sciendo

Financial Internet Quarterly 2025, vol. 21 / no. 3, p. 28-44

10.2478/fiqf-2025-0017

Financial Internet Quarterly

FROM OBSTACLES TO NEW OPPORTUNITIES: EXPLORING PROFITABILITY IN THE BANKING INDUSTRY AMID SUSTAINABILITY AND THE GREEN TRANSITION

Petra Jílková[1], Ladislava Knihová[2], Natálie Heroldová[3]

Abstract

This study examines the relationship between sustainability and the financial performance of European banks, focusing on their Return on Average Assets (ROAA) and Return on Average Equity (ROAE). Using panel regression analysis on data from 2018 to 2022, the findings reveal a negative correlation between sustainability factors and short-term profitability, suggesting that sustainability-related investments may initially lead to higher costs and lower returns. However, the results also indicate a potential association between sustainability engagement and long-term financial resilience, though the exact causal mechanisms remain subject to further research. The study contributes to the ongoing debate on the financial implications of sustainability in the banking sector and highlights the need for further econometric analysis to assess the long-term effects of sustainable investments.

JEL classification: G21, Q56, M14

Keywords: ESG Factors, Profitability Analysis, Sustainable Banking, Sustainable Development Goals (SDGs)

Received: 22.10.2024 Accepted: 19.03.2025

Cite this:

Jílková, P., Knihová, L. & Heroldová, N. (2025). From obstacles to new opportunities: exploring profitability in the banking industry amid sustainability and the green transition. Financial Internet Quarterly 21(3), pp. 28-44.

[1] Department of Banking and Insurance, Faculty of Finance and Accounting, University of Economics in Prague, The Czech Republic, e-mail: petra.jilkova@vse.cz, ORCID: https://orcid.org/0000-0002-2884-5334.

[2] Anglo-American University in Prague, The School of Business, The Czech Republic, e-mail: ladislava.knihova@aauni.edu, ORCID: https://orcid.org/0000-0003-4938-1572.

[3] Czech Technical University in Prague, Masaryk Institute of Advanced Studies, The Czech Republic, e-mail: natalie.heroldova@cvut.cz., ORCID: https://orcid.org/0009-0009-2650-3814.

Introduction

Since 2018, the banking sector's profitability in the European Union has been undergoing a diverse evolution. It has been strongly influenced by various factors. In this period, we witnessed the rise of digital banking, along with regulatory changes and economic fluctuations. Apart from the growing consumer demand for sustainability, regulatory frameworks such as the EU Taxonomy Regulation (Regulation 2020/852/EU of the European Parliament and of the Council of June 18, 2024), the Corporate Sustainability Reporting Directive (Directive 2022/2464/EU of the European Parliament and of the Council of December 14, 2022) and Sustainable Finance Disclosure Regulation (Regulation 2019/2088/EU of the European Parliament and of the Council of November 27 2024) are influencing how banks integrate sustainability and ESG policies into their operations, creating both opportunities and challenges for the sector. Thus, ESG integration is driven not only by market trends but also by an increasingly stringent regulatory framework. These regulations have shaped the most critical operating conditions during this period. At the same time, the European banking sector has faced the consequences of negative interest rates. The European Central Bank introduced negative interest rates in 2014. As expected, this policy had a profound impact on traditional banking models, not only reducing net interest margins but also affecting the overall profitability of the sector. Moreover, the persistent low-interest-rate environment prompted banks to seek alternative revenue streams, leading to a rise in fee-based services. Shortly thereafter, significant investments in financial technologies (FinTech) followed, as companies sought innovative solutions to adapt to the changing financial landscape. However, the onset of the COVID-19 crisis in 2020 further exacerbated challenges for banks. It was a time when economic uncertainty and increased provisioning for loan losses further reduced the profitability of the entire banking sector. Amid the crisis in 2020, financial institutions, led by banks, increased investments in their digitalization efforts. Banks not only expanded their existing online services but also focused on innovations, driven by the need to adapt to changing consumer behavior. As the banking industry continues to evolve, it seeks sustainable pathways. (Gomber et al., 2018)

In recent years, in harmony with the new EU legal norms and under the pressures of their customers, companies have focused their attention on activities related to environmental, social, and governance (ESG) factors. Inevitably, this has introduced a new layer to bank profitability. In this context, green finance, Sustainable Development Goals (SDGs) and ESG considerations are becoming significant trends shaping the future of the banking industry. This trend not only reflects the need for sustainable development but also potentially changes the landscape of the banking sector. Banks have been compelled to adapt their strategies and meet new regulatory requirements related to sustainability. Simultaneously, they react to the growing demand for ethical investments. The European Green Deal (2019) is considered one of the most significant agreements. These policy initiatives aim to guide the European Union toward a green transformation. The European Green Deal stipulates the ultimate goal, i.e. to achieve climate neutrality by 2050 (European Council, 2024). The sub-goal is then a prosperous society based on a competitive and sustainable economy. Here, banks play a key role in financing projects leading to the transition to a low-carbon economy. Other activities within the sector have also evolved from this European Union initiative (European Council, 2024).

This paper aims to examine green financing, SDGs, and ESG factors from the viewpoint of the profitability of the banking sector in the European Union. In analysing how the transition to sustainability affects their financial performance, the authors use panel regression as a statistical method suitable for analysing data involving multiple entities, i.e. ESG rating, observed over time. The authors examine the relationship between green financing, SDGs, and ESG factors, and key financial indicators such as Return on Average Assets (ROAA) and Return on Average Equity (ROAE). To guide this investigation, the following research question was formulated:

RQ: How does the sustainability level, measured by ESG composite scores and SDG composite scores, influence the profitability of selected banks in the European Union?

The research question will be addressed through the empirical analysis presented in this study, utilizing panel regression models.

Literature review and hypotheses development

Financial products like green loans and green investment portfolios are gaining prominence in bank portfolios. These green products can influence bank profitability. Recent research, in line with Akomea-Frimpong et al. (2021) and Debrah et al. (2023), indicates that green banking is gaining academic and practical attention. The focus has been predominantly on developing 'green bank products' and identifying the 'determinants of green banking'. These two research areas are seen as key drivers of sustainable financial growth. Simultaneously, these studies highlight that integrating green financial instruments, such as green loans and credits, not only supports environmental sustainability but also enhances financial institutions' profitability and operational efficiency.

The inclusion of green loans and green credits in bank portfolios can have a substantial effect on profitability. The impact is seen mainly by enhancing key financial performance metrics like return on assets (ROA), return on equity (ROE), and Net Interest Margin (NIM). The study by Mirović et al. (2023) revealed that the presence of green loans in a bank's portfolio positively influences liquidity management and, consequently, bank profitability. This underscores the growing strategic importance of green finance in modern banking practices, as financial institutions increasingly recognize the dual benefit of supporting sustainability and improving profitability.

Another study on Chinese banks found a positive correlation between the development of green credit businesses and the profitability of commercial banks. Yin et al. (2021) highlight that green credit has a particularly strong positive impact on the profitability of non-state-owned banks in China. These institutions can use green lending to expand into new markets and reduce financial risks. On the other hand, state-owned banks often provide green loans as part of government-driven policies, sometimes resulting in lower profitability as they prioritize national environmental goals over financial returns. Despite this, the study highlights that risk management is not a significant obstacle for banks issuing green credit. In addition, the research points out that while government investments in environmental projects may lower the demand for green credit, non-state-owned banks still benefit from increased profitability and reduced risk exposure through green lending. The research findings indicate that green finance is essential for sustainable, long-term financial growth.

Although some studies have not found immediate profitability increases from green banking, they note that green finance is an investment for future growth. Research has suggested that while short-term profitability might not significantly change, long-term returns are likely due to increased sustainability efforts. Jain & Sharma (2023) highlight that green banking practices often require substantial initial investments, which may delay immediate financial gains. However, over time, these practices lead to improved operational efficiency, reduced risks, and greater access to green finance markets, all contributing to long-term profitability. In addition to adopting environmentally sustainable practices, banks simultaneously build more substantial brand equity and gain a more positive brand image. This, in turn, fosters stronger customer loyalty, as consumers increasingly prefer to align themselves with institutions that demonstrate a commitment to sustainability. Many customers enter the stage of brand advocacy, or even brand attachment, on the customer journey. The positive perception of green banking among environmentally conscious customers not only strengthens customer retention but also attracts new clients, further boosting the bank's profitability in the long run and supporting brand strength.

While ESG factors often influence a bank's profitability, the reverse relationship - where profitability affects ESG engagement - is frequently overlooked. More profitable banks have greater resources, allowing them to invest more substantially in ESG initiatives. Although the literature on this reverse causality is less extensive, several studies have confirmed its existence. The findings of Chams et al. (2021) reveal a stimulus effect between free cash flow (FCF) and ESG scores. Deb et al. (2024) ascertain that a company's focus on environmental, social, and governance (ESG) issues represents a strategic step toward long-term sustainability. Their findings indicate that while ESG activities negatively impact short-term financial indicators such as Return on Assets (ROA) and Return on Equity (ROE), they contribute positively to long-term market value, measured using Tobin's Q. This contrast supports stakeholder theory and underscores the importance of ESG in building long-term corporate value. Rastogi et al. (2024) take a cautious stance and emphasize the importance of multi-country research on this issue. They argue that banks, even if highly profitable, should not exceed reasonable limits when investing in ESG initiatives to ensure their financial stability. Wang et al. (2024) acknowledge the lack of multi-country data as a limitation, which also presents an opportunity for future research. Another interesting study on 36 Chinese commercial banks from 2010 to 2021 provides valuable insights into the reverse relationship between profitability and ESG engagement. The research highlights how banks' ESG performance promotes green innovation, particularly when effective remuneration incentives for management are in place. This finding underscores the role of profitability and internal financial stability in enabling banks to invest in ESG-driven initiatives. Furthermore, the study identifies the mediating role of the non-performing loan ratio and the Lerner index, showing how profitability channels support ESG efforts. These insights strengthen the argument that higher profitability facilitates greater investment in ESG strategies, reinforcing the reverse causality between financial performance and sustainability engagement (Wang et al., 2024). This body of research underscores the complex interplay between profitability and ESG engagement, emphasizing the need for a balanced approach to sustainability investments that considers both financial stability and long-term strategic goals.

A key theme of today's financial business models is the adoption of sustainable technological innovations. According to Beck et al. (2016), financial innovations have a positive impact on bank growth. Fast-developing European banks are forming strategic partnerships with

fintech companies to drive these advancements. These collaborations allow banks to leverage fintech expertise to enhance their green offerings and streamline operations. By incorporating advanced technologies such as artificial intelligence and blockchain, banks can significantly enhance the efficiency of green finance processes. They can also streamline their operations, and develop innovative financial products focused on sustainability. This approach facilitates the wider adoption of green banking practices and strengthens the institution's commitment to environmental goals. As a result, banks can solidify their competitive standing in the market while simultaneously boosting their profitability through reduced costs and improved customer engagement with eco-friendly and other sustainable initiatives. Such strategic partnerships are becoming essential for banks seeking to remain competitive while simultaneously contributing to a more sustainable future. Brandl and Hornuf (2020) and Hornuf et al. (2021) show that banks with a clearly defined digital strategy are significantly more likely to form alliances with fintech companies. The reason is that many fintech companies offer software solutions. These collaborations, particularly in the areas of product development and innovation, allow banks to integrate cutting-edge financial technologies. These, in turn, streamline operations and enhance the level of customer services provided. As a result, it improves operational efficiency but also contributes to the long-term profitability and competitiveness of the banks which proactively become involved in such fintech partnerships. Bömer and Maxin (2018) further emphasize the importance of fintech partnerships by highlighting how these collaborations enable fintech companies to navigate regulatory complexities and gain market entry. By leveraging the banks' established infrastructure, regulatory expertise, and access to financial resources, fintechs can more easily bring their innovative solutions to market. These partnerships also provide fintechs with access to a broad customer base and established networks, enhancing their credibility and profitability. Banks, in turn, benefit from the fintechs' ability to develop new, cutting-edge financial products that align with the growing demand for sustainable and technologically advanced solutions. These joint ventures accelerate product innovation and strengthen both parties' competitive positions in an increasingly digitalized financial landscape. However, while green financial products like green loans and credits enhance key performance metrics like return on Average Assets (ROAA), Return on Average Equity (ROAE) and net interest margin (NIM), there are nuanced challenges to profitability in 'Socially Responsible Investments' (SRIs). The 'Warm-glow investment' theory, as outlined by Dreyer et al. (2023), empirically estimates the model that explains why green assets should perform poorly relative to conventional non-green assets. Dreyer et al. emphasize that 'We found that in periods of high uncertainty, warm-glow investors may move their wealth from responsible assets to more conventional assets, motivated by a fear of loss of wealth and future consumption' (2023). Thus, in periods of high uncertainty, investors are believed to prioritize the psychological satisfaction of supporting environmentally friendly ventures over immediate financial returns.

This can sometimes result in the overvaluation of green stocks, which tend to underperform compared to traditional financial assets. However, for banks, integrating green finance into their portfolios brings long-term advantages. Green loans, for instance, enhance liquidity management and improve risk control, mitigating the potential short-term underperformance observed in green stocks. Importantly, this applies not only to the bank's investments in green portfolios but also to the fact that banks themselves issue shares in which investors are keen to invest. By adopting green finance, banks can attract sustainability-focused investors, bolstering their market position and ensuring both direct and indirect long-term profitability.

Investors have preferred socially responsible investments (SRIs), such as those with high environmental, social, and governance (ESG) scores, often accepting lower returns for the psychological satisfaction of supporting sustainable causes. This is consistent with the warm-glow theory, according to which investors derive non-financial utility from investing in sustainable assets, for example in the form of personal satisfaction from investing in sustainable assets.

Dreyer et al. (2024) highlight that in times of crisis, investor interest in socially responsible investments (SRIs) declines as investors focus more on maximizing returns rather than the psychological satisfaction of supporting sustainable ventures. Under normal conditions, companies with high ESG scores may underperform in stock returns, and during periods of uncertainty, their performance tends to align with that of conventional stocks. Moreover, the impact of ESG factors on ROA/ROAA is inconsistent, with environmental and governance factors often having a negative relationship, while social scores show a positive effect. Thus, while green finance offers long-term strategic benefits, it is important for banks to manage these assets carefully, particularly during volatile economic periods when the appeal of green investments may wane. Bank profitability is influenced by a wide range of factors of different nature and intensity. The country's economic situation in which the subject operates may be considered. However, in the banking sector, individual banking houses are interconnected and often operate, for example, across Europe or in several countries simultaneously. For this reason, some studies include

macroeconomic indicators such as GDP or inflation, while various factors related to the banking sector in different countries also have an impact. Furthermore, studies also consider internal factors and specific indicators of the banks themselves.

Local studies that focus on individual countries, such as Kumar et al. (2020) and Haris et al. (2020), provide valuable insights into the specific economic, regulatory, and market conditions that shape the impact of green finance within those regions. These studies emphasize how different national policies, and institutional frameworks can influence the effectiveness of green bank strategies in improving both sustainability and financial performance, offering a more nuanced understanding of how green finance strategies can be tailored to fit local contexts. Yuan et al. (2022a) explore the determinants of profitability in banks from Bangladesh and India, identifying how bank-specific factors such as bank size and the debt-to-asset ratio positively impact profitability, while macroeconomic variables like inflation and GDP growth also play significant roles. Menicucci and Paolucci (2016) examined, from 2006 to 2015, the profitability and endogenous variables of the 28 biggest banks in the European Union (EU). A significant link between profitability as well as liquidity ratio (LR), bank size, and deposit ratio is supported by empirical findings. Profitability, meanwhile, is negatively impacted by the asset quality based on the results of the regression. Mehta and Bhavani (2017) conducted research on the variables that influenced the profitability of 19 commercial banks operating in the United Arab Emirates (UAE) between 2006 and 2013. They discovered three elements, including cost-effectiveness, capital ratio, and asset quality that significantly improve the bank's profitability. Dreyer et al. (2024) claim that environmental and governance performances are negatively related to ROA. For the social pillar, they verify the opposite: the higher the social pillar score, the higher the ROA. Voicu et al. (2022) explores the influence of ESG performance on the profitability of 333 banks across Europe, America, and Asia between 2019 and 2021. However, the research identifies how overall ESG rating had a neutral effect on profitability before the onset of the COVID-19 pandemic and a positive impact during the pandemic. Yuen et al. (2022b) then proved that banks with higher ESG scoring were more profitable.

The research focuses on sustainability and control variables. ESG and SDG variables are incorporated into the analysis, including environmental, social, and governance (ESG composite score) and Sustainable Development Goals (SDG composite score) scores, to assess their impact on bank profitability and explore the role of sustainable banking practices in shaping financial performance. The control variables are divided into three main groups in the second step. Firstly, banking sector variables like cost efficiency, capital ratio and other indicators are considered. Secondly, macroeconomic variables encompass broader economic indicators such as GDP growth, inflation rates, and unemployment levels, which shape the overall financial environment in which banks operate. Lastly, microeconomic variables include bank-specific metrics such as bank concentration or bank cost efficiency. These variables directly influence a bank's profitability, operational efficiency and risk management.

Table 1: Variable description and expected effects

Symbol	Description	Expected Effect Based on Literature Review
Bank Profitability Variables		
ROAA	Return on Average Assets	
ROAE	Return on Average Equity	
Sustainability Variables		
ESG	ESG Overall Score	+/-
SDG	Sustainable Development Goals Score	+
Control Variables - Banking Sector		
COST	Cost Efficiency	-
TIER 1	Capital Ratio	+/-
SIZE	Bank size measured by log of total assets	+/-
ROE	Return on Equity	+
LOS	Loan Loss Reserves to Total Loans	-
Control Variables - Macroeconomic		
INF	Inflation, consumer prices (annual %)	+
GS	Gross National Savings (% GDP)	+
UNM	Unemployment	-
GDP1	GDP Growth Rate (annual %)	+

Symbol	Description	Expected Effect Based on Literature Review
Control Variables - Microeconomic		
COMP	Concentration of the five largest banks	+/-
BCOST	Bank Cost Efficiency %	-
CRE	Loans to Bank Deposits %	+
DEP	Bank Deposits to GDP %	+
bNIM	Bank Net Interest Margin %	+
bROA	Bank Return on Assets (pre-tax) %	+
bROE	Bank Return on Equity %	+
DMBA	Bank Deposits to GDP %	-

Source: Authors' own work based on (Azmi et al., 2021; Nizam et al., 2021; Lee et al., 2018; Rahi et al., 2022).

Apart from standard expected variables influencing bank profitability, this study also considers ESG composite score, SDG composite score, and cost efficiency due to their growing relevance in sustainable finance. The authors based the research on a comprehensive literature review, which provides an in-depth analysis of the relationship between sustainable banking practices and financial performance. Prior studies have explored various aspects of this relationship, particularly the impact of ESG scores on profitability (Azmi et al., 2021; Nizam et al., 2021) and cost efficiency as a key determinant of financial stability (Lee et al., 2018; Rahi et al., 2022). These studies suggest that while ESG integration can enhance risk management and stakeholder trust in the long term, it often imposes short-term financial burdens. By building upon these insights, this research contributes to the ongoing discussion by examining the extent to which ESG and SDG strategies influence key profitability metrics such as ROAA and ROAE.

With reference to ESG scoring (rating), it is worth noticing that it has evolved over time hand in hand with the increasing significance of sustainability initiatives in corporate decision-making. Initially, ESG assessments were primarily developed for investors, helping them to find the best investment possibilities if they wanted to support the ESG ideas financially. Over the years, as sustainability became a key business priority, the need for a standardized definition grew. Organizations like PwC (2025) have contributed to this evolution by simplifying the concept, making it easier for businesses and stakeholders to understand. PwC's definition presents ESG rating as a straightforward metric that evaluates corporate efficiency and sustainability. It reads as follows. 'An ESG rating is a metric used to assess a company's performance in environmental, social, and governance (ESG) factors, reflecting its sustainability practices and corporate responsibility' (PricewaterhouseCoopers, 2025). This simplified definition by PwC aligns with the broader regulatory framework established by the European Union, which provides a more detailed and structured interpretation of ESG ratings. 'ESG rating means an opinion or a score, or a combination of both, regarding a rated item's profile or characteristics with regard to environmental, social and human rights, or governance factors, or regarding a rated item's exposure to risks or impact on environmental, social and human rights, or governance factors, that is based on both an established methodology and a defined ranking system of rating categories, irrespective of whether such ESG rating is labelled as 'ESG rating', 'ESG opinion' or 'ESG score' (Regulation 2024/3005/EU of the European Parliament and of the Council of November 27 2024 on the Transparency and Integrity of Environmental, Social and Governance (ESG) Rating Activities, and Amending Regulations 2019/2088/EU and 2023/2859/EU, 2024).

While PwC focuses on making ESG scoring accessible for businesses and stakeholders, the EU definition offers a comprehensive, standardized approach, emphasizing transparency, methodology, and the impact of ESG factors. The EU regulation ensures consistency across rating systems, reinforcing the credibility and comparability of ESG assessments in financial and corporate decision-making. It is important to distinguish between ESG rating and ESG scoring. The ESG scoring is a number that refers to the sustainable level of the company based on the defined methodology. On the other hand, an ESG rating is a broader assessment that includes the ESG score and incorporates qualitative analysis.

An assessment of progress towards the Sustainable Development Goals - SDGs for all UN member states has been provided in a recently published document titled The Sustainable Development Report 2024 (Sachs et al., 2024). Here, the SDG Index composite score is presented on a scale of 0 to 100 and can be interpreted as a percentage towards optimal performance on the SDGs. Therefore, the difference between 100 and a country's SDG Index score is the distance, in percentage points, that must be overcome to reach optimum SDG performance. (Sachs et al., 2024)

Considering the research question guiding this paper, i.e., RQ How does the sustainability level, measured by ESG composite scores and SDG composite scores, influence the profitability of selected banks in

the European Union, the following research hypotheses were formulated. These hypotheses are based on the theoretical argument and empirical findings discussed earlier. The research aim is to test the extent to which sustainable banking practices impact the financial performance of banks. These hypotheses were formulated as follows:

H_1: The level of ESG composite score has a positive impact on the profitability of selected banks in the European Union, primarily by increasing Return on Average Assets (ROAA) and Return on Average Equity (ROAE).

H_2: The level of SDG composite score has a positive impact on the profitability of selected banks in the European Union, primarily by increasing Return on Average Assets (ROAA) and Return on Average Equity (ROAE).

Research methodology

The methodology used in this research focuses on analysing the impact of environmental, social, and governance (ESG) factors and SDGs on the profitability of selected banks within the European Union (EU). The research employs a quantitative approach, relying on statistical techniques to model and interpret the relationship between various independent variables and bank profitability. The study collected panel data from 20 large banks in the EU between the years 2018 and 2022. The data related to ESG composite scores and microeconomic and banking sector indicators were extracted from Refinitiv Eikon (2023) and Bureau van Dijk and Orbis (2024). Data related to the SDG composite scores was obtained from the Europe Sustainable Development Report 2023 (Sachs et al., 2023), which focuses on sustainable development in the European region and provides an assessment and analysis of sustainability developments. Macroeconomic indicators and indicators for the banking sector were obtained from the World Bank Database (2023).

The analysis begins in 2018 due to significant developments in the banking and regulatory environment that have shaped the sustainability landscape. Firstly, the European Union's sustainable finance agenda gained momentum in 2018, with the European Commission releasing its Action Plan on Financing Sustainable Growth (Renewed Sustainable Finance Strategy and Implementation of the Action Plan on Financing Sustainable Growth - European Commission, 2020). This plan set the foundation for regulatory initiatives such as the EU Taxonomy and Sustainable Finance Disclosure Regulation (SFDR), which later influenced banks' ESG integration. Additionally, the period starting in 2018 saw increasing pressure from investors and stakeholders on banks to incorporate ESG factors into their financial strategies, marking a shift in sustainable finance practices. Furthermore, the post-2018 period witnessed economic challenges, including persistently low interest rates and digitalization trends, which further impacted banking profitability and the adoption of sustainability-oriented investment strategies. Given these developments, 2018 represents a meaningful starting point for analysing the interplay between sustainability and bank profitability.

To ensure the accuracy and robustness of the analysis, a data cleaning process was conducted. This involved verifying the completeness and consistency of the dataset, handling missing values, and excluding banks with insufficient or unreliable data. Specifically, due to limited data availability, five banks were removed and replaced by the other five banks in the ranking to maintain comparability and consistency across the sample. This refinement process ensured that the final dataset accurately reflected the financial and ESG characteristics of the selected banks. The panel regression approach was selected because it allows the analysis of both cross-sectional (differences among banks) and time-series (changes over the years) data, providing a more comprehensive understanding of the relationships between variables. This method also accommodates unobserved heterogeneity, which may exist across banks due to differences in size, geographic focus, or operational strategies.

Based on the literature review (Azmi et al., 2021, Lee et al., 2018, Nizam et al., 2021, Rahi et al., 2022), the control variables were divided into macroeconomic, banking sector-specific, and microeconomic variables. This categorization allowed for a systematic analysis of the diverse factors influencing bank profitability. Subsequently, a correlation analysis was conducted to identify relevant relationships among the variables. Based on the results of this analysis, the final variables included in the study were selected, as presented in Table 3. This approach ensured that the chosen variables effectively capture the key determinants of bank profitability and enable a robust analysis of their interrelationships. The model was developed based on a review of the relevant literature to encompass all pertinent variables. However, during the modelling process, certain indicators were excluded due to poor data quality, economic interpretation, model stability, multicollinearity, and statistical insignificance. These steps were taken to ensure the robustness and interpretability of the results. The final models include variables that best explain the relationship between bank profitability, their sustainability strategies, and other control variables, without introducing bias from redundant or low-quality variables. In constructing the model, the possibility of using separate metrics for the individual components of ESG (Environmental, Social, Governance) was considered. However, the final model

opted for the use of aggregated ESG scores due to data quality and availability. The following table (Table 2) provides an overview of the 20 large banks within the European Union analysed in this study, offering insights into their market capitalization and geographical distribution.

Table 2: The list of analysed banks

Bank	Country	Market Capitalization (M EUR)
BNP Paribas SA	France	2666.38
Crédit Agricole Group	France	2379.12
Banco Santander SA	Spain	1734.66
Société Générale SA	France	1486.82
Deutsche Bank AG	Germany	1336.79
Intesa Sanpaolo SpA	Italy	975.68
ING Groep NV	The Netherlands	967.82
UniCredit SpA	Italy	857.77
Banco Bilbao Vizcaya Argentaria SA	Spain	713.14
Nordea Bank Abp	Finland	594.84
CaixaBank SA	Spain	566.23
Danske Bank A/S	Denmark	505.90
Commerzbank AG	Germany	477.44
ABN AMRO Bank NV	The Netherlands	379.58
KBC Group NV	Belgium	355.87
Erste Group Bank AG	Austria	323.86
Skandinaviska Enskilda Banken AB	Sweden	317.12
Svenska Handelsbanken AB	Sweden	310.02
DNB Bank ASA	Norway	307.38
Swedbank AB	Sweden	256.26

Source: Authors' own work based on Refinitiv Eikon (2023) and Orbis (2024).

The data set includes financial performance indicators, i.e. significant indicators such as ROAA - Return on Average Assets and ROAE - Return on Average Equity. These serve as the key dependent variables. The characteristics of this core dataset are detailed in the following Table 3, which includes key statistical variables such as minimum and maximum values, mean, median, and standard deviation.

Table 3: Dataset description

Symbol	Minimum	Maximum	Average	Median	Standard Deviation
Bank Profitability Variables					
ROAA	-0.60	1.08	0.48	0.50	0.32
ROAE	-11.09	16.42	7.62	8.26	5.21
Sustainability Variables (SUST)					
ESG	60.57	95.48	78.28	77.12	9.13
SDG	68.59	81.68	74.19	73.05	4.27
Control Variables - Banking Sector (CBS)					
COST	0.27	1.54	0.68	0.65	0.23
TIER 1	12.40	22.70	16.69	16.20	2.71
SIZE	19.21	21.70	20.54	20.13	0.90
ROE	-11.64	16.16	8.15	8.66	5.28
LOS	0.00	0.06	0.02	0.01	0.01
Control Variables - Macroeconomic (CMA)					
INF	-0.32	10.00	2.79	1.78	2.77
GS	16.33	50.92	26.62	25.81	5.05
UNM	2.99	15.53	8.11	7.36	4.14
GDP1	-11.33	6.99	1.26	1.99	4.28
Control Variables - Microeconomic (CMI)					
COMP	73.78	96.93	87.62	89.10	6.54
BCOST	36.88	97.17	65.45	67.14	12.08
CRE	56.60	197.50	116.55	116.45	23.57
DEP	58.33	274.94	96.92	87.40	38.34
BNIM	0.39	2.15	1.02	0.97	0.26
BROA	-0.72	1.58	0.44	0.44	0.35
BROE	-12.48	16.16	6.14	7.22	4.18
DMBA	81.51	174.83	124.41	120.31	21.85
SMR	-20.47	43.19	14.07	24.41	10.07

Source: Authors' own work.

To quantify the relationship between the selected independent variables and bank profitability, a multiple regression analysis was employed. This statistical method allows for the simultaneous assessment of several predictors and their influence on the dependent variables (ROAA and ROAE). Two regression models are presented.

MODEL I enables the examination of the influence of independent variables on ROAA, and MODEL II enables the examination of the influence of independent variables on ROAE, according to the following relations:

Model I: ROAA (Return on Average Assets)

$$ROAA = b_0 + b_1 \cdot x_1 + b_2 \cdot x_2 + ... + b_m \cdot x_m + \varepsilon_i \quad (1)$$

$$ROAA = b_0 + b_1 \cdot SUST + b_2 \cdot CBS + b_3 \cdot CMA + b_4 \cdot CMI + \varepsilon_i \quad (2)$$

Model I: ROAE (Return on Average Equity)

$$ROAE = b_0 + b_1 \cdot x_1 + b_2 \cdot x_2 + ... + b_m \cdot x_m + \varepsilon_i \quad (3)$$

$$ROAE = b_0 + b_1 \cdot SUST + b_2 \cdot CBS + b_3 \cdot CMA + b_4 \cdot CMI + \varepsilon_i \quad (4)$$

Where:

ROAA, ROAE = dependent variable,

b_0 to b_m = estimates of regression coefficients,

x_0 to x_m = independent and control variables,

ε_i = a random component.

Before conducting the final version of the regression analysis, we had performed several pre-tests to ensure the validity of the model. We applied for the Augmented Dickey-Fuller (ADF) test. The aim was to check for the stationarity of time series data. Next, we addressed multicollinearity by calculating the Variance Inflation Factor (VIF). Finally, we tested for heteroscedasticity using the Breusch-Pagan test. It detects unequal variance of residuals. This approach allows for a precise estimation of the relationships between the independent, control and dependent variables (ROAA and ROAE). The method assumes that the residuals, or errors, are typically distributed and that no significant autocorrelation exists among them. By relying on OLS, the study ensures that the regression coefficients are unbiased and efficient, given that the proper assumptions are met. Several diagnostic checks were needed to verify the estimated model's robustness and reliability. These diagnostic checks strengthen the reliability of the regression analysis, ensuring that the estimated coefficients are robust and that the model effectively captures the underlying relationships between the ESG composite scores, SDG composite scores, other control variables, and bank profitability indicators.

Results

The study aimed to assess the impact of ESG composite and SDG composite scores on the profitability of selected banks within the European Union, along with other key banking sectors, macroeconomic and microeconomic control indicators. The analysis was based on panel data from 20 large banks. The data were processed, and regression models were designed to evaluate their Return on Average Assets (ROAA) and Return on Average Equity (ROAE) across 2018-2022. Before conducting the multiple regression analysis, a correlation analysis was first performed. Thus, the authors verified the relationship between the dependent and independent variables. The results of this analysis provided valuable information about the relevance of individual factors for the subsequent regression analysis.

Table 4 below contains the values of the correlation coefficients, along with the critical value used to determine the statistical significance of the correlations between the dependent and independent variables. Considering the number of observations (20 in this case) and the significance level set at five percent ($\alpha = 0.05$), the critical value was determined to be 0.423.

Table 4: Correlation coefficient summary

Variable	Critical Value	ROAA	Linear Dependence Result (ROAA)	ROAE	Linear Dependence Result (ROAE)
COST	0.423	-0.813100	DEPENDENCE	-0.771140	DEPENDENCE
TIER1	0.423	0.379824	IN-DEPENDENCE	0.489994	DEPENDENCE
SIZE	0.423	-0.614920	DEPENDENCE	-0.608490	DEPENDENCE
ROE	0.423	0.949275	DEPENDENCE	0.963828	DEPENDENCE
LOS	0.423	-0.123707	IN-DEPENDENCE	-0.251090	IN-DEPENDENCE
INF	0.423	0.431319	DEPENDENCE	0.373275	IN-DEPENDENCE
GS	0.423	0.234177	IN-DEPENDENCE	0.217685	IN-DEPENDENCE
UNM	0.423	0.070736	IN-DEPENDENCE	0.028751	IN-DEPENDENCE
GDP	0.423	0.476338	DEPENDENCE	0.631945	DEPENDENCE
SDG	0.423	0.264222	IN-DEPENDENCE	0.383181	IN-DEPENDENCE
COMP	0.423	0.135227	IN-DEPENDENCE	0.185071	IN-DEPENDENCE
BCOST	0.423	-0.740240	DEPENDENCE	-0.801960	DEPENDENCE
CRE	0.423	0.651072	DEPENDENCE	0.621095	DEPENDENCE
DEP	0.423	-0.333657	IN-DEPENDENCE	-0.221440	IN-DEPENDENCE
bNIM	0.423	0.562052	DEPENDENCE	0.391677	IN-DEPENDENCE

Variable	Critical Value	ROAA	Linear Dependence Result (ROAA)	ROAE	Linear Dependence Result (ROAE)
bROA	0.423	0.769785	DEPENDENCE	0.810529	DEPENDENCE
bROE	0.423	0.717510	DEPENDENCE	0.849996	DEPENDENCE
DMBA	0.423	0.187556	IN-DEPENDENCE	0.296248	IN-DEPENDENCE
SMR	0.423	-0.033210	IN-DEPENDENCE	0.109815	IN-DEPENDENCE
ESG	0.423	-0.299970	IN-DEPENDENCE	-0.408360	IN-DEPENDENCE

Source: Authors' own work.

This table summarizes the results of the correlation analysis between various variables (e.g. COST, ROE, ESG, SDG, etc.) and two indicators of bank profitability - ROAA (Return on Average Assets) and ROAE (Return on Average Equity). Statistically, the correlation coefficients indicate the strength and direction of the relationship between these variables. The critical value (0.423) determines whether the relationship is statistically significant and informs us whether there is a linear dependency between the variables.

We begin by interpreting the influence of ESG on bank profitability. Firstly, the correlation coefficient for ESG and ROAA (-0.29997) is smaller than the critical value (0.423), indicating that there is no significant relationship between ESG and ROAA. Although the negative value suggests that a higher ESG score may slightly reduce a bank's return on assets, this could be due to the costs associated with implementing sustainable strategies, which may decrease asset efficiency in the short term. The correlation coefficient for ESG and ROAE (-0.40837) is very close to the critical value. ESG factors may have a negative impact on bank profitability, primarily due to the costs involved in adopting sustainable practices. However, this impact is relatively weak. Nevertheless, the results indicate that a higher ESG score could, in some cases, reduce the efficiency of both bank capital and assets.

Secondly, we interpret the impact of SDG on bank profitability. The correlation coefficient for SDG and ROAA (0.264422) as well as for SDG and ROAE (0.383181) is positive but does not reach the critical value. This suggests a potential association between sustainable development goals and the return on bank assets in the long term, which could be linked to more efficient and sustainable investments. However, this observation should not be interpreted as evidence of causality without further econometric analysis. Simultaneously, this finding suggests that investments in sustainability may have a positive long-term impact. However, the effects may not be immediately noticeable. The main purpose of the research was to estimate the influence of sustainability on bank profitability measured by SDG and ESG composite scores and expressed by ROAA and ROAE. Therefore, these two variables were tested arbitrarily. The other variables were added to the model taking into account the results of correlation analyses. Both ESG and SDG were found to be in significant in the estimated models. For the sake of policy relevance, further modelling focused on SDG. The estimated model's results are indicated in the Tables No. 5 and No. 6 below.

The first regression model was created with the dependent variable ROAA and the independent variables SDG, COST, ROE, and SIZE.

Table 5: ROAA Regression Model

Variables	COEF.	P-Value
INTERCEPT	2.022203	0.014999707
SDG	-0.009310	0.029449826
COST	-0.317580	0.009185156
ROE	0.049578	1.4135E-07
SIZE	-0.051510	0.091447041
Multiple R	0.976388	
R^2	0.953333	
Adjusted R^2	0.940888	
Standard Error	0.061224	
F- statistics	76.605930	8.48706E-10

Source: Authors' own work.

The following equation can express the resulting relationship of the dependent variable ROAA with the selected indicators:

Model I: ROAA (Return on Average Assets):

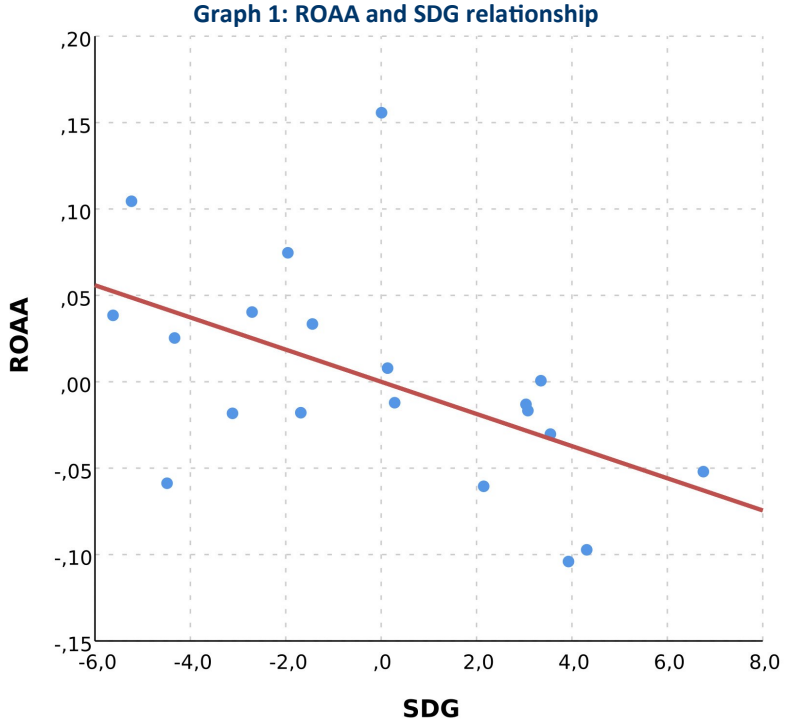
$$ROAA = 2.022203 - 0.00931SDG - 0.31758COST + 0.049578ROE - 0.05151SIZE + \varepsilon_i \quad (5)$$

Based on the model, a significant negative relationship between cost (COST) and profitability (ROAA) can be confirmed, even at the 1% significance level. This result aligns with theoretical expectations. The next indicator, ROE, shows a strong positive dependence on the dependent variable ROAA. This result is supported both by the literature review and the correlation analysis conducted. The strong interconnection between

ROE and ROAA can be explained by the fact that both indicators measure the efficiency of a bank's use of its assets and resources to achieve profitability. Higher return on assets (ROAA) generally indicates that the bank is successfully utilizing its assets to generate profit. ROE further takes into account the bank's financial structure, including its debt. The strong correlation between these two indicators suggests that banks with higher asset profitability are often able to achieve higher returns for their shareholders through efficient use of their assets and financial resources. A surprising finding was the SDG factor. In the model, regression analysis revealed that this indicator negatively affects ROAA, with statistical significance at the 5% level.

This phenomenon can be interpreted as a consequence of the inefficient use of a bank's resources in relation to its sustainable development strategy. Banks that focus on sustainable development goals (SDG) may be more prone to allocating resources to projects with lower returns or higher costs, which can negatively impact the overall return on assets (ROAA). Such a negative impact of SDG on ROAA can be further intensified not only by economic factors but also by regulatory requirements and pressures from stakeholders advocating for sustainable investment strategies. The SIZE indicator, which measures the size of the banks, continues to show a significant negative relationship, particularly when the analysis is limited to large banks.

Graph 1: ROAA and SDG relationship



Source: Authors' own work.

Graph 1 illustrates the relationship between SDG score (x-axis) and ROAA (Return on Average Assets) (y-axis) for a selected sample of banks. Each point represents an individual bank, while the red regression line indicates the trend between these variables. The downward slope suggests a negative relationship, meaning higher SDG scores are associated with lower ROAA values. This aligns with previous correlation analysis, which showed a weak negative correlation.

The second regression model was created with the dependent variable ROAE and the independent variables SDG, COST, ROE, LOS, and INF.

Table 6: ROAE regression model

Variables	COEF.	P-Value
INTERCEPT	21.231810	0.020257036
SDG	-0.178210	0.052275800
COST	-3.901190	0.010522813
ROE	0.902458	6.71581E-09
LOS	-101.384000	0.009460788
INF	-1.239960	0.064589399

Variables	COEF.	P-Value
Multiple R	0.983784	
R^2	0.967831	
Adjusted R^2	0.956343	
Standard Error	0.785232	
F- statistics	84.241660	6.08086E-10

Source: Authors' own work.

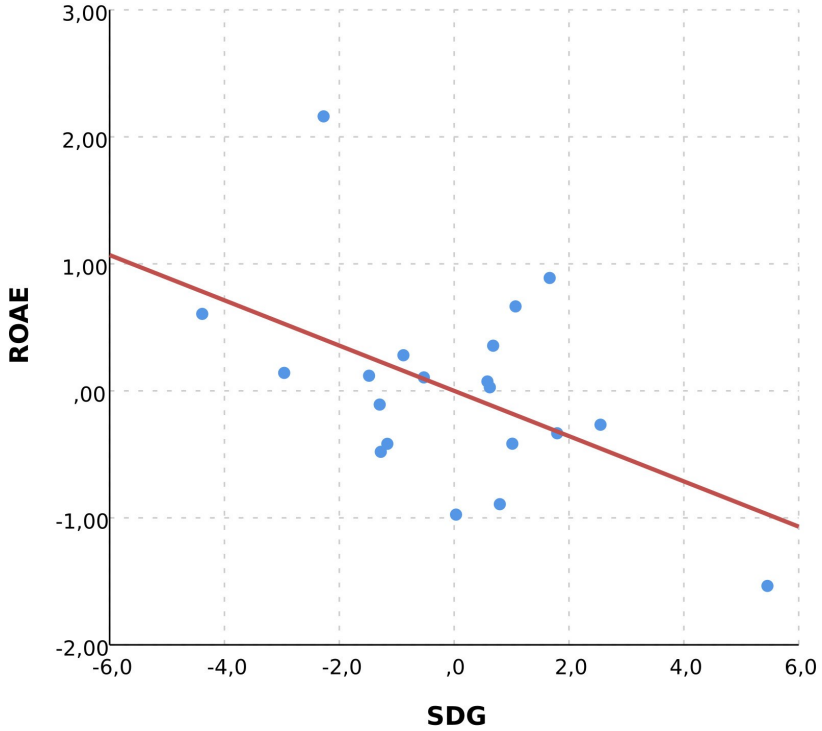
The resulting relationship of the dependent variable ROAE with the selected indicators can be expressed by the following equation:

Model II: ROAE (Return on Average Equity):

$$ROAE = 21.23181 - 0.17821SDG - 3.90119COST + 0.902458ROE - 101.384LOS - 1.23996INF + \varepsilon_i \quad (6)$$

Similarly, we can observe the negative impact of cost (COST) and profitability (ROAE), as in the first model. ROE also shows the same relationship, strongly influencing ROAE at the 1% significance level. Surprisingly, the loan loss reserves to total loans ratio (LOS) shows a significant negative impact, contrary to what was indicated in the correlation analysis but in line with the expectations from the literature review. This suggests that loan loss reserves have a substantial effect on the bank's net profit and ROAE. These reserves directly reduce net profit and ROAE by increasing costs and allocating capital that could otherwise be used for profitable activities. Moreover, high provisions may signal deteriorating loan quality, leading to regulatory scrutiny and negative market perception, which in turn impacts the bank's stock value and cost of capital. Additionally, these provisions can compel banks to adopt more conservative operational strategies, limiting their ability to engage in higher-return opportunities. Thus, despite their importance in risk management, loan loss reserves can significantly affect a bank's profitability and financial health. In contrast, inflation had a negative impact, but only at the 10% significance level. Inflation typically increases financing and operational costs for banks, reducing their profitability. As inflation rises, so do the costs of capital and loan reserves, which elevates the risk of loan defaults. This phenomenon negatively affects the performance of banks, particularly ROE. Inflation can lead to lower interest margins and decreased efficiency in capital utilization, ultimately reducing overall bank profitability. The study by Rahman et al. (2015) confirmed the negative effect of inflation on bank profitability, as measured by indicators such as ROA and ROE.

Graph 2: ROAE and SDG relationship



Source: Authors' own work.

Graph 2 illustrates the relationship between the SDG score (x-axis) and ROAE (Return on Average Equity) (y-axis) for a selected sample of banks. It represents partial relationship of ESG Score to ROAE controlled for other variables used in the model (i.e. COST, ROE, LOS and INF). The slope of the line is equal to the regression coefficient for SDG.

In both models, the ESG indicator was removed due to insufficient significance, meaning that the hypothesis concerning ESG was not verified. On the other hand, the SDG indicator was included in both models and showed a negative impact.

Discussion

Regulations such as the EU Taxonomy Regulation (Regulation 2020/852/EU of the European Parliament and of the Council of June 18 2024), the Corporate Sustainability Reporting Directive (Directive 2022/2464/EU of the European Parliament and of the Council of December 14 2022) and Sustainable Finance Disclosure Regulation (Regulation 2019/2088/EU of the European Parliament and of the Council of November 27 2024) require banks to align their practices with clearly defined sustainability criteria. While compliance can increase operational costs in the short term, it also provides opportunities for banks to access sustainability-linked incentives and meet investor expectations for transparent ESG reporting. However, the financial implications of adopting ESG practices remain a subject of debate. The study aims to explore the relationship between ESG and SDG composite scores, sustainability strategies, and bank profitability. Therefore, the following research questions is proposed.

RQ: How does the sustainability level, measured by ESG composite scores and SDG composite scores, influence the overall profitability of selected banks in the European Union?

To address these research questions, two hypotheses were formulated to test the relationship between sustainability strategies, and bank profitability.

H_1: The level of the ESG composite score has a positive impact on the profitability of selected banks in the European Union, primarily by increasing Return on Average Assets (ROAA) and Return on Average Equity (ROAE).

The correlation between ESG and ROAA is -0.299970, and the correlation between ESG and ROAE is -0.408360. Both values are below the critical threshold (0.423), indicating that no significant correlation exists between the level of ESG composite score and profitability. The negative values suggest a weak inverse relationship, meaning that higher ESG composite scores might be slightly associated with lower profitability, but the relationship is not statistically significant. The ESG variable was excluded from both regression models (ROAA and ROAE) due to insufficient significance. H_1 was rejected as the level of ESG composite score does not show a positive impact on bank profitability.

H_2: The level of SDG composite score has a positive impact on the profitability of selected banks in the European Union, primarily by increasing Return on Average Assets (ROAA) and Return on Average Equity (ROAE).

The correlation between SDG and ROAA is 0.264222, and the correlation between SDG and ROAE is 0.383181. Both values are below the critical threshold (0.423), indicating that no significant relationship exists between SDG and bank profitability based on simple correlation analysis. Although the correlations are positive, their low magnitude suggests a weak association rather than a strong predictive relationship. In the ROAA regression model (Table 5), the coefficient for SDG is -0.00931, with a p-value of 0.0294, indicating a statistically significant negative impact at the 5% level. In the ROAE regression model (Table 6), the coefficient for SDG is -0.17821, with a p-value of 0.0522, indicating a negative impact that is close to statistical significance at the 5% level (but still above it). Contrary to the hypothesis (H_2), the regression results indicate that SDG has a negative impact on bank profitability (ROAA and ROAE) rather than a positive one. H_2 is rejected based on the empirical evidence, as the SDG score does not have a positive impact on bank profitability. Instead, it shows a negative or insignificant effect on ROAA and ROAE, suggesting that sustainability efforts may require a longer time horizon to generate financial benefits.

Analysing the relationship between ESG and SDG factors and bank profitability revealed some important insights. Contrary to the initial hypothesis, ESG factors did not show a positive impact on profitability. Instead, the findings suggest that SDG initiatives may impose financial burdens on banks in the short term, potentially due to the significant investments required to implement sustainable practices. This aligns with previous studies indicating that the financial benefits of sustainable initiatives are often delayed, as initial costs can outweigh immediate returns. For banks in the European Union, the adoption of sustainable measures appears to be more focused on long-term value creation and reputational gains rather than short-term profitability. Despite these short-term challenges, the long-term benefits of both ESG and SDG-related strategies cannot be overlooked. However, it is important to note that the conducted correlation analysis does not establish causality, and the observed relationships should be interpreted as associations rather than definitive cause-and-effect links. The results indicate that, for banks in

the European Union, the adoption of sustainable measures may be more focused on long-term value creation and reputational gains rather than short-term profitability. While short-term financial strain is evident, the long-term benefits of sustainable strategies remain an area for further investigation. Banks that successfully integrate sustainable practices are likely to benefit from increased brand loyalty, improved risk management, and access to new market opportunities. As sustainability becomes a priority for more investors and consumers, banks with strong sustainability performance are poised to gain greater customer trust and stronger stakeholder relationships.

While the findings highlight a negative correlation between sustainable initiatives and profitability in the short term, this relationship warrants further exploration. Apart from regulatory compliance and market demands for sustainability, the counterarguments supporting the justification for long-term value creation inevitably include the strategic integration of ESG practices into all levels of the value chain. It will help banks to position themselves as industry leaders, fostering trust among stakeholders and capturing emerging market opportunities.

Adopting effective mitigation strategies could help banks navigate the challenges posed by high sustainability costs. Banks can increase investments into new age technologies, adopt incremental implementation of sustainable practices, prioritize projects with high potential for long-term profitability, focus on collaboration with public and state partners, offer sustainability-link products (green loans, sustainability-linked bonds), and focus on developing robust risk management frameworks tailored to sustainability investments. Thus, banks can minimize their exposure to potential losses, especially in volatile markets.

In conclusion, while ESG and SDG initiatives may reduce short-term profitability, they represent crucial steps toward creating sustainable and resilient financial institutions in the long term. Future research should explore the evolving impact of these factors, particularly as banks become more proficient at embedding sustainability into their core operations. Additionally, the role of AI in shaping sustainable finance should be investigated as well, as AI technologies are rapidly emerging and have the potential to significantly influence how banks manage ESG and SDG-related strategies, optimize operations, and enhance decision-making in the sustainability landscape.

The authors are fully aware of some limitations of their research which lies mainly in the scope of data representing only the years 2018-2022, limited geographical focus only on the EU countries, and selection of variables, i.e., while the selected profitability metrics (ROAA and ROAE) provide valuable insights, they might not capture the complexities and all financial implications of ESG and SDG integration. The authors are also fully aware of the potential impact of external factors like geopolitical tensions, economic crises, or rapid technological advancements due to AI and other new age technologies, which could influence the effectiveness of sustainable strategies and are not fully addressed in the proposed models. Another limitation of this research is the unavailability of detailed data for individual ESG factors (Environmental, Social, Governance), which led to the use of aggregated ESG scores only. For future research, it would be beneficial to conduct a deeper analysis among selected banks, focusing on the disaggregated impact of individual ESG pillars on profitability.

Further research should focus on the practical implications for banks, particularly the integration of ESG and SDG initiatives into long-term strategic planning. This encompasses embedding sustainability principles across all levels of the value chain, including governance structures, operational processes, and product offerings. While the study identifies correlations between sustainability factors and financial performance, it does not imply a direct causal relationship. Future research should employ advanced econometric techniques, such as panel data models with lag effects, to assess the potential long-term financial impact of sustainability investments more rigorously. Future research projects could provide evidence-based recommendations on how banks can incorporate sustainability metrics into their decision-making processes to evaluate both risks and opportunities associated with sustainable practices. Additionally, studies could explore how banks might allocate resources toward technological innovations, such as AI-powered risk assessment tools and blockchain, to enhance efficiency and facilitate smoother transitions to sustainable practices by strengthening stakeholder engagement. The potential of implementing sustainability initiatives incrementally, while prioritizing projects with the highest potential for long-term returns, should also be investigated.

Conclusion

The study investigated the impact of sustainability factors on the profitability of selected European Union banks. It was designed to examine their relationship with key profitability metrics. Return on Average Assets (ROAA) and Return on Average Equity (ROAE) were the main factors explored. The research findings are significant since they unveiled mixed results pertaining to the process of integrating sustainable practices into the banking sector. It aims to offer insights into balancing sustainability with financial performance in a changing regulatory and economic environment. While ROE consistently showed a positive and significant impact on bank profitability, ESG factors exhibited a negative cor-

relation with both ROAA and ROAE. High initial costs related to the implementation of sustainable practices represent a significant factor in this outcome. This suggests that, although sustainability initiatives may not deliver immediate financial returns, they are crucial for long-term growth. While the SDG score showed some positive influence on ROAA, it did not demonstrate a statistically significant relationship. This indicates that, although sustainable goals align with long-term growth objectives, their immediate financial impact is still limited.

Additionally, the study highlighted the critical role of cost efficiency (COST), showing a strong negative relationship between higher operational costs and profitability. Larger banks (SIZE) also tended to experience reduced profitability, particularly in terms of ROAA, likely due to the complexities and inefficiencies associated with managing larger institutions.

In conclusion, while the adoption of ESG and SDG practices is crucial for future sustainability and long-term profitability, they currently pose challenges to short-term financial performance. Banks must continue to balance these sustainability initiatives with efficient cost management to navigate the evolving regulatory and economic landscape. Further, there are potential strategies to consider. To suggest a few of them, banks can integrate advanced technologies such as AI and blockchain to streamline financially demanding finance processes, develop strategic partnerships with technologically advanced clients in implementing technologically challenging operations like biometric payment systems, and implement ESG project gradually since phasing in projects with high potential for long-term profitability can help create a balance between sustainability goals and financial performance. Last but not least, the focus on monitoring public-private partnership opportunities while leveraging incentives from governments can help offset costs associated with ESG implementation, foster positive branding and stronger relationships with environmentally and socially conscious clients. While the findings underscore the short-term financial strain of integrating ESG and SDG strategies, the long-term perspective reveals significant potential value. Banks that invest in sustainability stand to benefit from stronger stakeholder trust, enhanced market positioning, and reduced risks associated with regulatory non-compliance or environmental volatility. Moreover, the alignment with global sustainability trends offers opportunities for innovation, diversification, and revenue generation, making ESG and SDG integration not just a challenge but a strategic advantage for long-term profitability and resilience. This long-term potential is closely intertwined with the influence of legal regulations, which play a critical role in shaping the viability of ESG strategies. The role of legal regulations is crucial as they are shaping the long-term viability of ESG strategies. As ESG and SDG strategies continue to evolve, compliance with legal frameworks such as the CSRD and SFDR will remain pivotal, especially in ensuring banks' alignment with sustainability goals and mitigating reputational and regulatory risks. Future research should explore these complementary strategies to assess their impact on long-term profitability due to the fact that sustainable practices become an integral part of the financial system, particularly in the face of shifting global political commitments to climate initiatives.

Acknowledgements

This paper was supported by the University of Economics in Prague (Project No. VSE IG102025, FFU 27/2025).

References

Akomea-Frimpong, I., Adeabah, D., Ofosu, D. & Tenakwah, E.J. (2021). A review of studies on green finance of banks, research gaps and future directions. Journal of Sustainable Finance and Investment, 12(4), 1241-1264. https://dx.doi.org/10.1080/20430795.2020.1870202.

Azmi, W., Hassan, M.K., Houston, R. & Karim, M.S. (2021). ESG activities and banking performance: International evidence from emerging economies. Journal of International Financial Markets, Institutions and Money, 70, 1-18. https://dx.doi.org/10.1016/j.intfin.2020.101277.

Beck, T., Chen, T., Lin, C. & Song, F.M. (2016). Financial innovation: The bright and the dark sides. Journal of Banking & Finance, 72, 28-51.

Bömer, M. & Maxin, H. (2018). Why fintechs cooperate with banks - evidence from germany. Zeitschrift Für Die Gesamte Versicherungswissenschaft, 107(4), 359-386. https://dx.doi.org/10.1007/s12297-018-0421-6.

Brandl, B. & Hornuf, L. (2020). Where did FinTechs come from, and where do they go? The transformation of the financial industry in Germany after digitalization. Frontiers in Artificial Intelligence, 3, 1-18. https://dx.doi.org/10.3389/frai.2020.00008.

Bureau van Dijk. (2024). Orbis [Company database]. Bureau van Dijk. Accessed via Prague University of Economics and Business, (Accessed: 22.10.2024).

Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 Amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as Regards Corporate Sustainability Reporting (Text with EEA Relevance), EP, CONSIL, 322 OJ L (2022). http://data.europa.eu/eli/dir/2022/2464/oj/eng.

Debrah, C., Darko, A. & Chan, A.P.C. (2022). A bibliometric-qualitative literature review of green finance gap and future research directions. Climate and Development, 15(5), 432-455. https://dx.doi.org/10.1080/17565529.2022.2095331.

Dreyer, J.K., Sharma, V. & Smith, W. (2023). Warm-glow investment and the underperformance of green stocks. International Review of Economics & Finance, 83, 546-570, https://dx.doi.org/10.1016/j.iref.2022.10.006.

Dreyer, J.K., Sund, K.J. & Tatomir, M. (2024). Doing good in good times only? Uncertainty as contingency factor of warm-glow investment. Research in International Business and Finance, 71, 1-17.

Deb, R., Behra, A. & Dusmanta, K. (2024). ESG Score and Firm Performance: Evidence from Indian–Listed Firms. South Asian Journal of Management, 30(4), 56-80. https://dx.doi.org/10.62206/sajm.30.4.2023.56-80.

European Council. (2024). European Green Deal. Consilium. https://www.consilium.europa.eu/en/policies/green-deal/ (Accessed: 22.10.2024).

Gomber, P., Kauffman, R.J., Parker, C. & Weber, B.W. (2018). On the Fintech Revolution: Interpreting the Forces of Innovation, Disruption, and Transformation in Financial Services. Journal of Management Information Systems, 35(1), 220-265. https://dx.doi.org/10.1080/07421222.2018.1440766.

Haris, M., Tan, Y., Malik, A. & Ain, Q.U. (2020). A Study on the Impact of Capitalization on the Profitability of Banks in Emerging Markets: A Case of Pakistan. Journal of Risk and Financial Management, 13(9), 217-238. https://dx.doi.org/10.3390/jrfm13090217.

Hornuf, L., Klus, M.F., Lohwasser, T.S. & Schwienbacher, A. (2020). How do banks interact with fintech startups? Small Business Economics, 57(3), 1505-1526. https://dx.doi.org/10.1007/s11187-020-00359-3.

Chams, N., García-Blandón, J. & Hassan, K. (2021). Role Reversal! Financial Performance as an Antecedent of ESG: The Moderating Effect of Total Quality Management. Sustainability, 13(13), 7026-7044. https://dx.doi.org/10.3390/su13137026.

Jain, P. & Sharma, B.K. (2023). Impact of Green Banking Practices on Sustainable Environmental Performance and Profitability of Private Sector Banks. International Journal of Social Ecology and Sustainable Development, 14(1), 1-19. https://dx.doi.org/10.4018/ijsesd.330135.

Kumar, V., Acharya, S. & Ho, L.T.H. (2020). Does Monetary Policy Influence the Profitability of Banks in New Zealand? International Journal of Financial Studies, 8(2), 35-52. https://dx.doi.org/10.3390/ijfs8020035.

Lee, D.D., Faff, R.W. & Rekker, S.A.C. (2013). Do high and low-ranked sustainability stocks perform differently? International Journal of Accounting & Information Management, 21(2), 116–132. https://dx.doi.org/10.1108/18347641311312267.

Mehta, A. & Ganga, B. (2017). What Determines Banks' Profitability? Evidence from Emerging Markets-the Case of the UAE Banking Sector. Accounting and Finance Research 6(1), 77-88. https://dx.doi.10.5430/afr.v6n1p77.

Menicucci, E. & Paolucci, G. (2016). The determinants of bank profitability: empirical evidence from European banking sector. Journal of Financial Reporting and Accounting, 14(1), 86-115. https://dx.doi.org/10.1108/jfra-05-2015-0060.

Mirovic, V., Kalas, B., Djokic, I., Milicevic, N., Djokic, N. & Djakovic, M. (2023). Green Loans in Bank Portfolio: Financial and Marketing Implications. Sustainability, 15(7), 1-14. https://dx.doi.org/10.3390/su15075914.

Nizam, E., Ng, A., Dewandaru, G., Nagayev, R. & Nkoba, M.A. (2019). The impact of social and environmental sustainability on financial performance: A global analysis of the banking sector. Journal of Multinational Financial Management, 49, 35-53. https://dx.doi.org/10.1016/j.mulfin.2019.01.002.

Rahi, A.F., Akter, R. & Johansson, J. (2021). Do sustainability practices influence financial performance? Evidence from the Nordic financial industry. Accounting Research Journal, 35(2), 292-314. https://dx.doi.org/10.1108/arj-12-2020-0373.

Rastogi, S., Kanoujiya, J., Gautam, R.S. & Agarwal, B. (2024). Profitability Is Not a Ticket to Increase the Investments in ESG: Evidence from Indian Banks. Vision: The Journal of Business Perspective 0(0), 1-15. https://dx.doi.org/10.1177/09722629241257120.

Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on Sustainability-related Disclosures in the Financial Services Sector. (2024). https://eur-lex.europa.eu/eli/reg/2019/2088/oj/eng (Accessed: 22.10.2024).

Regulation (EU) 2024/3005 of the European Parliament and of the Council of 27 November 2024 on the Transparency and Integrity of Environmental, Social and Governance (ESG) Rating Activities, and Amending Regulations (EU) 2019/2088 and (EU) 2023/2859 (Text with EEA relevance). (2024). https://eur-lex.europa.eu/eli/reg/2024/3005/oj/eng (Accessed: 22.10.2024).

Refinitiv. (2023). Eikon [Financial database]. Refinitiv. Accessed via Prague University of Economics and Business.

Renewed sustainable finance strategy and implementation of the action plan on financing sustainable growth — European Commission. (2020). https://finance.ec.europa.eu/publications/renewed-sustainable-finance-strategy-and-implementation-action-plan-financing-sustainable-growth_en (Accessed: 22.10.2024).

Sachs, J.D., Lafortune, G. & Fuller, G. (2024). The SDGs and the UN Summit of the Future. Sustainable Development Report 2024. Dublin University Press, Dublin. https://dx.doi.org/10.25546/108572.

Voicu Dan, D., Oana Marina, B., Bogdan Stefan, I. & Liliana, I.F. (2022). The Influence of ESG Factors on Financial Performance in the Banking Sector during the Covid-19 Pandemic. Economic Computation & Economic Cybernetics Studies & Research, 56(4), 71-88. https://dx.doi.10.24818/18423264/56.4.22.05.

Yin, W., Zhu, Z., Kirkulak-Uludag, B. & Zhu, Y. (2021). The Determinants of Green Credit and Its Impact on the Performance of Chinese Banks. Journal of Cleaner Production, 286, 1-11. https://dx.doi.org/10.1016/j.jclepro.2020.124991.

Yuan, D., Gazi, Md.A.I., Harymawan, I., Dhar, B.K. & Hossain, A.I. (2022). Profitability determining factors of banking sector: Panel data analysis of commercial banks in South Asian countries. Frontiers in Psychology, 13, 1-17. https://dx.doi.org/10.3389/fpsyg.2022.1000412.

Yuen, M.K., Ngo, T., Le, T.D.Q. & Ho, T.H. (2022). The environment, social and governance (ESG) activities and profitability under COVID-19: evidence from the global banking sector. Journal of Economics and Development, 24(4), 345-364. https://dx.doi.org/10.1108/jed-08-2022-0136.

Wang, Q., Zhang, Y., Li, Y. & Wang, P. (2024). ESG performance and green innovation in commercial banks: Evidence from China. PLOS ONE, 19(11), 1-18. https://dx.doi.org/10.1371/journal.pone.0308513.

World Bank Group. (2024). World Development Indicators DataBank. https://databank.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG/1ff4a498/Popular-Indicators (Accessed: 22.10.2024).