtained in this stage were used in the further part of the study to identify the causes of the gap between subjective and objective risk tolerance of households, i.e., the ranges of survey responses for targeted re-examination.

In the second stage of the study, we focused only on households that declared no willingness to take any financial risk in each country. The following research question was posed: *which of the socio-demographics and socio-economics determine the likelihood of possession of risky financial assets by households that declare risk aversion? In other words, which household characteristics can be considered as favouring the occurrence of the considered inconsistency of information in the countries analysed?* In this part of the study, we used the model (1) for the dichotomous dependent variable *R_assets* that identifies households which simultaneously declared risk aversion and possessed at least one type of risky asset. A value of 1 was assigned to such households, while the others (being risk-averse and risk-free) were assigned 0. At this stage, the profiles of households whose inconsistent information should be subject to re-examination were determined.

The results from the second stage also allowed us to identify similarities and differences in the profiles of households (specified for individual countries) whose survey responses would be classified for re-examination. Thus, we asked the question: *to what extent are the profiles of households affected by the information inconsistency similar among the euro area countries?* Based on the characteristics favouring the occurrence of inconsistent information and the confirmed strengthening influence of incomes, and the education and age of the responding person along with their ranges, we classified the countries according to the similarities of the profiles of risk-averse but risk-taking respondents. For this purpose, the hierarchical taxonomic method with Ward's formula was used with the input dataset consisting of dummies identifying the profile for each country based on the parameter estimates of logit regression. Therefore, if a statistically significant parameter characterised a given variable in this regression, then 1 was assigned to a given country; otherwise it was 0. Based on this set of dummies, a Jaccard distance matrix was determined [83].

In the third stage of the study, we combined the results obtained in the two previous stages, relating to the statistical significance and directions of the impact of individual independent variables on the probability of occurrence of the phenomena explained. The goal of this stage was to provide answers to the following questions: *can we conclude on the causes of information inconsistency in each country? If so, then for which households is the incorrect self-assessment of risk aversion the most probable cause*

and for which is it the participation in inadequate (risky) assets? This part of the study allowed, therefore, to recognise the causes of the analysed information inconsistency in households of specified profiles. They were indicated by the characteristics that played the role of:

1. Destimulants of the declared risk aversion (in stage 1) and stimulants of holding risky assets by households unwilling to take the risk (in stage 2). The widespread risk tolerance of households with such characteristics suggested incorrect self-classification of those who declared risk aversion when holding risky assets. In their case, re-examination should therefore first serve to identify the real attitude towards risk.
2. Stimulants of both the declared risk aversion (in stage 1) and the possession of risky assets by households unwilling to take the risk (in stage 2). The widespread risk aversion of households displaying such characteristics indicated that decisions about participation in risky assets should be seen as potentially erroneous. Therefore, in the case of such households, re-examination should be first of all focused on the adequacy of holding risky assets, including the testing of the household's knowledge of the main characteristics and risks related to these assets and their investment experience.

In the above cases, the re-examination might therefore be carried out with a focus on a specific area of information obtained from households, which, based on the results of the study, was indicated as the most probable cause of inconsistency. It should be noted, however, that the need for re-examination also applies to households with characteristics of which statistical significance was not confirmed at the adopted level of significance regarding the declared risk aversion (in stage 1), but it was confirmed regarding the possession of risky assets (in stage 2). In their case, one can only conclude that there is an increased tendency to provide inconsistent information, without suggesting its cause.

It should be noted that the recognition of the declared risk aversion as one of the reasons for the information inconsistency and the need for its re-examination indicates the limitations of the single question method. In this case, the following question should be raised: *for which households may the usefulness of the single question be limited?*

The overall procedure applied in the study is presented in Figure 1.

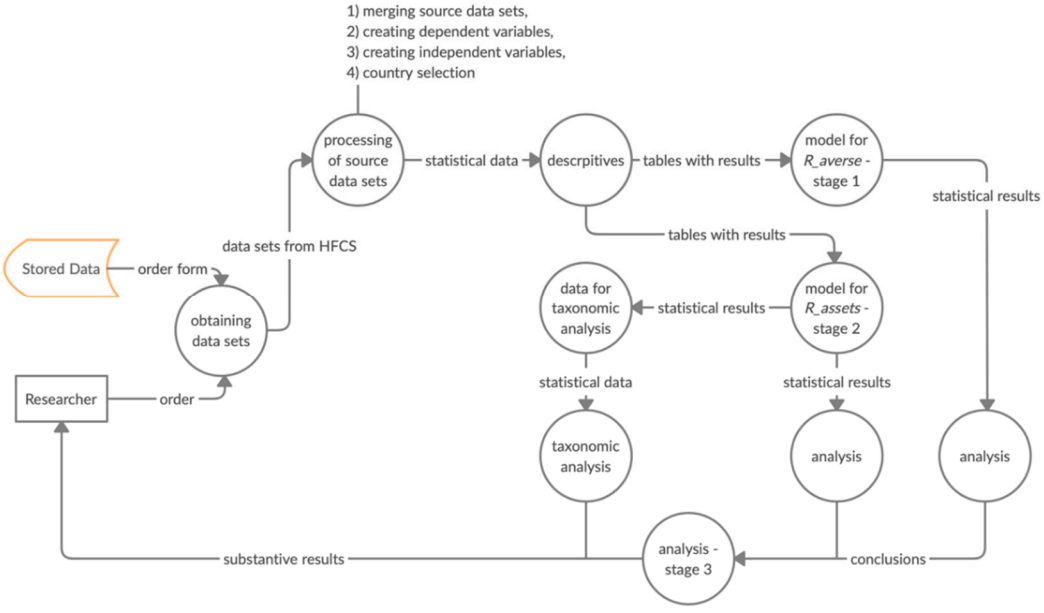

Figure 1. Graphical description of the study. Source: Created by the authors.

4. Data

Our study is based on the second wave data of the Eurosystem HFCS [84], which is a unique source of information about the distribution of socio-demographic and socio-economic features within

the populations of the EU countries, including the self-assessed financial risk tolerance and the classes of financial assets held. The data are confidential and made available on request for research purposes.

In the euro area, information inconsistency was related to diverse domestic fractions of risk-averse household (Figure 2). On the basis of the adopted threshold at 5%, we selected 16 out of 18 countries surveyed for the study, in which from 5.2% to 35.3% of households with subjective risk aversion held risky assets in their portfolios. These were Austria (AT), Belgium (BE), Cyprus (CY), Estonia (EE), Finland (FI), France (FR), Germany (DE), Ireland (IE), Italy (IT), Luxembourg (LU), Malta (MT), the Netherlands (NL), Portugal (PT), Slovakia (SK), Slovenia SI), and Spain (ES). We omitted Greece (GR) and Latvia (LV) since the fractions in question were much below the threshold there—0.7% and 1.6%, respectively. Taking into account that risk aversion was the most popular attitude in these two countries (declared by about 80% of Greeks and Latvians), one may conclude that subjective risk intolerance of households residing there was generally reflected in their portfolios. This consistency could result from the significantly worse living standards when compared with the remaining euro area countries, as evidenced by the Eurostat for 2014 (the reference year for both countries). The data reveal low satisfaction from own financial situation of more than half of each population and annual median equivalised net incomes of both countries classified to the lowest.

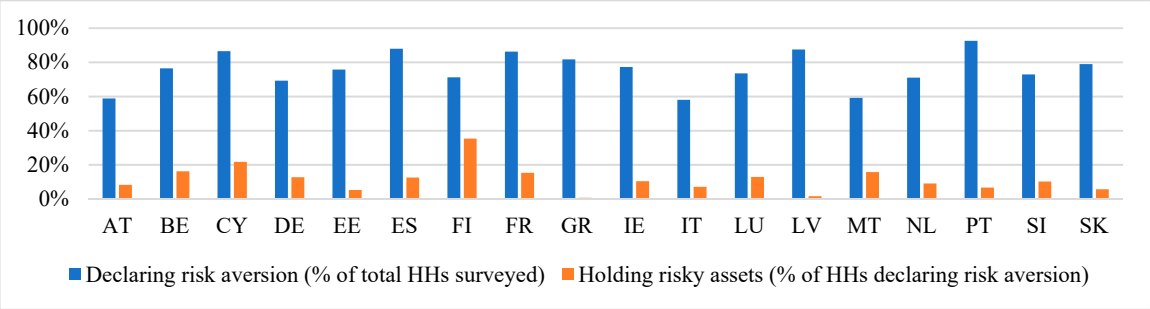

Figure 2. Households declaring risk aversion and their fractions responsible for information inconsistency in the population of individual countries. Source: Created by the authors and based on the Eurosystem HFCS data.

The total number of households covered by our study was 70,730, while in individual countries it ranged from 999 (in Malta) to 12,035 (in France). In most countries, including Austria, Belgium, Cyprus, France, Germany, Luxembourg, Italy, Slovakia, and Slovenia, 2014 was the reference year, but for Estonia, Finland, Ireland, Malta, the Netherlands, and Portugal, it was 2013. This difference should not be perceived as relevant for our study, since we did not use data in monetary units, subject to decline under the European sovereign debt crisis.

In the HFCS database, the information on the attitudes of households towards financial risk was obtained only by the single question self-classification method. We were interested in respondents declaring the attitude 'Not willing to take any financial risk', distinguished by the unequivocal self-assessment (risk aversion), and thus excluding the possibility of interest in any risky assets. In the study, it was described by the dummy variable *R_averse*.

As concerns the information on financial asset classes held by households, we focused solely on the assets with capital-loss risk, no matter whether they were perceived as risky or fairly risky. We included into this group publicly traded shares, other equities related to non-self-employment, not publicly traded businesses, mutual fund units, bonds except state or other general government, and sums on managed accounts. Based on them, the dummy variable *R_assets* was created that identifies the participation of a household in at least one type of these assets. It should be explained that the decision to use the dummy resulted from the shortage of data about the values of risky assets in households' portfolios for selected countries.

For the purposes of statistical analysis, we used a set of independent variables related to socio-demographics and socio-economics. A household's members typically own financial assets jointly

and declare a common attitude towards financial risk, but many of its attributes are personal-specific. In the HFCS, the most knowledgeable member regarding the situation of a household and a primary decision-maker is the responding person, thus we also controlled for his or her attributes. The set was composed of the following:

1. Quintile class of total gross income of a household, at a country level (dummies): *TGI_1Q*—the first quantile (reference variable); *TGI_2Q*—the second quantile; *TGI_3Q*—the third quantile; *TGI_4Q*—the fourth quantile; *TGI_5Q*—the fifth quantile;
2. Type of income of a household (dummies): *I_Empl*—employee income; *I_SEmpl*—self-employment income; *I_Pens*—income from pensions; *I_STrans*—regular social transfers (except pensions);
3. Number of adult members of a household (discrete variable): *N_Adult*;
4. Number of dependent children in a household (discrete variable): *N_Child*;
5. Education level of a responding persons (dummies): *E_1L*—primary and lower (reference variable); *E_2L1S*—lower secondary; *E_2L2S*—upper secondary; *E_3L*—tertiary.
6. Marital status of a responding person (dummies): *MS_S* (reference variable)—single (never married); *MS_M&CU*—married and in a consensual union on a legal basis; *MS_Wid*—widowed; *MS_Div*—divorced;
7. Age of a responding person (dummies): *A < 25* (reference variable); *A_25–39*; *A_40–54*; *A_55+*; age ranges correspond to those adopted in the European Commission study on financial assets and liabilities of European citizens (EC, 2012);
8. Gender of a responding person (a dummy): *Gender*—1 if male.

It should be added that we also took into account other variables related to the type of household, such as being credit constrained or receiving intergeneration transfers (gifts and inheritances), as well as a responding person's labour status. Due to their statistical insignificance or lack of data for selected countries, these variables were finally omitted in the multidimensional statistical analysis. Summary statistics of the independent variables which were used in the model (1) are presented in Tables A1 and A2. They were computed using sampling weights according to the HFCS guidelines [85].

The sampling weights were also applied to gather in-depth information for each country regarding the distribution of:

- the risk aversion among households characterised by a particular socio-demographic or socio-economic feature,
- the occurrence of risky assets among risk-averse households with a given socio-demographic or socio-economic characteristic.

The information allowed us to supplement the findings from the regression modelling in stages 1 and 2 of the study.

5. Results and Discussion

5.1. Risk-Averse Households but Participating in Risky Assets

Since the providers of inconsistent information were selected from households declaring risk aversion, in the first stage of the study we profiled the latter for each country. The results of regression modelling are presented in Table A3. Some of the distinguishing characteristics of these households turned out to be statistically significant in larger groups of countries, showing supranational significance. They referred to the following:

1. The household, taking into account:

    - its income level, primarily the lowest within the first quintile group in the country of residence (in 16 countries). Risk aversion was declared by the majority of such households, representing from 72% (in Italy) up to 98% (in Portugal) of domestic populations;
    - its sources of income, in particular pensions and regular social transfers (in 8 and 6 countries respectively). Within these subsets of countries, risk aversion was declared from 65% (in Italy) up to 96% (in Portugal) of retired households, and from 57% (in Austria) up to 86% (in France) of living from social transfers;
    - its size, expressed by a large number of adult members (in 13 countries). Among the households of at least three adult members, risk aversion was declared by from 66% (in Malta) up to 93% (in Cyprus).

2. The responding person, taking into account his or her:

    - level of education, most of all primary and lower (in 15 countries). Risk aversion was declared by from 75% (in Italy) up to 97% (in Portugal) of households distinguished by this feature;
    - gender, as risk aversion was more common among women (in 14 countries);
    - age, primarily not below 55 (in 11 countries). Taking into account the structure of households from the highest age range regarding risk attitude, between 71% (in Austria) and 95% (in Portugal) of them declared risk aversion;
    - marital status; risk aversion was declared mainly by the widowed and the divorced (in 10 and 9 countries, respectively). Among widowed responding persons, the share of risk-averse ranged from 74% (in Italy) up to (94% in Estonia), while among divorced persons from 75% (in Germany) up to 90% (in France).

In turn, earning income from self-employment was the most often destimulant of declaring risk aversion (in 10 countries). Our results are therefore in line with the results dominating in the literature, regarding the significance of the characteristics and the directions of their impact. Detailed results from this part of the study were used in its third stage.

Profiling of the providers of inconsistent survey information (subject to re-examination) was performed in the second stage of the study, based on the same set of socio-demographics and socio-economics. Detailed modelling results are contained in Table A4. It should be noted that characteristics such as the level of household income, education, and age of respondents were described by more than one independent variable. When considering these characteristics, we primarily focused on the variables that had the greatest positive impact on the probability of having risky assets by those declaring aversion to risk. Table 1 lists for each country the characteristics that favoured the occurrence of inconsistencies in survey information, and therefore can be treated as helpful in profiling respondents whose answers burdened with the greatest risk of inconsistency. As can be seen, these households were not homogeneous in 16 countries.

Despite the visible differences in household profiles, some similarities could be seen within specific groups of countries. The statistical significance of *the level of income classified as the highest* in the country was confirmed particularly often (in all countries except the Netherlands and Slovakia), *ceteris paribus*. Its importance as a determinant of the gap between subjective and objective risk attitude of an investor was confirmed by a study by Marinelli, Mazzoli and Palmucci [12] and Moreschi [20] who found that the inclination to provide inconsistent information increases along with increasing income. They explain this positive relationship with the smaller significance of potential losses for wealthy people, and thus by their lower precision in assessing their risk attitude and selecting financial assets. In our study, we also confirm the increase in the probability of information inconsistency with the rise in the level of income starting from the first quintile group in Austria, Belgium, Cyprus, Finland, France, Germany, Italy, Malta, and Spain, while in other countries within its higher ranges, *ceteris paribus*. The significance of the incomes from the highest range was evidenced in the structure of domestic

populations, as from 13% in Estonia up to 56% in Finland of households declaring aversion to risk and achieving such incomes had risky assets. The results of our study also confirmed the significance of *the source of income*, since in Estonia, Finland, Ireland, Luxembourg, Portugal, and Slovakia, the problem of inconsistent information in particular concerned those living on *self-employment incomes* (*ceteris paribus*). In Finland, it related to every second such household. The results of Stewart and Roth's [72] study suggest that its cause may be the hidden willingness to risk of these households. It can also be added that the provision of inconsistent information least often concerned those living on incomes from employment in Cyprus, Germany, Ireland, Italy, Malta, Portugal, Slovenia, and Spain, as well as from regular social transfers in Estonia, Finland, France, Ireland, Luxembourg, the Netherlands, Portugal, and Spain, *ceteris paribus*. The negative impact of the last characteristic seems obvious, due to the difficult financial situation of such households limiting their activity on the market for retail financial services. Their lowest subjective and objective risk appetite is also emphasised by Chang, DeVaney and Chiremba [15].

A characteristic favouring the provision of inconsistent information was also the *size of the household*, expressed in both the number of adult members and dependent children. Previous studies differ with regard to its significance. Some indicate a greater susceptibility of small households, explaining it with a smaller sense of mutual responsibility and less pressure among their members [22,86]. We find this regularity in our results for Austria, Belgium, France, Germany, Italy, Luxembourg, Malta, and Spain. It is worth adding that in Belgium, for instance, every fourth two-person household declaring risk aversion possessed risky assets. However, some studies emphasize that the problem of inconsistent information mainly concerns large households due to difficulties in determining a common risk attitude for the group of people and the selection of adequate assets. In such a situation, the information provided may be influenced by the objectives and preferences of one of the household members [9,10,66]. In our study, the increased propensity to provide inconsistent information by large households has been confirmed for Finland, *ceteris paribus*. More than half of Finnish households with at least three adult members and declared risk aversion participated in risky assets. As concerns the number of dependent children, the results of our study confirmed the significance of this characteristic in five countries, while the direction of its impact was not consistent. In the case of Belgium and Estonia, households distinguished by their higher number showed a greater tendency to provide inconsistent information, *ceteris paribus*. However, the study of Marinelli, Mazzoli and Palmucci [12] shows that the fact of raising children may make adult household members more diligent in assessing their own attitude towards risk and selecting assets, due to the consequences of their current financial decisions for the forthcoming status of children. In our study, the negative impact of the number of children was confirmed for France, Malta, and Slovakia.

Households whose responding persons completed *a tertiary level of education* were evidently more susceptible to providing inconsistent information. This characteristic turned out to be statistically significant in all countries except Austria, Cyprus and Malta. Numerous studies recognise it as conducive to subjective risk tolerance and risk-taking, thus signalling that the information inconsistency we analysed could have originated from declaring false risk aversion. Marinelli, Mazzoli and Palmucci [12] do not confirm the significance of the level of education for the gap between subjective and objective risk tolerance which, however, could be due to the non-representativeness of their research sample. It should be added that in Finland, France, Luxembourg, Portugal, and Spain, the impact of education on the likelihood of providing inconsistent information increased gradually, starting from its lowest level, *ceteris paribus*. However, in Estonia, Germany, Ireland, Italy, and the Netherlands, it strengthened within the two highest levels—upper secondary and tertiary. It is noteworthy that in Finland nearly half of the households that declared risk aversion and had responding persons with a tertiary level of education possessed risky assets, while in France, Spain, and Belgium it was about 25%.

Our results confirmed the significance of *the responding person's age of at least 55 years* in nine countries. It should be added that in some of them, a higher age range was related to a higher probability of information inconsistency, *ceteris paribus*. In France, the strength of the impact of the respondent's

age started to increase from the lowest range (up to 24 years), while in Belgium, Finland, and Spain within the two highest ranges. Moreover, the significance of being at least 55 was strengthened by the significance of *incomes derived from pensions*. Together these two characteristics signalled that the problem of increased information inconsistency could have affected senior households in 13 countries. The significance of the age of the responding person has not been confirmed in Estonia, Slovakia, and Slovenia. In Finland, 40% of households declaring risk aversion and having responding persons at least 55 years old had risky assets. In Belgium, Cyprus, and Malta, this ratio was around 20%. It is worth noting that not only the lower subjective risk tolerance of people nearing retirement and on retirement is emphasized in the literature, but also the lower level of their financial literacy and cognitive abilities, which make seniors more exposed to wrong investment choices and falling victim to financial frauds [87,88].

The marital status of the responding person proved to be significant in eight countries. We observed an increased tendency to provide inconsistent information among households of the married and in a consensual union, *ceteris paribus,* most of all in Belgium, Cyprus, and Slovakia, while this was the case for the divorced in Slovakia and the widowed in Slovenia. The reasons for the significance of being married or in a consensual union can be explained by the possible conflict in risk tolerance of couples, often resulting in separate portfolios or decisions made on the basis of the risk tolerance of one household member [66]. For instance, among Cypriot households of the married and in a consensual union declaring risk aversion, 27% participated in risky assets. The statistical significance of the divorced and the widowed for the occurrence of the phenomenon of information inconsistency in Slovakia and Slovenia could result from the possession of risky assets previously belonging to the common property [15]. In turn, the increased propensity of singles to provide inconsistent information could be inferred primarily for the population of Spain, but also of Austria, France, and Germany.

Our study also confirmed the relevance of *the gender of the responding person*, pointing to the increased tendency of males to provide inconsistent information in France, Ireland, Luxembourg and Malta, *ceteris paribus*. In the literature, this characteristic is widely documented as a determinant of both subjective risk tolerance and risk-taking, which indicates that the reason for the inconsistency of survey responses in the countries indicated could be the erroneous declarations of male respondents regarding the household's attitude towards risk.

The results of our study revealed the heterogeneity of the profiles of households susceptible to providing inconsistent information within selected countries. In Belgium, these were households with extremely different income status, both the richest (with incomes from the fifth quintile range) and the relatively poor (living on social transfers), while in Germany, France, and Luxembourg at a different stage of development, with responding persons assigned to the lowest and highest age ranges. In Austria, both of the above cases were identified.

Following the characteristics indicated in Table 1, we grouped the countries according to the degree of similarity of the profiles of households that provided inconsistent information. Based on the hierarchical classification method with Ward's formula with a Jaccard distance matrix determined (Table A5), this similarity could be confirmed within the following subsets of countries (Figure 3): Ireland and Portugal; Germany and Italy; Finland and Spain; Austria and Belgium; France and Malta. For each of the pairs indicated, it is, therefore, possible to assume a similar approach to the suitability assessment regarding the households analysed. It was also possible to cut the dendrogram at higher levels of aggregation and to obtain the following subsets of countries: Austria, Belgium, Germany, and Italy; Cyprus, Finland, France, Malta, and Spain; Estonia, Luxembourg, Slovakia, and Slovenia; Ireland, the Netherlands, and Portugal. However, the diversity of household profiles within each of the extended groups was found to be significantly larger. The distinct differences of risk-averse but risk-taking households concerned Slovakia, the Netherlands, Slovenia, and Cyprus. The above findings may prove useful for practitioners when providing investment products, advisory, and portfolio management services to retail clients in the euro area, primarily if operating cross-border.

Table 1. The sets of socio-demographics and socio-economics favouring the occurrence of inconsistency in the information provided by a household.

	TGI_1Q	*TGI_2Q*	*TGI_3Q*	*TGI_4Q*	*TGI_5Q*	*N_Adult* (Small)	*N_Adult* (Large)	*N_Child* (Small)	*N_Child* (Large)	*E_1L*	*E_2L1S*	*E_2L2S*	*E_3L*	*I_SEmpl*	*I_Pens*	*I_STrans*	*MS_S*	*MS_M&CU*	*MS_Wid*	*MS_Div*	*Gender*	*A<25*	*A_25-39*	*A_40-54*	*A_55+*
AT	*	*	*	*	*H								H												
BE	*	*	*	*	*H								H											*	*H
CY	*	*	*	*	*H																				H
DE	*	*	*	*	*H							*	*H												
EE				*	*H							*	*H												
ES	*	*	*	*	*H					*	*	*	*H											*	*H
FI	*	*	*	*	*H					*	*	*	*H											*	*H
FR	*	*	*	*	*H					*	*	*	*H									*	*	*	*H
IE			*	*	*H							*	*H												H
IT	*	*	*	*	*H							*	*H												
LU				*	*H								H												
MT	*	*	*	*	*H																				H
NL												*	*H												H
PT			*	*	*H					*	*	*	*H												H
SI	*	*	*	*	*H								H												
SK													H												

Notes: variables named as in Section 'Data and Methodology'; the shaded fields relate to the characteristics statistically significantly increasing the likelihood of providing inconsistent information; (*) signifies a gradual strengthening of influence of a characteristic; (H) marks the level of a characteristic at which the possession of risky assets is most likely.

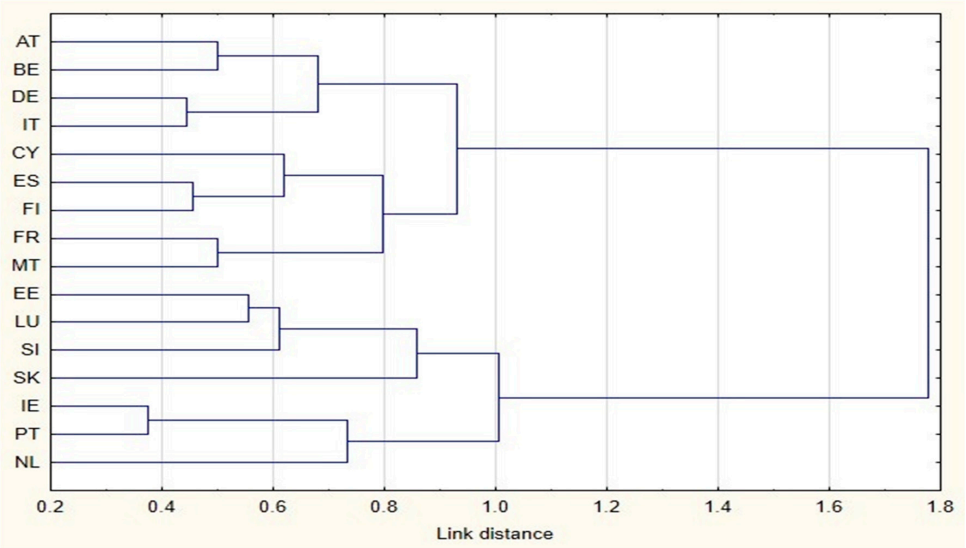

Figure 3. Hierarchical clustering dendrogram of 16 euro area countries with households risk-averse but risk-taking. Source: Created by the authors.

The heterogeneity of domestic profiles of households that provide inconsistent information may raise a question about its causes. It should be noted that the countries analysed vary in terms of vast institutional, structural, and macroeconomic features which shape risk tolerance and risk behaviour [48,89]. Thus, among the possible causes might be the differences in national pension systems, taxation, public wealth (including medical coverage and unemployment insurance), availability of financial products, as well as the differences in asset price dynamics. Additionally, a cause might be a diversity of populations in terms of socio-demographic and socio-economic features, related, among others, to wealth, income, age, and education.

5.2. Targeted Re-Examination of Household Survey Responses

Joining the results of regression modelling from stages 1–2 (Tables A3 and A4), we were able to indicate for individual countries the primary scopes of survey information to re-examination if provided by households of specific socio-demographics and socio-economics (Table 2). In the case of characteristics such as the level of household income, education, and age of the respondent, we focused primarily on their ranges, which in stages 1–2 were of the strongest impact, since in their case the cause of information inconsistency was most visible.

The problem of information inconsistency that might result from the inaccurate perception of own risk attitude concerned all countries, however, it referred to households with different characteristics. Due to the risk aversion declared, they can be considered potentially affected by the underestimation of own risk attitude. In some countries, such households were distinguished by the highest incomes, originating from self-employment, and male respondents with a tertiary level of education completed. It should be emphasised that all these characteristics are indicated in the existing subject literature as conducive to subjective risk tolerance, and therefore not constituting the attribute of risk-averse households. In Austria, Cyprus, and the Netherlands, the need to focus re-examination on the risk attitude was indicated by incomes classified into the highest. In Belgium, Germany, Italy, Slovenia, and Spain, in addition to the highest level of income, an important characteristic was also the tertiary education of respondents, while in Malta—male responding persons. In France and Luxembourg, apart from the highest level of income and tertiary education of the respondents, the representation of households by males was also important. In Ireland, the household profile consisting of all the above characteristics was complemented by the source of income from self-employment. In Portugal, in turn, potential difficulties with self-assessments of risk attitude were recognised among households achieving the highest incomes in the country, including those obtained from self-employment and represented by

persons with higher education. In Finland, the need to focus re-examination on risk attitudes signalled the highest income and its origin from self-employment. In the case of Slovakia, households with incomes from self-employment, and responding persons with tertiary education completed, *ceteris paribus*, were mainly perceived as unable to assess own attitudes towards financial risk.

Table 2. Variables indicating the scopes of information for re-examination.

	TGI_2Q	*TGI_3Q*	*TGI_4Q*	*TGI_5Q*	*N_Adult*	*N_Child*	*E_2L1S*	*E_2L2S*	*E_3L*	*I_SEmpl*	*I_Pens*	*I_STrans*	*MS_S*	*MS_M&CU*	*MS_Wid*	*MS_Div*	*Gender*	*A_25-39*	*A_40-54*	*A_55+*
AT				H																
BE				H																
CY				H																
DE				H					H											
EE				H																
ES				H					H											
FI				H				H												H
FR				H					H											H
IE				H					H											
IT				H					H											
LU				H					H											
MT				H																
NL				H																
PT				H					H											
SI				H																
SK																				

Notes: variables named as in the section 'Data and Methodology'; the fields shaded in grey mean that the discerned cause of information inconsistency is a false self-assessment of risk aversion; the fields shaded in black mean that the discerned cause of information inconsistency is inappropriate decisions about financial asset allocation; (H) signifies the level of a characteristic at which the cause of information inconsistency is the clearest.

Recognition of households whose self-assessed risk aversion raises objections, in practice, gives grounds for focusing the re-examination on the declared attitude. In the case of false declarations, such households can be considered risk-tolerant and offered financial assets from classes other than safe. It is noteworthy that the identification of households potentially affected by underestimation of own risk attitude reveals the imprecision of the single question method as well, i.e., its limitations if applied to households of the indicated characteristics.

The need for re-examination primarily targeted to the adequacy of risky assets holdings, with an assessment of households' knowledge about characteristics of and risks related to financial assets and their investment experience, was recognised in 11 countries. It refers to households that could be potentially affected by overexposure to financial risk. In their case, the most recurring characteristics in the euro area were the responding person's age from the highest range and income from pensions, signalling that the problem of inadequacy of assets could be related to senior households (Table 2). The significance of the first characteristic was confirmed in Cyprus, Finland, France, Ireland, the Netherlands, and Portugal, while the second—in Austria and Italy. As already explained, current literature addresses the problem of misallocation of assets among seniors, indicating as its cause the deficit of financial literacy and cognitive abilities [87,88]. The characteristics we recognise are reflected in the results of the study by Marinelli, Mazzoli and Palmucci [12], which confirms the positive effect of age on the occurrence of the gap between subjective and objective risk tolerance due to the overexposure to financial risks. Our findings are partly in line with the research results of Chang, De Vaney and Chiremba [15], which also signal the positive effect of age on objective risk tolerance. It should be added that the profile of Austrian households was supplemented with incomes derived from social transfers, while those of Finnish with a set of characteristics related to the respondents' secondary level of education (most of all the upper one), as well as a large number of adult members of a household. The significance of the last feature is signaled in the EU regulations [10] and previous studies, indicating the difficulties in

choosing the assets adequate to risk tolerance of all adult members of a large household [9,66]. In Spain, an incorrect selection of assets was signalled concerning the households represented by people aged from 40 to 54. Its intensification at this stage of life could result from the increased investment activities, described in the existing theory and empirical findings [90,91]. In Slovakia, in turn, the characteristic indicating the need to focus re-examination on the issue of asset selection was the divorced status of a responding person, *ceteris paribus*. This can be explained by the findings of Chang, DeVaney and Chiremba [15] showing that divorced singles may participate in assets that reflect their previous status as part of a couple.

Referring the results to the sphere of practice, one can conclude that the recognised inadequacy of participation in risky assets provides the basis for offering retail clients the asset switching or rebalancing portfolios under management by professionals.

6. Conclusions

The study allowed us to recognise the risk-averse but risk-taking households in 16 euro area countries. Particular socio-demographics and socio-economics distinguished them from consistent households, i.e., risk-averse and risk-free. Some of these characteristics were found statistically significant within larger groups of countries, causing the problem of information inconsistency to partly take an international dimension. It should be emphasised, however, that in every country, the profile of households analysed was complemented by characteristics of significance shaped at the domestic level.

The results of our study can be considered important for the sustainable development of financial institutions providing to retail clients the investment products, and advisory and portfolio management services under the new regulatory environment of MiFID II and MiFIR. They can be useful, among others, for entities operating cross-border, since we recognise the similarities in the profiles of households providing inconsistent information within the subsets of countries. Heterogeneity of the profiles of risk-averse but risk-taking households across the euro area indicates the need for shaping the consumer protection regulations to some extent at the domestic level, to take into account the specificities of particular populations.

Our study has identified certain socio-demographics and socio-economics that predispose households to declare untrue risk aversion or make wrong asset allocation decisions at the country level. Therefore, the results gave the basis to propose the orientation of re-examination towards particular scopes of survey information. The identification of household profiles having difficulties with self-assessment of risk attitude based on the single question self-classification indicates the limitations of this method. We identified the type of households regarding which its results should be applied with utmost caution in each country. In turn, the possible inadequacy of having risky assets was signalled in 11 countries, and related, among others, to senior households. In every country, the profile of households covered by targeted re-examination was supplemented by characteristics of domestic importance. This leads to conclusions that the approach to targeted re-examination should be individualised within the countries.

The presented research has two limitations that should be kept in mind when interpreting the results. Analysing the problem of information inconsistency, we rely on the fact that households participate in risky assets instead of on their amounts. This is due to the limited availability of appropriate data for households in selected countries. However, since we focus solely on risk-averse respondents, i.e., the most conservative ones regarding their risk attitude, we can expect them to be risk-free. The second limitation has to do with the factors omitted by us, which are also presented in the literature as determinants of households' risk attitudes and risk behaviour, such as psychological traits. This also stems from their unavailability in the database. Moreover, we were primarily interested in applying the households' characteristics which are readily available for practitioners and thus could facilitate the identification of potential providers of inconsistent information. It is worth noting that there is no alternative database to the HFCS, which would allow us to take up the discussed issue for such a large group of euro area countries.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Summary statistics for independent variables—stage 1 of the study.

Variable	Country							
	AT	**BE**	**CY**	**DE**	**EE**	**ES**	**FI**	**FR**
				%				
Educ_1L	0.45	9.55	24.15	1.62	2.60	38.28	1.68	16.37
Educ_2L1S	14.07	16.96	7.31	9.56	13.90	15.44	25.13	13.58
Educ_2L2S	65.02	33.33	42.62	57.79	49.51	17.61	39.99	41.23
Educ_3L	20.46	40.16	25.93	31.03	33.99	28.66	33.19	28.82
I_Empl	57.76	57.49	65.29	63.39	68.97	62.16	66.15	60.24
I_SEmpl	13.23	9.57	16.41	12.72	4.89	14.87	14.65	7.93
I_Pens	46.24	36.40	32.28	36.65	51.41	39.61	43.80	41.87
I_STrans	30.02	41.04	30.47	38.33	34.20	25.53	55.29	47.61
MS_S	22.08	18.43	13.83	26.93	29.26	14.13	37.74	29.93
MS_M&CU	50.13	52.35	64.11	47.99	38.28	62.42	36.87	45.32
MS_Wid	12.04	14.77	11.17	10.84	16.80	14.80	9.44	12.38
MS_Div	15.75	14.45	10.90	14.23	15.65	8.65	15.94	12.38
Gender (Men)	63.32	62.11	58.27	64.04	50.43	68.72	56.86	58.72
A < 25	3.37	0.64	0.10	4.02	3.67	0.35	6.07	3.75
A_25–39	19.42	22.02	26.02	21.81	24.57	22.49	22.98	21.57
A_40–54	28.04	28.64	34.44	28.98	27.35	32.00	25.21	27.62
A_55+	49.17	48.70	39,44	45.20	44.42	45.16	45.74	47.07
				Averages				
TGI	43,667.93	51,744.16	30,312.60	48,205.63	17,027.73	31,866.33	50,015.19	37,552.46
N_Adult	1.72	1.71	1.95	1.64	1.74	2.02	1.58	1.65
N_Child	0.42	0.62	0.81	0.38	0.51	0.61	0.46	0.57
	IE	**IT**	**LU**	**MT**	**NL**	**PT**	**SK**	**SI**
				%				
Educ_1L	14.07	23.23	20.50	22.16	3.24	53.03	1.12	4.95
Educ_2L1S	17.28	28.87	9.48	33.55	24.82	16.47	11.42	17.23
Educ_2L2S	34.68	34.47	38.36	26.67	36.00	13.54	67.96	56.30
Educ_3L	33.97	13.43	31.66	17.62	35.94	16.96	19.50	21.52
I_Empl	63.73	54.20	71.61	62.27	65.25	60.86	64.44	57.23
I_SEmpl	18.68	15.88	8.14	17.29	14.86	15,93	17.65	10.83
I_Pens	33.18	47.62	34.58	43.39	36.28	46.77	48.80	52.63
I_STrans	59.67	5.57	36.10	40.57	59.97	27.46	40.59	28.81
MS_S	27.90	17.24	27.17	16.32	34.08	14.98	12.02	17.34
MS_M&CU	54.60	56.34	49.57	64.27	46.66	60.33	59.22	59.01
MS_Wid	8.59	16.83	9.61	11.68	7.77	15.36	15.95	17.62
MS_Div	8.91	9.59	13.64	7.73	11.49	9.33	12.81	6.04
Gender (Men)	58.80	64.63	67.12	72.69	61.84	59.44	64.08	56.47
Age < 25	1.99	0.51	1.79	1.18	0.60	0.74	0.62	1.21
A_25–39	29.71	14.49	26.20	21.20	24.48	20.97	20.89	17.82
A_40–54	31.02	31.83	32.98	28.55	29.20	30.51	33.02	29.26
A_55+	37.28	53.17	39.03	49.07	45.72	47.78	45.48	51.71
				Averages				
TGI	54,644.09	33,373.89	86,778.41	27,670.56	50,430.71	21,555.82	15,297.52	19,858.43
N_Adult	1.88	1.91	1.78	2.01	1.64	2.00	2.10	1.91
N_Child	0.84	0.55	0.63	0.60	0.55	0.61	0.71	0.61

Notes: *TGI*—total gross income of a household. Source: The authors' own calculations.

Table A2. Summary statistics for independent variables—stage 2 of the study.

Variable	Country							
	AT	**BE**	**CY**	**DE**	**EE**	**ES**	**FI**	**FR**
				%				
Educ_1L	0.73	11.96	26.56	2.22	3.22	40.88	1.42	18.25
Educ_2L1S	18.77	19.53	8.12	12.03	15.52	15.55	30.15	14.38
Educ_2L2S	64.24	35.34	42.24	60.78	50.82	17.59	41.30	41.96
Educ_3L	16.26	33.18	23.08	24.97	30.44	25.99	27.13	25.40
I_Empl	48.63	53.47	63.72	58.57	61.83	60.92	60.26	57.87
I_SEmpl	10.57	7.05	16.15	9.46	4.07	13.57	13.50	7.18
I_Pens	58.21	39.11	32.30	42.68	60.20	41.22	49.47	44.93
I_STrans	29.05	41.65	30.36	37.94	30.18	26.06	54.84	47.59
MS_S	19.50	18.14	13.57	21.93	23.18	13.86	34.80	28.81
MS_M&CU	45.96	48.59	63.55	49.16	38.86	61.61	36.07	44.47
MS_Wid	16.58	16.83	11.81	13.43	20.82	15.68	11.33	13.78
MS_Div	17.95	16.43	11.07	15.48	17.14	8.85	17.80	12.93
Gender (Men)	57.21	58.35	57.05	60.57	46.04	67.79	52.93	57.16
A < 25	2.68	0.62	0.08	3.40	2.52	0.36	5.67	3.28
A_25–39	13.55	20.41	24.05	18.46	17.13	22.34	19.32	20.01
A_40–54	24.43	27.24	35.06	27.27	26.62	31.07	23.64	26.94
A_55+	59.34	51.73	40.80	50.86	53.73	46.23	51.37	49.77
				Averages				
TGI	38,586.49	46,238.90	28,813.69	40,705.45	13,903.49	29,127.54	43,700.65	35,172.24
N_Adult	1.67	1.66	1.97	1.64	1.72	2.02	1.56	1.64
N_Child	0.34	0.58	0.78	0.35	0.42	0.59	0.44	0.55
	IE	**IT**	**LU**	**MT**	**NL**	**PT**	**SK**	**SI**
				%				
Educ_1L	16.72	30.05	25.00	28.58	3.99	55.30	1.26	6.37
Educ_2L1S	19.71	31.35	11.26	38.04	29.74	16.43	13.22	18.80
Educ_2L2S	36.27	29.42	40.11	23.78	37.62	13.21	69.31	56.37
Educ_3L	27.30	9.18	23.64	9.60	28.66	15.07	16.21	18.46
I_Empl	60.18	50.44	69.11	54.33	59.74	59.55	60.05	50.49
I_SEmpl	16.56	13.11	7.29	15.14	13.08	15.04	15.31	8.73
I_Pens	37.00	53.20	38.37	49.47	41.67	48.40	52.67	57.99
I_STrans	60.47	5.43	35.08	40.98	64.05	27.62	39.95	26.93
MS_S	26.29	15.86	26.26	16.99	31.39	14.65	11.09	17.22
MS_M&CU	53.63	52.93	48.36	61.04	46.22	59.65	57.12	55.69
MS_Wid	10.20	21.39	11.74	14.85	9.30	16.26	18.41	20.46
MS_Div	9.87	9.82	13.63	7.12	13.09	9.44	13.39	6.63
Gender (Men)	56.72	60.16	63.73	70.17	56.79	58.29	62.74	55.54
Age < 25	1.92	0.33	1.61	0.90	0.48	0.65	0.58	1.15
A_25–39	27.03	13.32	24.584	16.42	22.81	20.00	19.15	14.71
A_40–54	30.05	29.17	32.29	27.99	25.85	30.29	30.22	26.93
A_55+	41.01	57.17	41.51	54.70	50.86	49.05	50.05	57.20
				Averages				
TGI	47,497.86	28,000.76	74,750.70	23,057.74	45,665.12	20,306.43	13,651.80	17,238.21
N_Adult	1.87	1.88	1.79	2.02	1.62	1.99	2.08	1.84
N_Child	0.83	0.50	0.63	0.58	0.52	0.60	0.66	0.53

Notes: *TGI*—total gross income of a household. Source: The authors' own calculations.

Table A3. Parameter estimates of logit regression model for individual countries—stage 1 of the study (dependent variable—*R _averse*).

Variable	Country							
	AT	**BE**	**CY**	**DE**	**EE**	**ES**	**FI**	**FR**
Intersept	−0.3877	2.4914	2.1675	x	0.7342	2.2638	x	1.8870
TGI_2Q	−0.3446	−0.7959	x	x	x	x	−0.3999	0.2735
TGI_3Q	−0.4560	−0.6618	−0.6920	−0.3728	x	−0.2974	−0.8151	x
TGI_4Q	−0.6921	−1.0336	−0.9770	−0.7834	−0.3266	−0.7114	−1.1198	−0.3883
TGI_5Q	−1.0198	−1.4327	−1.3664	−1.4857	−0.8618	−1.3342	−1.7248	−1.1126
I_Empl	0.3395	x	0.5423	x	−0.6589	0.2336	x	x
I_SEmpl	x	−0.5089	x	−0.3252	x	−0.3161	−0.2416	−0.1610
I_Pens	0.9159	x	x	x	x	0.3374	x	0.1813
I_STrans	0.2570	0.2541	x	x	x	0.3458	x	0.1478
N_Adult	x	0.2215	0.2586	0.3262	0.1641 [1]	0.1088 [1]	0.4224	0.1378
N_Child	x	x	x	x	−0.1042	x	0.1418	x
Educ_2L1S	x	x	x	x	x	−0.4600	0.7830	−0.5404
Educ_2L2S	−0.5065	−0.5658	−0.4456 [1]	−0.3765	x	−0.5827	0.4837	−0.7697
Educ_3L	−0.7817	−1.2253	−0.6478	−0.8554	−0.5668	−0.9550	x	−1.3481
MS_M&CU	x	x	x	0.4449	0.3745	0.2052 [1]	0.1774	x
MS_Wid	x	x	x	0.8045	0.6244 [1]	0.2817	0.4747	0.2374 [1]
MS_Div	x	0.4765	x	0.3120	0.3697 [1]	0.3047	0.3004	0.1695 [1]
A_25–39	x	x	−0.6104	0.6830	0.4951 [1]	x	0.4893	0.7789
A_40–54	0.5051	x	x	0.9226	1.0441	0.1792	0.8038	0.9539
A_55+	0.7623	x	0.3946	0.9317	1.5788	x	1.0467	0.9281
Gender	−0.3734	−0.4809	−0.3923	−0.3056	−0.3271	−0.3091	−0.3835	−0.3796
Variable	**IE**	**IT**	**LU**	**MT**	**NL**	**PT**	**SK**	**SI**
Intersept	1.7464	0.8925	1.8688	0.7887	1.2701	2.4058	1.2537	2.1290
TGI_2Q	x	−0.1740	x	−0.8383	x	x	x	x
TGI_3Q	−0.2248	−0.3031	x	−1.4938	−0.7478	−0.4115	−0.5512	x
TGI_4Q	−0.4880	−0.5108	−0.3961	−1.7184	−0.7559	−0.6519	−0.7229	−0.2943
TGI_5Q	−1.1262	−0.8242	−0.9015	−2.2892	−1.0579	−1.2766	−0.9495	−0.6702
I_Empl	x	0.3177	x	x	x	x	−0.5400	x
I_SEmpl	−0.4970	x	x	x	−0.3231 [1]	−0.3654	−0.6828	−0.3110
I_Pens	0.2865	0.3598	x	x	0.3422 [1]	0.2711	x	0.4594
I_STrans	0.2676	x	x	x	0.5545	x	x	x
N_Adult	0.1725	x	0.3212	0.5159	0.2856	x	0.3324	−0.1839
N_Child	0.0825	x	x	x	x	x	x	x
Educ_2L1S	x	−0.2875	x	x	x	−0.3630	x	−1.0209
Educ_2L2S	−0.5915	−0.6747	−0.7023	x	−0.4413 [1]	−0.6031	x	−1.0938
Educ_3L	−1.1660	−1.0291	−1.3963	−0.5924	−0.9318	−1.0890	−0.6961	−1.4455
MS_M&CU	0.2698	0.1392 [1]	x	x	x	x	x	0.2448
MS_Wid	0.4941	0.2975	0.8207	0.5936	x	x	0.7187	x
MS_Div	0.3745	x	x	x	x	x	0.4564	0.4881 [1]
A_25–39	x	x	x	x	x	1.3261	x	x
A_40–54	x	x	x	0.3218	x	1.4023	0.3101 [1]	0.2549
A_55+	0.2111 [1]	x	x	x	0.5185	1.4387	0.5990	0.3776
Gender	−0.4258	−0.3195	−0.5649	−0.2990 [1]	−0.5671	−0.4736	x	x

Notes: [1] denotes significance at the level of 0.051–0.1. Source: The authors' own calcul.ations.

Table A4. Parameter estimates of logit regression model for individual countries—stage 2 of the study (dependent variable—*R _assets*).

Variable	Country							
	AT	**BE**	**CY**	**DE**	**EE**	**ES**	**FI**	**FR**
Intersept	−2.9169	−3.2795	−2.9992	−2.9960	−5.2245	−3.3758	−3.0878	−4.0022
TGI_2Q	0.9944	0.8798	0.7549	0.5289 [2]	x [1]	0.7434	0.3519	0.6494
TGI_3Q	1.2824	1.0478	0.9141	0.8301	x	1.1636	0.6816	1.0600
TGI_4Q	1.9035	1.6981	1.1937	1.3629	0.7711	1.5707	1.0786	1.6487
TGI_5Q	2.6461	1.9135	1.6131	2.1006	1.3479	2.5583	1.4407	2.5852
I_Empl	x	x	−0.7856	−0.4274	x	−0.7550	x	x
I_SEmpl	x	x	x	x	0.7771	x	0.4949	x
I_Pens	0.6247	0.6639	x	x	x	x	0.2125	x
I_STrans	0.5615	0.3252 [2]	x	x	−0.6062	−0.2161 [2]	−0.2345	−0.2122

Table A4. *Cont.*

Variable	Country							
	AT	**BE**	**CY**	**DE**	**EE**	**ES**	**FI**	**FR**
N_Adult	−0.5260	−0.4661	x	−0.3553	x	−0.2092	0.2709	−0.2426
N_Child	x	0.2007	x	x	0.3269	x	x	−0.0685 [2]
Educ_2L1S	−1.1546	x	x	x	Ref.	0.5063	1.0341	0.4797
Educ_2L2S	−0.4529	x	x	1.2456	1.7242	0.9907	1.0667	0.4904
Educ_3L	x	0.2658 [2]	x	1.5354	2.2438	1.4262	1.3098	0.9037
MS_M&CU	x	0.3549 [2]	0.6441	x	x	−0.2927	x	x
MS_Wid	−0.8086	x	x	x	x	−0.3965	x	x
MS_Div	x	−0.5303	x	−0.5201	x	−0.5799	x	−0.2132
A_25–39	x	Ref.[3]	Ref.	−0.6298	Ref.	Ref.	x	0.7376 [2]
A_40–54	−0.5360	0.8249	0.9631	x	x	0.6700	0.1555	0.9644
A_55+	x	1.0623	0.9150	x	x	1.5214	0.4858	1.0043
Gender	x	x	x	x	x	x	x	0.2234
Variable	**IE**	**IT**	**LU**	**MT**	**NL**	**PT**	**SK**	**SI**
Intersept	−3.6318	−4.6027	−2.9229	−2.6711	−3.2135	−4.0706	−4.1166	−3.3556
TGI_2Q	x	1.4840	x	1.6362	x	x	x	0.7546
TGI_3Q	0.5968	2.2040	x	2.2453	x	0.8005	x	1.5385
TGI_4Q	1.1490	3.3642	0.6570	2.9769	x	1.0847	x	1.2610
TGI_5Q	2.0575	4.1353	1.3133	3.7597	x	1.6707	x	1.8135
I_Empl	−0.3107 [2]	−0.2860	x	−0.6770	x	−0.2445 [2]	x	−0.4239
I_SEmpl	0.2738	x	0.4902	x	x	0.3156	1.9934	x
I_Pens	x	0.6000	x	x	x	x	x	x
I_STrans	−0.3788	x	−0.3956	x	−9.4554	−0.4911	x	x
N_Adult	x	−0.4624	−0.2648	−0.6790	x	x	x	x
N_Child	x	x	x	−0.3736	x	x	−0.3973	x
Educ_2L1S	x	x	1.6494	x	x	0.3946	Ref.	x
Educ_2L2S	0.7182	0.2496	1.4188	x	0.9023	0.8009	x	x
Educ_3L	1.1823	0.4761	1.9743	x	0.9813	0.9462	0.7876	0.8182
MS_M&CU	x	x	x	x	x	x	0.8786	x
MS_Wid	x	x	x	x	x	x	x	0.5472
MS_Div	x	x	x	x	x	x	0.8492	x
A_25–39	−0.6582	x	−1.6315	x	Ref.	x	x	Ref.
A_40–54	x	x	−0.7804	x	x	x	x	x
A_55+	0.4274	x	x	0.7599	0.9615	0.4544	x	x
Gender	0.4155	x	0.4273	0.6578	x	x	x	x

Notes: [1] denotes significance at level 0.011–0.05; [2] denotes significance at the level of 0.051–0.1; [3] Reference variable, lack of observations in the HFCS database for a lower range of a feature. Source: The authors' own calculations.

Table A5. Jaccard distance matrix.

	AT	**BE**	**CY**	**DE**	**EE**	**ES**	**FI**	**FR**	**IE**	**IT**	**LU**	**MT**	**NL**	**PT**	**SI**	**SK**
AT	0.00	0.50	0.70	0.55	0.92	0.67	0.79	0.67	0.93	0.60	0.85	0.73	1.00	0.92	0.91	0.82
BE	0.50	0.00	0.50	0.62	0.77	0.50	0.54	0.63	0.79	0.55	0.79	0.67	0.86	0.78	0.87	0.89
CY	0.70	0.50	0.00	0.70	0.90	0.56	0.60	0.69	0.80	0.78	0.91	0.62	0.86	0.78	0.87	0.89
DE	0.55	0.62	0.70	0.00	0.73	0.55	0.79	0.46	0.75	0.44	0.75	0.73	0.78	0.83	0.67	0.82
EE	0.92	0.77	0.90	0.73	0.00	0.83	0.75	0.88	0.56	0.67	0.56	0.91	0.71	0.67	0.57	0.62
ES	0.67	0.50	0.56	0.55	0.83	0.00	0.45	0.46	0.75	0.60	0.64	0.60	0.78	0.60	0.80	0.92
FI	0.79	0.54	0.60	0.79	0.75	0.45	0.00	0.69	0.67	0.64	0.67	0.75	0.80	0.50	0.82	0.83
FR	0.67	0.63	0.69	0.46	0.88	0.46	0.69	0.00	0.73	0.71	0.64	0.50	0.85	0.71	0.77	0.87
IE	0.93	0.79	0.80	0.75	0.56	0.75	0.67	0.73	0.00	0.70	0.60	0.70	0.57	0.38	0.78	0.80
IT	0.60	0.55	0.78	0.44	0.67	0.60	0.64	0.71	0.70	0.00	0.70	0.67	0.71	0.80	0.75	0.90
LU	0.85	0.79	0.91	0.75	0.56	0.64	0.67	0.64	0.60	0.70	0.00	0.70	0.89	0.56	0.63	0.80
MT	0.73	0.67	0.62	0.73	0.91	0.60	0.75	0.50	0.70	0.67	0.70	0.00	0.87	0.80	0.89	1.00
NL	1.00	0.86	0.86	0.78	0.71	0.78	0.80	0.85	0.57	0.71	0.89	0.87	0.00	0.71	0.83	0.86
PT	0.92	0.78	0.78	0.83	0.67	0.60	0.50	0.71	0.38	0.80	0.56	0.80	0.71	0.00	0.75	0.78
SI	0.91	0.87	0.87	0.67	0.57	0.80	0.82	0.77	0.78	0.75	0.63	0.89	0.83	0.75	0.00	0.87
SK	0.82	0.89	0.89	0.82	0.62	0.92	0.83	0.87	0.80	0.90	0.80	1.00	0.86	0.78	0.87	0.00

Source: The authors' own calculations.

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Financial Knowledge, Confidence, and Sustainable Financial Behavior

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Abstract: This paper analyzes the effect of financial knowledge and confidence in shaping individual investment choices, sustainable debt behavior, and preferences for socially and environmentally responsible financial companies. Exploiting data from the "Italian Literacy and Financial Competence Survey" (IACOFI) carried out by the Bank of Italy in early 2020, we address potential endogeneity concerns in order to investigate the causal effect of objective financial knowledge on individual financial behaviors. To this aim, we perform endogenous probit regressions, using the respondent's long-term planning attitude, the use of information and communication technology devices, and the financial knowledge of peers as additional instrumental variables. Our main empirical findings show that objective financial knowledge exerts a positive and significant effect on financial market participation and preferences for ethical financial companies. Moreover, we provide strong empirical evidence about the role of confidence biases on individual financial behaviors. In particular, overconfident individuals display a higher probability of making financial investments, experiencing losses due to investment fraud, and being over-indebted. Conversely, underconfident individuals exhibit suboptimal investment choices, but are less likely to engage in risky financial behaviors.

Keywords: financial knowledge; overconfidence; underconfidence; sustainable financial behavior; financial market participation; investment fraud; over-indebtedness; ethical financial companies

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1. Introduction and Motivation

The literature has provided strong evidence that higher levels of financial knowledge are associated with more sustainable financial behaviors and higher levels of financial health [1–6]. As observed by van Raaij [7], responsible financial behaviors improve personal financial well-being: individuals with responsible financial behavior are less likely to have financial problems, such as over-indebtedness, financial anxiety, and fragility, and to be exposed to investment fraud. Financial behaviors performed in a responsible and sustainable way entail taking controllable and calculated risks, retaining a sufficient part of income for unforeseen expenditures, preventing excessive debt accumulation, engaging in financial planning activities, avoiding impulsive decisions and purchases, and seeking financial advice when one's own competencies are insufficient.

Financial knowledge significantly contributes to improving individuals' economic performance, with beneficial effects on their well-being and, as a consequence, on the well-being of the society at large [1]. In fact, people with lower levels of financial knowledge engage in high-cost transactions, incur higher fees and high-cost borrowing [4], and are characterized by greater financial fragility and less ability to manage unexpected financial difficulties [5]. Individuals who are more financially literate are more willing to seek professional financial advice or counselling than people who are less financially literate [8] and are better able to detect financial fraud [9]. Furthermore, they also have high awareness of the potential financial losses or gains derived from suboptimal financial decisions and thus are more willing to seek financial advice [10]. As demonstrated by van Rooij et al. [11], financial literacy could improve wealth accumulation and saving plans, being positively

related to the likelihood of investing in the stock market. Long-term financial planning capabilities also affect retirement planning behavior, which is associated with better retirement security [12,13]. Lusardi and Tufano [4] also emphasize the significant role of knowledge of the concepts related to debt (i.e., debt literacy) and financial experiences in reducing over-indebtedness.

A further aspect, still scarcely explored in the literature, is the link between financial knowledge and socially responsible investments. Financial literacy and environmental knowledge (i.e., eco-literacy) are generally considered factors that increase preferences for ethical financial companies, which in turn play a key role in promoting sustainable investments [14]. As discussed in Phillips and Johnson [15], a lack of knowledge of the social investment market and inadequate financial literacy represent significant barriers to participation in socially responsible investments. Gutsche and Zwergel [16] point out that basic knowledge and trust in providers of socially responsible investment products are required to overcome at least some of the barriers that limit this kind of investment. Moreover, they find that eco-labelling schemes (especially sustainability certificates) contribute to decreasing information costs for individual investors, encouraging their participation in socially responsible investments. However, Gutsche et al. [17] show that financially literate individuals in Japan, despite being more aware of sustainable investments and having lower participation costs, tend to shun sustainable financial products, possibly to avoid limited risk diversification and restricted investment opportunities related to sustainable investment strategies (e.g., negative screening). In this respect, Rossi et al. [18] also show that individuals who perceive themselves as very knowledgeable in financial matters tend to allocate much lower amounts to socially responsible investments; conversely, individuals who have more objective financial knowledge are significantly more likely to participate in social investments.

Besides objective financial knowledge, self-assessed financial knowledge provides a measure of confidence in one's own financial capabilities and is generally considered an important element for understanding individual financial behavior [10,19]. However, several authors have highlighted that individuals tend to misjudge their skills, incurring cognitive biases. Over- and underestimation of one's actual performance, as well as over- and underplacement of one's own performance relative to others, lead to overconfidence and underconfidence biases, respectively [20]. Recent studies have focused on confidence biases in the self-assessment of financial competencies, showing that individuals tend to misjudge their financial skills. The misperception of one's own financial competences and skills may entail negative consequences for financial behavior and decision-making, which affect individual financial well-being in the short- and medium-long term [21]. Specifically, overconfident individuals present a higher likelihood of having carried out some retirement planning, but they do not demonstrate actual retirement preparedness [22]. The condition of overconfidence is associated with various risky behaviors that can have detrimental effects on financial health [23]. A higher self-perception of financial literacy results in a lower propensity to seek financial advice and leads to riskier financial behavior [24–26]. Moreover, overconfident individuals are found to be more likely to experience losses due to investments, or to suffer fraud through unauthorized use of payment cards [27]. Coherently, underconfidence bias leads to investment choices that are not value-maximizing [28] and has a significant negative impact on wealth accumulation and on stock market participation [11,29]. Perceived financial knowledge is relevant for information-searching behavior with regard to socially responsible investments and affects the manner in which consumers make investment decisions [15].

Previous literature has also pointed out the existence of significant gender gaps in financial knowledge and self-confidence. Both financial literacy and confidence matter for financial decision making and, as demonstrated by Bucher-Koenen et al. [30], much of the gender gap in financial knowledge can be attributed to differences in confidence and the remainder to true knowledge differences. Accordingly, Aristei and Gallo [31] provide

international evidence that women are less likely than men to overestimate their financial skills but tend instead to underestimate their actual financial competencies.

Our work aims at contributing to the literature by providing new insights into the role of financial knowledge and confidence in shaping individual financial behaviors. Using microdata from the "Italian Literacy and Financial Competence Survey" (IACOFI) and addressing potential endogeneity issues, we assess the effects of objective financial knowledge and of confidence biases in the self-assessment of one's own competencies on financial market participation and sustainable financial behaviors. More specifically, following previous literature, we focus on the individual propensity to invest in financial assets, to be exposed to investment fraud, and to engage in unsustainable debt behavior. Furthermore, we assess respondents' preferences for socially and environmentally responsible companies as a proxy for individual attitudes towards sustainable investments.

Based on the above considerations, we posit our first two research hypotheses:

Hypothesis 1 (H1). *Financial knowledge exerts a positive effect on financial market participation, contributes to limit hazardous and unsustainable financial behaviors, and increases preferences for socially and environmental responsible financial companies.*

Hypothesis 2 (H2). *Controlling for the actual level of financial knowledge, confidence biases affect individual financial behaviors and play a crucial role in sustainable debt behaviors.*

We further explore the role of misperception of one's own financial competencies on financial behaviors and test the following two additional hypotheses:

Hypothesis 3a (H3a). *Overconfident individuals are characterized by higher financial market participation but tend to engage in riskier and less sustainable financial behaviors.*

Hypothesis 3b (H3b). *Underconfident individuals show suboptimal investment choices and more passive investment patterns but are less likely to make hazardous financial choices.*

The remainder of the paper is organized as follows. Section 2 describes the data and the main variables used for the analysis. Section 3 illustrates the econometric methods, while the empirical results are presented and discussed in Section 4. Finally, Section 5 draws conclusions and discusses policy implications.

2. Data and Measurement

2.1. Data

We use data from the 2020 "Italian Literacy and Financial Competence Survey" (IACOFI), carried out by the Bank of Italy between January and February 2020 on a stratified sample (by gender, age, and area of residence) of approximately 2000 adult individuals between 18 and 79 years old. This survey provides detailed information on respondents' financial knowledge, behavior, and attitudes, based on the harmonized methodology defined by the OECD International Network on Financial Education (OECD/INFE) [32,33], together with their socio-demographic and economic characteristics.

2.2. Financial Behaviors

In our empirical analysis, we focus on different dimensions of individual financial behavior that are commonly considered in the literature. First, as in most previous studies [11,13,19,29,34–37], we focus on individual portfolio choices and consider the decision to invest in financial assets. In particular, we define a binary indicator (*Financial investment*) that equals 1 if the respondent, in the last two years, has invested in stocks and shares, public and private bonds, mutual and pension plans, cryptocurrencies, or initial coin offerings (ICOs). From Table 1, which presents descriptive statistics for all the variables considered in the empirical analysis, we notice that only 9.3% of the respondents have invested in

financial products during the last two years, confirming the low levels of financial market participation in Italy [38–40].

Table 1. Descriptive statistics.

Variable	Observations	Mean
(a) Dependent variables		
Financial investment	2036	0.093
Investment fraud	2036	0.048
Over-indebted	2036	0.081
ESR attitude	2036	0.241
(b) Explanatory variables		
(b1) Financial knowledge and confidence		
Objective FK	2036	3.924
Subjective FK	1910	2.200
Overconfident	1910	0.145
Underconfident	1910	0.303
(b2) Other individual characteristics		
Female	2036	0.518
Age	2036	51.13
Self-employed	2036	0.114
Employee	2036	0.387
Retired	2036	0.272
Budget decision maker	2036	0.441
Married	2036	0.528
Tertiary education	2036	0.198
Upper secondary education	2036	0.425
Household size	2036	2.618
Any young children	2036	0.200
Homeowner with mortgage	2036	0.661
Homeowner without mortgage	2036	0.101
Income: 1060–1549 euro	2036	0.323
Income: 1550–2454 euro	2036	0.311
Income: >2454 euro	2036	0.240
Risk averse	2036	0.616

Notes: The table reports average values of all the dependent and explanatory variables, computed using sample weights. Source: Own elaboration on data from the Bank of Italy.

We then account for the respondent's propensity to engage in risky and unsustainable financial behaviors. To this aim, as in Di Salvatore et al. [27], we first define the dummy variable *Investment fraud*, which is equal to one if the individual accepted advice to invest in a financial product that was later found to be a scam. Furthermore, following Lusardi and Tufano [4] and Kurowski [41], we consider a self-reported measure of over-indebtedness and identify those individuals who declare to have too much debt at the time of the interview as over-indebted (*Over-indebted*). Table 1 shows that 4.8% of the respondents have been victims of financial scams, while more than 8% perceive themselves as excessively indebted.

Finally, we focus on respondents' stated preferences towards ethical financial companies, which provide a proxy for individuals' awareness of socially responsible investments and potential demand for sustainable financial products [16,18,42]. We thus define a dichotomous variable (*ESR attitude*) identifying respondents who report preferring dealing with financial companies that have a strong ethical stance (e.g., investing in renewable energies, excluding investments in businesses perceived to have negative social and environmental effects, etc.). In our sample, about one-quarter of the individuals (24.1%) report to prefer maintaining relationships with ethical financial companies.

Complete variable definitions are reported in Table A1 in the Appendix A.

2.3. Objective and subjective financial knowledge

As in most empirical studies (see e.g., [43,44]), we measure individual objective financial knowledge (*Objective FK*) as the number of correct answers to the seven financial knowledge questions defined by the OECD/INFE harmonized methodology and included in the IACOFI questionnaire. Financial knowledge questions are related to the time value of money, interest paid on a loan, interest plus principal, compound interest, risk and return, inflation, and risk diversification [32,33]. Furthermore, in line with Allgood and Walstad [10] and Pikulina et al. [28], we also consider self-assessed financial knowledge (*Subjective FK*), measured on an ordinal scale with five possible values: Very low (1), quite low (2), about average (3), quite high (4), and very high (5), as a proxy for the respondent's perception of her/his own financial competencies. As can be noted from Table 1, Italian adults are characterized by average objective and subjective financial knowledge scores equal to 3.92 and 2.12, respectively. Additional descriptive information on objective and subjective financial knowledge (as well as on financial behaviors) disaggregated by individual and household characteristics are presented in Table A2 in the Appendix A.

Once objective and subjective knowledge measures have been defined, in order to assess confidence biases in the self-assessment of one's own financial competencies, we consider the mismatch between actual and self-reported financial knowledge. Specifically, in line with Allgood and Walstad [10] and Xia et al. [29], we define a binary variable (*Overconfident*) that identifies as overconfident those individuals ranked below the sample mean of the objective financial knowledge score (equal to 3.924), but whose self-reported financial knowledge is above the sample mean (equal to 2.200). Accordingly, the binary indicator *Underconfident* defines as underconfident those respondents with an objective financial knowledge score higher than the mean, but whose self-reported financial knowledge is lower than the mean. Figure 1 shows the joint and marginal distributions of objective and subjective financial knowledge and highlights the incidence of overconfidence and underconfidence biases. We notice that only 55.2% of the respondents correctly assess their financial capabilities: less knowledgeable people who correctly recognize their financial illiteracy represent 24.9% of the sample, while those with higher-than-average levels of both objective and subjective knowledge are 30.3%. Conversely, 44.8% of the respondents are affected by confidence biases in the self-assessment of their own financial competencies: 14.5% of the respondents overestimate their financial abilities, while 30.3% of them understate their actual knowledge.

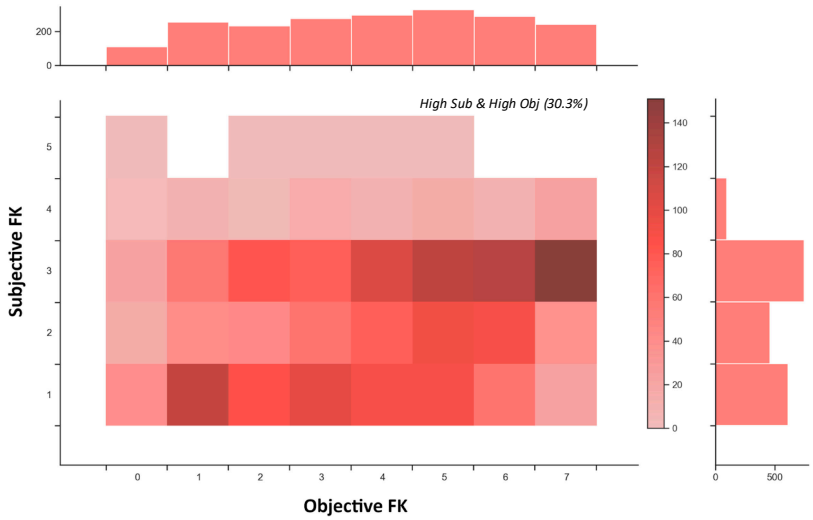

Figure 1. Joint and marginal distributions of objective and subjective financial knowledge. Source: Own elaboration on data from the Bank of Italy.

Table 2 reports the observed proportions and the unconditional differences in the proportions of the financial behavior indicators for the subsamples of individuals with

objective financial knowledge below and above the average (panel *(a)*). The proportion of individuals who have invested in financial assets in the last two years is significantly higher, by 5.5 percentage points, in the high financial knowledge group. At the same time, more financially knowledgeable respondents are, on average, 3.0 and 3.5% less likely to have fallen victim of investment scams and to be over-indebted than individuals in the low knowledge group, respectively. Furthermore, higher levels of knowledge are associated with a greater preference for ethical financial companies: the proportion of individuals declaring to prefer to use financial companies that have a strong ethical stance is 13.7% higher in the high knowledge group than in the group of less knowledgeable individuals. These results provide preliminary evidence about the crucial role exerted by financial knowledge in shaping individuals' responsible and sustainable financial behavior.

Table 2. Financial behaviors, financial knowledge, and confidence.

		(a) Whole sample (N = 2036)	
Variable	**Objective FK below the mean**	**Objective FK above the mean**	**Difference**
Financial investment	0.030	0.085	0.055 ***
Investment fraud	0.071	0.030	−0.040 ***
Over-indebted	0.111	0.076	−0.035 ***
ESR attitude	0.162	0.299	0.137 ***
	(b) Sub-sample of respondents with a lower-than-average objective FK (N = 780)		
Variable	**Subjective FK below the mean**	**Subjective FK above the mean (*Overconfident*)**	**Difference**
Financial investment	0.012	0.069	0.057 ***
Investment fraud	0.035	0.138	0.103 ***
Over-indebted	0.081	0.171	0.090 ***
ESR attitude	0.091	0.287	0.196 ***
	(c) Sub-sample of respondents with a higher-than-average objective FK (N = 1032)		
Variable	**Subjective FK below the mean (*Underconfident*)**	**Subjective FK above the mean**	**Difference**
Financial investment	0.041	0.131	−0.090 ***
Investment fraud	0.013	0.047	−0.035 ***
Over-indebted	0.073	0.079	−0.005
ESR attitude	0.222	0.382	−0.160 ***

Notes: The table reports average values and (unconditional) differences in the proportions of the outcome variables between the subsamples of individuals with an objective financial knowledge below and above the average value (equal to 3.92) (panel *(a)*), the subsamples of individuals with a subjective financial knowledge below and above the average value (equal to 2.20), conditional on being below (panel *(b)*) and above (panel *(c)*) the average value of the objective financial knowledge score. ***, **, and * denote the significance of the differences in proportions at 1, 5, and 10% levels, respectively. Source: Own elaboration on data from the Bank of Italy.

From panel *(b)* of Table 2, we notice that overconfident individuals who incorrectly self-report higher-than-average knowledge are not only 5.7% more likely to have invested in financial assets but are also 10.3 and 9% more likely to have fallen victim to investment scams and to be over-indebted than respondents who properly assess their low financial knowledge, respectively. This evidence highlights the higher financial market participation of overconfident individuals, but also their higher propensity to engage in risky and unsustainable financial behaviors, as documented in Calcagno and Monticone [8], Kramer [26], Xia et al. [29], and Bannier and Neubert [45]. Furthermore, panel *(c)* of Table 2 shows that underconfident individuals who understate their high financial knowledge are 9% less likely to invest in financial assets than those who correctly consider themselves as more knowledgeable than the average. At the same time, they are also characterized by a 3.5% lower vulnerability to investment fraud. This preliminary evidence suggests that

underconfidence is associated with more passive investment behavior, which may have harmful effects on financial planning and wealth accumulation [11,28], but also with a greater tendency to engage in more sustainable investment decisions.

2.4. Individual Characteristics

To properly assess the effects of financial knowledge and confidence biases on individual financial behaviors, and mitigate omitted variable bias as much as possible, we control for a large set of individual socio-demographic characteristics (gender, age (included as a linear and quadratic term), educational attainment, working and marital status, and variables related to the household's composition (size and presence of young children) and economic conditions (net monthly disposable income and homeownership). We also include a dummy identifying risk-averse individuals, as previous studies have highlighted the significant role of risk preferences on individual financial behaviors [11,29,43]. Furthermore, we control for homeownership with and without a mortgage and include a dummy variable indicating whether the individual is responsible for the household's budget; these proxies allow us to partly account for the role of financial and debt experience in affecting financial behaviors and knowledge [4]. Finally, we consider a set of dummies to control for the area of residence and municipality size. Summary statistics for all the explanatory variables considered are reported in Table 1.

3. Methods

We first consider a baseline standard probit regression of the binary indicators of individual financial behaviors discussed in Section 2.2 on the number of correct responses to financial knowledge questions (*Objective FK*), controlling for a large set of other individual observable characteristics. Formally:

$$Y_i = \mathbf{1}\left(\gamma Objective\ FK_i + \boldsymbol{x}_i'\boldsymbol{\beta} + \varepsilon_i > 0\right) \tag{1}$$

where $\mathbf{1}(\cdot)$ is an indicator function (equal to 1 if the expression in parentheses is true and 0 otherwise), Y_i represents different financial behaviors (i.e., *Financial investment*, *Investment fraud*, *Over-indebted*, *ESR attitude*), $\boldsymbol{x}_i$ is a vector of covariates, $\boldsymbol{\beta}$ is the corresponding parameter vector, and errors ε_i are assumed to follow a standard normal distribution.

Previous literature [43,44,46] has emphasized that an individual's objective financial knowledge may be endogenously determined with respect to her/his financial behavior. Endogeneity of financial knowledge may be due to an omitted variable bias stemming from the existence of unobservable factors that simultaneously influence individual financial behaviors and financial knowledge [26,47]. At the same time, endogeneity may be due to a reverse causation channel, as financial knowledge may be affected by the experience gained from previous financial decisions and by individuals' efforts to improve their own financial competencies to better manage their investments [13,48,49]. Furthermore, test-based measures of financial knowledge may not allow to properly measure "true" financial knowledge, and this measurement error may give rise to an endogeneity issue, possibly leading to downwardly biased estimates of the impact of financial knowledge [11,12]. All these potential endogeneity concerns should be properly taken into account to allow for a causal interpretation of the effect of financial knowledge on financial behavior. Following Klapper et al. [2] and Fornero and Monticone [13], we extend the standard (exogenous) probit model in Equation (1) to account for the potential endogeneity of financial knowledge. To this aim, we consider a probit model with one endogenous continuous regressor, which can be formalized as the following two-equation recursive system:

$$\begin{cases} Y_i = 1\left(\gamma Objective\ FK_i + \boldsymbol{x}_i'\boldsymbol{\beta_1} + \varepsilon_i > 0\right) \\ Objective\ FK_i = \boldsymbol{x}_i'\boldsymbol{\beta_2} + \boldsymbol{z}_i'\boldsymbol{\alpha} + u_i \end{cases} \tag{2}$$

where the second equation defines a reduced-form equation for *Objective FK* (i.e., the number of correct answers to financial knowledge questions) as a linear function of the

exogenous individual-level covariates in $\boldsymbol{x}_i$ and a set of additional instrumental variables $\boldsymbol{z}_i$, assumed to directly affect an individual's financial knowledge (i.e., relevant) but not to directly impact individual financial behaviors (i.e., exogenous). The error terms ε_i and u_i in model (2) are assumed to follow a bivariate normal distribution with zero means, variances respectively equal to 1 and σ_u^2, and arbitrary correlation $\rho\sigma_u$ (i.e., $(\varepsilon_i,\ u_i)\ \sim\ BVN\left[(0,\ 0);\left(1,\ \sigma_u^2\right);\rho\sigma_u\right]$). Endogeneity of financial knowledge arises from the error correlation: when $\rho \neq 0$, then *Objective FK*$_i$ and ε_i are correlated and a standard probit of Y on *Objective FK*$_i$ and $\boldsymbol{x}_i$ will lead to inconsistent estimates of the γ and $\boldsymbol{\beta}$ parameters.

Following Pikulina et al. [28] and Xia et al. [29], we further extend the baseline model to take into account the role of confidence in one's own financial competencies. Specifically, controlling for objective financial knowledge and other individual observable characteristics, we aim to assess the impact of overconfidence and underconfidence biases on individual financial behaviors. In our empirical analysis, we thus extend model (1) and consider the following extended standard probit specification:

$$Y_i = 1\left(\gamma Objective\ FK_i + \delta Overconfident + \theta Underconfident + \boldsymbol{x}_i'\boldsymbol{\beta} + \varepsilon_i\ > 0\right) \quad (3)$$

which includes the binary indicators *Overconfident* and *Underconfident* as additional regressors. Further, in this case, differently from previous studies [28,29], we explicitly allow *Objective FK* to be endogenously determined with respect to financial behaviors and specify the following bivariate recursive system:

$$\begin{cases} Y_i = 1\left(\gamma Objective\ FK_i + \delta_1 Overconfident + \theta_1 Underconfident + \boldsymbol{x}_i'\boldsymbol{\beta_1} + \varepsilon_i > 0\right) \\ Objective\ FK_i = \delta_2 Overconfident + \theta_2 Underconfident + \boldsymbol{x}_i'\boldsymbol{\beta_2} + \boldsymbol{z}_i'\boldsymbol{\alpha} + u_i \end{cases}. \quad (4)$$

where cross-equation error correlation ρ allows us to directly assess the endogeneity of financial knowledge with respect to individual financial behaviors.

In the next Section, we present and discuss results obtained from maximum likelihood (ML) estimation of the standard and endogenous probit models for the four binary indicators of individual financial behavior and compute average marginal effects to properly gauge the magnitude of the effects of objective financial knowledge and confidence indicators, while controlling for individual-level socio-demographic characteristics.

4. Results and Discussion

4.1. Financial Market Participation

Table 3 reports average marginal effects of the regressors, estimated from both standard and endogenous probit models for the probability of having invested in financial assets during the last two years.

We first consider an empirical specification (model (a)) that focuses on the role of objective financial knowledge on financial behavior. Focusing on standard probit results (column 1 of Table 3), we notice that objective financial knowledge exerts a positive and statistically significant (at the 1% level) effect on financial market participation. In particular, an additional correct answer to the financial literacy questions increases the probability of investing in financial assets by about one percentage point. Moreover, the investment decision is positively and significantly associated with having a high disposable income and a high education level, being married, and owning a home (with a mortgage). Working status also exerts a significant effect, with self-employed, employed, and retired individuals having a significantly higher investment probability than those unemployed or not in the labor force. Conversely, household size and risk aversion significantly reduce the investment probability, while a respondent's gender and age have no effect.

Table 3. The determinants of financial investment: Average marginal effects.

	Model (a)			Model (b)		
	Probit	Endogenous Probit		Probit	Endogenous Probit	
	(1)	(2)	(3)	(4)	(5)	(6)
	Financial Investment	Financial Investment	Objective FK	Financial Investment	Financial Investment	Objective FK
Objective FK	0.0092 ***	0.1154 ***		0.0129 ***	0.0885 ***	
	(0.0025)	(0.0148)		(0.0027)	(0.0167)	
Overconfident				0.0200	0.1628 ***	−1.8903 ***
				(0.0223)	(0.0347)	(0.1828)
Underconfident				−0.0247 *	−0.1364 ***	1.5623 ***
				(0.0142)	(0.0347)	(0.1318)
Female	−0.0083	0.0209	−0.2353 **	−0.0085	0.0116	−0.2433 ***
	(0.0087)	(0.0193)	(0.1159)	(0.0090)	(0.0149)	(0.0860)
Age	−0.0001	0.0006	−0.0044	−0.0001	0.0001	0.0006
	(0.0005)	(0.0009)	(0.0047)	(0.0006)	(0.0008)	(0.0034)
Self employed	0.0600 ***	0.0426	0.1311	0.0580 ***	0.0427	0.2576
	(0.0206)	(0.0328)	(0.1795)	(0.0212)	(0.0317)	(0.2073)
Employee	0.0542 ***	0.0724 ***	−0.1446	0.0556 ***	0.0649 ***	0.0088
	(0.0156)	(0.0262)	(0.1601)	(0.0162)	(0.0229)	(0.1604)
Retired	0.0554 **	0.0620	−0.0149	0.0527 *	0.0611	0.0457
	(0.0227)	(0.0393)	(0.1606)	(0.0287)	(0.0396)	(0.1388)
Budget decision maker	0.0418 ***	−0.0355	0.6588 ***	0.0396 **	−0.0047	0.5831 ***
	(0.0141)	(0.0232)	(0.1249)	(0.0155)	(0.0154)	(0.0885)
Married	0.0395 ***	0.0556 **	−0.1184	0.0447 ***	0.0558 ***	−0.0163
	(0.0141)	(0.0216)	(0.1186)	(0.0143)	(0.0181)	(0.0839)
Tertiary education	0.0527 ***	−0.0125	0.6240 ***	0.0508 **	−0.0085	0.9276 ***
	(0.0195)	(0.0351)	(0.1552)	(0.0234)	(0.0331)	(0.1528)
Upper secondary education	0.0221	−0.0279	0.4461 ***	0.0215	−0.0211	0.5859 ***
	(0.0150)	(0.0274)	(0.1450)	(0.0176)	(0.0278)	(0.1336)
Household size	−0.0250 ***	−0.0307 ***	0.0111	−0.0279 ***	−0.0357 ***	−0.0144
	(0.0045)	(0.0114)	(0.0700)	(0.0056)	(0.0096)	(0.0617)
Any young children	0.0057	0.0059	0.0341	0.0091	0.0171	−0.0215
	(0.0187)	(0.0248)	(0.1055)	(0.0195)	(0.0261)	(0.0960)
Homeowner with mortgage	0.0397 ***	0.0521 *	−0.1009	0.0399 ***	0.0409 *	0.0753
	(0.0124)	(0.0304)	(0.2045)	(0.0128)	(0.0236)	(0.1752)
Homeowner without mortgage	0.0351	0.0931 ***	−0.5616 ***	0.0350	0.0538 *	−0.2280
	(0.0216)	(0.0332)	(0.1860)	(0.0221)	(0.0285)	(0.1608)
Income: 1060–1549 euro	0.0124	−0.0454	0.5572 ***	0.0146	−0.0025	0.2861 **
	(0.0152)	(0.0381)	(0.1644)	(0.0165)	(0.0370)	(0.1443)
Income: 1550–2454 euro	0.0252	−0.0985 **	1.2251 ***	0.0280	−0.0251	0.8547 ***
	(0.0161)	(0.0422)	(0.1814)	(0.0174)	(0.0343)	(0.1476)
Income: >2454 euro	0.0535 ***	−0.0857	1.3318 ***	0.0563 ***	0.0011	0.8844 ***
	(0.0187)	(0.0583)	(0.2592)	(0.0195)	(0.0440)	(0.2057)
Risk averse	−0.0431 ***	−0.1015 ***	0.5406 ***	−0.0407 ***	−0.0526 ***	0.0787
	(0.0100)	(0.0172)	(0.0898)	(0.0097)	(0.0170)	(0.0997)
Peer-group objective FK			0.1211			0.2114 **
			(0.0932)			(0.0857)
Long-term attitude			0.3761 ***			0.6192 ***
			(0.0914)			(0.0946)
ICT use			0.4493 **			0.6147 ***
			(0.1816)			(0.1945)
Exogeneity test ($\rho = 0$)		[0.0000]			[0.0005]	
ALN overidentification test		[0.1792]			[0.1722]	
Weak-instrument *F* test		[0.0002]			[0.0000]	
N	2036	2036		1910	1910	
Log Likelihood	−354.62	−4530.21		−343.11	−3893.89	

Notes: The table reports the average marginal effects on the probability of having invested in financial assets in the last two years, estimated from standard and endogenous probit models. Estimated average marginal effects on the number of correct answers to financial knowledge questions are also reported in columns (3) and (6). All the regressions include macro area and municipality size dummies. Robust standard errors, clustered by macro area and age class, are reported in parentheses below the estimates. The *p*-values of the exogeneity test, the Amemiya–Lee–Newey overidentification test, and the *F* test for weak instruments are reported in square brackets. ***, **, and * denote significance at 1, 5, and 10% levels, respectively. Source: Own elaboration on data from the Bank of Italy.

As discussed in Section 3, financial knowledge may be endogenous with respect to individual financial behavior, due to omitted-variable bias, reverse causality, and measurement errors, leading to biased parameter estimates. For this reason, we explicitly allow for the possibility that financial knowledge is endogenously determined and extend the standard probit approach by jointly modelling financial market participation and objective financial knowledge by means of a bivariate system of equations. Columns 2 and 3 of Table 3 report the average marginal effects on financial investment probability and on the number of correct responses to financial knowledge questions, respectively. Before commenting on the estimated effects, we discuss the identification strategy and formally test the exogeneity of financial knowledge.

Despite the difficulties in finding valid instruments for financial knowledge [13,43,50], in all the endogenous probit models we consider two types of instrumental variables related to the knowledge of the respondent's reference group and to her/his financial attitudes. The first instrumental variable (*Peer-group objective FK*) hinges on the idea that an individual's financial knowledge is influenced by the financial knowledge of her/his peer or reference group [2,11,48,51], defined as those individuals living in the same macro-area and belonging to the same age class of the respondent. The assumption behind the choice of this instrument is that the there is no "reflection problem" [52], that is the respondent cannot significantly affect the behavior of the peer. In particular, following Bucher-Koenen and Lusardi [49], we assume that individuals exposed to financially knowledgeable people become more knowledgeable themselves and that the financial knowledge of the group is beyond the control of the individual. The second set of instruments relates to the respondent's tendency to plan for the long-term (*Long-term attitude*) and to use information and communications technology (ICT) instruments (i.e., banking apps or money management tools on a computer, mobile phone, and/or tablet) to keep note of payment deadlines and track income and expenses (*ICT use*). As in Fornero and Monticone [13] and French et al. [53], the assumption is that these factors contribute to directly affecting the incentive to increase financial competencies, but they only indirectly affect financial choices through the financial knowledge channel. To assess the validity of our identification strategy, we first test the exogeneity of the additional instrumental variables by means of the Amemiya–Lee–Newey overidentification test. Results clearly indicate that the additional instruments considered are exogenous (p-value equal to 0.1792). Furthermore, results of the F test for the joint significance of the instrumental variables in the reduced-form equation of financial knowledge allow us to reject the null hypothesis that the instruments are weak at the 1% level (p-value equal to 0.0002). After having provided support for the instruments' validity, we assess the endogeneity of financial knowledge by means of a significance test of the cross-equation error correlation ρ. Results of this formal exogeneity test indicate that financial knowledge cannot be considered as exogenously determined with respect to investment choices (p-value equal to 0.0000). The endogenous probit model should thus be preferred against the standard probit, as it allows us to address the endogeneity of financial knowledge and obtain consistent parameter estimates. To further assess the appropriateness of our identification strategy and the robustness of our empirical findings, we also use linear probability models estimated using both two-stage least squares and the generated instruments method proposed by Lewbel [54]. Results of these analyses, not reported here but available upon request, confirm the validity of our identification strategy and provide estimates of the effects of financial knowledge that are in line with those obtained from endogenous probit regressions.

Column 2 of Table 3 reports the average marginal effects of the covariates on the probability of investing in financial assets estimated from the endogenous probit model. The estimated impact of financial knowledge remains positive and statistically significant at the 1% level, but the magnitude of the effect strongly increases. Specifically, when endogeneity is properly taken into account, a unit increase in the number of correct answers to financial knowledge questions raises the likelihood of participating in financial markets by about 11.5 percentage points. In this application, the marginal effect estimated by means

of the endogenous probit is thus more than 11 times larger than that estimated from the standard probit. This evidence provides support for the significant downward bias in the estimation of the impact of financial knowledge that arises when its endogenous nature is not modelled, as already pointed out in most previous empirical studies [13,46,50].

With respect to the effect of the other control variables, most of the results obtained in the standard probit remain confirmed. In particular, respondents who are married, employed, and homeowners (with and without a mortgage) are characterized by a higher probability to invest in financial assets, while financial market participation decreases with risk aversion and household size. Conversely, when the endogeneity of the financial knowledge is taken into account, income and education levels do not exert a significant impact on individual financial investment behavior.

Finally, estimated marginal effects obtained from the reduced-form equation for *Objective FK* (column 3 of Table 3) allows for assessing the main determinants of objective financial knowledge. Coherently with the findings of Bucher-Koenen et al. [30,55], Cupák et al. [56], Swiecka et al. [57], Kadoya and Khan [58], and Aristei and Gallo [59], we provide evidence of a significant gender gap in objective financial knowledge: all other things being equal, women are characterized by a number of correct answers 0.235 lower than that of men. Moreover, individuals who are responsible for the household's budget, have higher education levels and higher disposable income, and more risk averse have significantly higher objective financial knowledge, supporting the significant role of financial experience, educational attainment, and income levels in increasing financial competencies [4].

We further extend the baseline specification to account for the effect of confidence in one's own financial competencies on financial behavior. To this aim, we include the dummies *Overconfident* and *Underconfident* as additional regressors in the probit regressions (model (b)), considering as the omitted reference group those individuals who correctly assess their financial knowledge (i.e., those with high subjective and high objective knowledge and those with low subjective and low objective knowledge). It is worth remarking that, due to the 126 missing values related to subjective financial knowledge, the estimation sample is reduced to 1910 observations. Results reported in column 4 of Table 3 largely confirm the evidence obtained in the baseline standard probit. In particular, an additional correct answer to the financial knowledge questions significantly increases the probability of financial market participation by about 1.3% percentage points. At the same time, overconfidence bias does not affect investment behavior, while underconfident individuals are 2.47% less likely to invest in financial assets than those correctly assessing their financial knowledge. Furthermore, in this case, we allow for the potential endogeneity of objective knowledge by specifying an endogenous probit model, using the same identification strategy discussed above. Results reported in columns 5 and 6 of Table 3 support the validity of the additional instruments considered and confirm that financial knowledge is endogenously determined with individual investment choices. Focusing on the estimated marginal effects, a unit increase in the number of correct responses significantly raises investment probability by about 8.9 percentage points. Coherently with the evidence obtained in the baseline specification, this result confirms that the standard probit produces severely downwardly biased estimates of the impact of financial knowledge and further highlights the necessity of accounting for the endogeneity of objective knowledge with respect to individual financial behaviors. Furthermore, we provide strong empirical evidence about the role of confidence biases in affecting investment choices. In line with the results of Allgood and Walstad [10], Pikulina et al. [28], and Xia et al. [29], we find that individuals overestimating their actual financial knowledge are 16.28% more likely to invest in financial assets than similar individuals who correctly assess their competencies; at the same time, underconfident individuals have a participation probability about 13.6% lower than the reference group. Thus, taking into account the endogeneity of actual financial knowledge and controlling for other socio-demographic characteristics, we show that overconfidence bias leads to excess entry into financial markets, while underconfidence

bias makes individuals more likely to refrain from investing in financial assets. Overall, the evidence obtained suggests that overconfident individuals tend to engage in excess trading, whereas underconfident individuals inappropriately choose passive investment patterns; both of these investment behaviors may have negative consequences on financial planning and wealth accumulation [11,28].

4.2. Vulnerability to Investment Fraud

After having assessed the determinants of financial investment, we focus on financial investment behavior and analyze the role of financial knowledge and confidence on individual vulnerability to investment fraud. To this aim, we estimate standard and endogenous probit models for the probability of having invested in a financial product that later proved to be a scam, adopting the same empirical approach used in the analysis of financial market participation. Results reported in Table 4 show that financial knowledge is also endogenously determined with respect to hazardous investment choices: for both the baseline and extended specifications, exogeneity of financial knowledge is rejected at the 5% level and results of the instrument validity tests support the appropriateness of our identification strategy. Based on this evidence, in discussing estimation results, we mainly focus on the average marginal effects estimated from the endogenous probit. In particular, from column 2 of Table 4 we find that objective financial knowledge, despite having the expected sign, has no significant effect on the probability of being a victim of financial fraud. This evidence is in line with the findings of DeLiema et al. [60] who show that more financially literate and educated adults are not immune to investment fraud. At the same time, the determinants of the probability of having experienced an investment fraud are similar to those of financial market participation, suggesting that individuals who are more likely to invest in financial assets are also more exposed to financial scams, as they are more likely to be targeted by fraudsters [7].

Focusing on the extended specification (model (b)), we find that financial knowledge remains statistically insignificant, whereas confidence biases in assessing one's own financial competencies emerge as significant determinants of individual susceptibility to investment fraud. Specifically, we find that respondents who overestimate their financial knowledge are about 6% more likely to have experienced fraud than those correctly assessing their capabilities. At the same time, individuals who understate their financial competencies are 4.9% less likely to experience financial scams than the reference group. Thus, misperception of one's own financial abilities rather than actual knowledge seems to determine individual propensity to engage in hazardous financial behaviors. This evidence is in line with the findings of Di Salvatore et al. [27] and clearly points out the detrimental role of financial knowledge overconfidence on financial decision-making. As discussed in van Raaij [7] and Deevy et al. [61], individuals who are excessively confident in their actual financial capabilities are more prone to underestimate actual investment risks and this makes them particularly vulnerable to financial scams and investment fraud.

4.3. Sustainable Debt Behavior and Over-Indebtedness

Table 5 reports results the determinants of the probability of being excessively indebted. As in the previous analyses, we find that the endogenous probit model is necessary to take into account the endogeneity of objective financial knowledge and avoid biased estimates; moreover, results of overidentification and weak-instrument tests confirm, once again, the validity of our identification strategy. Analyzing the average marginal effects estimated from the baseline endogenous probit (column 2 of Table 5), we find that having low income and education levels and being risk averse significantly reduce over-indebtedness probability. Moreover, we point out that objective financial knowledge significantly increases the probability of being over-indebted: a unit increase in the number of correct answers to financial knowledge questions raises over-indebtedness probability by more than 12.7 percentage points. This evidence seems to be at odds with the findings of French and McKillop [62] and Meyll and Pauls [63], which indicate that higher levels of financial

knowledge are associated with lower debt burdens and a lower over-indebtedness probability. However, it should be kept in mind that in our analysis we consider a self-reported measure of over-indebtedness, while the above-mentioned studies consider objective measures of excessive indebtedness based on either debt-servicing ratios or arrears indicators.

Table 4. The determinants of having invested in a fraud: Average marginal effects.

	Model (a)			**Model (b)**		
	Probit	**Endogenous Probit**		**Probit**	**Endogenous Probit**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Investment Fraud	**Investment Fraud**	**Objective FK**	**Investment Fraud**	**Investment Fraud**	**Objective FK**
Objective FK	−0.0048	−0.0246		−0.0028	−0.0148	
	(0.0035)	(0.0439)		(0.0029)	(0.0159)	
Overconfident				0.0243 **	0.0605 **	−1.8915 ***
				(0.0114)	(0.0302)	(0.2379)
Underconfident				−0.0203 *	−0.0489 **	1.5608 ***
				(0.0100)	(0.0242)	(0.1417)
Female	0.0023	0.0136	−0.2178 **	−0.0012	0.0048	−0.2332 ***
	(0.0053)	(0.0181)	(0.0981)	(0.0104)	(0.0128)	(0.0777)
Age	−0.0009 ***	−0.0009 *	−0.0039	−0.0007	−0.0007	0.0009
	(0.0003)	(0.0005)	(0.0044)	(0.0005)	(0.0004)	(0.0030)
Self employed	0.0718 ***	0.0689 **	0.1331	0.0587 **	0.0499 ***	0.2586
	(0.0135)	(0.0291)	(0.1643)	(0.0230)	(0.0123)	(0.1704)
Employee	0.0524 ***	0.0745 **	−0.1414	0.0489 ***	0.0581 ***	0.0113
	(0.0155)	(0.0365)	(0.1263)	(0.0175)	(0.0136)	(0.0998)
Retired	0.0740 ***	0.0595 *	−0.0042	0.0669 ***	0.0429 *	0.0509
	(0.0181)	(0.0328)	(0.1777)	(0.0250)	(0.0229)	(0.1311)
Budget decision maker	−0.0188	−0.0470	0.6596 ***	−0.0223 **	−0.0361 *	0.5870 ***
	(0.0188)	(0.0451)	(0.0920)	(0.0114)	(0.0185)	(0.0907)
Married	0.0277 **	0.0479 **	−0.1165	0.0255 *	0.0365 **	−0.0154
	(0.0132)	(0.0241)	(0.1090)	(0.0142)	(0.0158)	(0.0974)
Tertiary education	0.0064	−0.0109	0.6230 ***	0.0089	−0.0075	0.9269 ***
	(0.0227)	(0.0325)	(0.1426)	(0.0165)	(0.0203)	(0.1489)
Upper secondary education	0.0065	−0.0190	0.4451 ***	0.0049	−0.0178 *	0.5857 ***
	(0.0129)	(0.0277)	(0.1037)	(0.0138)	(0.0106)	(0.1252)
Household size	0.0102 **	0.0034	0.0105	0.0115 **	0.0049	−0.0150
	(0.0052)	(0.0063)	(0.0489)	(0.0058)	(0.0065)	(0.0655)
Any young children	−0.0182	−0.0247	0.0313	−0.0224 *	−0.0229 *	−0.0230
	(0.0128)	(0.0180)	(0.1187)	(0.0134)	(0.0132)	(0.1141)
Homeowner with mortgage	0.0286 ***	0.0432 *	−0.1005	0.0238	0.0289 **	0.0754
	(0.0085)	(0.0263)	(0.1104)	(0.0147)	(0.0144)	(0.1848)
Homeowner without mortgage	0.0311 **	0.0553	−0.5587 ***	0.0206	0.0252 *	−0.2268 *
	(0.0124)	(0.0462)	(0.1583)	(0.0191)	(0.0148)	(0.1185)
Income: 1060–1549 euro	0.0146	−0.0538	0.5538 ***	0.0266	−0.0176	0.2841 ***
	(0.0327)	(0.0542)	(0.1449)	(0.0165)	(0.0240)	(0.1093)
Income: 1550–2454 euro	0.0089	−0.0813	1.2234 ***	0.0234	−0.0309	0.8546 ***
	(0.0297)	(0.0843)	(0.1553)	(0.0180)	(0.0221)	(0.1044)
Income: >2454 euro	−0.0331	−0.1373	1.3327 ***	−0.0208	−0.0803 **	0.8871 ***
	(0.0294)	(0.1109)	(0.1834)	(0.0187)	(0.0316)	(0.1310)
Risk averse	−0.0788 ***	−0.1017 *	0.5392 ***	−0.0747 ***	−0.0690 ***	0.0781
	(0.0158)	(0.0573)	(0.0921)	(0.0136)	(0.0166)	(0.1056)
Peer-group objective FK			0.1823			0.2503 **
			(0.1397)			(0.1016)
Long-term attitude			0.3586 ***			0.6117 ***
			(0.0918)			(0.1152)
ICT use			0.4688 **			0.5945 ***
			(0.1831)			(0.2119)
Exogeneity test ($\rho = 0$)		[0.0410]			[0.0432]	
ALN overidentification test		[0.2111]			[0.2175]	
Weak-instrument F test		[0.0000]			[0.0000]	
N	2036	2036		1910	1910	
Log Likelihood	−352.45	−3887.69		−260.67	−3807.49	

Notes: The Table reports the average marginal effects on the probability of having invested in a fraud, estimated from standard and endogenous probit models. Estimated average marginal effects on the number of correct answers to financial knowledge questions are also reported in columns (3) and (6). All the regressions include macro area and municipality size dummies. Robust standard errors, clustered by macro area and age class, are reported in parentheses below the estimates. The p-values of the exogeneity test, the Amemiya–Lee–Newey overidentification test, and the F test for weak instruments are reported in square brackets. ***, **, and * denote significance at 1, 5, and 10% levels, respectively. Source: Own elaboration on data from the Bank of Italy.

Table 5. The determinants of over-indebtedness: Average marginal effects.

	Model (a)			**Model (b)**		
	Probit	**Endogenous Probit**		**Probit**	**Endogenous Probit**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Over-Indebted	**Over-Indebted**	**Objective FK**	**Over-Indebted**	**Over-Indebted**	**Objective FK**
Objective FK	−0.0010	0.1272 ***		0.0032	0.1025 ***	
	(0.0041)	(0.0141)		(0.0051)	(0.0251)	
Overconfident				0.0485 ***	0.2376 ***	−1.8965 ***
				(0.0159)	(0.0485)	(0.1805)
Underconfident				−0.0012	−0.1486 ***	1.5554 ***
				(0.0153)	(0.0477)	(0.1317)
Female	−0.0152	0.0221	−0.2045 **	−0.0153	0.0127	−0.2199 ***
	(0.0124)	(0.0216)	(0.0966)	(0.0133)	(0.0217)	(0.0739)
Age	−0.0011 **	0.0000	−0.0034	−0.0010 **	−0.0007	0.0013
	(0.0004)	(0.0008)	(0.0047)	(0.0005)	(0.0007)	(0.0034)
Self employed	0.0149	−0.0087	0.1414	0.0101	−0.0182	0.2623
	(0.0225)	(0.0273)	(0.1759)	(0.0217)	(0.0303)	(0.2070)
Employee	−0.0051	0.0147	−0.1306	−0.0017	−0.0011	0.0174
	(0.0204)	(0.0284)	(0.1571)	(0.0210)	(0.0270)	(0.1598)
Retired	0.0510 **	0.0403	0.0002	0.0466**	0.0445	0.0564
	(0.0198)	(0.0312)	(0.1571)	(0.0206)	(0.0283)	(0.1383)
Budget decision maker	−0.0252 *	−0.1165 ***	0.6896 ***	−0.0264 *	−0.1021 ***	0.6024 ***
	(0.0133)	(0.0180)	(0.1258)	(0.0140)	(0.0199)	(0.0864)
Married	0.0122	0.0220	−0.1145	0.0092	0.0080	−0.0142
	(0.0178)	(0.0138)	(0.1179)	(0.0196)	(0.0213)	(0.0839)
Tertiary education	−0.0264	−0.1053 ***	0.6263 ***	−0.0366	−0.1358 ***	0.9268 ***
	(0.0281)	(0.0336)	(0.1552)	(0.0281)	(0.0355)	(0.1528)
Upper secondary education	−0.0037	−0.0656 **	0.4507 ***	−0.0160	−0.0824 ***	0.5879 ***
	(0.0207)	(0.0285)	(0.1452)	(0.0210)	(0.0307)	(0.1339)
Household size	0.0003	−0.0010	0.0085	−0.0011	0.0005	−0.0163
	(0.0065)	(0.0102)	(0.0697)	(0.0068)	(0.0097)	(0.0612)
Any young children	−0.0022	−0.0070	0.0302	−0.0008	0.0002	−0.0246
	(0.0177)	(0.0174)	(0.1061)	(0.0175)	(0.0183)	(0.0946)
Homeowner with mortgage	−0.0371 **	−0.0218	−0.0949	−0.0346 *	−0.0524*	0.0771
	(0.0174)	(0.0298)	(0.2033)	(0.0184)	(0.0280)	(0.1744)
Homeowner without mortgage	0.0188	0.0822 **	−0.5538 ***	0.0178	0.0370	−0.2245
	(0.0279)	(0.0353)	(0.1867)	(0.0292)	(0.0384)	(0.1614)
Income: 1060–1549 euro	0.0313	−0.0543 *	0.5468 ***	0.0311	−0.0040	0.2802 *
	(0.0191)	(0.0303)	(0.1658)	(0.0192)	(0.0335)	(0.1457)
Income: 1550–2454 euro	−0.0071	−0.1638 ***	1.2190 ***	0.0001	−0.0919 **	0.8534 ***
	(0.0230)	(0.0324)	(0.1815)	(0.0246)	(0.0416)	(0.1477)
Income: >2454 euro	−0.0281	−0.1961 ***	1.3400 ***	−0.0240	−0.1233 ***	0.8932 ***
	(0.0225)	(0.0408)	(0.2584)	(0.0246)	(0.0468)	(0.2050)
Risk averse	−0.0748 ***	−0.1201 ***	0.5400 ***	−0.0687 ***	−0.0746 ***	0.0784
	(0.0162)	(0.0191)	(0.0893)	(0.0162)	(0.0209)	(0.0990)
Peer-group objective FK			0.2384 ***			0.3045 ***
			(0.0770)			(0.0704)
Long-term attitude			0.3648 ***			0.6102 ***
			(0.0840)			(0.0951)
ICT use			0.2069			0.4694 **
			(0.1944)			(0.2025)
Exogeneity test ($\rho = 0$)		[0.0000]			[0.0000]	
ALN overidentification test		[0.1679]			[0.1881]	
Weak-instrument *F* test		[0.0000]			[0.0000]	
N	2036	2036		1910	1910	
Log Likelihood	−556.32	−4721.36		−523.23	−4060.40	

Notes: The table reports the average marginal effects on the probability of being over-indebted, estimated from standard and endogenous probit models. Estimated average marginal effects on the number of correct answers to financial knowledge questions are also reported in columns (3) and (6). All the regressions include macro area and municipality size dummies. Robust standard errors, clustered by macro area and age class, are reported in parentheses below the estimates. The *p*-values of the exogeneity test, the Amemiya–Lee–Newey overidentification test, and the *F* test for weak instruments are reported in square brackets. ***, **, and * denote significance at 1, 5, and 10% levels, respectively Source: Own elaboration on data from the Bank of Italy.

The empirical evidence obtained can be thus explained by the fact that more financially knowledgeable individuals are not only more likely to participate in investment and credit markets, but they are also better able to correctly judge their debt position. These two

mechanisms may contribute to determining the positive impact of objective financial knowledge on the probability of self-reporting an excessive debt burden. The relevance of the first mechanism can be tested by modelling individuals' self-selection into the credit market (i.e., by jointly analyzing the probability of having debt and the conditional probability of being over-indebted). Unfortunately, the available data do not allow us to carry out such analysis and account for potential selectivity bias.

Extending the model to account for the effect of confidence, we find that the positive impact of objective financial knowledge remains confirmed and that misperception of one's own financial abilities significantly affects the probability of being over-indebted. In particular, controlling for objective knowledge and other socio-demographic characteristics, overconfident individuals are about 24% more likely to report being excessively indebted than those who correctly assess their financial competencies; conversely, those who understate their financial knowledge are about 15% less likely to be over-indebted than the control group. The evidence obtained further stresses the adverse impact of overconfidence bias on the sustainability of individual financial choices, supporting the findings of Lusardi and Tufano [4] and Gathergood [64]. Excessive self-confidence, combined with lack of skill or cognition, significantly impairs individuals' ability to manage their finances correctly and leads to unsustainable levels of debt. Empirical results also highlight individuals who are responsible for the household's budget and those with mortgage loan experience have a significantly lower probability of being over-indebted. This evidence confirms the beneficial role of financial and credit experience on debt sustainability, coherently with the findings of Lusardi and Tufano [4] and Kurowski [41],

4.4. Preference for Socially and Environmentally Responsible Financial Companies

Finally, we analyze individuals' attitudes towards environmentally and socially responsible financial companies. Table 6 reports results on the drivers of the probability of preferring financial companies that have a strong ethical stance, obtained from standard and endogenous probit models. Even in this case, financial knowledge is endogenously determined with respect to preferences for responsible financial companies and instrument validity is confirmed.

From the average marginal effects estimated from the baseline endogenous probit (column 2 of Table 6), we find that women are about 3% more likely to prefer ethical financial companies than men. Similarly, older individuals and those with lower income levels, higher education attainment, and lower risk aversion are characterized by a greater preference for financial companies with an ethical stance.

Objective financial knowledge significantly contributes to increasing the likelihood of preferring environmentally and socially responsible financial companies. Specifically, a unit increase in the number of correct responses to financial knowledge questions raises the probability of dealing with ethical financial companies by more than 14 percentage points. As it can be noticed, accounting for the endogeneity of financial knowledge allows avoiding downwardly biased estimates of its effect on the preference for ethical financial companies: the corresponding marginal effect estimated from the standard (exogenous) probit regression is more than 4 times lower (3.33%) than that obtained from the endogenous model. This result provides strong empirical evidence that greater preference for environmentally and socially responsible financial companies characterizes more financially knowledgeable individuals and suggests that inadequate financial knowledge represents a significant barrier to individuals' participation in socially responsible investments. Coherently with Phillips and Johnson [14], Gutsche and Zwergel [16], and Gutsche et al. [17], our findings point out that improvements in financial knowledge levels may significantly contribute to increasing trust in providers of sustainable investment products, overcoming initial entry hurdles for individual investors, and encouraging participation in the socially responsible investment market.

Table 6. The determinants of preferring ethical financial companies: Average marginal effects.

	Model (a)			Model (b)		
	Probit	Endogenous Probit		Probit	Endogenous Probit	
	(1) ESR Attitude	(2) ESR Attitude	(3) Objective FK	(4) ESR Attitude	(5) ESR Attitude	(6) Objective FK
Objective FK	0.0333 ***	0.1433 ***		0.0448 ***	0.1550 ***	
	(0.0034)	(0.0026)		(0.0055)	(0.0084)	
Overconfident				0.1042 ***	0.3028 ***	−1.8999 ***
				(0.0351)	(0.0288)	(0.1839)
Underconfident				−0.0310	−0.2081 ***	1.5543 ***
				(0.0262)	(0.0210)	(0.1332)
Female	−0.0191	0.0308 *	−0.2404 **	−0.0156	0.0304 **	−0.2417 ***
	(0.0147)	(0.0161)	(0.1010)	(0.0159)	(0.0151)	(0.0785)
Age	0.0009	0.0012 **	−0.0044	0.0008	0.0009	0.0007
	(0.0011)	(0.0005)	(0.0049)	(0.0011)	(0.0007)	(0.0034)
Self employed	0.0561 **	−0.0049	0.1410	0.0425	−0.0165	0.2627
	(0.0253)	(0.0263)	(0.1781)	(0.0264)	(0.0352)	(0.2060)
Employee	0.0085	0.0206	−0.1350	0.0038	0.0007	0.0164
	(0.0276)	(0.0217)	(0.1569)	(0.0263)	(0.0216)	(0.1580)
Retired	−0.0081	0.0002	−0.0210	−0.0215	−0.0169	0.0428
	(0.0429)	(0.0188)	(0.1590)	(0.0425)	(0.0254)	(0.1412)
Budget decision maker	0.0603 ***	−0.0793 ***	0.6969 ***	0.0522 **	−0.0619 ***	0.6089 ***
	(0.0214)	(0.0184)	(0.1309)	(0.0229)	(0.0160)	(0.0910)
Married	0.0554*	0.0322*	−0.1174	0.0416	0.0239	−0.0167
	(0.0299)	(0.0179)	(0.1182)	(0.0309)	(0.0190)	(0.0850)
Tertiary education	0.1588 ***	−0.0331	0.6310 ***	0.1394 ***	−0.0382	0.9289 ***
	(0.0342)	(0.0258)	(0.1537)	(0.0342)	(0.0306)	(0.1517)
Upper secondary education	0.0657 **	−0.0409 **	0.4551 ***	0.0444 *	−0.0539 **	0.5915 ***
	(0.0262)	(0.0201)	(0.1431)	(0.0244)	(0.0225)	(0.1323)
Household size	0.0035	−0.0003	0.0094	0.0040	0.0042	−0.0160
	(0.0095)	(0.0096)	(0.0698)	(0.0094)	(0.0094)	(0.0613)
Any young children	−0.0041	−0.0054	0.0357	−0.0046	0.0012	−0.0204
	(0.0214)	(0.0137)	(0.1071)	(0.0224)	(0.0152)	(0.0962)
Homeowner with mortgage	0.0092	0.0119	−0.0934	0.0030	−0.0156	0.0789
	(0.0258)	(0.0282)	(0.2049)	(0.0281)	(0.0303)	(0.1746)
Homeowner without mortgage	0.1001 **	0.1048 ***	−0.5574 ***	0.0937 **	0.0804 ***	−0.2264
	(0.0395)	(0.0270)	(0.1849)	(0.0388)	(0.0280)	(0.1606)
Income: 1060–1549 euro	0.0555	−0.0550 ***	0.5535 ***	0.0598 *	−0.0052	0.2821 *
	(0.0341)	(0.0204)	(0.1657)	(0.0355)	(0.0246)	(0.1452)
Income: 1550–2454 euro	0.0174	−0.1516 ***	1.2221 ***	0.0318	−0.0913 ***	0.8519 ***
	(0.0276)	(0.0242)	(0.1821)	(0.0295)	(0.0295)	(0.1477)
Income: >2454 euro	0.0598 *	−0.1534 ***	1.3407 ***	0.0759 **	−0.0726	0.8905 ***
	(0.0309)	(0.0377)	(0.2583)	(0.0362)	(0.0444)	(0.2045)
Risk averse	−0.0479 ***	−0.0815 ***	0.5414 ***	−0.0336 *	−0.0225	0.0822
	(0.0177)	(0.0139)	(0.0916)	(0.0194)	(0.0176)	(0.0995)
Peer-group objective FK			0.1176 *			0.2253 ***
			(0.0624)			(0.0692)
Long-term attitude			0.3860 ***			0.6479 ***
			(0.1009)			(0.0893)
ICT use			0.1067			0.3611*
			(0.1761)			(0.2184)
Exogeneity test ($\rho = 0$)		[0.0000]			[0.0000]	
ALN overidentification test		[0.5461]			[0.4315]	
Weak-instrument F test		[0.0000]			[0.0000]	
N	2036	2036		1910	1910	
Log Likelihood	−1004.35	−4768.44		−945.41	−4468.71	

Notes: The table reports the average marginal effects on the probability of preferring socially and environmentally responsible financial companies, estimated from standard and endogenous probit models. Estimated average marginal effects on the number of correct answers to financial knowledge questions are also reported in columns (3) and (6). All the regressions include macro area and municipality size dummies. Robust standard errors, clustered by macro area and age class, are reported in parentheses below the estimates. The p-values of the exogeneity test, the Amemiya–Lee–Newey overidentification test, and the F test for weak instruments are reported in square brackets. ***, **, and * denote significance at 1, 5, and 10% levels, respectively. Source: Own elaboration on data from the Bank of Italy.

Results from the extended specification (model (b)) confirm the significant role of objective financial knowledge and also suggest that self-confidence in one's own financial

competencies affects individual preferences for ethical financial companies. In particular, overconfident individuals are not only more likely to invest in financial assets, but they have greater preference for environmentally and socially responsible financial companies than individuals who correctly self-report their financial abilities. Similarly, those who underestimated their financial knowledge are less likely to prefer dealing with ethical financial companies (by about 21 percentage points), as their lower propensity to participate in financial markets and their passive investment behavior may contribute to reducing their awareness about environmentally and socially responsible investing. Since sustainable investment products are more complex than conventional products, information and search costs are higher compared to conventional investing and this may represent an important barrier for those individuals who are, by their very nature, less interested in pursuing financial investment.

5. Conclusions

This paper contributes to the existing literature by providing evidence about the role of financial knowledge and confidence in shaping individual financial market participation, sustainable debt behavior, and preferences for socially and environmentally responsible financial companies.

In line with previous empirical studies [30,34,46], we find that objective financial knowledge exerts a positive and statistically significant effect on financial market participation. Furthermore, we point out that overconfident individuals tend to engage in excess trading, being more likely to invest in financial assets than similar individuals who correctly assess their competencies, whereas underconfident individuals inappropriately choose passive investment patterns and refrain from riskier investments. This evidence supports the findings of previous literature [10,28,29] and suggests that the systematic misjudgment of one's own financial abilities may lead to negative consequences on financial planning and wealth accumulation.

Focusing on risky investment behavior and analyzing, in particular, the role of financial knowledge and confidence on an individual's vulnerability to investment fraud, our results demonstrate that objective financial knowledge has no significant effect on the probability of being a victim of financial fraud; nevertheless, individuals who are more likely to invest in financial assets are also more exposed to financial scams. Confidence biases in assessing one's own financial competencies emerge as significant determinants of individual susceptibility to investment fraud. In particular, we find that overconfident individuals are more likely to have experienced fraud than those correctly assessing their capabilities; at the same time, individuals who understate their financial abilities are less likely to expose themselves to hazardous financial behaviors. This evidence clearly points out the detrimental role of financial knowledge overconfidence on financial decision-making, confirming the results of previous studies [7,27,61]. The analysis of debt sustainability highlights that overconfidence and less financial knowledge significantly impair individuals' ability to manage their finances correctly and lead to unsustainable levels of debt.

Finally, objective financial knowledge significantly contributes to increasing the likelihood of preferring environmentally and socially responsible financial companies, suggesting that inadequate financial knowledge represents a significant barrier to individuals' participation in socially responsible investments. Coherently, those who underestimated their financial knowledge are less likely to prefer dealing with ethical financial companies, as their lower level of investment experience and their passive investment behavior may reduce their awareness of environmentally and socially responsible investments and their understanding of sustainable financial products, usually characterized by a more complex structure than conventional products.

Our main results provide significant insights into the crucial role played by financial knowledge and self-confidence in improving individual well-being and social and environmental wealth. Therefore, programs aimed at increasing the average level of financial knowledge and the awareness of one's own financial competencies could significantly

contribute to reduce riskier financial behaviors and build a culture of sustainability, both maintaining debt at sustainable levels and encouraging the choice of ethical financial companies and sustainable financial products. These policies could be pursued through the implementation of financial education programs starting from primary schools and through financial inclusion and information plans aimed at the most vulnerable and fragile groups in society (e.g., women, young people, persons with low income levels). Moreover, the reduction of information deficit and asymmetries, by means of targeted and transparent information documents and contracts, could improve understanding of the financial structure of socially and environmentally sustainable investments and the performance of this kind of investment. Since individual investors are prone to judgment and decision-making errors in their investment choices, the promotion of cost-controlled financial advisory activities could also ensure greater awareness of investment choices and a more sustainable debt burden in the medium–long term. Nevertheless, policy interventions supporting environmental values and the ecological political identification of a country could also play a significant role in incentivizing individual sustainable investment behavior.

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Appendix A

Table A1. Variable definitions.

Variable	Definition
(a) Dependent variables	
Financial investment	Equals 1 if the respondent, in the last two years, has invested in stocks and shares, public and private bonds, mutual and pension plans, cryptocurrencies or ICOs; 0 otherwise
Investment fraud	Equals 1 if the respondent accepted advice to invest in a financial product that was later found to be a scam; 0 otherwise
Over-indebted	Equals 1 if the respondent agrees or totally agrees to the statement "I have too much debt right now"; 0 otherwise
ESR attitude	Equals 1 if the respondent agrees or totally agrees to the statement "I prefer to use financial companies that have a strong ethical stance"; 0 otherwise
(b) Explanatory variables	
(b1) Financial knowledge and confidence	
Objective FK	Number of correct answers to financial knowledge questions
Subjective FK	Self-rated financial knowledge, measured on a scale from 1 (very low) to 5 (very high)
Overconfident	Equals 1 if the respondent's *Subjective FK* is above the sample mean and *Objective FK* is below the sample mean; 0 otherwise
Underconfident	Equals 1 if the respondent's *Subjective FK* is below the sample mean and *Objective FK* is above the sample mean; 0 otherwise
(b2) Other individual characteristics	
Female	Equals 1 if the respondent is a woman; 0 otherwise
Age	Age of the respondent in years
Self-employed	Equals 1 if the respondent is self-employed; 0 otherwise
Employee	Equals 1 if the respondent is an employee; 0 otherwise
Retired	Equals 1 if the respondent is retired; 0 otherwise
Budget decision maker	Equals 1 if the respondent is the person responsible for the household's budget and expenditures; 0 otherwise
Married	Equals 1 if the respondent is married; 0 otherwise
Tertiary education	Equals 1 if the respondent has a tertiary education; 0 otherwise
Upper secondary education	Equals 1 if the respondent has an upper secondary education; 0 otherwise
Household size	Number of household members
Any young children	Equals 1 if at least one child below 18 years lives in the household; 0 otherwise
Homeowner with mortgage	Equals 1 if the respondent is a homeowner with mortgage; 0 otherwise
Homeowner without mortgage	Equals 1 if the respondent is a homeowner without mortgage; 0 otherwise
Income: 1060–1549 euro	Total household net monthly disposable income between 1060 and 1549 euro
Income: 1550–2454 euro	Total household net monthly disposable income between 1550 and 2454 euro
Income: >2454 euro	Total household net monthly disposable income above 2454 euro
Risk averse	Equals 1 if the respondent disagrees or totally disagrees to the statement "I am prepared to risk some of my own money when saving or making an investment"; 0 otherwise
(c) Instrumental variables	
Peer-group objective FK	Average number of correct answers to financial knowledge questions of the other individuals of the same gender, living in the same macro-area and belonging to the same age class of the respondents
Long-term attitude	Equals 1 if the respondent disagrees or totally disagrees to the statement "I tend to live for today and let tomorrow take care of itself" and/or if the respondent agrees or totally agrees to the statement "I set long term financial goals and strive to achieve them"; 0 otherwise
ICT use	Equals 1 if the respondent use ICT instruments (i.e., banking apps or money management tools on a computer, mobile phone and/or tablet) to keep note of payment deadlines and track income and expenses; 0 otherwise

Table A2. Descriptive statistics disaggregated by individual and household characteristics.

	Financial Investment	Investment Fraud	Over-Indebted	ESR Attitude	Objective FK	Subjective FK
Gender						
Male	0.114	0.055	0.101	0.266	4.063	2.347
Female	0.074	0.042	0.062	0.218	3.794	2.064
Age						
Less than 25	0.009	0.026	0.057	0.173	3.93	1.948
25–34	0.109	0.063	0.102	0.236	3.881	2.204
35–44	0.109	0.075	0.089	0.305	4.225	2.436
45–54	0.131	0.036	0.092	0.296	4.09	2.44
55–64	0.111	0.041	0.079	0.272	4.023	2.261
65 and above	0.063	0.045	0.066	0.169	3.588	1.92
Working status						
Self employed	0.174	0.064	0.073	0.372	4.533	2.618
Employee	0.125	0.062	0.086	0.286	4.076	2.438
Retired	0.085	0.044	0.077	0.172	3.659	1.935
Unemployed/Not in labour force	0.009	0.023	0.079	0.183	3.675	1.887
Household budget decision making						
Budget decision maker	0.159	0.034	0.060	0.312	4.380	2.415
Not budget decision maker	0.042	0.060	0.097	0.185	3.565	2.022
Marital status						
Married	0.118	0.060	0.086	0.283	3.990	2.282
Not married	0.066	0.035	0.075	0.194	3.850	2.109
Education						
Less than upper secondary	0.047	0.039	0.079	0.148	3.490	1.822
Upper secondary	0.116	0.061	0.090	0.270	4.083	2.372
Tertiary	0.131	0.039	0.063	0.356	4.405	2.559
Household size						
1 person	0.078	0.013	0.056	0.152	3.603	2.100
2 persons	0.119	0.058	0.096	0.212	3.862	2.145
3 persons	0.106	0.082	0.105	0.311	3.846	2.263
4 persons	0.066	0.035	0.057	0.284	4.330	2.332
5 persons and more	0.023	0.000	0.054	0.234	4.237	2.075
Household composition						
Any young children	0.130	0.049	0.079	0.335	4.234	2.370
No young children	0.084	0.048	0.081	0.218	3.846	2.158
Housing tenure						
Homeowner without mortgage	0.111	0.051	0.066	0.244	4.036	2.248
Homeowner with mortgage	0.107	0.081	0.132	0.368	3.646	2.412
Renter or other	0.037	0.026	0.100	0.179	3.729	1.972
Household disposable income						
Less than 1060 euro	0.005	0.027	0.081	0.103	2.997	1.755
1060–1549 euro	0.056	0.061	0.113	0.210	3.517	2.025
1550–2454 euro	0.113	0.061	0.069	0.232	4.271	2.327
2455 euro and above	0.165	0.025	0.052	0.367	4.509	2.496
Risk aversion						
Risk averse	0.068	0.013	0.051	0.217	4.049	2.027
Non risk averse	0.133	0.105	0.128	0.28	3.723	2.486
Area of residence						
North	0.124	0.056	0.072	0.258	3.965	2.321
Centre	0.123	0.046	0.087	0.251	4.076	2.169
South	0.034	0.039	0.088	0.213	3.779	2.052
Total	0.093	0.048	0.081	0.241	3.924	2.200

Notes: The table reports average values of financial behavior indicators and objective and subjective financial knowledge disaggregated by individual and household characteristics, computed using sample weights. Source: Own elaboration on data from the Bank of Italy.

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