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The Relationship between Environmental, Social and Governance Factors, Economic Growth, and Banking Activity

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Abstract: The sustainability-linked discussion has gained international importance, with the banking sector being an essential pillar of the new economy, particularly through channeling financial resources to environmentally friendly economic activities. It is, however, still unclear if ESG is profitable, both for the economy and banks. This paper aims at filling this gap by presenting, from a macroeconomic perspective, the impact of ESG efforts and the banking sector's contribution to a sustainable economy. Using panel regression models with fixed effects, the study investigates the impact of ESG factors and banking activity on economic growth. The results show a negative relationship between country-level ESG scores and economic growth, both in the short and long run, while increased financial intermediation by the banking sector, used as a proxy of potential green lending activity, does not necessarily enhance economic growth. Through delving into the interplay between the ESG score, economic development, and banking activity, this research could serve as a discussion point for economists, bankers, and policymakers when designing the economic and financial strategies for transitioning to a green economy.

Keywords: sustainability; economic development; ESG; green finance

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1. Introduction

The years following the Paris Agreement, signed in 2015, have placed the concept of ESG (Environmental, Social, Governance) at the forefront of the global economic dialogue, emphasizing the particular importance of sustainability and social responsibility. Although numerous analyses explore the relationship between ESG and Gross Domestic Product (GDP), in the scientific literature there is no consensus on whether ESG can contribute to economic development. Thus, the origins and underlying paradigms of both indicators should be better understood, and their interrelationships should be contextualized in the economic analysis.

ESG represents a framework for the holistic integration of sustainability, ethical considerations, and corporate responsibility into decision-making processes to drive long-term value creation and mitigate risks. ESG indicators are related to the concept of sustainable economic development, which is based on the principles of the circular economy. This means a sustainable use of natural resources, considering the constraints on production. The circular economy promotes waste reduction and environmental and social responsibility in the long run (Geissdoerfer et al. 2017).

On the other hand, GDP per capita and traditional/resource-related economic growth metrics are based on a linear growth model. According to this model, natural resources are plentiful and inexhaustible (Daly 2005; Meadows et al. 1972), and it often overlooks the long-term depletion of natural resources (Stiglitz et al. 2009).

This fundamental difference between circular and linear economic growth models raises questions about whether ESG is beneficial from an economic point of view. This

relationship poses a high degree of complexity and involves all relevant stakeholders, from the broader economy, international institutions, governments, regulatory authorities, NGOs, and consumers (Chen et al. 2022a).

As investments in sustainable economic activities continue, the benefits become more evident, leading to a more significant relationship between ESG performance and GDP growth (Eccles et al. 2014). This long-term relationship underscores the economic costs and the eventual rewards associated with the shift towards sustainability.

In this highly volatile context, especially after the outbreak of the COVID-19 pandemic, the importance of the banking sector is distinguished in the global efforts for a sustainable economy, having a pivotal role in directing financial resources to those economic initiatives that are friendly to the environment, therefore to sustainable economic development.

Our paper aims at investigating the interaction between ESG and economic development and, while adding value to the existing literature by including the banking sector in this analysis, accounting for the potential impact of green lending on economic development.

In this context, we will analyze the impact that ESG factors have on macroeconomic indicators if they are promoters of economic growth and thus provide economic benefits to the entire economy, not just at the company level, as discovered by Edmans (2023). The analysis is performed for a dataset covering the 27 European Union (EU) member states, making it very relevant in the current geopolitical context, as the EU has been at the forefront of the transition towards a green economy. The addition of the banking sector is also highly relevant for the European context, as banks traditionally finance 70–80% of the economic activity in Europe.

These considerations further strengthen the relevance and added value of our paper, placing it as one of the early studies approaching sustainable economic growth from both an ESG and a banking perspective, aiming to present a holistic and relevant perspective on this very topical subject in the post-pandemic reality, where the global concern for sustainability and social responsibility has increased.

2. Literature Review

The first step towards understanding the complex topic of sustainable development was taken by the United Nations (2004), through the report "Who cares wins", in which it aggregated the main components of this struggle under the umbrella of a term that would quickly enter the collective language—ESG (environmental, social, governance). At that time, investors were encouraged to overcome the "complexity and diversity of the issue", to embrace new ideas, and to implement them in their business strategies for the long term.

In the ex-post Paris Agreement period (2015), especially during the years of the COVID-19 pandemic, the need to accelerate the transition towards a sustainable economy emerged prominently on the public agenda (Yuen et al. 2022).

Enhanced sustainability performance has a positive effect on economic development (Wang et al. 2023). Studies from the specialized literature, such as (Diaye et al. 2022), indicate the existence of a positive link between ESG factors and GDP per capita in the long term, but the same relationship is no longer valid when we talk about the short term.

In order to achieve climate targets, public authorities should focus not only on GDP but also on the development of human resources specialized in ESG issues, the development of green financing strategies, innovation, and the allocation of funds to reduce the risks associated with sustainable economic development, permanently seeking the positive impact of green financing on economic growth (Ouyang et al. 2023).

Green economic growth is accentuated by the increasing consumption of natural and financial resources, and to be sustained in the long term, authorities should develop measures for the efficient use of these resources (Ruan et al. 2023).

The integration of ESG factors into the business strategies of companies facilitates the reduction of risks, the improvement of profitability, and the loyalty of a well-prepared human resource. The effects of ESG practices are reflected in the value of companies—

from a micro perspective—and in economic development—from a macro perspective (Azmi et al. 2021)—even if, in the latter case, the growth rate may be temporarily slowed down (Ouyang et al. 2023). The results of studies in the literature are not homogeneous, however, indicating that ESG performance has a greater positive influence on economic development in high-income countries that emit significant amounts of greenhouse gases than in countries whose incomes depend on natural resources (Wang et al. 2023).

Climate change is expected to accelerate, and the effects will no longer be felt only at the environmental level, as they affect all economic activities (Park and Kim 2020). In this context, understanding the interdependencies between ESG, economic development, and financing flows takes on increased importance.

Friede et al. (2015) show that, in the long term, strong ESG practices may positively affect economic development through superior financial performance. This result may be influenced by brand value, better risk management and reputation, or improved operational efficiency. Furthermore, access to lower costs of capital facilitates investments in sustainable initiatives, which can contribute to overall economic development.

Another piece of research (Eccles et al. 2014) delves into the influence of sustainability-linked practices on economic development. The authors find that economic growth can be influenced by the integration of ESG into organizational processes through increased innovation, enhanced operational efficiency, and, maybe most importantly, a better relationship with stakeholders.

Embracing ESG practices may materialize in productivity improvements, a reduction in costs, and risk mitigation, which may bolster economic development (Khan et al. 2016).

Furthermore, Abate et al. (2021) suggest that strong ESG practices tend to influence the financial outcomes within an economy and can materialize in better foreign investment rates and more responsible business conduct.

As of this writing, empirical evidence on causality between ESG and economic development does not show a clear positive relationship between them. On the contrary, there are studies (Tarmuji et al. 2016) that show that environmentally friendly economic practices do not significantly influence economic development, as they involve the use of additional financial and human resources. In addition, clarifications are needed from the regulators regarding the consideration of an economic activity as ESG-compliant, as there are differences in value between the same company, which is analyzed according to different ESG rating systems (Gilchrist et al. 2021).

In this context, whose volatility was accelerated by the COVID-19 pandemic, green financing plays an essential role in the restructuring of the economy and sustainable development, a fact also supported by some studies in the specialized literature (Ziolo et al. 2021) showing a positive relationship between green finance and sustainable economic development.

Flammer (2021) revealed that the use of bonds to fund projects that benefit the environment is gaining importance in industries where environmental concerns hold financial weight. These bonds showcase a company's dedication to sustainability, attracting investors who prioritize eco-friendly investments. According to Revelli and Viviani (2015), sustainable finance, including ESG investments, can enhance performance by aligning business practices with investor values and societal expectations. Shahrour et al. (2023) stress that ESG initiatives can mitigate risks and foster stable, sustained growth. Stroebel and Wurgler (2021) elaborated on how climate finance, through green bonds, plays a vital role in transitioning towards a low-carbon economy by mobilizing private funds for large-scale sustainable projects. These viewpoints underscore the nature and potential benefits of finance for both economic progress and environmental sustainability. Thus, the financial sector, specifically banking organizations, can be a promoter of sustainable economic growth by mobilizing financial resources and allocating them according to ESG factors (Chen et al. 2022b). The impact of ESG on the banking sector is even greater in countries with a poorly developed financial market, which rely predominantly on the banking sector to cover financing needs.

A higher ESG score leads to a reduction in systematic risk and is a magnet for investors who maintain such assets for the long-term, even in times of crisis (Cerqueti et al. 2021). However, the main challenge that researchers still face in supporting these ideas is the lack of a sufficiently broad spectrum of relevant historical data, which allows the methodological analysis of ESG risks on banks (Blanchard et al. 2022), which is an aspect that requires extensive analysis.

The investments needed to attain the target of net zero carbon emissions require the mobilization of huge financial resources, both public and private. That is why the banking system can be part of the complex mechanism needed to reduce the effects of climate change, but global coordination is needed to face these complex challenges (Bank for International Settlement 2023).

The specialized literature suggests that the inclusion of ESG principles in economic processes is important, but ESG is not the only criterion that determines the value of an economy, hence the idea that the world needs performing economies, not just those that excel in the ESG chapter (Edmans 2023).

3. Materials and Methods

The empirical study in this paper is based on a set of panel country-level data, with yearly periodicity, covering the 27 European Union countries for the period 2000–2021. The data used in this paper were gathered from the World Bank—World Development Indicators (WDI), Eurostat, International Monetary Fund, and LSEG Workspace databases. A description of the variables can be found in Table 1.

Table 1. Description of the variables.

Variables	Description	Source
GDPC	Gross domestic product per capita growth rate (%)	World Bank
ESG	Country-level ESG score (0–100)	Refinitiv
EXPEND	Government expenditure on environmental protection, annual rate of change (%). Calculated by authors based on government expenditure on environmental protection annual data expressed as million Euros	Eurostat
DEBT	Private debt, loans, and securities (% of GDP)	IMF
ROE	Return on equity for the banking sector, country aggregated data (%)	World Bank
TRADE	Trade openness, expressed as the sum of exports and imports (% of GDP)	World Bank
FDI	Foreign direct investments (% of GDP)	World Bank

Source: Authors' computations.

The dependent variable is the gross domestic product per capita growth rate (GDPC), used as a proxy for economic growth. This is the most popular approach in the literature, and although the Human Development Index could be used as an alternative, this would imply a relatively high correlation with the ESG score, as the underlying construction of the two presents similarities. For the country-level ESG rating (ESG), we acknowledge that this could vary depending on the data provider; however, we could not perform a comparison as we have been limited by having access only to the Refinitiv portal for the purpose of this study. The government's expenditure on environmental protection (EXPEND) is used to capture some of the government's efforts towards a greener economy. From a banking perspective, we would have preferred to include the volume of green loans in the study; however, green loans data are, to the best of our knowledge, very scarce at the time of this study, thus limiting our approach. We have instead used the total private debt provided by the banking sector (DEBT), an indicator usually used for measuring the level of financial intermediation in an economy. The rationale behind this is that a more sophisticated banking system should be responsible for a larger proportion of green loans issuance. When issuing green loans, banks are also interested in the profitability aspect,

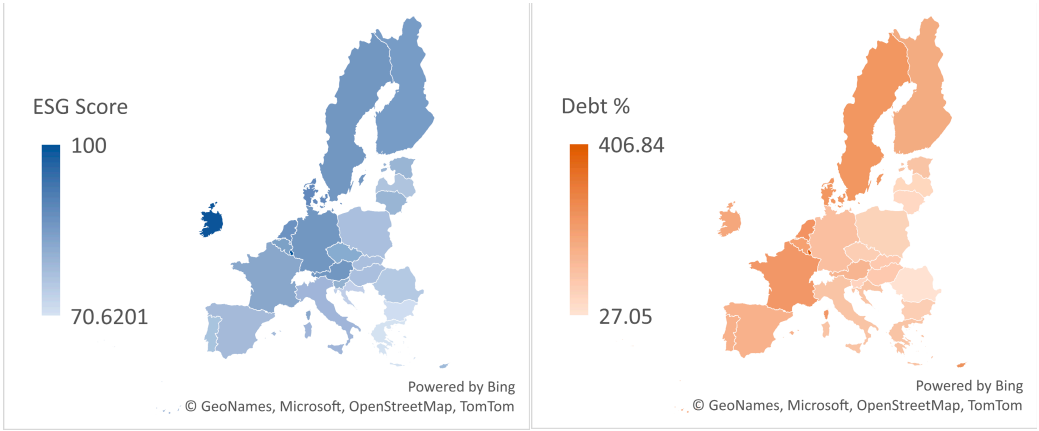
so we have added the return on equity (ROE) of the banking sector to our model. Trade openness (TRADE) and foreign direct investments (FDI) have been introduced into our model as control variables. Table 2 below presents a summary of statistics for the variables described so far.

Table 2. Descriptive statistics of the variables (raw data).

Variables	Obs.	Mean	Std. Dev.	Min	Max
GDPC	594	2.1881	4.0643	−14.4643	23.2009
ESG	594	79.3182	8.0159	57.0640	100.0000
EXPEND	594	7.9892	48.8698	−651.5679	788.2353
DEBT	594	147.9667	78.0941	10.7454	406.8442
ROE	587	8.9754	14.7384	−112.1940	42.4162
TRADE	594	120.0189	63.9356	45.4188	388.1204
FDI	592	13.9741	46.0028	−117.4194	449.0809

Source: Authors' computations.

In order to have a holistic understanding of the European context concerning country-level ESG performance, on the one hand, and banking system footprint, on the other hand, a graphical representation of these two concepts is presented in Figure 1 for the year 2021. As expected, western economies seem to both perform better in terms of ESG score and incorporate larger banking systems in terms of financial intermediation. As Western and Northern European economies are developed ones, they are more inclined towards making ESG efforts, as they have already achieved high levels of economic prosperity. On the other end of the spectrum, developing economies are in a "catching up" process with Western European economies, so their efforts would naturally be focused on obtaining the highest level of economic growth. This can easily be seen in panel (a) of Figure 1, as Southern, Central, and Eastern European countries show lower ESG scores. From a banking perspective, Western countries seem to boast higher degrees of financial intermediation compared to those in the CEE region, as the latter group of countries have transitioned to market economies at a later stage. It is important to note these disparities within the data sample to better contextualize the results that will be presented throughout our study. Figure 1 has been created using the Map charts function in Microsoft Excel, based on a sample of our dataset.



(**a**) (**b**)

Figure 1. Country-level comparison of the 2021 values for the two main dependent variables. (**a**) Country-level ESG score. (**b**) Private debt as percentage of GDP.

As argued by Baltagi (2013), when dealing with a data sample covering a specific set of countries, it is appropriate to use a fixed effects model specification. While also referring to the arguments of Hill et al. (2020) and considering that our data sample covers the 27 EU member states, we chose to specify our model with cross-sectional fixed

effects, to overcome omitted variable bias in our analysis. The first step in deploying our model is testing the correlation within our sample of variables. In the correlation matrix presented in Table 3, we could not identify any high correlation (above the 70% level), thus avoiding multicollinearity issues and allowing us to use the full set of variables within the regression model.

Table 3. Correlation matrix.

Variables	GDPC	ESG	EXPEND	DEBT	ROE	TRADE	FDI
GDPC	1						
ESG	−0.2046	1					
EXPEND	0.1011	−0.1242	1				
DEBT	−0.2794	0.6648	−0.1174	1			
ROE	0.3643	0.0063	0.0813	−0.1697	1		
TRADE	0.0984	0.3811	−0.0531	0.4231	0.0416	1	
FDI	−0.0471	0.0301	−0.0136	0.1715	0.0386	0.2315	1

Source: Authors' computations.

The econometric modeling of data as well as the estimation of models were performed using the Eviews 10 software. The panel data fixed effects model has the general specification as follows:

$$Y_{it} = \alpha + \beta_1 X_{it} + \beta_2 Z_{it} + \varepsilon_{it}\ i = 1, 2, \ldots, 27,\ t = 2000, 2001, \ldots, 2021 \quad (1)$$

where Y denotes the dependent variable, namely the gross domestic product per capita, X signifies the explanatory variables in the form of ESG score, government expenditure on environmental protection, private debt, and return on equity, Z represents the control variables in the form of trade openness and foreign direct investments, α is the intercept, β_1 and β_2 are parameters, ε is the error term, i is the subscript of countries, and t is the subscript of time dimension.

In order to investigate the linkages between our independent variables and the GDP per capita, we deployed a Granger causality test based on a panel vector error correction model (PVECM) in a similar way to studies such as Armeanu et al. (2017) and Pala (2016). The first step is to assess the stationarity of the variables, for which we have chosen to perform the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests. The results of the unit root test, presented in Table 4, indicate that ESG, DEBT, and TRADE are non-stationary in levels; however, by applying first difference, one can notice that all variables are first order stationary.

Table 4. Panel unit root tests results.

Variables	Level		Variables	First Difference	
	ADF	PP		ADF	PP
GDPC	176.245 ***	322.550 ***	ΔGDPC	344.350 ***	1646.77 ***
ESG	48.6516	41.3095	ΔESG	178.856 ***	305.435 ***
EXPEND	209.490 ***	494.397 ***	ΔEXPEND	404.489 ***	3305.89 ***
DEBT	59.1633	49.6008	ΔDEBT	78.9068 **	203.776 ***
ROE	122.013 ***	160.052 ***	ΔROE	359.067 ***	1396.25 ***
TRADE	29.1197	28.5453	ΔTRADE	238.209 ***	448.866 ***
FDI	129.915 ***	275.710 ***	ΔFDI	297.323 ***	1342.41 ***

Source: Authors' computations. Notes: ** $p < 0.05$, *** $p < 0.01$.

This allows us to investigate the cointegration of our variables by performing the Fisher panel cointegration test. The outcome, presented in Table 5, allows us to reject the null hypothesis of no-cointegration; therefore, indicating the presence of a long-run equilibrium between our dependent and independent variables.

Table 5. Fisher (combined Johansen) test results.

Hypothesized No. of CE(s)	Fisher Stat. (From Trace Test)	Fisher Stat. (From Max-Eigen Test)
None	694.2 ***	435.1 ***
At most 1	379.8 ***	231 ***
At most 2	211.4 ***	126.6 ***

Source: Authors' computations. Notes: *** $p < 0.01$.

At this point, we can deploy the next step of our analysis by estimating a fully modified ordinary least squares (FMOLS) and a dynamic ordinary least squares (DOLS) in order to estimate the long-run connection between our variables of interest. A similar methodology has been implemented by Armeanu et al. (2017), only for a different set of variables. To the best of our knowledge, few papers so far approach the relationship between ESG and economic growth, both from a short-run and a long-run perspective; one of the studies doing so is that by Diaye et al. (2022). Finally, we estimate the PVECM in order to perform the Granger causality test based on the following vector error correction model:

$$\Delta GDPC_{it} = \alpha_{1j} + \Sigma^{q}_{k=1}\phi_{11ik}\Delta GDPC_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{12ik}\Delta ESG_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{13ik}\Delta EXPEND_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{14ik}\Delta DEBT_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{15ik}\Delta ROE_{it\text{-}k} + \vartheta_{1i}\varepsilon_{it\text{-}1} + u_{1it} \quad (2)$$

$$\Delta ESG_{it} = \alpha_{2j} + \Sigma^{q}_{k=1}\phi_{21ik}\Delta GDPC_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{22ik}\Delta ESG_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{23ik}\Delta EXPEND_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{24ik}\Delta DEBT_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{25ik}\Delta ROE_{it\text{-}k} + \vartheta_{2i}\varepsilon_{it\text{-}1} + u_{2it} \quad (3)$$

$$\Delta EXPEND_{it} = \alpha_{3j} + \Sigma^{q}_{k=1}\phi_{31ik}\Delta GDPC_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{32ik}\Delta ESG_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{33ik}\Delta EXPEND_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{34ik}\Delta DEBT_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{35ik}\Delta ROE_{it\text{-}k} + \vartheta_{3i}\varepsilon_{it\text{-}1} + u_{3it} \quad (4)$$

$$\Delta DEBT_{it} = \alpha_{4j} + \Sigma^{q}_{k=1}\phi_{41ik}\Delta GDPC_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{42ik}\Delta ESG_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{43ik}\Delta EXPEND_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{44ik}\Delta DEBT_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{45ik}\Delta ROE_{it\text{-}k} + \vartheta_{4i}\varepsilon_{it\text{-}1} + u_{4it} \quad (5)$$

$$\Delta ROE_{it} = \alpha_{5j} + \Sigma^{q}_{k=1}\phi_{51ik}\Delta GDPC_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{52ik}\Delta ESG_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{53ik}\Delta EXPEND_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{54ik}\Delta DEBT_{it\text{-}k} + \Sigma^{q}_{k=1}\phi_{55ik}\Delta ROE_{it\text{-}k} + \vartheta_{5i}\varepsilon_{it\text{-}1} + u_{5it} \quad (6)$$

where Δ denotes the first-difference operator, q is the lag length set at one according to likelihood ratio tests, and u reveals the serially uncorrelated error term. Equations (2)–(6) estimate the long-term relationship for each of the selected variables of interest.

4. Results and Discussion

In this section, we present, interpret, and discuss our empirical results in light of the current debate among policymakers concerning ESG and economic growth, as well as in light of the most relevant studies in the literature. While some studies do suggest that improved ESG performance and green lending have a positive impact on economic growth (Diaye et al. 2022; Ngo et al. 2021), there are also voices in the literature (Howarth 2012) and among some policymakers (Boffa 2024) that are scrutinizing the economic benefits of ESG-related efforts. Our findings tend to confirm the latter batch of opinions.

The results of the fixed effects panel regression models are presented in Table 6. We ran three separate regression models: one including only ESG-related independent variables and control variables; one including only banking-related variables along with control variables; and a third one including the full set of variables. As model (1) does not render statistically significant results, and as model (2) yields similar results with the ones found in model (3), we consider the results of model (3) as being the most representative, and we provide an interpretation only for the last one. Unlike the findings of Wang et al. (2023), the results of the fixed effects panel regression indicate a negative relationship between country-level ESG score and economic growth, as an increase in ESG score by 1 point would decrease GDP per capita by 0.27% at a confidence level of 99%. The two underpinning concepts analyzed, ESG and GDP per capita growth rate, rely on fundamentally different economic theories. ESG is underpinned by a vision of economic development based on the circular

economy, where constraints on production are imposed by the sustainable management of natural resources, while traditional economic growth is based on linear growth in which natural resources are inexhaustible. If we are to put these theories into context, it is to be expected that improving ESG performance and transitioning to a more sustainable, circular economy, would imply a loss in economic growth and wealth creation, at least in the short to medium term. One study that provides empirical evidence to back up our results is that of Howarth (2012), who argues that achieving ESG objectives implies a reduction in consumption and production, thus affecting economic growth. Mehrhoff (2023) argues that although the green transition comes at a high cost, it will positively impact economic growth in the long run in the way that economic losses caused by climate change can be mitigated by coordinated and timely ESG efforts performed in the present. For this reason, we aimed to also capture the long-run implications of ESG performance over economic growth by implementing other econometric techniques as well.

Table 6. Fixed effects estimations.

Variables	Equations		
	(1)	(2)	(3)
ESG	−0.0399 (−0.5354)		−0.2737 *** (−4.0528)
EXPEND	0.0062 * (1.8440)		0.0030 (1.0051)
DEBT		−0.0407 *** (−6.9008)	−0.0438 *** (−7.4802)
ROE		0.0844 *** (7.5801)	0.0889 *** (8.0272)
TRADE	0.0192 ** (1.9736)	0.0564 *** (6.2854)	0.0764 *** (7.6267)
FDI	−0.0043 (−1.0904)	0.0009 (0.2621)	0.0014 (0.3878)
Adjusted R^2	0.1140	0.3150	0.3348
No. of obs.	592	585	585

Source: Authors' computations. Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Values in parentheses represent t-statistic.

Regarding banking activity, the results suggest that an increase in financial intermediation of 1% would lead to a decrease in GDP per capita of approximately 0.04%. Economic theory would suggest that indebtedness would promote economic growth through the channels of private consumption and investments. However, as Izak (2012) suggests, there can be situations in which indebtedness will lead to lower economic growth. At this point, it remains an open debate on whether green lending would have a positive impact on economic growth. Studies covering this topic, mainly performed by using data for China, where green lending data is available on a more granular level, such as Li et al. (2022), suggest a positive relationship between green financing and economic performance. The results suggest that ROE has a positive influence on economic growth, which could lead to the indirect assumption that if green lending activity leads to banks becoming more profitable, this could have some positive implications for the overall economy. Regarding the control variables, the results indicate that only trade openness would have a significant effect on economic growth, with a 1% increase in trade openness leading to an increase in GDP per capita of approximately 0.7%.

Table 7 depicts the results of the FMOLS and DOLS models, illustrating the long-run relationship between ESG performance, banking activity, and economic growth. The long-run results point out that a one-point increase in the ESG score would lead to a decrease in GDP per capita by about 0.15 percent in the case of FMOLS or 0.23 percent in the case of DOLS. Government expenditure on environmental protection only has statistical significance in the DOLS model with a 1 percent increase, leading to a 0.018 percent increase

in GDP per capita. To the best of our knowledge, our study is one of the first to analyze the long-run impact of the ESG score on economic growth from a FMOLS and DOLS perspective, while other authors such as Diaye et al. (2022) have performed similar studies by deploying panel cointegration methods. Our long-run results are contrary to those found in the previously mentioned study, and they reinforce the findings of the short-run fixed effects model. Increasing private debt as a percentage of GDP by 1 percent negatively influences economic growth at a 99% confidence level in the FMOLS model by 0.01 percent, while bank profitability corresponds to a GDP per capita increase in both models by 0.09 percent (for FMOLS) or 0.07 percent (for DOLS).

Table 7. Panel fully modified OLS (FMOLS) and dynamic OLS (DOLS) estimations.

Variables	FMOLS	DOLS
ESG	−0.1555 *** (−2.8288)	−0.2348 *** (−2.5512)
EXPEND	0.0052 (1.5577)	0.0181 * (1.6886)
DEBT	−0.0108 *** (−2.3787)	−0.0029 (−0.4255)
ROE	0.0934 *** (9.6737)	0.0747 ** (0.0405)
Adjusted R2	0.2344	0.6958
No. of obs.	559	503

Source: Authors' computations. Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Values in parentheses represent t-statistic.

Finally, we examine the short-term and long-term direction of causality between gross domestic product per capita, ESG score, government expenditure, private debt, and banking sector return on equity by deploying a PVECM Granger causality test, the results of which are presented in Table 8 below. The causal relationship depicted in the first results column indicates that the ESG score and banks' ROE positively cause the gross domestic product per capita in the short term. The ESG score and the level of indebtedness seem to negatively influence each other, as a bidirectional causality has been identified between the two in the short run. Further on, a negative causality between the ESG score and the government expenditure on environmental protection has been identified, a result that leads one to believe that improving the ESG performance of a country would lead to less of a need for environmental protection public expenditure, which is something to be desired. Moving on to the banking ROE, we identify two more bidirectional relationships as the gross domestic product per capita and the ESG score positively influence the overall financial performance of banks, whilst a negative causality stemming from private debt to ROE has been identified. In the long run, the output suggests a unidirectional causality running from the ESG score and private debt towards both gross domestic product per capital and banking return on equity, while there is a bidirectional relationship between the latter two. To the best of our knowledge, this is one of the first studies covering Granger causality for this set of variables. Our results concerning the causality between ESG and economic growth partially confirm those found in other studies (Ho et al. 2019) that imply a causality analysis.

Table 8. Granger causality for the panel vector error correction model (PVECM).

Variables	Short-Run Granger Causality					Long-Run Granger Causality
	ΔGDP	**ΔESG**	**ΔEXPEND**	**ΔDEBT**	**ΔROE**	**ECT**
ΔGDP	-	−0.0048	0.2798	−0.1021	0.8014 ***	−0.8025 ***
ΔESG	0.7250 **	-	−7.0998 ***	−3.0919 ***	4.2438 ***	0.0610 ***
ΔEXPEND	−0.0030	0.0005	-	0.0056	0.0008	1.1621
ΔDEBT	−0.0057	−0.0086 ***	0.0496	-	−0.1751 ***	0.9326 ***
ΔROE	0.0391 ***	0.0017	−0.3378 **	−0.0351	-	−1.2316 ***
Adjusted R^2	0.1381	0.1381	0.1381	0.1381	0.1381	0.1381
No. of obs.	532	532	532	532	532	532

Source: Authors' computations. Notes: ** $p < 0.05$, *** $p < 0.01$.

5. Conclusions

The scope of this paper addresses a very frequently asked question on whether ESG performance, potentially financed via loans, and green loans in particular, leads to an improvement in economic well-being. The research topic is highly relevant in the current context, as negative climate change events are intensifying and policymakers are under pressure to implement measures to attain sustainability goals without denting economic growth. By adding the banking dimension to the ESG—the economic growth nexus—we aim to bridge this gap in the existing literature.

Whilst the existing studies underline the importance of climate change and generally find a positive relationship between ESG and economic growth, there are cases of highly relevant research that highlight the opposite and argue in favor of a trade-off between ESG performance and economic growth. Therefore, it is difficult to establish a clear causal relationship between ESG and economic development.

We employed multiple econometric techniques, according to the latest developments in the relevant literature, to study the impact of the ESG score, government expenditure on environmental protection, private debt, and banking system return on equity on the gross domestic product per capita for a panel dataset consisting of 27 EU member countries for the time period 2000–2021. The results suggest that the ESG score and private debt negatively influence economic growth, both in the short- and long-term.

The main contribution of this paper consists in performing the analysis using a novel set of variables by adding the banking dimension to the 27 EU member states, whilst deploying multiple econometric instruments to study both the short-run and long-run interdependencies.

Our study has some practical implications by serving as a discussion point for policymakers trying to design and implement measures aimed at protecting the environment and providing social responsibility. Whilst it is desirable to achieve ESG goals, decision-makers are faced with the dilemma of potentially harming economic activity in the process—a trade-off that they will very likely have to accept. In this context, our study provides useful information regarding the size of the economic loss that governments might have to account for when aiming at improving ESG performance. The banking industry is faced with the challenge of "greening" its loan portfolio in a push by policymakers to promote sustainable projects and discourage harmful ones. However, the results show that increasing the proportion of loans does not necessarily lead to an increase in economic performance, whilst intuition might indicate otherwise. Limiting finance for "brown" sectors, which are still at the core of many European economies, can be harmful for the economy.

However, we acknowledge that our study also has its limitations, both in terms of datasets and the technical models implemented. At the time of writing this paper, the availability of data proved to be a significant challenge, given the novelty of ESG aspects. With regards to the model assumptions, we are also aware of some potential limitations.

Policies aimed at "greening the economy" are envisioned to have positive effects in the long run, so exploring the idea of including lags could enhance our model. Moreover, endogeneity concerns could be raised, as there might be unobserved variables that explain the relationship between gross domestic product per capita and the ESG score.

This study can be improved by addressing the above-mentioned concerns via an instrumental variable approach, or a dynamic GMM approach could provide added value to the study. Furthermore, this paper could also be enhanced by deploying more sophisticated econometric techniques for studying the long-run effects, such as a Bayesian latent factor model. Once a reliable data repository for aggregated green loans at the level of the EU member states is available, we aim to extend this study by incorporating green lending data and, perhaps, also green bonds data.

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