








# “Do the Sustainable Development Goals enhance bank profitability? Global panel evidence”

<b>AUTHORS</b>	Shadiyya Amanova  Bulqeyis Novruzova  Zahid Ganbarov  Sakina Hajiyeva  Javid Huseynli  Ali Hanifayev 
<b>ARTICLE INFO</b>	Shadiyya Amanova, Bulqeyis Novruzova, Zahid Ganbarov, Sakina Hajiyeva, Javid Huseynli and Ali Hanifayev (2025). Do the Sustainable Development Goals enhance bank profitability? Global panel evidence. <i>Banks and Bank Systems</i> , 20(3), 173-190. doi: <a href="https://doi.org/10.21511/bbs.20(3).2025.13">10.21511/bbs.20(3).2025.13</a>
<b>DOI</b>	<a href="http://dx.doi.org/10.21511/bbs.20(3).2025.13">http://dx.doi.org/10.21511/bbs.20(3).2025.13</a>
<b>RELEASED ON</b>	Friday, 03 October 2025
<b>RECEIVED ON</b>	Friday, 22 August 2025
<b>ACCEPTED ON</b>	Friday, 26 September 2025
<b>LICENSE</b>	 This work is licensed under a <a href="https://creativecommons.org/licenses/by/4.0/">Creative Commons Attribution 4.0 International License</a>
<b>JOURNAL</b>	"Banks and Bank Systems"
<b>ISSN PRINT</b>	1816-7403
<b>ISSN ONLINE</b>	1991-7074
<b>PUBLISHER</b>	LLC “Consulting Publishing Company “Business Perspectives”
<b>FOUNDER</b>	LLC “Consulting Publishing Company “Business Perspectives”



NUMBER OF REFERENCES

59



NUMBER OF FIGURES

0



NUMBER OF TABLES

11

© The author(s) 2026. This publication is an open access article.



## BUSINESS PERSPECTIVES



LLC "CPC "Business Perspectives"  
Hryhorii Skovoroda lane, 10,  
Sumy, 40022, Ukraine  
[www.businessperspectives.org](http://www.businessperspectives.org)

**Type of the article:** Research Article

**Received on:** 22<sup>nd</sup> of August, 2025

**Accepted on:** 26<sup>th</sup> of September, 2025

**Published on:** 3<sup>rd</sup> of October, 2025

© Shadiyya Amanova, Bulqeyis Novruzova, Zahid Ganbarov, Sakina Hajiyeva, Javid Huseynli, Ali Hanifayev, 2025

Shadiyya Amanova, Ph.D. in Economics, Lecturer, Department of Economics, Azerbaijan University of Tourism and Management, Azerbaijan. (Corresponding author)

Bulqeyis Novruzova, Ph.D. in Economics, Associate Professor, Department of International Trade and Management, Nakhchivan State University, Azerbaijan.

Zahid Ganbarov, Lecturer, Department of International Trade and Management, Nakhchivan State University, Azerbaijan.

Sakina Hajiyeva, PhD in Economics, Associate Professor, Azerbaijan University of Tourism and Management, Head of the Department of Economics, Azerbaijan.

Javid Huseynli, Lecturer, Doctoral Student, Academy of Public Administration under the President of the Republic of Azerbaijan, Azerbaijan.

Ali Hanifayev, Lecturer, Department of Economics, Azerbaijan University of Tourism and Management, Azerbaijan.



This is an Open Access article, distributed under the terms of the [Creative Commons Attribution 4.0 International license](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted re-use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Conflict of interest statement:**

Author(s) reported no conflict of interest

Shadiyya Amanova (Azerbaijan), Bulqeyis Novruzova (Azerbaijan), Zahid Ganbarov (Azerbaijan), Sakina Hajiyeva (Azerbaijan), Javid Huseynli (Azerbaijan), Ali Hanifayev (Azerbaijan)

# DO THE SUSTAINABLE DEVELOPMENT GOALS ENHANCE BANK PROFITABILITY? GLOBAL PANEL EVIDENCE

## Abstract

The growing focus of the IMF, World Bank, OECD, and European Commission on aligning finance with the Sustainable Development Goals (SDGs) raises the question of whether sustainability enhances banking sector profitability. This study aims to assess the impact of SDG performance on bank profitability, measured by return on assets (ROA), return on equity (ROE), and interest margin to gross income, controlling for GDP growth and inflation. The analysis uses an unbalanced panel of 143 countries over 2000–2024 (more than 2,100 country-year observations), applying fixed effects, random effects, and multilevel models with robust covariance estimators. The results show that the SDG Index Score has a weak and inconsistent effect on profitability. It is weakly positive for ROA ( $\beta = 0.125$ ,  $p = 0.085$ ) and marginally positive for interest margins ( $\beta = 0.151$ ,  $p = 0.019$ ), but becomes insignificant under robust specifications. For ROE, the SDG Index turns significantly negative in the random effects model ( $\beta = -0.119$ ,  $p = 0.001$ ), suggesting that higher SDG performance may be associated with lower equity returns. In contrast, the macroeconomic controls are robust across all models: GDP growth increases ROA ( $\beta = 0.107$ ,  $p < 0.001$ ) and ROE ( $\beta = 0.108$ ,  $p < 0.001$ ) but reduces interest margins ( $\beta = -0.061$ ,  $p < 0.001$ ), while inflation consistently raises profitability across all indicators. Regional patterns further indicate lower profitability in OECD and Western Europe and higher interest margins in East and South Asia, Latin America, and MENA.

## Keywords

sustainable development goals, bank profitability, return on assets, return on equity, interest margin, panel data

## JEL Classification

G21, G32, Q56, C33

## INTRODUCTION

The relevance of studying whether the Sustainable Development Goals (SDGs) enhance bank profitability is underscored by the increasing attention of international institutions to the intersection of sustainability and financial stability. The IMF has emphasized that banks are not only providers of credit and liquidity but also crucial intermediaries in mobilizing and allocating financial resources required for sustainable growth. As economies transition towards achieving the SDGs, banks are expected to channel financing into infrastructure, green technologies, and inclusive development projects. However, the IMF also warns that climate change, rising inequality, and governance deficiencies represent emerging systemic risks that can undermine financial stability and erode bank profitability. These risks manifest through increased credit defaults in vulnerable sectors, asset devaluations linked to climate shocks, and reputational or regulatory pressures from weak governance. In this regard, the IMF stresses that banks must adapt their business models, risk management frameworks, and lending practices to integrate sustainability considerations to safeguard long-term profitability and resilience (IMF, 2023).

The World Bank underscores that robust and inclusive financial systems are essential for post-pandemic recovery and sustainability. It stresses the importance of climate-resilient finance, digital innovation, and inclusive banking, which directly influence banks' profitability and ability to support progress toward the SDGs (World Bank, 2022).

The OECD strongly emphasizes the need to align financial flows with sustainability imperatives, arguing that sustainable finance is no longer a peripheral concern but a central component of long-term economic and financial strategy. According to the OECD, banks and other financial institutions must increasingly adapt their operations, investment priorities, and risk management practices to incorporate environmental and social objectives if they remain resilient in the face of global challenges such as climate change and demographic pressures. Sustainable finance strategies are therefore presented not only as instruments to advance the SDGs but also as safeguards for financial institutions' competitiveness, stability, and long-term performance. At the same time, the OECD recognizes that empirical insights into the direct implications of sustainability alignment for bank profitability remain limited, underscoring the importance of further research in this area (OECD, 2020).

Meanwhile, the European Commission positions sustainable finance at the heart of its *Green Deal* and Action Plan, combining regulatory initiatives, such as ESG disclosures and the EU Taxonomy, with financial objectives to ensure that the financial sector supports sustainability without compromising profitability (EC, 2021).

In this context, assessing the link between SDG performance and banking profitability addresses a pressing gap in academic literature and policy debates. While regulators and international organizations increasingly demand that banks incorporate sustainability into their strategies, there is limited cross-country evidence on whether these commitments translate into tangible financial returns. Understanding this relationship is vital for policymakers designing incentives and supervisory frameworks, investors evaluating the sustainability-profitability nexus, and banks balancing financial performance with global development responsibilities. Against the backdrop of macroeconomic volatility, inflationary pressures, and regional disparities, this research provides timely insights into whether advancing the SDGs strengthens or weakens banks' profitability, thereby informing policy design and strategic decision-making within the financial sector.

---

## 1. LITERATURE REVIEW

Integrating sustainability considerations into financial systems has become a cornerstone of contemporary research, linking global development goals with financial institutions' performance. Early conceptualizations underline that the achievement of sustainable growth requires a synergy between environmental, social, and governance (ESG) priorities and financial stability, with the banking sector acting as the principal intermediary in aligning financial flows with the SDGs (Dadkhah et al., 2024; Makarenko & Vorontsova, 2024; Murshudli, 2023; Vasilyeva et al., 2022). Within this paradigm, ESG performance is increasingly considered a determinant of corporate legitimacy, profitability, and resilience (Serhane, 2025; Serpeninova et al., 2025).

The literature on ESG and banking profitability has expanded along several thematic directions. One strand emphasizes the role of ESG disclosure and governance structures in shaping financial outcomes. Studies confirm that ESG transparency can positively influence bank performance by reducing information asymmetry and enhancing stakeholder confidence (Loan et al., 2024; Muazaroh et al., 2025; Serpeninova et al., 2024). Governance-related characteristics, including board size, gender diversity, and audit committee functions, are also found to improve ESG reporting quality and indirectly strengthen profitability through enhanced risk management and investor trust (Ruziwa et al., 2025; Kurniasari & Dwi Lestari, 2025; Noor et al., 2024). Complementary findings highlight the impact of corporate governance in the insurance and banking sectors,

confirming that institutional mechanisms are vital for sustaining financial performance under ESG frameworks (Filipava & Murshudli, 2023; Ntshangase et al., 2024; Yanto et al., 2025). Foreign direct investment has been shown to promote sustainable development but may also alter the incentives for financial institutions in capital allocation (Bagirzadeh et al., 2025). Digitalization and public health determinants interact with financial stability, highlighting that ESG considerations cannot be studied in isolation but are embedded within wider socio-economic systems (Dobrovolska & Kolomiiets, 2024; Firstová & Vysochyna, 2024; Murshudli & Loguinov, 2020).

A second line of inquiry explores the direct nexus between ESG scores and profitability measures. Evidence from emerging markets is exceptionally mixed. Even poor ESG performance in Indonesia can support profitability in listed firms, suggesting that investors and markets may prioritize short-term gains over long-term sustainability integration (Hermansyah et al., 2025). Conversely, research in South Africa demonstrates that equity financing is more strongly supported by sound ESG performance, indicating that regional contexts and capital market maturity play a critical role (Msomi, 2025). Additional studies from Vietnam and ASEAN economies also identify ESG disclosure as positively correlated with bank profitability, though the strength of the effect varies by ownership structure and national governance context (Loan et al., 2024; Nathania & Ekawati, 2024). In Visegrad countries, empirical results confirm the environmental pillar of ESG as a driver of firm sustainability, suggesting that specific components may be more decisive than aggregate indices (Kubalek et al., 2024). In addition, evidence from Indian markets demonstrates that ESG factors influence price discovery, confirming that sustainability can affect capital market efficiency (Sharma et al., 2025).

Closely related literature connects ESG factors with broader corporate strategies and financial policies. Corporate sustainability performance has been shown to influence payout policies of global firms, reflecting a growing linkage between ESG integration and shareholder value distribution (Matuszewska-Pierzynka & Pieloch-Babiarz, 2025). Research on ESG ratings reveals their sig-

nificance for investors, particularly where firm characteristics amplify their relevance in valuation processes (Moolkham, 2025). Findings from employee stock ownership plans in China indicate that ESG performance improves sustainability outcomes and incentivizes employee engagement, thereby indirectly supporting profitability (Liu et al., 2024). ESG's interconnection with taxation practices has also been observed, where sustainability initiatives correlate with reduced tax aggressiveness, enhancing reputational capital while balancing profitability objectives (Yanto et al., 2025). Historical perspectives confirm that corporate social responsibility has long been embedded in banking profitability analysis, reflecting evolving ESG practices over time (Vasylieva et al., 2014).

ESG shapes banking performance alongside traditional financial determinants. Empirical evidence consistently highlights GDP growth, inflation, and financial access as core macroeconomic drivers influencing returns on assets and equity (Budhathoki et al., 2025; Hedau & Malla, 2024; Saienko et al., 2025). Studies of financial inclusion show that socio-economic challenges can limit good governance, thereby moderating profitability outcomes (Adhikari et al., 2025; Kuzior et al., 2023; Kubatko et al., 2024). Broader structural and institutional determinants of financial stability, such as regulatory frameworks and key prudential indicators, further define profitability outcomes within the ESG-finance nexus (Mursalov et al., 2023; 2025; Rybalchenko et al., 2022).

Scholars also situate ESG within the wider transition towards sustainable finance and corporate responsibility. Evidence demonstrates that sustainable business models and renewable energy investments support profitability by aligning corporate strategies with global climate objectives (Pimenowa et al., 2023; Prokopenko et al., 2023a; 2023b; Standal et al., 2023; Dirma et al., 2024). The EU's clean energy cooperation and renewable energy transitions further illustrate how environmental sustainability integrates with financial development (Vakulenko & Rekunenko, 2025; Vasa et al., 2024). Studies on the solidarity economy and ethical leadership under conditions of war and uncertainty reinforce the importance of ESG as a guiding principle for resilience in turbulent environments (Kuzior et al., 2023; Prokopenko et al., 2025).

The ESG-profitability nexus is connected to global structural processes. The interplay between ESG investments, foreign direct investment, and migration dynamics highlights the broader systemic implications of sustainability-driven finance for banks and economies (Zatonatskiy et al., 2024). Broader studies of trade, renewable energy, and ethical leadership reinforce the idea that ESG enhances profitability and systemic stability (Kubatko et al., 2024; Prokopenko et al., 2025; Vasa et al., 2024).

Attention is given to reporting, transparency, and stakeholder perceptions. Stakeholders in Europe increasingly demand accurate ESG reporting, though challenges of credibility and comparability persist (Strouhal et al., 2025; Serpeninova et al., 2025). ESG disclosure is associated with improved firm value in sustainability indices, confirming that transparent communication enhances investor trust and profitability prospects (Serpeninova et al., 2024). Research further demonstrates that ESG-related corporate social responsibility, green branding, and sustainability benchmarks positively influence legitimacy and financial outcomes (Starchenko et al., 2021; Serhane, 2025; Makarenko & Vorontsova, 2024). Transparent reporting, accountability, and adoption of advanced technologies contribute to sustainable finance practices and strengthen profitability. The role of artificial intelligence and machine learning in combating illegal financial operations has been emphasized as a foundation for resilient financial institutions, indirectly enhancing ESG compliance (Lyeonov et al., 2024). Related studies highlight both the risks and opportunities of artificial intelligence in shaping future governance frameworks (Yarovenko et al., 2024).

Institutional frameworks, innovation ecosystems, and collaborative models further illustrate ESG's role. The Five-Helix Model highlights how Industry 4.0 development integrates business, governance, and sustainability (Megits et al., 2022). Similarly, sustainable business models in turbulent environments show that ESG-driven adaptation enhances long-term resilience (Pimenowa et al., 2023). Leadership, knowledge management, and culture have been identified as central pillars of organizational transformation towards sustainability, reinforcing the link between ESG and institutional competitiveness (Tessema, 2025).

The literature presents a complex and heterogeneous picture of the ESG-profitability nexus. While ESG disclosure and transparency generally strengthen financial performance, empirical evidence on the direct effect of ESG scores on bank profitability remains mixed across regions and methodologies. Profitability is consistently shaped by macroeconomic and institutional determinants, with ESG impacts mediated by governance structures, market maturity, and regional specificities. Overall, the current scientific landscape demonstrates that ESG has the potential to enhance bank profitability. However, its influence is highly context-dependent, warranting further research at both the global and bank-specific levels.

This research aims to investigate the impact of sustainable development performance on banking sector profitability across countries, considering macroeconomic dynamics and regional heterogeneity within a panel data framework.

## 2. METHODOLOGY

This study employs a quantitative research design based on panel data analysis to examine the relationship between sustainable development performance, macroeconomic conditions, and banking sector profitability across countries. The dataset covers 143 countries from 2000 to 2024, yielding an unbalanced panel of more than 2,100 country-year observations.

### 2.1. Variables and data sources

The dependent variables represent three dimensions of banking profitability and efficiency derived from the IMF's Core Financial Soundness Indicators: return on assets ( $y_1$ ), return on equity ( $y_2$ ), and interest margin to gross income ( $y_3$ ), all expressed in percentages. The key explanatory variable is the SDG Index Score ( $x_1$ ) provided by Sachs et al. (2025), which captures countries' overall progress towards achieving the United Nations Sustainable Development Goals. Two macroeconomic indicators from the World Bank World Development Indicators are included as controls: GDP per capita growth ( $x_2$ ) and inflation measured by the GDP deflator ( $x_3$ ).

The empirical analysis is based on a balanced set of 143 countries representing all major world regions. The sample includes advanced and emerging economies, providing exhaustive coverage of diverse institutional, financial, and macroeconomic environments. The countries range from large economies such as the United States, China, Germany, and Brazil to small island states such as Seychelles, St. Lucia, and Vanuatu. This ensures the panel captures a broad spectrum of development paths and financial system characteristics. Including this heterogeneous sample enhances the generalizability of the results and allows the analysis to account for structural differences between developed, transition, and developing economies.

The timespan of observations differs across countries, as it depends on the availability of consistent data for all indicators across the three databases (Sachs et al., 2025; IMF, n.d.; World Bank, n.d.), resulting in an unbalanced panel structure.

## 2.2. Data preparation

The raw data were inspected for missing values, outliers, and distributional properties. Descriptive statistics indicated substantial deviations from normality in several variables, particularly the financial indicators and inflation, which exhibited extreme skewness and kurtosis. The Yeo–Johnson transformation was applied to all variables to address these issues. This transformation allows for the inclusion of negative values without data shifting and helps stabilize variance, reduce skewness, and approximate normality. The transformed variables were used in all subsequent econometric estimations.

## 2.3. Econometric specification

Panel data estimators were employed to exploit the dataset's cross-sectional and time-series variation. The baseline specification takes the following form:

$$y_{it} = \alpha + \beta_1 x_{1it} + \beta_2 x_{2it} + \beta_3 x_{3it} + \mu_i + \varepsilon_{it}, \quad (1)$$

where  $y_{it}$  denotes one of the banking profitability indicators ( $y_1, y_2, y_3$ ) for country  $i$  in year  $t$ ,  $x_1$ – $x_3$  are the explanatory variables,  $\mu_i$  represents unobserved country-specific heterogeneity, and  $\varepsilon_{it}$  is the idiosyncratic error term.

Both fixed effects (FE) and random effects (RE) models were estimated to assess the robustness of results. The Hausman test was used to determine the appropriate specification in each case. In addition, the models were extended to include regional dummy variables to account for structural differences across world regions, and a multilevel specification with countries nested in regions was applied to decompose variance at the regional and country levels.

## 2.4. Robustness checks

Given heteroskedasticity, autocorrelation, and cross-sectional dependence identified by diagnostic tests, standard errors were corrected using robust covariance estimators. Specifically, cluster-robust (by country and time) and Driscoll–Kraay standard errors were applied to the FE models. This ensured valid inference under violations of classical assumptions.

All computations were conducted in R Studio using the *plm*, *car*, and *lme4* packages.

# 3. RESULTS

## 3.1. Return on Assets vs SDG Index Score

The descriptive statistics provide an overview of the panel dataset covering 2,155 country-year observations between 2001 and 2024 (Table 1). The SDG Index Score ( $x_1$ ) distribution reveals a mean of 68.2, with values ranging from 40.1 to 87.1, suggesting moderate variability across countries ( $sd = 9.9$ ). The distribution is slightly left-skewed, indicating that higher scores are more concentrated.

The dependent variable, Return on Assets ( $y_1$ ), shows an average of 2.6 per cent but with considerable dispersion ( $sd = 4.2$ ). Extreme outliers are evident, with values as low as  $-20.7$  and as high as  $54.9$ , resulting in strong positive skewness ( $3.94$ ) and a leptokurtic distribution ( $kurtosis = 27.6$ ). This implies that profitability varies substantially across countries and years, with certain economies experiencing extreme gains or losses.

For macroeconomic controls, GDP per capita growth (x2) averages 1.8 per cent but spans from severe contraction (−36.8 per cent) to rapid expansion (33.8 per cent). The negative skewness (−1.08) and high kurtosis (8.57) reflect growth rates’ asymmetric and fat-tailed nature, likely driven by crises and recovery episodes. Inflation (x3) averages 5.2 per cent, with extreme outliers reaching over 200 per cent, and shows very high skewness (7.97) and excess kurtosis (130.3). These statistics highlight that while most countries experience moderate inflation, a few observations capture episodes of hyperinflation, strongly distorting the distribution.

The descriptive statistics suggest that while the SDG Index Score is relatively well-behaved and approximately symmetric, the economic and financial indicators, particularly Return on Assets, GDP growth, and inflation, exhibit substantial departures from normality due to skewness, excess kurtosis, and the presence of extreme outliers. Such characteristics can distort regression estimates if untreated. Therefore, variable transformations or robust estimation techniques are necessary to stabilize variance, reduce asymmetry, and ensure more reliable econometric inference in the subsequent panel analysis.

The Yeo-Johnson transformation was applied to all variables to address the substantial deviations from normality identified in the descriptive analysis. The estimated transformation parameters indicate the extent of adjustment required for each series. For the dependent variable, Return on Assets (y1), the optimal  $\lambda$  was 0.74, suggesting a moderate transformation was needed to reduce skewness and stabilize variance. The SDG Index Score (x1) displayed a comparatively high  $\lambda$  of 2.34, implying substantial departure from normality and the need for a stronger correction. GDP per capita growth (x2) was associated with a  $\lambda$  of 1.15, close

to unity, indicating that only a mild adjustment was necessary. Inflation (x3) exhibited a  $\lambda$  of 0.80, again pointing to moderate transformation. These results confirm that the Yeo-Johnson approach provides a suitable framework for normalizing the distributional properties of the variables without requiring data shifts to handle negative values. The transformed variables were subsequently used in the econometric modeling to ensure robustness and reliability of inference.

The fixed effects estimation (Table 2) for the transformed dependent variable  $y1_{yj}$  indicates that GDP per capita growth ( $x2_{yj}$ ) and inflation ( $x3_{yj}$ ) exert statistically significant positive effects on bank profitability, with coefficients of 0.107 and 0.062, respectively. These findings suggest that both macroeconomic growth and price dynamics are associated with improved returns on assets in the panel. The SDG Index Score ( $x1_{yj}$ ) is only weakly significant at the 10 per cent level, implying a modest contribution of sustainable development performance to profitability. Although the F-statistic confirms overall model significance, the explanatory power of the fixed effects specification remains low ( $R^2 = 0.035$ ), indicating that unobserved country-specific or temporal factors drive a large share of the variation in profitability.

The random effects model (Table 2) yields broadly consistent results, with GDP growth and inflation remaining significant positive predictors of profitability. However, in contrast to the fixed effects model, the SDG Index Score turns negative and statistically insignificant, while the constant term is also insignificant. The variance decomposition highlights that most variability is attributable to individual (country-level) effects (58.5%), underscoring the relevance of cross-sectional heterogeneity. The model exhibits similar explanatory power ( $R^2 = 0.032$ ) and confirms the overall joint significance of the regressors ( $\chi^2 = 70.1, p < 0.001$ ).

**Table 1.** Descriptive statistics of main variables (2001–2024)

Source: Authors’ calculation in R Studio.

Variable	Mean	Std. Dev.	Median	Min	Max	Skewness	Kurtosis
SDG Index Score (x1)	68.19	9.92	69.38	40.05	87.10	−0.47	−0.50
Return on Assets, % (y1)	2.62	4.24	1.61	−20.69	54.85	3.94	27.61
GDP per capita growth, % (x2)	1.82	4.47	2.11	−36.82	33.77	−1.08	8.57
Inflation, % (x3)	5.21	9.38	3.40	−28.76	207.92	7.97	130.31

Note: N = 2,155 country-year observations.

**Table 2.** FE and RE estimation results with the Hausman test

Source: Authors' calculation in R Studio.

Variable	FE Estimate	FE Std. Error	FE t-value	FE p-value	RE Estimate	RE Std. Error	RE z-value	RE p-value
Intercept	–	–	–	–	0.020	0.065	0.316	0.752
x1_yj (SDG)	0.125	0.073	1.723	0.085	–0.066	0.049	–1.354	0.176
x2_yj (GDP gr.)	0.107	0.015	7.058	<0.0001***	0.103	0.015	6.788	<0.0001***
x3_yj (Infl.)	0.062	0.016	3.792	<0.0001***	0.064	0.016	3.902	<0.0001***

Note: Model fit statistics: 1) FE model –  $R^2 = 0.035$  (Adj.  $R^2 = -0.035$ ),  $F(3,2009) = 24.15$ ,  $p < 0.001$ ; RE model –  $R^2 = 0.032$  (Adj.  $R^2 = 0.030$ ),  $\chi^2(3) = 70.12$ ,  $p < 0.001$ ; Hausman test –  $\chi^2(3) = 1.79$ ,  $p = 0.617$  → Random Effects preferred. Signif. codes: '\*\*\*' – 0.001; '\*\*' – 0.01; '\*' – 0.05; '.' – 0.1; 'no symbols' – insignificant.

The Hausman test (Table 2) provides a  $\chi^2$  statistic of 1.79 with a p-value of 0.617, failing to reject the null hypothesis that the random effects estimator is consistent. Consequently, the random effects specification is preferred, as it retains efficiency while accounting for both within- and between-country variation.

The diagnostic checks reveal several violations of the classical assumptions underlying the fixed effects estimator. The Breusch–Pagan test (BP = 16.31,  $p < 0.001$ ) indicates the presence of heteroskedasticity in the residuals, implying that the error variance is not constant across observations. The panel version of the Breusch–Pagan test further confirms significant individual effects ( $\chi^2 = 4829.9$ ,  $p < 0.001$ ), supporting the appropriateness of a panel specification over pooled OLS.

Tests for serial correlation also show strong evidence of dependence in the error structure. Both the Breusch–Godfrey/Wooldridge test ( $\chi^2 = 120.13$ ,  $p < 0.001$ ) and the Wooldridge test for serial correlation ( $F = 10.61$ ,  $p < 0.01$ ) reject the null of no autocorrelation, suggesting that error terms are correlated within countries over time. In addition, Pesaran's CD test ( $z = 38.29$ ,  $p < 0.001$ ) indicates severe cross-sectional dependence, consistent with the notion that global or regional shocks simultaneously affect multiple countries.

These results imply that the FE model suffers from heteroskedasticity, autocorrelation, and cross-sectional dependence. Consequently, conventional standard errors are unreliable and require robust inference procedures. Therefore, the use of clustered or Driscoll–Kraay standard errors is necessary to obtain valid coefficient significance tests and ensure the robustness of econometric conclusions.

After correcting for violations of classical assumptions using robust standard errors, the core results of the fixed effects model remain broadly consistent but with varying statistical precision depending on the type of correction applied. When clustering by country (group), GDP growth (x2\_yj) and inflation (x3\_yj) remain strongly significant predictors of profitability, while the SDG Index Score (x1\_yj) loses statistical significance at conventional levels. Clustering by time produces a similar pattern, with only growth and inflation retaining significance, but with larger standard errors reflecting temporal correlation.

The use of Driscoll–Kraay robust standard errors, which jointly account for heteroskedasticity, autocorrelation, and cross-sectional dependence, further attenuates the precision of the SDG Index coefficient, rendering it clearly insignificant. In contrast, GDP growth continues to display a significant positive effect, albeit with a reduced magnitude of significance ( $p < 0.01$ ), while inflation remains robustly significant ( $p < 0.001$ ). These results confirm that the panel's main drivers of bank profitability are macroeconomic dynamics. At the same time, the contribution of sustainable development performance is not robust to corrections for dependence and heterogeneity in the error structure (Table 3).

The multilevel model allows the decomposition of variation in bank profitability into region-level, country-level, and residual components. The variance decomposition indicates that the standard deviation of random intercepts is 0.75 at the country level (nested within regions) and 0.44 at the region level, compared with 0.63 at the residual (time) level (Table 4). This suggests that differences across countries are the dominant source of heterogeneity, although regional clustering also contributes meaningfully to the variation in returns on assets.

**Table 3.** Robust fixed effects estimations with alternative covariance structures

Source: Authors' calculation in R Studio.

Variable	Estimate	Cluster by Country: Std. Error (p)	Cluster by Time: Std. Error (p)	Driscoll-Kraay: Std. Error (p)
x1_yj (SDG)	0.125	0.089 (p = 0.160)	0.136 (p = 0.357)	0.156 (p = 0.421)
x2_yj (GDP gr.)	0.107	0.029 (p < 0.001)	0.032 (p < 0.001)	0.039 (p = 0.006)
x3_yj (Infl.)	0.062	0.018 (p < 0.001)	0.018 (p < 0.001)	0.018 (p < 0.001)

Note: Estimates are based on the fixed effects (within) model. Robust covariance estimators applied: HC1 cluster by group, HC1 cluster by time, and Driscoll-Kraay (lag = 2).

Turning to the fixed effects, GDP per capita growth (x2\_yj) and inflation (x3\_yj) emerge as positive and highly significant predictors of profitability. A one-unit increase in growth raises profitability by approximately 0.105, while a one-unit increase in inflation raises it by 0.064. By contrast, the SDG Index Score (x1\_yj) is not statistically significant in this specification, while the intercept term is also indistinguishable from zero.

Including random intercepts for both regions and countries improves the model by acknowledging structural differences at multiple levels of aggregation (Table 4). The results reinforce the earlier panel findings that macroeconomic performance, particularly growth and inflation dynamics, is the key banking profitability determinant. In contrast, sustainable development performance does not show a robust association once hierarchical clustering is considered.

**Table 4.** Multilevel model (countries nested in regions) estimation results

Source: Authors' calculation in R Studio.

Fixed effects	Estimate	Std. Error	t-value
Intercept	0.069	0.178	0.389
x1_yj (SDG Score)	0.056	0.061	0.916
x2_yj (GDP growth)	0.105	0.015	6.977***
x3_yj (Inflation)	0.064	0.016	3.911***
Random effects	Variance	Std. Dev.	
Region	0.192	0.438	-
Country (nested)	0.565	0.752	-
Residual	0.396	0.629	-

Note: Number of observations = 2,155; Countries = 143; Regions = 8. REML criterion = 4584.5. Signif. codes: '\*\*\*' – 0.001; '\*\*' – 0.01; '\*' – 0.05; '.' – 0.1; 'no symbols' – insignificant.

The random effects specification, including regional dummy variables, explains differences in bank profitability within and across countries. The variance decomposition indicates that 56.5% of the residual variation is attributable to country-

specific heterogeneity, while 43.5% is idiosyncratic, highlighting the importance of capturing cross-sectional diversity in the model.

Among the explanatory variables, GDP per capita growth (x2\_yj) and inflation (x3\_yj) remain positive and highly statistically significant predictors of returns on assets, consistent with earlier findings. A one-unit increase in GDP growth raises profitability by approximately 0.106, while a one-unit increase in inflation is associated with a 0.064 increase. The SDG Index Score (x1\_yj) remains positive but statistically insignificant, suggesting that sustainable development performance is not a robust determinant of banking profitability.

The inclusion of regional dummies provides additional insights. Compared to the reference region (Africa), significant adverse effects are found for Eastern Europe & Asia (-0.79), OECD countries (-0.71), and Western Europe (-1.61), indicating systematically lower profitability levels in these regions once other factors are controlled for. Oceania, in contrast, exhibits significantly higher profitability (+0.81). Other regions, such as Latin America and the Caribbean (LAC), the Middle East and North Africa (MENA), and East and South Asia, show adverse but statistically weaker or insignificant effects. These results confirm the existence of structural regional differences in banking profitability.

In this case, the RE model is more appropriate than FE because regional dummies are time-invariant and would be perfectly collinear with country fixed effects in a one-way FE model (Table 5). The within transformation in FE eliminates all time-invariant variables, meaning the region's impact cannot be estimated. By contrast, the RE model retains both within-country variation (over time) and between-country variation (across re-

**Table 5.** RE model with regional dummy variables

Source: Authors' calculation in R Studio.

Variable	Estimate	Std. Error	z-value	p-value
Intercept	0.417	0.154	2.701	0.0069**
x1_yj (SDG Score)	0.094	0.063	1.483	0.1381
x2_yj (GDP growth)	0.106	0.015	6.993	<0.0001***
x3_yj (Inflation)	0.064	0.016	3.908	<0.0001***
Region: Eastern Europe & Asia	-0.793	0.238	-3.332	0.0009***
Region: East & South Asia	-0.331	0.231	-1.434	0.1514
Region: Latin America & Caribbean	-0.403	0.218	-1.853	0.0640
Region: MENA	-0.388	0.297	-1.303	0.1925
Region: Oceania	0.809	0.311	2.600	0.0093**
Region: OECD	-0.709	0.233	-3.048	0.0023**
Region: Western Europe	-1.607	0.771	-2.086	0.0370*

Note: Model fit statistics: Total Sum of Squares = 892.8; Residual Sum of Squares = 852.5;  $R^2 = 0.045$ ; Adjusted  $R^2 = 0.041$ ;  $\chi^2(10) = 101.3$ ,  $p < 0.001$ . The reference region is Africa. Signif. codes: '\*\*\*' – 0.001; '\*\*' – 0.01; '\*' – 0.05; '.' – 0.1; 'no symbols' – insignificant.

gions), allowing explicit estimation of region effects alongside the macroeconomic covariates. The Hausman test previously indicated that RE is consistent, further supporting the choice of this specification.

Compared to Africa, banks in OECD and Western Europe exhibit systematically lower profitability, while Oceania shows significantly higher returns, underscoring firm regional heterogeneity in banking performance.

### 3.2. Return on Equity vs SDG Index Score

The newly considered dependent variable,  $y_2$  (Return on equity), shows a mean of 10.8 but with very high variability ( $sd = 18.1$ ) and an extreme range from -131 to over 630. The skewness (17.17) and kurtosis (628.8) values highlight the presence of extreme outliers and a highly non-normal distribution, consistent with episodes of extraordinary gains or losses in banking or economic performance. This strongly indicates the need for transformation or robust estimation to mitigate the influence of extreme values. The Yeo–Johnson transformation for  $y_2$  produced an estimated  $\lambda = 0.97$ , which is very close to one, indicating that the variable is already approximately normally distributed and only a minimal transformation was required to stabilize its distribution.

The FE model shows that GDP per capita growth and inflation are significant positive drivers of re-

turn on equity, while the SDG Index Score has no effect. However, the model's explanatory power is low, indicating that most variation is explained by unobserved heterogeneity. RE model confirms the positive influence of growth and inflation, but also reveals a significant negative association between SDG performance and ROE when cross-country variation is considered (Table 6). Variance decomposition indicates that most residual variation stems from idiosyncratic shocks rather than country effects. The Hausman test ( $\chi^2 = 4.96$ ,  $p = 0.175$ ) suggests that the random effects estimator is consistent and preferable, as it captures both within- and between-country dynamics and allows time-invariant factors such as regional context to be included in the analysis.

The application of robust covariance estimators confirms the stability of the main findings while correcting for heteroskedasticity, autocorrelation, and cross-sectional dependence. When standard errors are clustered by country, GDP per capita growth and inflation remain significant positive determinants of return on equity, while the SDG Index Score remains statistically insignificant. Clustering by time and applying Driscoll–Kraay corrections yield similar results, with GDP growth and inflation continuing to exert positive and significant effects, albeit at lower levels of statistical significance due to wider robust standard errors.

Across all specifications, the consistent insignificance of the SDG Index Score suggests that sustainable development performance is not a direct

**Table 6.** FE vs. RE estimations for ROE

Source: Authors' calculation in R Studio.

Variable	FE Estimate	FE Std. Error	FE t-value	FE p-value	RE Estimate	RE Std. Error	RE z-value	RE p-value
Intercept	–	–	–	–	0.002	0.038	0.055	0.956
x1_yj (SDG Score)	–0.010	0.101	–0.098	0.922	–0.119	0.036	–3.279	0.001**
x2_yj (GDP growth)	0.106	0.021	4.951	< 0.0001***	0.108	0.021	5.170	< 0.0001***
x3_yj (Inflation)	0.062	0.023	2.657	0.008**	0.075	0.022	3.381	< 0.0001***

Note: Model fit statistics: FE model –  $R^2 = 0.017$ , Adj.  $R^2 = -0.053$ ,  $F(3,2030) = 11.61$ ,  $p < 0.001$ ; RE model –  $R^2 = 0.024$ , Adj.  $R^2 = 0.023$ ,  $\chi^2(3) = 54.19$ ,  $p < 0.001$ ; Hausman test –  $\chi^2(3) = 4.96$ ,  $p = 0.175$  → Random Effects preferred. Signif. codes: '\*\*\*' – 0.001; '\*\*' – 0.01; '\*' – 0.05; '.' – 0.1; 'no symbols' – insignificant.

**Table 7.** Robust fixed effects estimations for ROE

Source: Authors' calculation in R Studio.

Variable	Estimate	Cluster by Country: Std. Error (p)	Cluster by Time: Std. Error (p)	Driscoll–Kraay (lag=2): Std. Error (p)
x1_yj (SDG Score)	–0.010	0.145 (p = 0.945)	0.205 (p = 0.961)	0.205 (p = 0.961)
x2_yj (GDP gr.)	0.106	0.024 (p < 0.001)	0.038 (p = 0.005)	0.038 (p = 0.005)
x3_yj (Inflation)	0.062	0.019 (p < 0.001)	0.024 (p = 0.011)	0.024 (p = 0.011)

Note: Estimates from the fixed effects model. Robust covariance estimators were applied: HC1 cluster by group, HC1 cluster by time, and Driscoll-Kraay with maxlag = 2.

driver of banking profitability. In contrast, the robustness of GDP growth and inflation underscores the central role of macroeconomic conditions in shaping financial performance. The similarity of results across the different robust corrections provides confidence in the reliability of the estimated relationships (Table 7).

The random effects specification with regional controls highlights the importance of macroeconomic dynamics and structural regional differences in

shaping return on equity. The variance decomposition shows that most residual variation (86%) stems from idiosyncratic shocks, while 14% is attributable to unobserved country-specific heterogeneity.

Among the explanatory variables, GDP per capita growth and inflation remain positive and highly significant predictors of ROE. A one-unit increase in GDP growth raises profitability by 0.110, while a one-unit rise in inflation increases it by 0.072. By contrast, the SDG Index Score is not statistically

**Table 8.** Random effects estimation for ROE with regional controls

Source: Authors' calculation in R Studio.

Variable	Estimate	Std. Error	z-value	p-value
Intercept	0.283	0.108	2.615	0.0089**
x1_yj (SDG Score)	0.025	0.060	0.425	0.671
x2_yj (GDP growth)	0.110	0.021	5.225	< 0.001***
x3_yj (Inflation)	0.072	0.022	3.235	0.001**
Region: Eastern Europe & Asia	–0.500	0.159	–3.142	0.0017**
Region: East & South Asia	–0.261	0.142	–1.830	0.0673.
Region: Latin America & Caribbean	–0.002	0.137	–0.016	0.987
Region: MENA	–0.510	0.179	–2.847	0.0044**
Region: Oceania	–0.206	0.186	–1.109	0.268
Region: OECD	–0.459	0.173	–2.653	0.0080**
Region: Western Europe	–1.770	0.465	–3.810	< 0.001***

Note: Model fit statistics: Total Sum of Squares = 1813.2; Residual Sum of Squares = 1742.2;  $R^2 = 0.039$ , Adj.  $R^2 = 0.035$ ;  $\chi^2(10) = 88.11$ ,  $p < 0.001$ . The Reference category for regions is Africa. Signif. codes: '\*\*\*' – 0.001; '\*\*' – 0.01; '\*' – 0.05; '.' – 0.1; 'no symbols' – insignificant.

significant, indicating that sustainable development performance does not directly explain banking returns in this context.

Regional differences are evident. Compared to the baseline region (Africa), Eastern Europe & Asia, the MENA region, the OECD, and Western Europe show significantly lower profitability, with the most substantial adverse effect for Western Europe (−1.77). Eastern and South Asia exhibit a weakly adverse effect, which is significant only at the 10% level, while Latin America and Oceania do not differ significantly from Africa. These results suggest that regional context plays a key role, with banking profitability generally lower in advanced and some transitional economies relative to Africa (Table 8).

Banks in Africa exhibit comparatively higher ROE, while Western Europe, OECD countries, and MENA regions show systematically lower profitability, with Western Europe recording the weakest performance.

### 3.3. Interest Margin to Gross Income vs SDG Index Score

The new financial indicator, Interest margin to gross income ( $y_3$ ), has a mean of 59.8 with a standard deviation of 15.9. The central tendency (median = 61.4) suggests that interest income typically accounts for around 60% of banks' gross income. However, the extreme minimum value (−294.3) and maximum (100.8) indicate the presence of severe outliers, producing extreme left skewness (−6.38) and very high kurtosis (121.7). These distributional properties point to exceptional crisis episodes or data irregularities that must be addressed through transformation or robust estimation.

The fixed effects model reveals that the SDG Index Score ( $x_{1\_y_j}$ ) significantly impacts interest margins, with higher sustainable development performance associated with a higher share of interest income in total bank revenues. Inflation ( $x_{3\_y_j}$ ) also shows a positive and significant effect. At the same time, GDP per capita growth ( $x_{2\_y_j}$ ) has a significant negative impact, suggesting that banks rely relatively less on interest income as part of their gross income in periods of higher economic growth. Despite these significant associations,

the overall explanatory power of the fixed effects model remains low ( $R^2 = 0.015$ ), indicating that most variation is explained by unobserved heterogeneity (Table 9).

The random effects specification confirms the adverse effect of GDP growth and the positive effect of inflation but does not find a significant role for the SDG Index Score. The variance decomposition shows that 67% of the residual variation is attributable to country-specific heterogeneity, underscoring the relevance of structural cross-country differences in interest margin behavior (Table 9). Although the random effects model has a slightly lower  $R^2$  (0.011), it retains efficiency by accounting for both within- and between-country variation.

The Hausman test produces a  $\chi^2$  statistic of 4.23 with a p-value of 0.237, failing to reject the null hypothesis that the random effects estimator is consistent (Table 9). This indicates that the random effects specification is preferable for this model, as it provides efficient estimates while enabling the assessment of time-invariant factors alongside macroeconomic and financial variables.

Applying robust covariance estimators helps address heteroskedasticity, autocorrelation, and cross-sectional dependence in the fixed effects model. When clustering by country, only GDP per capita growth remains statistically significant, negatively affecting interest margins, while both the SDG Index Score and inflation lose significance. This suggests that once within-country correlation is accounted for, economic growth continues to exert a robust negative influence on the share of interest income in banks' gross income.

The results differ slightly when clustering by time or using Driscoll–Kraay corrections. The SDG Index Score becomes marginally significant at the 10% level, suggesting a weak positive link between sustainable development performance and interest margins. GDP growth remains strongly negative and significant across all specifications, confirming its robust association. Inflation becomes significant over time, and Driscoll–Kraay, but not under country clustering, pointing to a context-dependent effect (Table 10). Overall, the robustness checks confirm that higher economic growth consistently reduces the reliance on inter-

**Table 9.** FE vs. RE estimations for interest margin to gross income (y3)

Source: Authors' calculation in R Studio.

Variable	FE Estimate	FE Std. Error	FE t-value	FE p-value	RE Estimate	RE Std. Error	RE z-value	RE p-value
Intercept	–	–	–	–	0.016	0.068	0.231	0.817
x1_yj (SDG Score)	0.151	0.064	2.352	0.019*	0.060	0.047	1.273	0.203
x2_yj (GDP growth)	–0.061	0.013	–4.556	< 0.0001***	–0.058	0.013	–4.333	< 0.0001***
x3_yj (Inflation)	0.033	0.015	2.294	0.022*	0.030	0.015	2.085	0.037*

Note: Model fit statistics: FE model –  $R^2 = 0.015$ , Adj.  $R^2 = -0.056$ ,  $F(3,2016) = 10.24$ ,  $p < 0.001$ ; RE model –  $R^2 = 0.011$ , Adj.  $R^2 = 0.009$ ,  $\chi^2(3) = 23.37$ ,  $p < 0.001$ ; Hausman test –  $\chi^2(3) = 4.23$ ,  $p = 0.237$  → Random Effects preferred. The dependent variable is the interest margin on gross income (y3). Signif. codes: '\*\*\*' – 0.001; '\*\*' – 0.01; '\*' – 0.05; '.' – 0.1; 'no symbols' – insignificant.

**Table 10.** Robust fixed effects estimations for interest margin to gross income (y3)

Source: Authors' calculation in R Studio.

Variable	Estimate	Cluster by Country: Std. Error (p)	Cluster by Time: Std. Error (p)	Driscoll-Kraay (lag = 2): Std. Error (p)
x1_yj (SDG Score)	0.151	0.132 (p = 0.253)	0.089 (p = 0.089)	0.088 (p = 0.088)
x2_yj (GDP gr.)	–0.061	0.013 (p < 0.001)	0.017 (p < 0.001)	0.014 (p < 0.001)
x3_yj (Inflation)	0.033	0.027 (p = 0.215)	0.015 (p = 0.025)	0.015 (p = 0.030)

Note: Estimates from the fixed effects model. Robust covariance estimators were applied: HC1 cluster by group, HC1 cluster by time, and Driscoll–Kraay with maxlag = 2.

est income, while inflation and sustainable development performance have weaker, less consistent effects.

The random effects model with regional controls shows that macroeconomic variables and regional context shape banks' interest margins. The variance decomposition indicates that 65% of residual variation is attributable to country-specific effects, while 35% stems from idiosyncratic shocks, underlining the importance of structural heterogeneity across countries.

Among the explanatory variables, GDP per capita growth is consistently negative and highly significant, suggesting that stronger economic expansion reduces banks' reliance on interest income as a share of total revenues. Inflation displays a modest but significant positive effect, indicating increased reliance on interest margins in inflationary environments. The SDG Index Score is only weakly significant at the 10% level, implying a fragile positive association with bank interest margins.

**Table 11.** Random Effects estimation for interest margin to gross income (y3) with regional controls

Source: Authors' calculation in R Studio.

Variable	Estimate	Std. Error	z-value	p-value
Intercept	–0.244	0.156	–1.562	0.118
x1_yj (SDG Score)	0.102	0.058	1.764	0.078.
x2_yj (GDP growth)	–0.059	0.013	–4.413	< 0.0001***
x3_yj (Inflation)	0.031	0.015	2.155	0.031*
Region: Eastern Europe & Asia	0.032	0.243	0.133	0.894
Region: East & South Asia	1.008	0.239	4.215	< 0.0001***
Region: Latin America & Caribbean	0.660	0.225	2.937	0.003**
Region: MENA	0.741	0.310	2.391	0.017*
Region: Oceania	0.419	0.325	1.290	0.197
Region: OECD	–0.084	0.232	–0.363	0.716
Region: Western Europe	–0.528	0.802	–0.658	0.510

Note: Model fit statistics: Total Sum of Squares = 691.77; Residual Sum of Squares = 672.79;  $R^2 = 0.027$ , Adj.  $R^2 = 0.023$ ;  $\chi^2(10) = 60.64$ ,  $p < 0.001$ . The Reference category for regions is Africa. Signif. codes: '\*\*\*' – 0.001; '\*\*' – 0.01; '\*' – 0.05; '.' – 0.1; 'no symbols' – insignificant.

The regional dummies highlight marked cross-regional heterogeneity (Table 11). Compared to Africa, East and South Asia (1.01), Latin America and the Caribbean (0.66), and MENA (0.74) all exhibit significantly higher interest margins. Oceania shows a positive but insignificant effect, while Eastern Europe & Asia, OECD, and Western Europe do not significantly differ from the African baseline. These results suggest that banks in developing and emerging regions rely more heavily on interest income than those in advanced economies, reflecting structural differences in banking models and financial intermediation.

Banks in East & South Asia, Latin America, and MENA exhibit significantly higher interest margins than in Africa, while advanced economies show no meaningful differences.

## 4. DISCUSSION

The results of this study provide a nuanced understanding of the relationship between sustainable development performance, proxied by the SDG Index, and banking sector profitability across countries. The key finding is that the SDG Index Score has weak and inconsistent effects on profitability: only marginally positive for ROA and interest margins, but significantly negative for ROE in the random effects specification. This sharply contrasts the consistent and robust effects of macroeconomic variables, with GDP growth and inflation emerging as the primary drivers of bank profitability.

These results partly resonate with the broader empirical literature. The weak significance of SDG scores for ROA is consistent with evidence from Indonesia, where even poor ESG performance does not necessarily undermine profitability, suggesting that markets may tolerate limited sustainability integration when short-term financial gains are prioritized (Hermansyah et al., 2025). Conversely, the adverse effect of SDG performance on ROE aligns with findings from South Africa, which emphasize that while ESG may improve access to equity financing, it can also impose compliance costs that reduce short-term equity returns (Msomi, 2025). Similarly, evidence from Vietnam and ASEAN countries indicates that ESG disclosure can enhance profitability, but only un-

der specific governance and ownership contexts, underlining the conditional nature of the relationship (Loan et al., 2024; Nathania & Ekawati, 2024).

The positive association between inflation and profitability across all measures mirrors earlier research identifying macroeconomic conditions as decisive factors in determining financial outcomes. Consistent with prior evidence on financial access and economic growth as drivers of bank performance (Budhathoki et al., 2025; Hedau & Malla, 2024), the present findings highlight that macroeconomic stability and growth dynamics exert far stronger and more reliable effects than ESG performance. The robust negative relationship between GDP growth and interest margins is also in line with studies showing that expanding economies reduce banks' reliance on interest-based income, as other sources of revenues diversify with development (Saienko et al., 2025).

The regional heterogeneity identified in this study further substantiates the literature that emphasizes structural and institutional differences in shaping ESG-profitability links. Higher interest margins in East & South Asia, Latin America, and MENA correspond with findings that developing and emerging economies rely more on traditional banking income streams (Kubalek et al., 2024; Zatonatskiy et al., 2024). Conversely, the systematically lower profitability in OECD and Western Europe mirrors evidence that mature banking systems face tighter regulatory environments and higher sustainability compliance costs, which constrain margins (Strouhal et al., 2025).

The findings demonstrate that while ESG and SDG performance are increasingly embedded in financial narratives and regulatory frameworks, their measurable impact on profitability is inconsistent and context-dependent. By contrast, macroeconomic fundamentals (growth and inflation) remain the most robust determinants of banking profitability. This suggests that sustainability strategies may reinforce long-term resilience, as shown in studies of sustainable business models and ethical leadership (Pimenowa et al., 2023; Prokopenko et al., 2025), but they are unlikely to serve as immediate levers for financial performance without supportive governance frameworks and market maturity.

Limitations. This research has several limitations that should be acknowledged. First, the panel is unbalanced, with timespans varying across countries depending on consistent data availability in the SDG Index, IMF Core FSI, and World Bank databases. Second, while the Yeo–Johnson transformation was applied to reduce skewness and outlier effects, extreme values, particularly in return on equity and inflation, may still influence the robustness of the estimates. Third, the SDG Index is an aggregate measure that may mask individual goals' heterogeneous effects on financial outcomes, limiting the ability to disentangle spe-

cific channels through which sustainable development affects banking performance. Finally, the study focuses on macro-level indicators. It does not incorporate micro-level bank characteristics (e.g., capital adequacy, asset quality, or ownership structures), which could influence macroeconomic and sustainability factors to shape profitability. These limitations suggest that future research should combine macroeconomic data with bank-level information and explore disaggregated SDG indicators to provide a more nuanced understanding of the nexus between sustainability and financial performance.

---

## CONCLUSION

This study examined how sustainable development performance, measured by the SDG Index, influences bank profitability across countries, captured through ROA, ROE, and interest margins, while controlling for GDP growth, inflation, and regional heterogeneity.

The results indicate that the SDG Index Score exerts only a limited and inconsistent impact on bank profitability. For ROA and interest margins, positive effects appeared in fixed effects models, yet these lost significance under robust estimations, while ROE showed a significant negative relationship in the random effects model ( $\beta = -0.119$ ,  $p = 0.001$ ). By contrast, macroeconomic controls displayed strong and stable effects: GDP growth enhanced ROA and ROE but reduced interest margins, suggesting shifts in income structures as economies expand, whereas inflation consistently raised all profitability measures. Regional variation was also evident, with OECD and Western Europe recording lower profitability, and Oceania, East & South Asia, and Latin America showing stronger margins, underlining the importance of structural and institutional contexts.

From a policy perspective, these results imply that while sustainable development progress is an essential long-term objective, it does not yet serve as a robust or consistent driver of banking profitability. Policymakers should therefore avoid framing the SDGs as short-term financial performance instruments but rather as complementary to macroeconomic stability and financial resilience. Priority should be placed on policies that promote sustained economic growth and controlled inflation, as these remain the most reliable drivers of banking sector profitability. At the same time, regional structural differences suggest that financial regulation and SDG integration strategies should be tailored to regional contexts, with greater attention to developing and emerging economies where banks remain heavily dependent on interest income.

## AUTHOR CONTRIBUTIONS

Conceptualization: Shadiyya Amanova, Bulqeyis Novruzova, Zahid Ganbarov.

Data curation: Sakina Hajiyeva, Javid Huseynli, Ali Hanifayev.

Formal analysis: Shadiyya Amanova, Bulqeyis Novruzova, Zahid Ganbarov.

Funding acquisition: Sakina Hajiyeva, Javid Huseynli, Ali Hanifayev.

Investigation: Sakina Hajiyeva, Bulqeyis Novruzova, Ali Hanifayev.

Methodology: Shadiyya Amanova, Bulqeyis Novruzova, Zahid Ganbarov.

Project administration: Shadiyya Amanova, Sakina Hajiyeva, Javid Huseynli.

Resources: Javid Huseynli, Bulqeyis Novruzova, Zahid Ganbarov.  
 Software: Ali Hanifayev, Javid Huseynli, Sakina Hajiyeva,  
 Supervision: Shadiyya Amanova, Sakina Hajiyeva.  
 Validation: Zahid Ganbarov, Ali Hanifayev.  
 Visualization: Javid Huseynli, Ali Hanifayev.  
 Writing – original draft Zahid Ganbarov, Sakina Hajiyeva, Ali Hanifayev.  
 Writing – review & editing: Shadiyya Amanova, Bulqeyis Novruzova, Javid Huseynli.

## REFERENCES

- Adhikari, G. M., Sapkota, N., Parajuli, D., & Bhattarai, G. (2025). Impact of Green Banking Practices in Enhancing Customer Loyalty: Insights from Banking Sector Customers. *Financial Markets, Institutions and Risks*, 9(1), 195-215. [https://doi.org/10.61093/fmir.9\(1\).195-215.2025](https://doi.org/10.61093/fmir.9(1).195-215.2025)
- Bagirzadeh, M., Churikanova, O., Celika, M., Hurochkina, V., Petrushenko, Y. & Kyslytska, V. (2025). Influence of Foreign Direct Investment on Sustainable Development. *Financial Markets, Institutions and Risks*, 9(2), 35-65. [https://doi.org/10.61093/fmir.9\(2\).35-65.2025](https://doi.org/10.61093/fmir.9(2).35-65.2025)
- Budhathoki, P. B., Karki, M., Lama, P. B., & Chataut, M. K. (2025). Financial Access and Its Socio-economic Dilemmas: Assessing the Impact on Bank Performance. *SocioEconomic Challenges*, 9(1), 58-69. [https://doi.org/10.61093/sec.9\(1\).58-69.2025](https://doi.org/10.61093/sec.9(1).58-69.2025)
- Dadkhah, M., Nedungadi, P., Raman, R., & Dávid, L. D. (2024). Emerging and disruptive technologies and the sustainable development goals: A state of art and research agenda. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 19(1), 13-21. <https://doi.org/10.24136/eq.2985>
- Dirma, V., Neverauskienė, L. O., Tvaronavičienė, M., Danilevičienė, I., & Tamošiūnienė, R. (2024). The impact of renewable energy development on economic growth. *Energies*, 17(24), 6328. <https://doi.org/10.3390/en17246328>
- Dobrovol'ska, O., & Kolomiiets, S. (2024). The Impact of Digitalisation on Social Determinants of Public Health. *Health Economics and Management Review*, 5(3), 128-142. <https://doi.org/10.61093/hem.2024.3-09>
- European Commission (EC). (2021). *Strategy for financing the transition to a sustainable economy*. Retrieved from [https://finance.ec.europa.eu/publications/strategy-financing-transition-sustainable-economy\\_en](https://finance.ec.europa.eu/publications/strategy-financing-transition-sustainable-economy_en)
- Filipava, L., & Murshudli, F. (2023). The Development of the Global Green Finance Market: The Role of Banks and Non-banking Institutional Investors. In Naifar, N., & Elsayed, A. (Eds.), *Green Finance Instruments, FinTech, and Investment Strategies: Sustainable Portfolio Management in the Post-COVID Era* (pp. 27-46). Cham: Springer International Publishing. [https://doi.org/10.1007/978-3-031-29031-2\\_2](https://doi.org/10.1007/978-3-031-29031-2_2)
- Firstová, J., & Vysochyna, A. (2024). Optimisation of socio-economic, environmental and public health determinants of national security for post-pandemic recovery. *Health Economics and Management Review*, 5(1), 67-79. <https://doi.org/10.61093/hem.2024.1-05>
- Hedau, A., & Malla, V. (2024). Analyzing the Impact of Government Policy Measures on the Return on Equity. *SocioEconomic Challenges*, 8(2), 157-169. [https://doi.org/10.61093/sec.8\(2\).157-169.2024](https://doi.org/10.61093/sec.8(2).157-169.2024)
- Hermansyah, F. I., Anwar, A. I., Aksah, N. M., Ulumuddin, I., Janah, R. T., Amaliah, N. R., & Arifin, A. H. (2025). Does poor ESG performance still drive profitability? New evidence from Indonesia's SRI-KEHATI listed firms. *Investment Management and Financial Innovations*, 22(3), 14-26. [https://doi.org/10.21511/imfi.22\(3\).2025.02](https://doi.org/10.21511/imfi.22(3).2025.02)
- International Monetary Fund (IMF). (2023). *Global Financial Stability Report: Financial and Climate Policies for a High-Interest-Rate Era*. Washington, DC. Retrieved from <https://www.imf.org/en/Publications/GFSR/Issues/2023/10/10/global-financial-stability-report-october-2023>
- International Monetary Fund (IMF). (n.d.). *Data Home*. Retrieved from <https://data.imf.org/en>
- Kubalek, J., Erben, E., & Kudej, M. (2024). Impact of the environmental ESG pillar on firm sustainability: Empirical research in the V4 countries. *Journal of International Studies*, 17(3), 148-163 <https://doi.org/10.14254/2071-8330.2024/17-3/8>
- Kubatko, O., Kuzior, A., Kovalov, B., Rekunenko, I., Stepanenko, Y., & Sulym, V. (2024). Economic, institutional and environmental drivers of foreign trade. *International Journal of Environment and Sustainable Development*, 23(4), 480-499. <https://doi.org/10.1504/ijesd.2024.141861>
- Kurniasari, F., & Dwi Lestari, E. (2025). Does corporate governance matter in elucidating factors that drive profitability in the insurance industry? *Insurance Markets and Companies*, 16(1), 90-102. [https://doi.org/10.21511/ins.16\(1\).2025.08](https://doi.org/10.21511/ins.16(1).2025.08)
- Kuzior, O., Kostenko, A., Sotnyk, I., Yulija, C., Tuliakov, O., & Podmanicka, M. (2023). Socioeconomic sustainability and the solidarity economy formation under the war conditions in Ukraine. *Financial and Credit Activity Problems of Theory and Practice*, 5(52), 256-267. <https://doi.org/10.55643/fcaptop.5.52.2023.4132>
- Liu, Y., McDowell, S., Xue, C., & Zhang, J. (2024). Environmental, social, and governance per-

- formance: The role of Chinese employee stock ownership plans. *Environmental Economics*, 15(2), 132-148. [https://doi.org/10.21511/ee.15\(2\).2024.10](https://doi.org/10.21511/ee.15(2).2024.10)
19. Loan, B. T. T., Anh, T. T. L., & Hoang, T. (2024). ESG disclosure and financial performance: Empirical study of Vietnamese commercial banks. *Banks and Bank Systems*, 19(1), 208-220. [https://doi.org/10.21511/bbs.19\(1\).2024.18](https://doi.org/10.21511/bbs.19(1).2024.18)
  20. Lyeonov, S., Draskovic, V., Kubaščíkova, Z., & Fenyves, V. (2024). Artificial intelligence and machine learning in combating illegal financial operations: Bibliometric analysis. *Human Technology*, 20(2), 325-360. <https://doi.org/10.14254/1795-6889.2024.20-2.5>
  21. Makarenko, I., & Vorontsova, A. (Eds). (2024). *Sustainability benchmarks and progress: EU-Ukraine experience*. The Academic Research and Publishing UG (AR&P), Hamburg, Germany. <https://doi.org/10.61093/978-3-911748-01-8/2024>
  22. Matuszewska-Pierzynka, A., & Pieloch-Babiarz, A. (2025). Effect of corporate sustainability performance on the changes in payout policy of the top global companies. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 20(1), 357-388. <https://doi.org/10.24136/eq.3513>
  23. Megits, N., Aliyev, S., Pustovhar, S., Bielialov, T., & Prokopenko, O. (2022). The «Five-Helix» Model as an effective way to develop business in Industry 4.0 of selected countries. *Journal of Eastern European and Central Asian Research*, 9(2), 357-368. <https://doi.org/10.15549/jeeecar.v9i2.920>
  24. Moolkham, M. (2025). How do firm characteristics amplify the importance of ESG ratings for investors? *Economics and Sociology*, 18(1), 90-115. <https://doi.org/10.14254/2071-789X.2025/18-1/5>
  25. Msomi, T. S. (2025). The nexus of ESG performance and equity financing: Evidence from JSE-listed non-financial firms in South Africa. *Investment Management and Financial Innovations*, 22(3), 92-105. [https://doi.org/10.21511/imfi.22\(3\).2025.07](https://doi.org/10.21511/imfi.22(3).2025.07)
  26. Muazaroh, Lestari, W., & Purnama Sari, L. (2025). The role of gender diversity, board size, and ESG disclosure in improving performance and managing risks. *Problems and Perspectives in Management*, 23(1), 288-298. [https://doi.org/10.21511/ppm.23\(1\).2025.21](https://doi.org/10.21511/ppm.23(1).2025.21)
  27. Mursalov, M., Niemi, O., Kolumiits, S., & Trofimenko, D. (2025). Determinants of Financial Stability in Banks: The Impact of Key Regulatory Financial Indicators. *Financial Markets, Institutions and Risks*, 9(2), 123-134. [https://doi.org/10.61093/fmir.9\(2\).123-134.2025](https://doi.org/10.61093/fmir.9(2).123-134.2025)
  28. Mursalov, M., Yarovenko, H., & Vasilyeva, T. (2023). Entrepreneurial Ecosystem and Digitalization: Relationship and Synergy of Development. In Strielkowski, W. (Ed.), *Leadership, Entrepreneurship and Sustainable Development Post COVID-19*. NILBEC 2022. Springer Proceedings in Business and Economics. Cham: Springer. [https://doi.org/10.1007/978-3-031-28131-0\\_9](https://doi.org/10.1007/978-3-031-28131-0_9)
  29. Murshudli, F., & Loguinov B. (2020). Transnationalization and Digitalization of Banks as Means of Evolving Efficiency Not Accountability. Economic and Social Development (Book of Proceedings, Vol. 1/4). 55<sup>th</sup> International Scientific Conference on Economic and Social Development (pp. 798-809). Baku: VDEA – UNEC. Retrieved from [https://www.esd-conference.com/upload/book\\_of\\_proceedings/Book\\_of\\_Proceedings\\_esdBaku2020\\_Vol1\\_Online.pdf](https://www.esd-conference.com/upload/book_of_proceedings/Book_of_Proceedings_esdBaku2020_Vol1_Online.pdf)
  30. Murshudli, F. F. (2023). Green Banking for Sustainable Development. *Foresight and STI Governance*, 17(2), 82-94. Retrieved from [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=4622773](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4622773)
  31. Nathania, R., & Ekawati, E. (2024). Banking on ESG: How ownership influences financial outcomes in 5-ASEAN countries. *Banks and Bank Systems*, 19(3), 121-132. [https://doi.org/10.21511/bbs.19\(3\).2024.11](https://doi.org/10.21511/bbs.19(3).2024.11)
  32. Noor, A. S., Alam, S., Nohong, M., & Sobarsyah, M. (2024). Investigating the impact of corporate governance and investment decisions on financial performance and firm value in insurance and banking sectors. *Insurance Markets and Companies*, 15(2), 122-132. [https://doi.org/10.21511/ins.15\(2\).2024.11](https://doi.org/10.21511/ins.15(2).2024.11)
  33. Ntshangase, B. A., Makole, K. R., & Msosa, S. K. (2024). Overcoming the Socio-Economic Challenges to Good Governance: Streamlining Cooperative Governance Model. *SocioEconomic Challenges*, 8(4), 19-30. [https://doi.org/10.61093/sec.8\(4\).19-30.2024](https://doi.org/10.61093/sec.8(4).19-30.2024)
  34. OECD. (2020), *OECD Business and Finance Outlook 2020: Sustainable and Resilient Finance*. Paris: OECD Publishing, <https://doi.org/10.1787/eb61fd29-en>.
  35. Pimenowa, O., Pimenov, S., Fyliuk, H., Sitnicki, M. W., Kolosha, V., & Kurinskyi, D. (2023). Sustainable Business Model of Modern Enterprises in Conditions of Uncertainty and Turbulence. *Sustainability*, 15(3), 2654. <https://doi.org/10.3390/su15032654>
  36. Prokopenko, O., Jarvis, M., Shahnazaryan, N., Chechel, A., Sapiński, A., & Batsenko, L. (2025). Bridging Risk Ethics and Sustainability: A Data-Driven Study of Ethical Leadership Practices in Risky Business Environments. *Business Ethics and Leadership*, 9(2), 211-224. [https://doi.org/10.61093/bel.9\(2\).211-224.2025](https://doi.org/10.61093/bel.9(2).211-224.2025)
  37. Prokopenko, O., Kurbatova, T., Bashynska, I., & Pysmenna, U. (2023a). Improving the Feed-in Tariff Policy for Renewable Energy Promotion in Ukraine's Households. *Energies*, 16(19), 6773. <https://doi.org/10.3390/en16196773>
  38. Prokopenko, O., Kurbatova, T., Khalilova, M., Zerkal, A., Prause, G., Binda, J., Berdiyrov, T., Klapkiv, Y., Sanetra-Półgrabi, S., & Komarnitskiy, I. (2023b). Impact of Investments and R&D Costs in Renewable Energy Technologies on Companies' Profitability Indicators: Assessment and Forecast. *Energies*, 16(3), 1021. <https://doi.org/10.3390/en16031021>
  39. Ruziwa, R. M., Mvunabandi, J. D., & Nomlala, B. C. (2025). Audit committee characteristics and envi-

- ronmental, social, and governance reporting quality: An analysis of top 100 JSE-listed corporations. *Accounting and Financial Control*, 6(1), 38-52. [https://doi.org/10.21511/afc.06\(1\).2025.04](https://doi.org/10.21511/afc.06(1).2025.04)
40. Rybalchenko, S., Lukianykhina, O., Alamanova, C., Saienko, V., & Sunduk, T. (2022). Anti-crisis management of banking institutions: current problems and prospects for improvement. *Financial and Credit Activity-Problems of Theory and Practice*, 5(46), 29-39. <https://doi.org/10.55643/fcaptop.5.46.2022.3907>
  41. Sachs, J.D., Lafortune, G., Fuller, G., & Iablonovski, G. (2025). *Sustainable Development Report 2025. Financing Sustainable Development to 2030 and Mid-Century*. Paris: SDSN; Dublin: Dublin University Press. Retrieved from <https://s3.amazonaws.com/sustainabledevelopment.report/2025/sustainable-development-report-2025.pdf>
  42. Saienko, V., Skomorovskyi, A., Iermak, V., Sereda, O., & Bulavynets, O. (2025). The role of financial inclusion in driving economic growth. *African Journal of Applied Research*, 11(1), 472-483. <https://doi.org/10.26437/ajar.v11i1.864>
  43. Serhane, S. (2025). The Multifaceted Nature of Corporate Social Responsibility: Exploring the Economic, Legal, Ethical, and Philanthropic Dimensions. *Business Ethics and Leadership*, 9(1), 230-239. [https://doi.org/10.61093/bel.9\(1\).230-239.2025](https://doi.org/10.61093/bel.9(1).230-239.2025)
  44. Serpeninova, Y., Partila, P., Raboshuk, A., Krukmal, O., & Nezhyd, Y. (2025). Transparency in Human Capital Disclosure in Non-Financial Reporting: Towards Ethical Governance and Corporate Social Responsibility in Banking. *Business Ethics and Leadership*, 9(2), 120-129. [https://doi.org/10.61093/bel.9\(2\).120-129.2025](https://doi.org/10.61093/bel.9(2).120-129.2025)
  45. Serpeninova, Y., Lehenchuk, S., Zdyrko, N., Zakharov, D., & Podolanchuk, O. (2024). Revealing the contribution of corporate sustainability practices to financial performance: Case of BIST Sustainability 25 Index companies. *Environmental Economics*, 15(1), 118-129. [https://doi.org/10.21511/ee.15\(1\).2024.10](https://doi.org/10.21511/ee.15(1).2024.10)
  46. Sharma, P., Agrawal, G., T. Sunil Kumar, C., Kumar, M., & Kalyani, S. (2025). Impact of environmental, social, and governance factors on the price discovery process in the Indian stock market. *Investment Management and Financial Innovations*, 22(2), 268-278. [https://doi.org/10.21511/imfi.22\(2\).2025.21](https://doi.org/10.21511/imfi.22(2).2025.21)
  47. Standal, K., Leiren, M. D., Alonso, I., Azevedo, I., Kudrenickis, I., Malek-Dizaji, P., Laes, E., Di Nucci, M. R., & Krug, M. (2023). Can renewable energy communities enable a just energy transition? Exploring alignment between stakeholder motivations and needs and EU policy in Latvia, Norway, Portugal and Spain. *Energy Research & Social Science*, 106, 103326. <https://doi.org/10.1016/j.erss.2023.103326>
  48. Starchenko, L., Lyeonov, S., Vasylieva, T., Pimonenko, T., & Lyulyov, O. (2021). Environmental management and green brand for sustainable entrepreneurship. *E3S Web of Conferences*, 234, 00015. <https://doi.org/10.1051/e3sconf/202123400015>
  49. Strouhal, J., Horák, J., Resik, A., Gurviš-Suits, N., & Kadak, T. (2025). Stakeholders' perceptions on ESG reporting: On the case of Czechia and Estonia. *Journal of International Studies*, 18(2), 75-93. <https://doi.org/10.14254/2071-8330.2025/18-2/4>
  50. Tessema, D. B. (2025). Pillars of Organizational Transformation and Sustainability: Leadership, Learning, Culture, and Knowledge Management as Key Success Factors in Environmental Public Health. *Health Economics and Management Review*, 6(1), 1-22. <https://doi.org/10.61093/hem.2025.1-01>
  51. Vakulenko, I., & Rekunen, I. (2025). *Clean energy projects for European integration and cooperation* (185 p.). The Academic Research and Publishing UG (i. G.). Hamburg, Germany. <https://doi.org/10.61093/978-3-911748-03-2/2025>
  52. Vasa, L., Kubatko, O., Sotnyk, I., Piven, V., Trypolska, G., & Pysmenna, U. (2024). Economic and environmental drivers of renewable energy transition in the EU. *Environmental Economics*, 15(2), 232-245. [https://doi.org/10.21511/ee.15\(2\).2024.16](https://doi.org/10.21511/ee.15(2).2024.16)
  53. Vasilyeva, T., Yarovenko, H., Babenko, D., Kalicheva, N., Frolova, N., & Shylovtseva, N. (2022). The barycentric model of determining the sustainable growth determinants. *Heritage and Sustainable Development*, 4(2), 145-164. <https://doi.org/10.37868/hsd.v4i2.148>
  54. Vasylieva, T., Leonov, S., & Lasukova, A. (2014). Evaluation of the banks corporate social responsibility concept implementation level. *Economic Annals-XXI*, 137, 1-2(1), 89-93. Retrieved from <https://ea21journal.world/index.php/ea-v137-23/>
  55. World Bank. (2022). *World Development Report 2022: Finance for an Equitable Recovery*. Washington, DC: World Bank. <https://doi.org/10.1596/978-1-4648-1730-4>
  56. World Bank. (n.d.). *World Bank Open Data*. Retrieved from <https://data.worldbank.org/indicator>
  57. Yanto, H., Hajawiyah, A., & Baroroh, N. (2025). The reciprocal effect of environmental, social, and governance (ESG) practices and tax aggressiveness in Indonesian and Malaysian companies. *Problems and Perspectives in Management*, 23(1), 339-351. [https://doi.org/10.21511/ppm.23\(1\).2025.25](https://doi.org/10.21511/ppm.23(1).2025.25)
  58. Yarovenko, H., Kuzior, A., Norek, T., & Lopatka, A. (2024). The future of artificial intelligence: Fear, hope or indifference? *Human Technology*, 20(3), 611-639. <https://doi.org/10.14254/1795-6889.2024.20-3.10>
  59. Zatonatskiy, D., Leonov, S., Cieśliński, W., & Vasa, L. (2024). Determinants of global migration: The impact of ESG investments and foreign direct investment. *Economics and Sociology*, 17(1), 215-235. <https://doi.org/10.14254/2071-789X.2024/17-1/14>

## **APPENDIX A. List of countries in the sample by region**

### **Africa**

Angola; Burundi; Botswana; Central African Republic; Cameroon; Congo, Dem. Rep.; Congo, Rep.; Comoros; Djibouti; Ethiopia; Gabon; Ghana; Guinea; Gambia, The; Equatorial Guinea; Kenya; Lesotho; Madagascar; Mozambique; Mauritius; Malawi; Namibia; Nigeria; Rwanda; Somalia; Eswatini; Seychelles; Chad; Tanzania; Uganda; South Africa; Zambia.

### **Eastern Europe & Asia**

Albania; Armenia; Azerbaijan; Bulgaria; Bosnia and Herzegovina; Belarus; Cyprus; Georgia; Croatia; Kazakhstan; Kyrgyz Republic; Moldova; North Macedonia; Malta; Montenegro; Romania; Russian Federation; Tajikistan; Ukraine; Uzbekistan.

### **East & South Asia**

Bangladesh; Brunei Darussalam; Bhutan; China; Indonesia; India; Cambodia; Sri Lanka; Maldives; Mongolia; Malaysia; Nepal; Pakistan; Philippines; Singapore; Thailand; Vietnam.

### **Latin America & Caribbean (LAC)**

Argentina; Antigua and Barbuda; Belize; Bolivia; Brazil; Barbados; Dominica; Dominican Republic; Ecuador; Grenada; Guatemala; Honduras; St. Kitts and Nevis; St. Lucia; Nicaragua; Panama; Peru; Paraguay; El Salvador; Trinidad and Tobago; Uruguay; St. Vincent and the Grenadines.

### **Middle East & North Africa (MENA)**

United Arab Emirates; Algeria; Iraq; Jordan; Kuwait; Lebanon; Morocco; Saudi Arabia.

### **Oceania**

Fiji; Micronesia, Fed. Sts.; Papua New Guinea; Solomon Islands; Tonga; Vanuatu; Samoa.

### **OECD**

Australia; Austria; Belgium; Canada; Switzerland; Chile; Colombia; Costa Rica; Czechia; Germany; Denmark; Spain; Estonia; Finland; France; United Kingdom; Greece; Hungary; Ireland; Iceland; Israel; Italy; Korea, Rep.; Lithuania; Luxembourg; Latvia; Mexico; Netherlands; Norway; Poland; Portugal; Slovak Republic; Slovenia; Sweden; Türkiye; United States.

### **Western Europe- Non-OECD**

San Marino.