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FINANCIAL, SPATIAL AND SYSTEMIC DETERMINANTS OF ESG SCORING ASSIGNED TO COMMERCIAL BANKS

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ABSTRACT: The aim is to verify which financial, spatial and systemic importance variables interact with ESG scoring. Based on data from 628 banks from 63 countries, a multinomial ordered logit model was built with the explanatory variables of Sustainalytics and Moody's ESG scores. Results indicate that membership in the EU, being an SIB, capitalisation, and revenues have a positive effect on ESG. In contrast, an increase in leverage, NPL ratio, and profitability are associated with a deterioration in scorings. Results differ in terms of the spatial aspect (in the case of Sustainalytics, additionally, location in the US favours ESG scoring) and the spectrum of systemic importance (in the case of Moody's, it is both global and local dimensions). This study is the first attempt to identify common (to different methodologies) determinants of ESG scoring. Its originality is also determined by the demonstration of a relationship between spatial variables and SIB's membership and ESG scoring.

KEYWORDS: commercial bank, ESG scoring, NPL, EU, SIB

Introduction

The acronym ESG refers to the environmental (E), social (S) and corporate governance (G) spheres. The E factor is related to the evaluation of the implementation of environmental strategy and policy, as well as environmental management. The S component takes into account the quality of relationships, communication and respect for the rights belonging to the company's various stakeholder groups (including employees, the local community and contractors, among others). The G factor, on the other hand, refers to an assessment of the quality of a company's governance, including but not limited to the management of conflicts of interest, as well as anti-corruption procedures and practices (Bernardelli et al., 2022; Mathis, 2022). ESG scorings are a synthesis of a company's non-financial performance, reflecting the level of risk and quality of management of the aforementioned areas that are non-financial in nature. ESG is attracting increasing attention from investors, company boards, and other stakeholders, as these factors are quite often shown as a potential source of shareholder value creation. Increasingly, ESG factors are treated not as divergent from economic goals but as complementary. This is evidenced by the results of studies confirming the positive impact of ESG performance on the financial performance of companies (Tarmuji et al., 2016; Gholami et al., 2022) and the behaviour of their issued shares on the stock market (Khan et al., 2016; Lööf & Stephan, 2019; Ehlers et al., 2022). Thus, stakeholder theory, developed by Freeman (1984), which takes into account the needs of the entire spectrum of stakeholders in business, is gaining popularity. It represents a kind of bifurcation of the prevailing paradigm about the creation of shareholder value as the overriding goal of doing business, the negative effects of which were evident as a consequence of the global financial crises. Individual and institutional investors around the world are looking for attractive equity investments combining satisfactory returns with positive environmental and social impact in the operations of selected companies, hence the importance of seeking relationships between financial and non-financial performance. Research to date has mainly focused on the impact of ESG ratings (or individual sub-scorings) on financial variables, company value, or investor interest in the securities they issue. Relatively little research has addressed the opposite direction of the relationship, i.e., the determinants of ESG scorings, and this research gap with respect to the commercial banking sector is filled by this study.

The main motivation of the authors of this study is to broaden the spectrum of determinants of ESG scoring assigned to commercial banks and to confront the obtained results based on post-pandemic data with previous findings.

The aim of the study is to verify which variables from three areas, financial, spatial and related to the systemic importance of the institution, affect ESG scoring. Based on data on 628 banks from 63 countries around the world from 2022 or 2021 (if 2022 was not available), downloaded from the Orbis database, as well

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as binary variables drawn from lists of institutions with global and local systemic importance, a multinomial ordered logit model was built with explanatory variables in the form of ESG scores assigned by Sustainalytics (ESG risk) and Moody's (ESG performance). The Sustainalytics' ESG risk rating reflects the level of ESG risk that is unmanaged. Moody's scoring provides investors with estimates of environmental, social, governance, carbon emissions footprint, transition and physical risk management scores. It focuses on the quality of ESG risk management and the evolution of ESG risk levels.

The study in question is the first attempt to identify common (to different assessment methodologies) determinants of ESG scoring. In addition to the proposed research method, its originality is also determined by the demonstration of the relationship between spatial variables and systemically important bank membership and ESG scoring. A very broad research sample of banks, coming from 63 countries located on different continents, was also considered.

The remainder of this article is structured as follows. Section 2 reviews the most significant literature. Section 3 describes the data and methodology employed in the empirical research. Section 4 presents and discusses the obtained results. Section 5 summarises and presents the main conclusions.

Determinants of ESG performance – literature review and hypothesis development

Most studies to date have focused on the impact of ESG performance on the financial health of the entity being evaluated. A review of the literature conducted by Friede et al. (2015) indicates that about 90% of studies conclude that there is no negative relationship between ESG performance and financial performance, and the majority prove a positive impact of ESG performance on the company's financial health. The positive impact of ESG performance on selected aspects of financial health has been demonstrated by Tarmuji et al. (2016), Ciciretti et al. (2014) and Wu and Shen (2013), while Caiazza et al. (2023) provide evidence that ESG scoring is negatively associated with firm credit risk. In this article, the purpose of the study is to establish the determinants of ESG scoring, including the financial factors affecting it. Thus, the opposite direction of causality is examined. At the outset, it should be noted that the study in question only concerns banks that have disclosed sufficient information for an ESG score to be assigned. Although EU regulations have the effect of requiring more and more disclosure in the area of sustainability, they are being introduced gradually, do not cover all aspects and do not apply to all types of business. So what makes some disclose ESG data voluntarily while others do not? With help comes legitimacy theory, according to which an individual's actions are aligned with the decisions expected of them by their environment and consistent with the norms and values of a given community (Jastrzębowski, 2014), although Deegan (2019) notes the need

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to develop legitimacy theory in the context of ESG disclosures. At this point, it is worth noting the duality of the studies. Some are focused on assessing the impact of a given variable on the extent of ESG disclosures (e.g., Abdul & Alsayegh, 2021), while others focus on ESG performance. Only the latter strand is considered in this article.

Factors affecting ESG performance can be divided into two groups: firm-specific and those related to the environment of the entity being evaluated (market or country characteristics). Among the determinants of firm-specific, financial and non-financial factors can be distinguished.

Financial firm-specific determinants

A relatively large number of studies point to the positive impact of **entity size** on the extent of ESG disclosures (Nurhayati et al., 2016; Kumar & Firoz, 2022; Hossain & Reaz, 2007), while relatively few studies have been devoted to the impact of company size on ESG performance. Prominent among these are the conclusions reached by El Khoury et al. (2023), who showed that bank size is positively correlated with ESG scoring. Similar conclusions are also made by Wu (2006), Chih et al. (2010), Crespi and Migliavacca (2020) and Drempetic et al. (2020). Given the results of the studies presented above, it can be expected that:

- The larger the scale of the bank's operations, the better the ESG score (H1).

The vast majority of studies to date have focused on determining the impact of ESG scoring on the financial performance of the evaluated entities. Only a few studies have been devoted to analysing the opposite relationship. Notable among them are studies indicating that a company's **profitability** positively affects the ESG sphere. Alam et al. (2022), studying listed companies in Malaysia, note that companies characterised by above-average profitability enjoy relatively higher ESG scores and also obtain higher scorings in each of the categories, i.e., E, S and G. In turn, Crespi and Migliavacca (2020), studying financial institutions, conclude that their ESG scores increase systematically and linearly over time, and this trend strengthens as the profitability of the rated institution increases. The above conclusions entitle us to formulate the following hypothesis:

- Banks with relatively higher profitability have correspondingly better ESG scorings (H2).

A study conducted on a sample of listed Malaysian companies by Alam et al. (2022) allows forthe conclusionthat companies with higher **leverage** have worse S, G and total ESG scores, while E scores are relatively higher in these cases. Thus, it can be expected that:

- Banks with relatively low capital adequacy ratios will be assigned relatively worse ESG scoring (H3).

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Finally, it is worth mentioning that not all studies prove the positive impact of a company's financial condition on ESG performance, i.e. the better the financial standing, the better the ESG scoring. For example, Chih et al. (2010) conclude that the financial condition of companies is not related to CSR. In contrast, El Khoury et al. (2023) conclude that a bank's performance negatively affects its ESG score.

Non-financial firm-specific factors

According to resource theory, better-performing companies have more financial resources to use for ESG activities (Margolis et al., 2007). Menicucci and Paolucci (2023) showed that for a broad group of Italian banks, a relatively long series of improvements in the environmental component of the ESG scoring are associated with improvements in accounting and market-based financial performance indicators. They combine this with the resource-based view and the stakeholder theory. ESG assessments are also positively influenced by the extent of data provided for evaluation (Drempetic et al., 2020), and this is related to the scale of the business, which indirectly relates to H1. In turn, Bernardelli et al. (2022) conclude that the share of exposures in a bank's portfolio to customers classified as operating in the fossil fuel sector, to coal mines or coal-fired power plants above a certain cut-off value increases the probability of classifying the bank in the group of institutions with higher ESG risk. Given the expected materialisation of the negative impact of exposures to the fossil fuel sector on bank performance (increasing credit risk), the relationship indicated by Bernardelli et al. (2022) is consistent with H2. Tang et al. (2021), on the other hand, demonstrate that companies owned by the same owners as the agencies evaluating them receive relatively higher ESG scorings.

Other determinants of ESG performance

Bernardelli et al. (2022) show that an increase in a country's descriptive SDI, as defined by Hickel (2020) by a unit translates on average, *ceteris paribus*, into a decrease in the chances of a bank being assigned to a high ESG risk group. Chih et al. (2010) note that financial firms in countries with stronger legal enforcement are relatively more committed to CSR. Also, the greater the extent of self-regulation, the better the CSR performance. According to Crespi and Migliavacca (2020), ESG scoring is positively correlated with the economic and social development of the country in which the rated companies operate. El Khoury et al. (2023), studying banks, find a negative effect of economic growth on the environmental pillar and a positive effect of social development on the combined ESG scoring and governance pillar. Bernhardsen and Ligard (2022) prove that family companies are characterised by lower ESG scoring relative to entities with a different ownership structure. In turn, Moura-Leite et al. (2012) note that the industry is an important factor to consider in CSR intensity. Also, Short et al. (2016) suggest

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that corporate social performance depends on the industry in which the company operates. Changes in scorings are linear, and the slope of the line varies across industries.

According to Ioannou and Serafeim (2012), the political system, followed by the labour and education system as well as the cultural system, are the most important factors affecting corporate social performance, while the role of the financial system is minor.

Due to the fact that within the EU, as well as outside this Community, there are European countries with a high level of economic and social development (such as the UK and Switzerland), the hypothesis was formulated that:

- Belonging to the European Union or being located in a country with a high level of socio-economic development has a positive impact on the bank's ESG score (H4).

ESG scorings

ESG scorings are granted by the same agencies that assign credit ratings (credit rating agencies, CRAs), companies that are controlled by CRAs, or entities without CRA ownership (inter alia stock index owners). This study focuses on ESG scorings assigned by Sustainalytics and Moody's. These are not the only agencies assigning this type. A synthetic characterisation of ESG scoring systems is provided in Table 1.

Table 1. Comparison of selected ESG scoring systems

Provider	Scale	Subject of evaluation
Sustainalytics	negligible (0-10), low (10-20), medium (20-30), high (30-40) and severe (40+)	ESG risks
Moody's	weak (0-29), limited (30-49), robust (50-59) and advanced (60-100)	ESG performance (management)
S&P	The weighted average of E, S and G scores affects ESG scoring. Scale from 0 to 100, where 100 points is the best note.	Exposure to and performance on ESG risks and their public disclosures
MSCI	Leader (AAA, AA), Average (A, BBB, BB) and Laggard (B, CCC).	Management of financially relevant ESG risks and opportunities
Bloomberg	From 0 to 100%; the higher the value, the better the ESG performance	ESG Disclosure Score and Bloomberg Gender-Equality Index
Refinitiv	From 0 to 100, where 100 indicates the best performance	ESG performance
CDP	From D- to A, where A indicates excellent performance	Environmental performance
FTSE Russell	From 0 to 5 (the best performance)	Corporate responsibility

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Sustainalytics employs a proprietary scoring framework that quantifies a company's ESG risk. This framework evaluates the company's performance on various ESG indicators falling under the category of greenhouse gas emissions, biodiversity conservations, resource management and efforts to reduce the environmental impact, i.e., pollution control measures, labour practices, diversity in the workplace and efforts to promote inclusion, human rights practices, product safety and quality standards, composition and independence of a company's board of directors, evaluation of executive pay structures and alignment with company performance, assessment of shareholder rights and governance mechanisms, examination of anti-corruption policies and ethical business conduct, with a focus on how well it manages key ESG risks and opportunities. Sustainalytics weighs these factors, taking into account the materiality of each issue within the specific industry and region in which the company operates, assesses controversies associated with the company that can impact ESG scoring and benchmarks a company's ESG performance against industry peers. Sustainalytics' ESG risk and Moody's ESG performance scores were constructed using a proprietary methodology known as the 'MIS-ESG'. An analysis of the documentation indicates that similar factors are used in the construction of the scoring as in the alternatively analysed score. The weights adopted for estimation, as well as the relative scale of the estimates, are different. Moody's scores also appear as sub-measures for each letter of the acronym (Moody's, 2023).

Sample and research method

Data from 628 banks in 63 countries around the world were used. A decomposition of the sample based on spatial criteria is provided in Figure 1.

The most recent financial data, i.e., from 2022, were included. If they were unavailable, data from 2021 were incorporated. Quantitative data were taken from the Orbis BvD database; binary variables were constructed using lists of systemically important institutions compiled by relevant international and national regulators.

The dependent variables were two ESG scorings (their latest and most recent value for each bank, i.e., usually given in 2022):

- Company ESG Risk Rating by Sustainalytics,
- ESG Rating by Moody's.

The share of each scoring level in the population for both types is shown in Figure 2.

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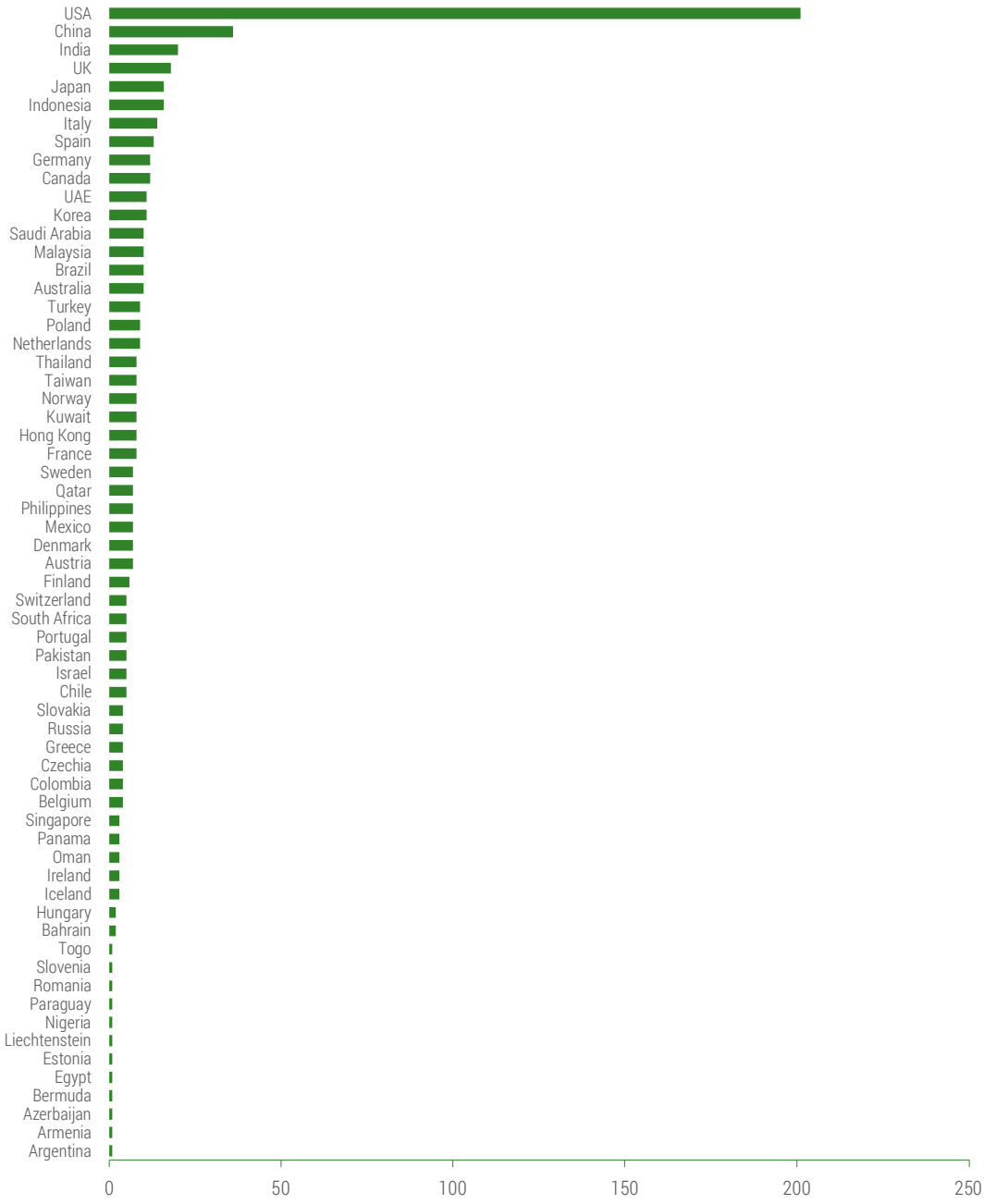

Figure 1. Number of banks used for analysis by country of origin

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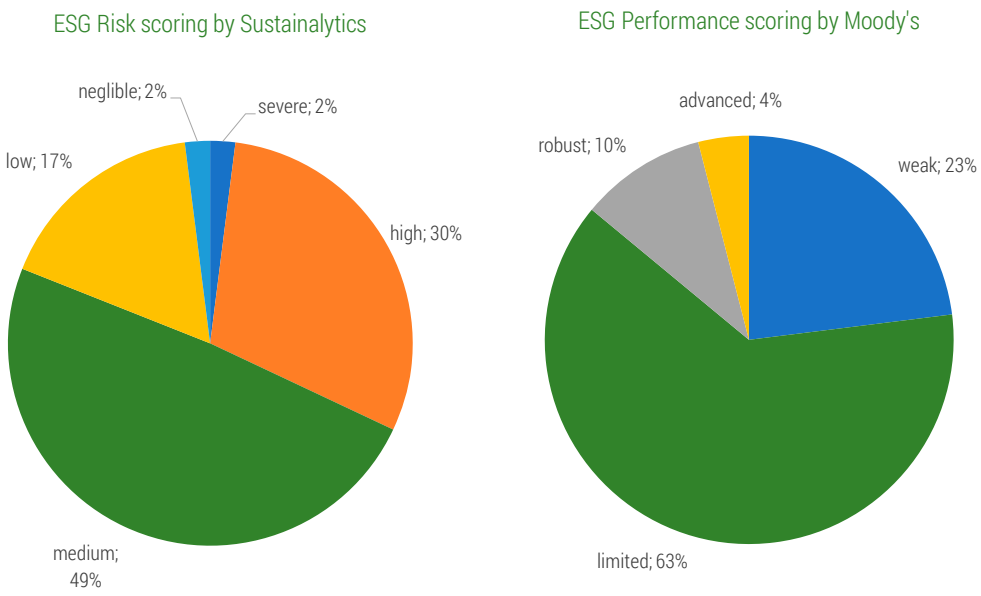

Figure 2. Share of each scoring level in the total population of surveyed entities

Based on the literature review, the following explanatory variables were selected for testing. Most variables were collected individually for each entity. In addition, a group of variables at the level of the bank's country of origin, extracted from the Global Innovation Index (GII) 2022 components, was also included (INST, REQ, HCR and CRO).

Table 2 shows the selected diagnostic variables.

Table 2. Variable definitions

Variable	Definition	Source
Leverage Ratio (LR)	Tier 1 capital over a bank's total exposure measure, which consists of on-balance sheet as well as off-balance sheet assets	Orbis BvD database
ROA	Bank return on assets (%, after tax)	Orbis BvD database
Share of non-performing loans (NPL)	bank non-performing loans to total loans (%)	Orbis BvD database
Tier 1 Capital (T1)	the ratio of a bank's core equity capital to its total risk-weighted assets (RWA)	Orbis BvD database
Total Capital Ratio (TCR)	relationship between total own funds and risk-weighted assets (RWA)	Orbis BvD database
Bank Z-Score	ROA+(equity/assets))/sd(ROA)	Orbis BvD database

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Variable	Definition	Source
Bank's total income (natural logarithm)	natural logarithm of total income	Orbis BvD database
Bank's location in the U.S.	Bank's location in the U.S. – binary variable. A variable that takes the value 1 if a banks has US location, and 0 otherwise.	international and nationalsupervisors
Bank's location in the EU	Bank's location in the EU – binary variable. A variable that takes the value 1 if a country has EU location, and 0 otherwise.	international and national supervisors
G-SIB – Global Systemically Important Banks	Global Systemically Important Banks as of 2022 – binary variable. A variable that takes the value 1 if a bank belongs to the G-SIB, and 0 otherwise.	Financial Stability Board
O-SIB – Other Systemically Important Institutions	Other Systemically Important Institutions as of 2022 – binary variable. A variable that takes the value 1 if a bank belongs to the O-SIB, and 0 otherwise.	EBA, EEA member states, UK; D-SIB's in the USA; D-SIBs located outside EEA or USA
INST – Institutions	Global Innovation Index (GII) subcategory including assessment of the political, regulatory and business environment	World Intellectual Property Organization (WIPO)
REQ – Regulatory quality	GII subcategory belonging to institutional variables, describing the quality of regulation	World Intellectual Property Organization (WIPO)
HCR – Human Capital and Research	GII subcategory covering education levels and outcomes, including tertiary education, and the intensity and effects of R&D spending	World Intellectual Property Organization (WIPO)
CRO – Creative Output	GII subcategory describing the creation of intangible assets, the development of creative industries and the development of the digital economy	World Intellectual Property Organization (WIPO)

Table 3 shows the descriptive statistics of the variables listed above.

Each level of ESG scoring (the explanatory variable) was assigned a numerical value:

- ESG by Sustainalytics: 1 (severe), 2 (high), 3 (medium), 4 (low), 5 (negligible) –measuring risk,
- ESG by Moody's: 1 (weak), 2 (limited), 3 (robust), 4 (advanced) – measuring performance.

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Table 3. Descriptive statistics of explanatory variables

	LR	ROA	NPL	TIER1	TCR	Z_SCORE	LN_INC.	INST	REQ	HCR	CRO
Average	9.995	0.962	2.411	15.352	17.412	68.845	14.056	65,26	63,02	42,66	30,79
Std dev	4.182	0.797	3.604	5.358	5.194	74.681	1.611	14,17	19,67	14,65	13,48
Min	2.070	-3.918	0.000	6.400	8.525	1.780	9.641	41,20	20,90	14,90	5,40
Max	48.958	8.430	40.245	64.250	64.250	887.940	18.670	95,90	100,00	66,40	56,30
CoV	0.418	0.829	1.495	0.349	0.298	1.085	0.115	0,22	0,31	0,34	0,44
	USA	EU	G_SIB	O_SIB							
1	201	121	23	143							
0	427	507	605	485							
% of 1	32.0%	19.3%	3.7%	22.8%							

Since both scorings evaluate ESG from two different perspectives – as risk (Sustainalytics) or as performance (Moody's), the scale was set so that in both cases, the direction of the relationship of the dependent variable with the explanatory variables was measured similarly, to allow for comparison. Due to the nature of the dependent variable, a multinomial ordered logit model was used. The model assumes that the examined characteristic is represented by a certain unobservable continuous variable y*, having a few cut-off points (κ_c) that divide its variability range into M ordered intervals. These intervals correspond to successive values of the observable variable y. The ordered variable y is thus a constrained record of the variable y*, which in turn is a linear function of the set of explanatory variables (vector x) and the unknown parameters (vector β). For i different objects (i = 1, 2,...,n), the objects are the individual banks that are the subject of the study the variable y* takes the form:

$$y^* = x_i'\beta + u_i, \tag{1}$$

where:

u_i – is a vector of independent random components, while according to the assumptions presented above:

$$\Pr(y_i \le c|x_i) = \Pr(y_i^* \le k_c^*|x_i) = g_{ci} \text{ for c=1,2,...,M-1.} \tag{2}$$

Assuming that the random component has a logistic distribution, the above formulas lead to the conclusion that:

$$logit(g_{ci}) = \log\left(\frac{g_{ci}}{1-g_{ci}}\right) = k_c - x_i'\beta. \tag{3}$$

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The logistic model of the ordered variable thus takes the form:

$$g_{ci} = \Pr(y_i \leq c|x_i) = \frac{\exp(k_c - x_i^{'}\beta)}{1+ \exp(k_c - x_i^{'}\beta)}. \quad (4)$$

The assessment of the quality of fit of the multinomial logit model includes checking the statistical significance and sign of individual predictors for the variables, odds-ratio i.e., the exponential coefficient interpreted as an increase or decrease of the chance for a unit change in the explanatory variable to achieve a relative result in relation to the reference group. The goodness of fit of the logit model can also be assessed using a number of diagnostic statistics such as the likelihood test and the pseudo-r coefficient. It is also a routine approach for this model to estimate a marginal effects matrix to assess the odds of assigning an individual to a given value group, i.e., the probability of an entity being in a given value cluster (Fullerton, 2009).

The correlation coefficient (Spearman's rank) between the two scoring scales is 0.439 ($p<0.0001$), while the dependency measure for ordinal variables (Kendall's Tau) takes the value of 0.401 ($p<0.0001$), indicating a limited relationship between the two measures in the sample.

Table 4. The Pearson correlation coefficients between continuous explanatory variables

	LR	ROA	NPL	TIER1	TCR	Z_SCORE	LN_INCOME
LR							
ROA	0.472**						
NPL	0.181	-0.174					
TIER1	0.238	0.100	0.124				
TCR	0.200	0.093	0.136	0.891***			
Z_SCORE	-0.097	-0.051	-0.198	0.000	-0.035		
LN_INCOME	-0.236	0.018	0.037	-0.131	-0.093	0.059	

Significance level: *p<0.1; **p<0.05; ***p<0.01.

The analysis of Pearson's correlation coefficients between explanatory variables of the continuous type allowed for the rejection of the hypothesis of collinearity in the data (Table 4). The exception is the strong positive correlation between variables describing the level of capital equipment of the bank. There were several arguments in favour of leaving both variables in the equation. Inter alia, the non-linear form of the estimated regression model and the varying relationship between the level of Tier 1 capital and the total capital ratio (TCR) in a large proportion of the analysed entities. Despite this, the high collinearity and

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correlation of the two capital ratios raised the danger of misspecification of the model. Therefore, different forms of the model, including all or only selected capital variables, were estimated for each dependent variable. The best models were selected using the likelihood ratio test (LRT) and the Akaike Information Criterion (AIC).

Results and discussion

Table 5 shows the regression parameters for two models – with the dependent variable as ESG risk (Sustainalytics) and the dependent variable as ESG performance (Moody's).

Table 5. Regression parameter estimates for models with the dependent variable ESG scoring (Sustainalytics and Moody's)

	Dependent variable							
Explanatory variable	ESG Risk scoring Sustainalytics				Moody's ESG Performance scoring			
	Coefficient	Odds Ratio	OR 2.5%	OR 97.5%	Coefficient	Odds Ratio	OR 2.5%	OR 97.5%
LR	-0.034	0.967	0.919	1.017	-0.101**	0.904	0.853	0.956
	(0.032)				*(0.053)*			
ROA	-0.035	0.965	0.739	1.267	0.057	1.061	0.811	1.407
	(0.197)				*(0.151)*			
NPL	-0.052	0.950	0.894	1.007	0.035	1.036	0.975	1.096
	(0.046)				*(0.044)*			
TIER1	0.060**	1.062	1.021	1.106				
	(0.029)							
TCR					0.092***	1.096	1.056	1.140
					(0.017)			
Z_SCORE	-0.002	0.997	0.995	1.000	-0.006*	0.994	0.992	0.997
	(0.002)				*(0.002)*			
LN_INCOME	0.320***	1.436	1.240	1.665	0.596***	1.815	1.541	2.143
	(0.118)				*(0.137)*			
USA	-0.434	0.648	0.370	1.132	0.425***	1.530	0.904	2.593
	(0.484)				*(0.410)*			
EU	1.650***	5.207	3.040	8.928	2.07***	7.925	4.441	14.452
	(0.447)				*(0.652)*			
G-SIB	-1.510***	0.221	0.088	0.554	0.138	1.148	0.425	3.054
	(0.532)				(0.710)			

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	Dependent variable							
Explanatory variable	ESG Risk scoring Sustainalytics				Moody's ESG Performance scoring			
	Coefficient	Odds Ratio	OR 2.5%	OR 97.5%	Coefficient	Odds Ratio	OR 2.5%	OR 97.5%
O-SIB	0.309	1.362	0.833	2.228	-0.577	0.562	0.329	0.954
	(0.343)				*(0.353)*			
INST	0.054**	1.056	1.027	1.086				
	(0.023)							
REQ					0.036*	1.036	1.022	1.051
					(0.018)			
HCR	-0.073***	0.929	0.894	0.966				
	(0.025)							
CRO	0.059**	1.061	1.030	1.093				
	(0.029)							
Threshold Parameters								
(1->2)	3.83*				9.82***			
	(1.54)				*(2.33)*			
(2->3)	7.02***				14.2***			
	(1.87)				*(2.75)*			
(3->4)	9.89***				16.2***			
	(2.13)				*(2.73)*			
(4->5)	12.7***							
	(2.14)							
Model fit statistics								
Log-Likelihood:	-631.574				-481.093			
McFadden's R^2:	0.133				0.208			
AIC:	1297.15				990.187			
Observations:	628							
Significance level								
*p<0.1; **p<0.05; ***p<0.01.								

Standard errors in parentheses, clustered with respect to countries.

The estimation results indicate a limited relationship between the level of ESG scoring, both in the Sustainalytics and Moody's versions of the model. For the Sustainalytics model, a statistically significant (at the 5% and 1% level, respectively) relationship with the dependent variable was identified for the Tier 1 capital ratio, the value of the bank's total revenues, the location of the entity in

an EU country, and for institutions included in the Financial Stability Board's inventory of global systemically important entities. The direction of the relationship between the Tier 1 ratio and ESG risk scoring indicates that as the bank's relative capital endowment in premium category increases (expressed in terms of a one-unit increase in the T1ratio), the odds (odds ratio) of the entity's ESG risk level decreases. The odds ratio for this characteristic is greaterthan zero. For the variable expressing the log level of the entity's total revenue, as the entity's revenue increases, the odds of a decrease in the level of ESG risk of the entity increase. For statistically significant binary variables, banks located in the European Union have overfive times higher chances of reducing ESG risk than banks based outside the EU. In the case of global systemically important institutions, entities in this category were characterised by higher ESG risk. In the model, in which the dependent variable was the level of Moody's ESG score, which has the character of a performance measure rather than a risk measure, the leverage ratio, the level of total capitalisation, the bank's overall measure of individual risk, the level of total revenue and spatial location – the fact that the entity is registered in the US and the European Union – were identified as variables significantly affecting the dependent variable. In the case of leverage level, a one-unit increase in the measure implied a *ceteris paribus* reduction of about 10 percent in the odds of an increase in ESG scoring. Similarly, a six percent decrease in the chances of raising their ESG score was recorded, on average, by entities whose total risk increased by one unit. In terms of the measure of total capitalisation, a one-percent increase in the index is associated with a 1.1-fold increase in the chances of improving one's ESG standing, while a one-unit increase in total revenue represents a more than one-and-a-half-fold increase in the chances of raising one's ESG scoring. The binary variables that had a very strong effect on ESG scoring were indicators of spatial location, coding for a bank's headquarters in the European Union or in the United States. In the case of the United States, the odds of improving one's ESG scoring position almost doubled, while in the case of the European Union, the odds increased almost eightfold.

It was assumed that the results and performance of the model, in particular the strength and direction of the relationship of the ESG indices and explanatory variables, may also depend on some additional unobservable and unaccounted-for characteristics related rather to the general environment (economic, institutional, financial, innovative, etc.) in which the analysed credit institutions operate. This means that the results may significantly depend on the location of the entity in the country of origin. This is indicated, for example, by the very strongly statistically significant relationship between the dependent variables in both specifications of the ESG index and the binary variable encoding the country's membership in the European Union. The purpose of this additional modification of the models was also to remove the potentially occurring problem of endogeneity. The Global Innovation Index (Korzeb et al., 2023) was used for this purpose. This is the most comprehensive aggregate set of characteristics ordering countries by their capacity for and success in innovation, published annually since

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2007. The index is estimated as a simple weighted average of two scores in two sub-indices, the Innovation Input Index and Innovation Output Index, which are composed of five and two pillars, respectively. Each of these pillars describes an attribute of innovation and comprises up to five indicators, and their score is estimated by the weighted average method. The categories of inputs related to institutional development, the quality of human capital and the intensity of research and development spending, the level of infrastructure development, including IT infrastructure, market development and the development of business entities in the market. Output in terms of the index includes the ability to generate products that are at a high level of processing and create high added value, as well as the intensity of knowledge diffusion, the ability to create creative goods, including all kinds of intangible assets, such as patents, trademarks, companies and products with global presence and recognition. The subcategories within the index formed a total of 26 variables, together with the value of the entire index, with the potential to complete the logistic regression equation and contribute to increasing the goodness of fit of the models. The inclusion of individual subcategories or the total index value in the regression equation was tested, taking into account the level of correlation between individual subcategories. The goodness of fit and its potential improvement as a result of including additional variables was measured using the likelihood ratio test (LRT), which can be used especially to compare the performance of nested models and alternatively the information-theoretic metric, i.e. Akaike Information Criterion (AIC). It also required the estimation of adjusted standard error values clustered at the country level.

For both model specifications, statistically significant covariates belonged to the category describing the institutional strength of the state, including the quality of regulation. An increase in the country's position positively influenced the subject's broad ESG position. In the case of ESG risk, the bank's position is also significantly affected by factors related to the level of education, R&D spending, manufacturing, and economic creativity.

In order to better illustrate the relationship between the dependent variable and explanatory variables in a multinomial ordered logit model, it is possible to obtain predicted probabilities that are clearer and easier to understand than odds quotients. For this purpose, a univariate approach is used, in which the value of each independent variable is estimated for each level of the dependent variable so as to calculate the probability of being in each category. In the case of continuous variables, it is possible to set limits for which there is a change in the direction of the increase in the probability of a particular state or level of the dependent variable. In the case of dichotomous binary variables, straight lines run between the different states, the slope of which indicates the direction and strength of the impact.

In the case of Sustainalytics' risk scoring, univariate analysis indicates, in the case of binary variables, a strong and theoretically consistent effect on the probability of the dependent variable being in one of five value categories in the case

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of spatial characteristics – the bank's location within the European Union (Figure 3). This feature strengthens the probability of being in the lowest-risk category while lowering the bank's chances of belonging to the highest-risk category. The relationship is less clear when the bank belongs to one of the categories of entities classified as systemically important institutions. Also consistent with the theoretical assumption is the direction of the relationship observed for the variable determining the level of top-tier capitalisation. High capitalisation has a positive effect on the probability of moving to the lowest risk class while at the same time, although with a smaller amplitude, contributing to lowering the chance of entering the highest risk level. An increase in revenue lowers *ceteris paribus* in terms of the model of the risk of the highest level of risk and contributes to an increase in the probability of moving to the lowest risk category, which seems to harmonise with the bank's ability to engage more, including financially, in overcoming ESG risk. It also points to the danger of increased costs as a result of implementing ESG tools, negatively impacting corporate performance and undermining competitive advantages. On a univariate basis, the relationship with ESG risk does not seem to show a measure of overall bank risk, expressed by the Z-score, which contradicts the findings of Izcan and Bektas (2022), who, using a sample of 31 European banks, proved that ESG has a negative relationship with the idiosyncratic risk of banks for medium- to high-risk levels. It can be assumed that the lack of the observed relationship was determined by the characteristics of the two characteristics studied, which are artificial, aggregate variables where determining the actual relationship is not easy due to the potential presence of a number of other unobserved, latent relationships.

In the case of Moody's ESG scoring, as a result of the univariate analysis, strong and theoretically intuitive correlations for the binary variables are evident in the case of spatial location within the European Union and the USA (Figure 4). This fact reinforces the probability that the bank's performance in the ESG area will be at the highest advanced level. In the case of continuous variables, an increase in capitalisation in TCR terms positively affected the probability of moving to the highest ESG performance category, as did the value of the bank's revenues. On the other hand, excessive leverage negatively affected the bank's chances of moving into the high ESG performance category. No significant and unambiguous relationship was noted for the aggregate variable Z-score.

The results obtained for ESG scoring determined by Sustainalytics and Moody's differ. The relatively low correlation between the ESG scores of the different providers (contrary to credit ratings) is confirmed. This is due to methodological differences (different weights for individual components, different sets of variables, reliance on publicly available data or based on unpublished data, different rating scales, etc.) and different assessment objectives (level of ESG risk or quality of ESG risk management).

The results obtained in the course of this analysis confirm the conclusions of previous studies of the relationship between a bank's ESG level and its economic

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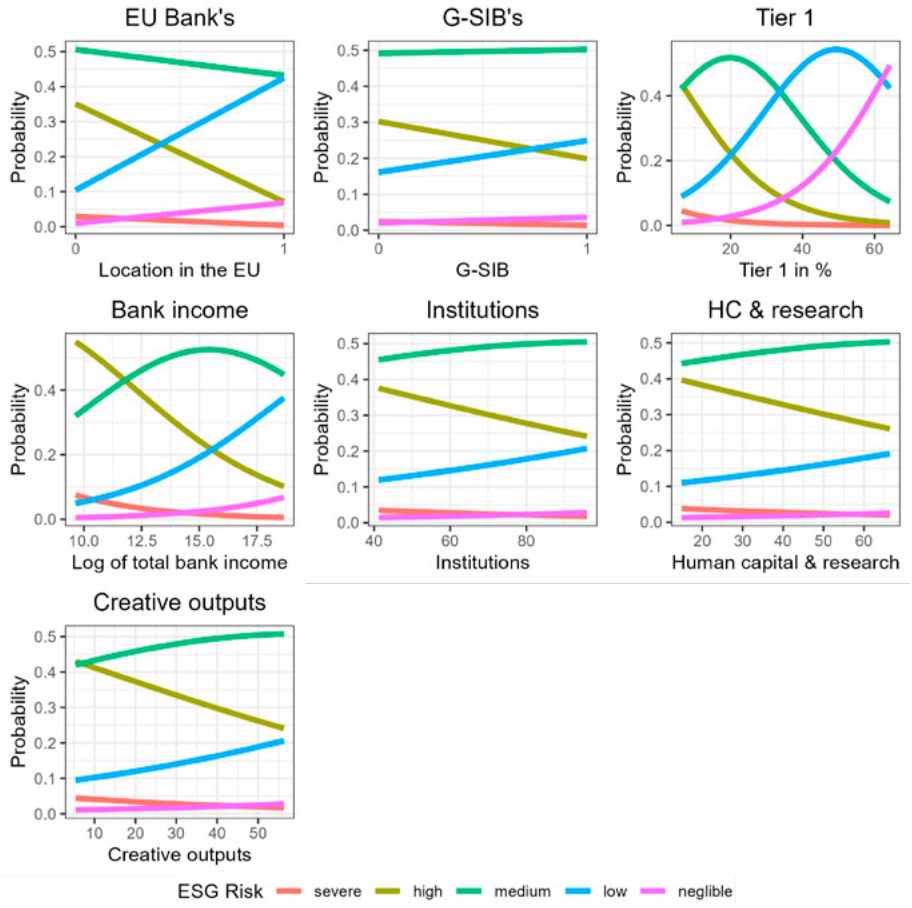

Figure 3. ESG scoring by Sustainalytics as dependent variable (5 levels) – univariate analysis

and financial characteristics, as well as the performance of the bank's stocks, as indicated by Trinh et al. (2023) who prove that investors appear to become more tolerant and more lenient towards banks with stronger CSR post ante economic recession. While a number of sources indicate that these factors are linked by a positive relationship, others indicate the absence of such a relationship. This result and its interpretation depend largely on spatial factors, i.e., the countries in which the surveys were conducted. It is pointed out that the concept of ESG is a very complicated and complex phenomenon, for which it is extremely complicated to determine the actual causal relationship. It is also possible to point out the heterogeneity of results for both types of ESG scoring and the predominance of statistically significant factors directly and indirectly related to bank risk in the

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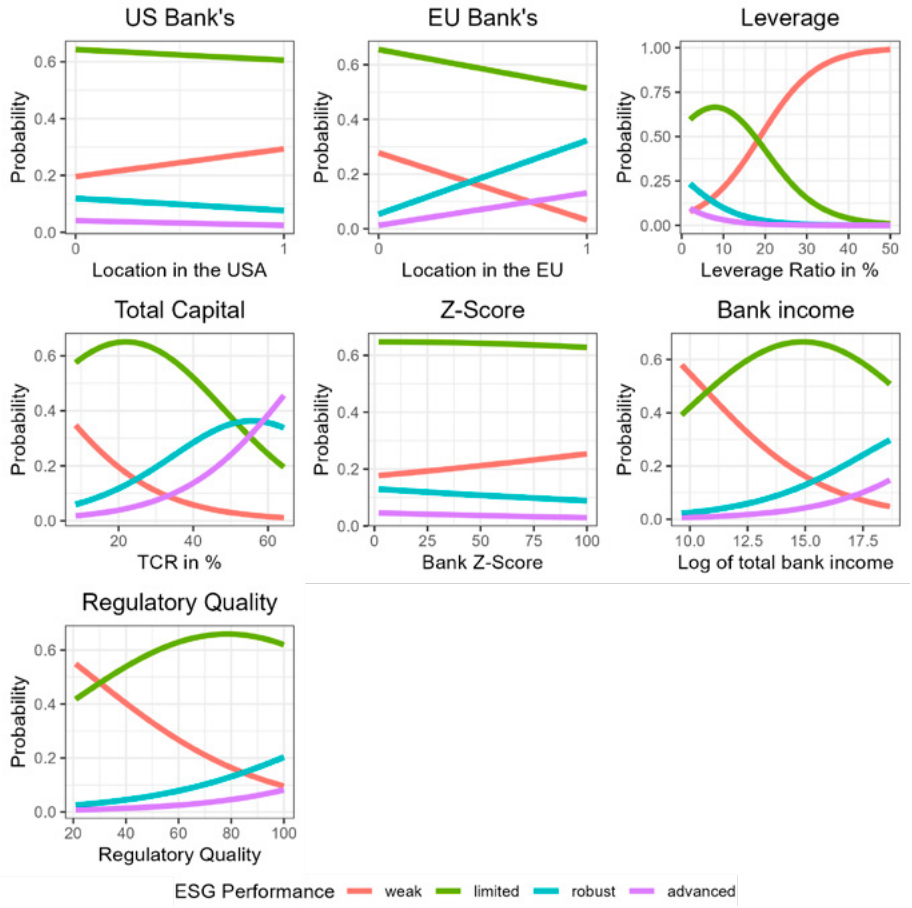

Figure 4. ESG scoring by Moody's as dependent variable (4 levels) – univariate analysis

case of Sustainalytics scoring and, at the same time, a significant share of statistically significant factors measuring performance in the case of scoring linked to ESG measurement of bank performance. Finally, it should be mentioned that the concept of ESG itself is not a single measure but rather a comprehensive environment.

The obtained results allow for indirect confirming H1 and recognising that the scale of a bank's operations positively influences ESG assessment, which is also evident from the studies by El Khoury et al. (2023), Wu (2006), Chih et al. (2010), Crespi and Migliavacca (2020) and Drempetic et al. (2020). At the same time, a relatively higher bank income level is associated with better ESG scoring, which indirectly confirms what was found by Alam et al. (2022) and Crespi and

Migliavacca (2020). Thus, H2 is accepted. In addition to the previously indicated arguments rationalising the demonstrated correlation, it should be pointed out that the profitability of banks during the period under study in the analysed ones was determined by various factors, including the nature of monetary policy and regulatory policy, which in some cases resulted in the need to deleverage lending. As was the case in Alam et al. (2022), this study found that capitalisation (capital adequacy) is positive, while leverage is negative, correlated with ESG scorings (both in terms of risk and performance), which is a premise for adopting H3. According to a study of both types of scoring, the bank's location in a socio-economically developed country positively influences ESG scorings, with Moody's concluding this is true not only for the EU but also for the US. The above conclusion, which is in line with the findings of Ioannou and Serafeim (2012), allows for confirming H4. At the same time, there are no studies in the literature devoted to the impact of a bank's status (as a systemically important institution or not) on its ESG assessment. Therefore, the conclusion about such a relationship, resulting from this study, turns out to be all the more important.

Conclusions

The results of this study support the theoretical assumptions that a spectrum of determinants, namely financial, spatial, and systemic significance variables, affect ESG scoring. This study is the first attempt to identify the common determinants of ESG scoring (across different assessment methodologies). In addition to the proposed research method, its originality is also determined by the attempted demonstration of the relationship between spatial variables and systemically important bank membership and ESG scoring. A very broad research sample of banks, coming from 63 countries located on different continents, was also considered. This study fills a research gap by identifying common determinants of ESG scoring (across different assessment methodologies).

The results of the study have various important implications. First, the study's findings should be useful primarily to managers in the banking sector in raising their awareness of the importance of ESG practices in achieving top performance and the importance of combining them in all parts of the business. The study provides noteworthy practical results, enabling decision-makers to adopt a combination of ESG practices to improve a bank's continuous improvement and value-creation processes. Second, the study also provides clues that can be useful to individual and institutional stock market investors, as the findings testify to a certain pattern of bank stock behaviour. Thus, they can be the basis for practical use of the results obtained in investment asset portfolio management strategies. Third, the results of the study also appear to be relevant to supervisory institutions responsible for the financial stability of the banking sector. This is especially true for macroprudential measures in the context of systemic risk, moni-

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toring the level of supply of business loans and related credit risk, and supervising the capital adequacy of banks. The results achieved prove that interaction between financial and ESG risks could also be used in the discussion on solutions promoting green finance and ideas considering the inclusion of climate risk into Pillar I capital requirements (Neisen et al., 2022). However, there is a need to standardise the methodologies of granting ESG scores so that the correlation between results provided by ESG agencies is as high as it is the case for credit ratings. This requires standardising the scope of the ESG area survey (risk, performance or a combination of these approaches), ensuring comparability of scales and weights assigned to ESG components. Only the high correlation of methodologies can be the basis for estimating the impact of ESG on default risk, which in turn is a sine qua non for including ESG assessments in the adjustment of banks' capital adequacy ratios.

The authors are aware of the limitations of this study, which include a sample of banks that are heterogeneous in terms of the nature of their banking activities and, thus, the specificity of their approach to ESG issues. Second, the concept of ESG is a relatively complex category, resulting from the unitary and complex nature of individual banks. Third, the period of the study relates to the specific post-pandemic period and the war in Ukraine, both of which can affect the performance of banks. Fourth, the analysis concerns a single period, and it would be useful to contrast the results obtained with panel data.

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The contribution of the authors

Conceptualisation, M.G., Z.K., P.N. and A.d.T.; literature review, M.G., Z.K., P.N. and A.d.T.; methodology, M.G., Z.K., P.N. and A.d.T.; formal analysis, M.G., Z.K., P.N. and A.d.T.; writing, M.G., Z.K., P.N. and A.d.T.; conclusions and discussion, M.G., Z.K., P.N. and A.d.T.

The authors have read and agreed to the published version of the manuscript.

References

Abdul, R. R., & Alsayegh, M. F. (2021). Determinants of Corporate Environment, Social and Governance (ESG) Reporting among Asian Firms. Journal of Risk and Financial Management, 14(4), 167. https://doi.org/10.3390/jrfm14040167

Alam, Md. M., Tahir, Y. M., Saif-Alyousfi, A. Y. H., Ali, W. B., Muda, R., & Nordin, S. (2022). Financial factors influencing environmental, social and governance ratings of publicly listed companies in Bursa Malaysia. Cogent Business & Management, 9(1), 2118207. http://dx.doi.org/10.1080/23311975.2022.2118207

Bernardelli, M., Korzeb, Z., & Niedziółka, P. (2022). Does Fossil Fuel Financing Affect Banks' ESG Ratings? Energies, 15(4), 1495. https://doi.org/10.3390/en15041495

Bernhardsen, F., & Ligard, M. (2022). *The Determinants of ESG Ratings in Family Firms: Evidence from the Nordic Market* [Master thesis]. Norwegian Business School. https://biopen.bi.no/bi-xmlui/handle/11250/3037333

Caiazza, S., Galloppo, G., & La Rosa, G. (2023). The mitigation role of corporate sustainability: Evidence from the CDS spread. Finance Research Letters, 52, 103561. https://doi.org/10.1016/j.frl.2022.103561

Chih, H. L., Chih, H. H., & Chen, T. H. (2010). On the determinants of corporate social responsibility: International evidence on the financial industry. Journal of Business Ethics, 93, 115-135. https://doi.org/10.1007/s10551-009-0186-x

Ciciretti, R., Kobeissi, N., & Zhu, Y. (2014). Corporate social responsibility and financial performance: An analysis of bank community responsibility. International Journal of Banking, Accounting and Finance, 5(4), 342-373. https://doi.org/10.1504/IJBAAF.2014.067026

Crespi, F., & Migliavacca, M. (2020). The Determinants of ESG Rating in the Financial Industry: The Same Old Story or a Different Tale? Sustainability, 12(16), 6398. https://doi.org/10.3390/su12166398

Deegan, C. M. (2019). Legitimacy theory. Accounting, Auditing and Accountability Journal, 32(8), 2307-2329. https://doi.org/10.1108/AAAJ-08-2018-3638

Drempetic, S., Klein, C., & Zwergel, B. (2020). The Influence of Firm Size on the ESG Score: Corporate Sustainability Ratings Under Review. Journal of Business Ethics, 167(2), 333-360. https://doi.org/10.1007/s10551-019-04164-1

Ehlers, T., Elsenhuber, U., Jegarasasingam, A., & Jondeau, E. (2022). *Deconstructing ESG Scores: How to Invest with Your Own Criteria.* https://www.bis.org/publ/work1008.pdf

El Khoury, R., Nasrallah, N., & Alareeni, B. (2023). The determinants of ESG in the banking sector of MENA region: a trend or necessity? Competitiveness Review, 33(1), 7-29. https://doi.org/10.1108/CR-09-2021-0118

Freeman, R. E. (1984). *Strategic Management: a stakeholder approach*. Boston: Pitman.

Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: aggregated evidence from more than 2000 empirical studies. Journal of Sustainable Finance & Investment, 5(4), 210-233. https://doi.org/10.1080/20430795.2015.1118917

Fullerton, A. S. (2009). A Conceptual Framework for Ordered Logistic Regression Models. Sociological Methods & Research, 38(2), 306-347. https://doi.org/10.1177/0049124109346162

Gholami, A., Sands, J., & Rahman, H. U. (2022). Environmental, social and governance disclosure and value generation: Is the financial industry different? Sustainability, 14(5), 2647. https://doi.org/10.3390/su14052647

Hickel, J. (2020). The sustainable development index: Measuring the ecological efficiency of human development in the Anthropocene. Ecological Economics, 167, 106331. https://doi.org/10.1016/j.ecolecon.2019.05.011

Hossain, M., & Reaz, M. (2007). The determinants and characteristics of voluntary disclosure by Indian banking companies. Corporate Social Responsibility and Environmental Management, 14(5), 274-288. https://doi.org/10.1002/csr.154

Ioannou, I., & Serafeim, G. (2012). What drives corporate social performance? The role of nation-level institutions. Journal of International Business Studies, 43(9), 834-864. https://doi.org/10.1057/jibs.2012.26

Izcan, D., & Bektas, E. (2022). The Relationship between ESG Scores and Firm-Specific Risk of Eurozone Banks. Sustainability, 14(14), 8619. https://doi.org/10.3390/su14148619

Jastrzębowski, A. (2014). The theory of legitimacy and the functions of accounting. Studia Oeconomica Posnaniensia, 2(4), 50-60. (in Polish).

Khan, M., Serafeim, G., & Yoon, A. (2016). Corporate sustainability: First evidence on materiality. Accounting Review, 91(6), 1697-1724. https://doi.org/10.2308/accr-51383

Korzeb, Z., Niedziółka, P., & Nistor, S. (2023). Sovereign creditworthiness and bank foreign ownership. An empirical investigation of the European banking sector. Journal of International Financial Markets, Institutions and Money, 89, 101857. https://doi.org/10.1016/j.intfin.2023.101857

Kumar, P., & Firoz, M. (2022). Determinants of environmental, social and governance (ESG) disclosures of top 100 Standard and Poor's Bombay Stock Exchange firms listed in India. Sri Lanka Journal of Social Sciences, 45(1), 77-91. https://doi.org/10.4038/sljss.v45i1.8074

Lööf, H., & Andreas, S. (2019). The Impact of ESG on Stocks' Downside Risk and Risk Adjusted Return. Working Paper Series in Economics and Institutions of Innovation, 477. https://ideas.repec.org/p/hhs/cesisp/0477.html

Margolis, J. D., Elfenbein, H. A., & Walsh, J. P. (2007). Does it pay to be good? A Meta-analysis and redirection of research on the relationship between corporate social and financial performance. Ann Arbor, 1001, 1-68. http://dx.doi.org/10.2139/ssrn.1866371

Mathis, S. (2022). *What is environmental, social and governance (ESG)?* https://www.techtarget.com/whatis/definition/environmental-social-and-governance-ESG

Menicucci, E., & Paolucci, G. (2023). ESG dimensions and bank performance: an empirical investigation in Italy. Corporate Governance: The International Journal of Business in Society, 23(3), 563-586.

Moody's. (2023). *Adaptable ESG Risk Solutions.* https://www.moodys.com/web/en/us/capabilities/esg-risk.html

Moura-Leite, R. C., Padgett, R. C., & Galan, J. I. (2012). Is social responsibility driven by industry or firm-specific factors? Management Decision, 50(7), 1200-1221. https://doi.org/10.1108/00251741211246969

Neisen, M., Bruhn, B., & Lienland, D. (2022). ESG rating as input for a sustainability capital buffer. Journal of Risk Management in Financial Institutions, 15(1), 72-84.

Nurhayati, R., Taylor, G., Rusmin, R., Tower, G., & Chatterjee, B. (2016). Factors determining social and environmental reporting by Indian textile and apparel firms: a test of legitimacy theory. Social Responsibility Journal, 12(1), 167-189. https://doi.org/10.1108/SRJ-06-2013-0074

Short, J. C., McKenny, A. F., Ketchen, D. J., Snow, C. C., & Hult, G. T. M. (2016). An empirical examination of firm, industry, and temporal effects on corporate social performance. Business and Society, 55(8), 1122-1156. https://doi.org/10.1177/0007650315574848

Sustainalytics. (2021). *ESG Risk Ratings – Methodology Abstract. Version 2.1.* https://connect.sustainalytics.com/esg-risk-ratings-methodology

Tang, D. Y., Yan, J., & Yao, Y. (2021). The Determinants of ESG Ratings: Rater Ownership Matters. *Proceedings of Paris December 2021 Finance Meeting EUROFIDAI – ESSEC*, France, Paris, 1-52. http://dx.doi.org/10.2139/ssrn.3889395

Tarmuji, I., Maelah, R., & Tarmuji, N. (2016). The Impact of Environmental, Social and Governance Practices (ESG) on Economic Performance: Evidence from ESG Score. International Journal of Trade, Economics and Finance, 7, 67-74. https://doi.org/10.18178/ijtef.2016.7.3.501

Trinh, V. Q., Cao, N. D., Li, T., & Elnahass, M. (2023). Social capital, trust, and bank tail risk: The value of ESG rating and the effects of crisis shocks. Journal of International Financial Markets, Institutions and Money, 83, 101740. https://doi.org/10.1016/j.intfin.2023.101740

Wu, M. L. (2006). Corporate social performance, corporate financial performance, and firm size: A meta-analysis. Journal of American Academy of Business, 8(1), 163-171.

Wu, M.-W., & Shen, C.-H. (2013). Corporate social responsibility in the banking industry: Motives and financial performance. Journal of Banking & Finance, 37(9), 3529-3547. https://doi.org/10.1016/j.jbankfin.2013.04.023

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Antonio de la TORRE

FINANSOWE, PRZESTRZENNE I SYSTEMOWE DETERMINANTY SCORINGÓW ESG NADANYCH BANKOM KOMERCYJNYM

STRESZCZENIE: Celem badania jest weryfikacja, które zmienne finansowe, przestrzenne oraz związane ze znaczeniem systemowym, oddziałują na scoring ESG. W oparciu o dane 628 banków z 63 krajów zbudowano wielomianowy uporządkowany model logitowy ze zmiennymi objaśnianymi w postaci scoringów ESG Sustainalytics oraz Moody's. Wyniki wskazują na to, że przynależność do Unii Europejskiej, do grupy banków o znaczeniu systemowym, kapitalizacja oraz przychody pozytywnie oddziałują na ocenę ESG. Z kolei wzrost dźwigni finansowej, wskaźnika NPL oraz rentowności banku wiążą się z pogorszeniem scoringu. Wyniki różnią się w zakresie aspektu przestrzennego (w przypadku Sustainalytics dodatkowo lokalizacja w USA sprzyja ocenie ESG) oraz spektrum znaczenia systemowego (w przypadku Moody's jest to wymiar zarówno globalny, jak i lokalny). Przedmiotowe badanie jest pierwszą próbą identyfikacji wspólnych (dla różnych metodyk oceny) determinant scoringu ESG. O jego oryginalności przesądza także wykazanie zależności między zmiennymi przestrzennymi oraz przynależnością do grupy instytucji o znaczeniu systemowym a scoringiem ESG.

SŁOWA KLUCZOWE: bank komercyjny, scoring ESG, NPL, UE, SIB

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