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EMPIRICAL RESEARCH OF ESG METRICS IN THE US BANKING SYSTEM: EVIDENCE FROM SMALL AND MEDIUM-SIZED BANKS

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ЕМПІРИЧНІ ДОСЛІДЖЕННЯ ESG МЕТРИК У БАНКІВСЬКІЙ СИСТЕМІ США: РЕЗУЛЬТАТИ ДЛЯ МАЛИХ ТА СЕРЕДНІХ БАНКІВ

This article presents the results of an empirical study of ESG assessments dynamics in the segments of small and medium-sized US banks. The object of the study was a sample of 132 banks whose shares were listed on the stock exchanges. Each bank from the sample had a market capitalization ranging from $2B to $10B (medium-sized banks) and $100M to $2B (small-sized banks) in 2023. ESG metrics of LSEG Data & Analytics (Refinitiv) from 2019 to 2023 were used in the framework of our research. The study was based on 6 ESG pillar scorings and sub-scorings corresponding to 10 categories.

The dynamics of indicated ESG scores were studied, and their regularities were determined. The problem of zero assessment for the five types of ESG scores was identified for some banks. Regularities associated with the relationship between ESG scoring values and the level of a bank`s market capitalization were identified as well: a higher bank capitalization determines higher ESG scoring values.

The dynamics of the average and marginal values of ESG indicators for individual years were assessed. It allowed us to identify trends in the characteristics of sustainable development, such as significant variability of ESG estimates depending on the size of the bank and a tendency for their increase over the studied time period. A correlation analysis of ESG scoring estimates was carried out, which allowed us to identify the relationships between the components of environmental, social and management categories, as well as to specify their interdependencies with the level of market capitalization of banks.

Cluster analysis was applied to the studied banking segment, based on market capitalization and ESG pillar scores. The division into four clusters made it possible to reflect the patterns of banks' characteristics in clusters.

The obtained results, which are presented in the article, permit the formation of a holistic view of ESG dynamics in the segment of small and medium-sized US banks, to expand the understanding of the growing importance of ESG factors in the banking sector, and to form the basis for further quantitative models in the field of sustainable finance.

У статті представлені результати емпіричного дослідження динаміки оцінок ESG в сегментах малих і середніх банків США. Об'єктом дослідження була вибірка зі 132 банків, акції яких були представлені на фондових біржах. У 2023 році кожен з цих банків мав ринкову капіталізацію від 2 до 10 мільярдів доларів (банки середнього розміру) і від 100 мільйонів до 2 мільярдів доларів (банки малого розміру). В рамках нашого дослідження використовувалися показники ESG LSEG Data & Analytics (Refinitiv) з 2019 по 2023 рік. Дослідження базувалося на 6 основних ESG скорингах та субскорингах, які відповідають 10 категоріям.

Досліджено динаміку всіх зазначених ESG скорингів та визначено їх закономірності. Ідентифіковано проблему наявності у низки банків нульових оцінок за п'ятьма видами ESG скорингових значень. Виявлено закономірності, пов'язані із взаємозв'язком між ESG оцінками та рівнем ринкової капіталізації банків: більша капіталізація банку обумовлює більші значення ESG оцінок.

Проведено оцінку динаміки середніх та граничних значень ESG скорингів за окремими роками. Це дозволило описати тенденції характеристик сталого розвитку, серед яких виявлено значну варіативність ESG скорингу залежно від розміру банків та тенденцію її збільшення за досліджуваний часовий період. Здійснено кореляційний аналіз оцінок ESG скорингів, який дозволив виявити взаємозв'язки між скорингами екологічних, соціальних та управлінських категорій, а також специфікувати їх взаємозалежності з рівнем ринкової капіталізації банків.

До досліджуваного банківського сегменту був застосований кластерний аналіз, на основі ринкової капіталізації та фундаментальних ESG компонентів. Розбиття на чотири кластера дало можливість відобразити закономірності банківських характеристик в кластерах.

Отримані результати та проведений аналіз, подані у статті, дозволяють сформувати цілісний погляд на ESG динаміку в сегменті малих

та середніх банків США, розширити розуміння зростаючої значимості ESG факторів в банківській сфері та сформувати підґрунтя для подальших кількісних моделей у сфері сталого фінансування.

Keywords: *ESG, ESG scoring, banking, sustainability, financial institutions, LSEG, USA banks, correlation analysis, cluster analysis.*

Ключові слова: *ESG, ESG рейтинг, банківська справа, сталий розвиток, фінансові установи, LSEG, банки США, кореляційний аналіз, кластерний аналіз.*

Statement of the problem in a general form and its connection with important scientific or practical tasks. Research into the dynamics of sustainable development, their modeling, and practical implementation is a relevant direction in the modern world, including the financial sector. Regulators in many countries of the world are actively developing strategies to support sustainable development, while at the same time looking for effective tools for their implementation in practice. Companies in the real sector of the economy, adapting to new conditions, are implementing new practices, and financial markets are paying increasing attention to new metrics. At the same time, banks, as one of the main sources of financing, are of great importance for decisions aimed at building business solutions in the context of climate change. No less important is the achievement of social justice and managerial efficiency. In this context, the ESG approach, which is based on taking into account the environmental, social, and governance characteristics of business entities, is of particular importance.

ESG factors are increasingly integrated into the practice of analyzing the efficiency of not only manufacturing industries, but also financial institutions themselves, in particular banks. The use of such assessments allows you to identify potential risks, form a more sustainable investment policy, and optimize corporate development strategies based not only on financial but also non-financial metrics. In addition, ESG ratings can have a direct impact on the cost of capital of a

company, its attractiveness to investors, and overall competitiveness. Progress in this direction is also an important signal of the adaptability and flexibility of business models to changing paradigms and regulations, if social significance is not a sufficient argument.

Despite the growing role of ESG in the global financial system, the scientific community still has a limited understanding of how banks' ESG indicators are interconnected with the market capitalization of banking institutions. Both the causal relationships between ESG rating characteristics and changes in the market value of banks, as well as the specifics of the dynamics of individual ESG components (E, S, G) in the short and medium term, remain insufficiently studied.

It is also difficult to interpret metrics directly from financial institutions for compliance with green practices, since they do not produce goods. Traditionally, the most significant ESG factor for corporations is environmental, and the direct impact of banks on the environment is disproportionate to industrial manufacturers. A significant factor for banks is the loan portfolio and their approaches (management) to financing corporate borrowers and selectivity. Reporting on the structure of the portfolio, credit risk assessment models and restrictions is often absent or extremely restrained, which creates significant information asymmetry in the market.

The relevance of the issue is due to the need to increase the transparency and efficiency of the banking sector in the context of the transformation of financial markets, as well as the formation of a new demand from society, investors and regulators for socially responsible and environmentally oriented financial activities. The practical significance of the study is also enhanced by the fact that, in the context of the growing influence of ESG factors on banks' investment decisions, the empirical study of these processes becomes critically important.

Our research was focused on small and medium-sized US banks (SMBs). The reasons for this are the crucial role such banks play in the economy, especially in supporting small and medium-sized enterprises (SMEs). Their understanding of credit markets is often strong, and they reflect the needs of customers (SME first of

all), providing adapted lending tailored to these needs. Therefore, understanding the development of the ESG concept in such banks is an important component of their holistic development in the near future.

Based on the above, we have defined the task of conducting a comprehensive analysis of the holistic dynamics of ESG scores in the activities of small and medium-sized US banks. In the research, we used data from the LSEG Data & Analytics (Refinitiv) rating platform for banking institutions for the period 2019-2023. Thus, the study of such a task has not only applied value for the banking sector, but also opens up prospects for the formation of theoretical foundations of ESG modeling and sustainable development policies in the field of finance.

Analysis of recent research and publications. To date, a significant amount of academic research is devoted to the formation and functioning of ESG-oriented banking systems, including the development of green lending instruments, modeling ESG risks and their integration into the financial decision-making process. This trend is largely driven by regulatory pressure and growing stakeholder demand for transparency and accountability in financial activities.

The paper [1] outlines the theoretical framework for the formation of green banking institutions. The authors provide a historical overview and classify the stages of development of green finance, noting the key regulatory and market drivers influencing their evolution. Their study emphasizes the importance of a unified theoretical approach to the implementation of green finance practices.

Specialized financing of green projects and businesses is a driver of green transformation. The article [2] focuses on the relationship between sustainable business strategies and the demand for green loans. The study supports the thesis that the availability of targeted green financial instruments can significantly stimulate the environmental transformation of the private sector.

As already mentioned, the main component of ESG factors for banks is their loan portfolio. In study [3], Concetta Carnevale and Danilo Drago found that negative ESG indicators are penalized by higher loan spreads. In contrast, positive

results of debtors in this direction have little impact on added value. The analysis of this direction is also complicated by the fact that it is possible for large public companies with a rating, which are a minority in the portfolio.

Siddharth Patel and Rajesh Desai also found that the size of a bank's assets positively affects disclosure of green lending [4]. However, reporting is less active as the share of non-performing assets and market value increases. This suggests that larger banks with lower market valuations and higher portfolio quality are more likely to disclose their green lending activities.

It is worth noting separately that the relationship between the market value of banking institutions and ESG scoring is a little studied. The paper [5] is devoted to assessing the impact of ESG indices on the market value of US commercial banks in the period 2016-2020. Using panel regression models taking into account both linear and quadratic dependencies, the authors established the presence of nonlinear relationships between the overall ESG scores and individual sub-indices (environmental, social and governance) and the market capitalization of banks. In particular, an inverted U-shaped relationship was found between the overall ESG index and the social sub-index and the market value of the banks: a moderate increase in these indicators correlates with an increase in market capitalization, but further growth demonstrates the opposite effect. For the environmental sub-index, on the contrary, a U-shaped relationship is observed, indicating an initial decrease, and subsequently a positive impact on the value of the bank. The management component, in turn, did not demonstrate a statistically significant impact.

A generalized analysis of the impact of ESG factors on the market capitalization of companies was also carried out in [6], which is based on a sample of over 5,000 public companies from different countries and sectors of the economy. The authors apply the method of multiple linear regression, taking into account key financial ratios, and demonstrate a stable positive correlation between the overall ESG scores and the market value of companies. The highest impact was found in countries with more developed regulatory frameworks for sustainable development, in particular in the UK and Japan. A separate analysis of the

components of ESG factors also confirms that the environmental and social components have a significant positive impact on capitalization, especially in the EU. At the same time, the management component shows mixed results: for some regions (for example, Japan) it was a strong predictor of market value, while for others it had no significant impact. The results of the study confirm the hypothesis of the growing importance of ESG information for investors, but also emphasize the need to take into account the national context and sectoral characteristics. The authors emphasize that to identify the full dynamics of ESG factors in the value of companies, it is advisable to use multi-year panel data, since ESG effects appear with a time lag.

A systematic review of the impact of ESG indicators on market capitalization was also carried out by Adamopoulou and Gkizori [7]. They analyzed ten quantitative studies for the period 2020-2025 within the framework of the PRISMA methodology. The authors concluded that, in general, ESG indicators are positively correlated with the capitalization of companies, especially in developed countries with strict regulatory requirements (EU, Japan, USA) and in regulated sectors (energy, finance). At the same time, ESG factors act as a buffer in crisis situations, in particular during the COVID-19 pandemic, reducing stock volatility and contributing to better liquidity. The article also emphasizes that the impact of ESG remains context-dependent due to low consistency between ratings of different agencies and the phenomenon of greenwashing. Despite the overall positive trend, the peer-reviewed papers recorded significant variability in results, due to both regional characteristics and differences in assessment methodology. The need to introduce unified ESG reporting standards and improve the transparency of assessments is important to ensure their financial relevance and increase investor confidence.

Formulation of the goals of the article (statement of the task). The purpose of the article is to present the results of the authors' empirical study of the ESG ratings of small and medium-sized US banks listed on primary stock exchanges.

The study involved identifying the dynamics of ESG scores received from LSEG Data & Analytics (Refinitiv) from 2019 to 2023. When formulating the research objective, the approach of a holistic ESG assessment was used using a number of components, in particular, sub-scores of environmental (E), social (S) and governance (G). The objective included identifying patterns of ESG dynamics and statistical relationships between ESG scores and market capitalization of banks.

MAIN RESEARCH EVIDENCE

1. Methodology

Our methodology included data from 5 years 2019-2023. The number of FDIC-insured commercial banks in the United States in 2019 was 4526 and decreased to 4036 in 2023 [8]. At the same time, some of the banks are public companies that are represented on primary stock exchanges. The focus of our attention was on banks that are represented on exchanges, because such banks are better covered by the ESG assessment system according to the LSEG methodology. According to [9] the list of all the bank stocks that are trading on the primary stock exchanges in the United States is 361.

To identify the small and mid-cap segment, we used an approach to segment companies based on their capitalization level [10]. Mid-cap stocks are defined as having a market capitalization between $2 and $10 billion USD. Small-Cap banks are banks with a market capitalization between $300M and $2 billion USD. If the bank has a smaller capitalization (Micro-Cap and Nano-Cap), we included it in Small-Cap. Thus, based on the approach to capitalization and the clarity of ESG assessments, we obtained 132 banks for the study.

The study used panel data of banking institutions for 2019-2023, generated by LSEG Data & Analytics[1], part of the London Stock Exchange Group. This is one of the world's largest providers of different financial markets data (including ESG scores).

[1] https://www.lseg.com/en/data-analytics

The collected data includes both combined ESG scores and detailed sub-scores for individual components of the ESG profile. In particular, we have included the combined ESG score (ESG Combined Score), the aggregate ESG score (ESG Score) and pillar scores: environmental (E-score), social (S-score), governance (G-score). In addition, the database contains specialized sub-scores, such as assessments for resource use, emissions, workforce, human rights, management efficiency, product responsibility, etc. Each indicator can take values from 0 to 100, where 0 is missing data or the worst possible result, and 100 is the highest score.

It should be noted that LSEG scores are based on an analysis of open sources - corporate reporting, news, government databases and specialized publications. The methodology involves a standardized benchmarking system in which companies are assessed using more than 870 metrics [11]. ESG Combined Score is an integral indicator that combines the basic ESG score with an adjustment for ESG controversies, which takes into account incidents related to violations of the principles of sustainable development. This indicator was chosen as the main variable for the analysis, since it most fully reflects both the declarative policy of institutions and the reputational risks associated with ESG activities. It is important that this indicator is adjusted for the controversial assessment of the data provider. This eliminates the distortion of the results associated with the fact that smaller companies have an advantage in assessment over larger ones due to the amount of available information and the media component. This is especially important in research that aims to uncover the connection between ESG and capitalization.

To construct a typology of banks' ESG behavior, the study used cluster analysis methods, the results of which allowed us to identify stable profiles of institutions based on the set of characteristics considered. In the LSEG scoring system, the structure of the aggregated assessment is hierarchical: the overall ESG index is formed on the basis of three main components - Environmental, Social, Governance, each of which, in turn, is divided into industry-specific categories (subcategories). For banking institutions, the generalized (rounded) weights of the

components are determined to reflect the specifics of their activities and the materiality of ESG factors in the financial sector (Table 1).

Table 1. ESG scores weights for the banking sector

Environmental (0,14)	**Social (0,50)**	**Governance (0,36)**
Emissions - 0,02 Ecological innovation - 0,10 Resource use - 0,02	Human rights - 0,10 Product responsibility - 0,09 Workforce - 0,19 Community - 0,12	Management - 0,24 Shareholders - 0,07 CSR strategy - 0,05

Source: based on [11, p. 27 (24)].

2. Dynamics of ESG scoring assessment

Analysis of the weighted average ESG scores of US banks with a market capitalization of up to $10 billion for the period 2019-2023 (Table 2) indicates a gradual but stable integration of sustainable development principles into the corporate policy of small and middle-sized banks. The integral ESG Combined Score demonstrates positive dynamics, confirming the hypothesis of growing interest of banks in the topic of sustainable financing. However, it should be noted that the absolute values remain relatively low within the general ESG rating range, which is due both to the limited resources of small banks for developing ESG infrastructure, and to the lower level of external pressure from investors, regulators and society compared to large banking groups and EU countries, where the average indicators often exceed 50 assessment points.

Table 2. Weighted average ESG scores by market capitalization

	2019	**2020**	**2021**	**2022**	**2023**
ESG comb. score	35.5	37.4	39.0	39.2	39.8
E score	27.0	30.0	30.5	31.5	31.8
S score	35.6	37.6	39.3	39.7	39.6
G score	47.1	48.1	49.8	49.2	50.8
St. dev. ESG c. s. (r.h.s)	***10.6***	***11.7***	***11.9***	***12.7***	***12.6***

Source: calculated by the authors.

Among the components of the integrated assessment, the block responsible for corporate governance (G pillar score) occupies the highest positions. This is quite expected, since even banks with smaller capitalization have basic corporate responsibility policies, supervisory structures and control mechanisms that are

mandatory within the US regulatory environment. In contrast, indicators for environmental (E pillar score) and social (S pillar score) aspects are growing more slowly, although they show gradual improvement. In the social dimension, small banks often have strong ties to local communities and a focus on customer loyalty, which partly contributes to better scores. At the same time, the environmental component remains less developed, in particular because such institutions are characterized by limited material environmental activity, and reporting in this area is mostly not mandatory.

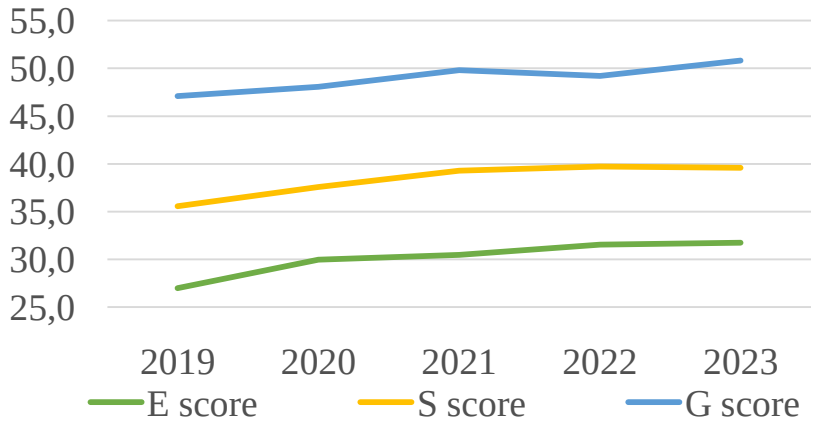

Figure 1. Weighted average ESG pillar scores

Source: calculated by the authors.

There is a gradual increase in the standard deviation of the integrated ESG Combined Score, which indicates an increasing unevenness in the implementation of ESG approaches even among banks in the same country and capitalization segment. This can be the result of differences in internal strategies, access to analytical resources, or management interest in building sustainable practices. Taken together, the results indicate that the US small banking sector demonstrates a cautious but noticeable trend towards ESG adaptation, which, however, is not yet systemic or strategically determined for most of the institutions studied.

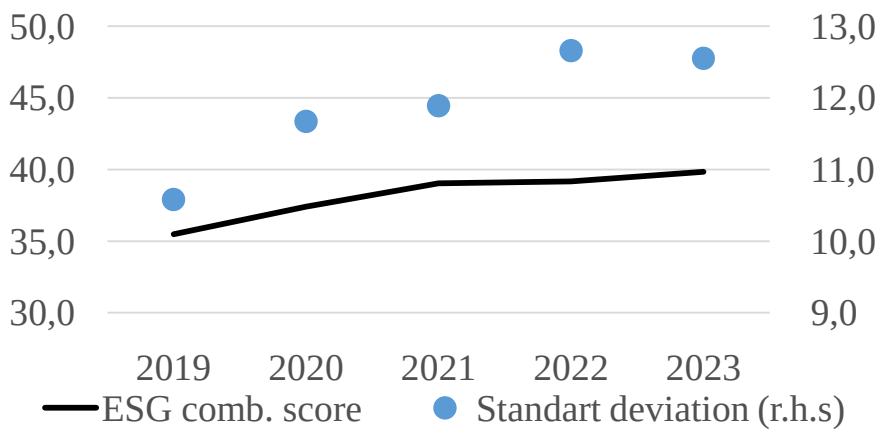

Figure 2. Weighted average ESG score and its standard deviation

Source: calculated by the authors.

3. Dynamics of some ESG sub-scores

The situation with individual ESG components in small and medium-sized US banks demonstrates the presence of systemic gaps and structural distortions in the field of non-financial reporting.

The environmental pillar score (E score) remains consistently low throughout the period, fluctuating around 24 points, indicating limited integration of environmental aspects into the activities of small US banks. This level of assessment reflects the lack of a systematic approach to environmental risk management, low priority of climate factors in strategic planning, as well as weak regulatory stimulation at the national level. Unlike more developed jurisdictions, where reporting on ESG indicators has become mandatory, for US banks with capitalization of up to $10 billion, the requirements remain fragmented, and participation in relevant initiatives is largely voluntary.

The state of the sub-scores of this category - Resource Use, Emissions and Ecological Innovation - is particularly indicative. They demonstrate not only low average values, but also a critically low level of completion: for most institutions, these indicators are either absent or equal to zero, which indicates that a significant part of banks does not generate or disclose relevant data at all. Although the share of banks with non-zero scores gradually increased from over 10-20% in 2019 to

approximately 50% in 2023, this is not enough to speak of a systemic change in practices.

Overall, the environmental ESG component of small US banks demonstrates both limited transparency and insufficient progress in qualitative indicators. This creates significant reputational risks in the context of global financial convergence, and also questions the ability of these institutions to adapt to the demands of sustainable development and climate transformation.

The social pillar score (S score) demonstrates slightly higher values than the environmental one and some positive dynamics: from 28.9 points in 2019 to 31.4 in 2023. This indicates a gradual, albeit moderate, increase in the attention of small US banks to the social aspects of their activities - such as human resources policy, interaction with communities, protection of customer rights and transparency in social responsibility. At the same time, the pace of this growth remains limited, and the overall level of assessments is average, which indicates the fragmentation of relevant practices and the insufficient impact of regulatory and market incentives in this area.

The most vulnerable subscore remains the Human Rights Score, which assesses the bank’s policy on human rights, non-discrimination, and ethical treatment of clients and employees. Throughout the period, this subscore is accompanied by an extremely high level of omissions: over 96% of institutions did not have relevant data in 2019, and even in 2023 this figure does not fall below 85%. This lack of data indicates the lack of unified reporting standards on human rights and the fact that most small banks either do not carry out appropriate monitoring or do not publish the results.

Other components of the social block demonstrate greater stability and complete coverage. For example, assessments in the areas of Workforce, Community and Product Responsibility are more representative and less sensitive to missing data, suggesting that these are the areas of social policy that are most understandable and accessible for implementation among small financial institutions.

The governance pillar score (G score) remains the most developed component of the ESG profile of small US banks, demonstrating steady growth from 43.5 points in 2019 to 48.2 in 2023. Compared to other components, the G score has not only a higher average level, but also lower volatility, indicating more established and understandable practices in the field of governance. Such dynamics are expected, given the general development of banking regulation in the US in terms of governance standards, in particular, regarding accountability, shareholder control and the role of management.

The sub-indicators of this block, in particular Management Score, Shareholders Score and Product Responsibility, cover the entire sample without gaps, which indicates that banks have clear and publicly declared policies in the field of management. The most dynamic indicator among them is Management Score, which increases from 50.2 to 56.0 points, which may indicate an improvement in the corporate governance structure, transparency of decisions and the effectiveness of internal control.

At the same time, the only weak point of G block remains the CSR Strategy[2] subscore. It reflects the presence and depth of implementation of corporate social responsibility as an element of management strategies. This indicator is accompanied by a significant number of omissions: almost 90% of banks did not have appropriate assessments in 2019, and even in 2023 the share of complete observations does not exceed 40%. This indicates a low degree of institutionalization of CSR in small US banks: relevant policies are either absent as a phenomenon, or remain formal and not reflected in public reporting. Given that CSR is a bridge between management responsibility and sustainable development, this situation significantly limits the potential of the G-component for comprehensive ESG transformation.

While the corporate governance unit shows the greatest maturity among the three components, its structure is still far from complete. Strong positions in

[2] Corporate social responsibility (CSR) is a self-regulating business model that helps a company be socially accountable to itself, its stakeholders, and the public.

management and control aspects are offset by weak integration of the strategic vision for sustainability, indicating the functional, rather than transformational, nature of ESG management in small and mid-sized US banks.

Table 3. Average ESG scores

	2019	2020	2021	2022	2023
ESG aggregate score	30.4	31.8	33.1	33.6	34.2
ESG combined score	30.4	31.8	33.1	33.5	33.9
E score	23.6	24.5	24.2	24.6	24.6
S score	28.9	30.0	31.3	31.5	31.4
G score	43.5	45.0	46.5	47.0	48.2
ESG controversies	99.8	99.7	98.5	98.5	96.7
Resource use	2.8	4.6	5.8	8.0	8.9
Emissions	3.9	7.1	9.7	15.2	16.0
Ecological innovation	2.8	4.4	4.8	5.4	6.5
Workforce	28.2	29.9	31.2	30.0	29.0
Human rights	1.1	1.7	3.1	4.3	5.4
Community	46.1	47.6	50.2	51.2	51.3
Product responsibility	37.3	37.1	36.5	37.2	38.1
Management	50.2	51.9	53.7	53.7	56.0
Shareholders	48.7	48.3	47.2	48.4	45.9
CSR strategy	2.4	5.7	9.4	11.5	12.6

Source: calculated by the authors.

As noted earlier, some components were not assessed for a significant proportion of banks, which is why they scored so low. Although the proportion of such observations has decreased over the years, the overall picture suggests that reporting on these components is patchy and is only just beginning to gain traction.

Table 4. Average scores without taking into account statistical outliers

	2019	2020	2021	2022	2023
Resource use	21.4	22.5	20.5	20.0	18.9
Emissions	18.9	21.4	21.0	21.5	21.5
Ecological innovation	36.9	36.2	35.1	32.5	30.6
Human rights	29.4	25.0	37.6	43.9	37.3
CSR strategy	25.9	31.4	31.9	32.3	32.6

Source: calculated by the authors.

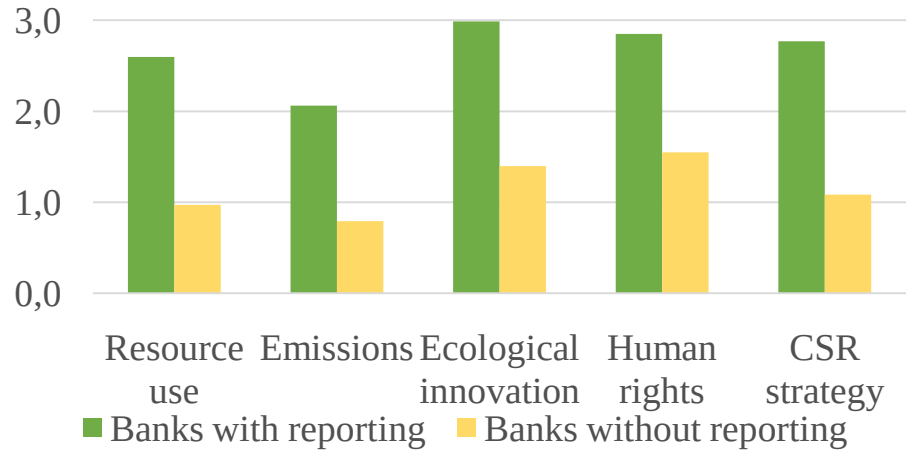

Figure 3. The average market capitalization of banks in 2023

Source: calculated by the authors.

As of 2023, there is a significant difference in market capitalization between banks that report on these less common metrics and those that do not: the average capitalization of the former is more than twice that of the latter. This indicates a relationship between the financial strength of an institution and the level of integration of ESG approaches into its strategic management and disclosure.

4. Correlation analysis

Correlation analysis showed the general structure of relationships between banks' market capitalization, ESG indicators and individual components of the assessment.

- Banks with higher capitalization receive higher ESG scores

The 2023 analysis confirms the presence of a positive correlation between bank size (market capitalization) and the ESG aggregate score (excluding controversies) (0.391), which is consistent with the resource hypothesis: larger organizations have more opportunities to implement ESG strategies. The closest relationships are recorded with S (0.467) and E (0.409) pillar scores, where the scale of operations creates both regulatory and public pressure to comply with social and environmental standards. At the same time, the relationship with G pillar score (0.108) is much weaker, which confirms the hypothesis that management practices are less dependent on bank size.

- High correlation within the ESG block

The general indices ESG aggregate score and ESG combined score have an almost perfect correlation with each other (0.990), which indicates their methodological closeness and lower role of controversies within same institutions size segment. The social pillar score (S score - 0.827) correlates most closely with ESG aggregate score, followed by environmental (E score - 0.637) and governance (G score - 0.751). High correlation values between integral scores and their subindices demonstrate the hierarchical integrity of the structure: in particular, E score has very strong connections with Ecological innovation (0.904), Resource Use (0.779) and Emissions (0.651), and S score - with Workforce (0.841), Product Responsibility (0.687) and Community (0.751). This indicates a high integration of the assessment in the methodology of the data provider, when environmental and social practices are complementary aspects of the overall picture.

- Negative correlation with controversies scores

The ESG controversies score, which reflects the presence of scandals or ESG conflicts around the bank, shows a negative correlation with all indicators, but most of all with the community score (-0.160) and other sub-scores of the social block. This confirms the vulnerability of institutions to reputational risks and demonstrates the effect of public pressure: in cases of ESG crises, companies not only lose investor trust, but also receive a systemic decrease in ratings, primarily for social reasons. From a theoretical perspective, this corresponds to the concept of business legitimacy: organizations with higher social visibility have a greater incentive to avoid behavior that may undermine trust in their ESG profile.

- The governance component has its own specifics

The correlation of G pillar score with the overall ESG aggregate score is high (0.751), but its connections with the environmental and social blocks are moderate or weak (E - 0.182, S - 0.268), which indicates the functional autonomy of the governance block. The closest connection, as before, is observed with Management score (0.947), which indicates the leading role of this sub-score in the formation of the overall G score. At the same time, shareholders' score (0.382) and CSR Strategy score (0.292) have lower, but statistically significant values, which

indicates the multidimensionality of the governance component of the ESG rating. In addition, the weak connection with the size of the bank (0.108) demonstrates that the effectiveness of management does not always depend on the scale of the institution - smaller banks can have both very strong and weak corporate compliance practices.

- The role of real environmental scores

We also found that greenhouse gas emissions per unit of revenue show only a weakly moderate correlation with other ESG indicators, which indicates a limited integration of physical environmental impacts into the overall assessment system. This situation can be explained by the specifics of banking activities: banks themselves are not a source of direct emissions, and their environmental footprint is realized indirectly through financing clients involved in carbon-intensive sectors. Today, most ESG assessment methodologies do not fully take into account these "financed" emissions, which creates a gap between reported indicators and the bank's actual impact on the environment.

Thus, the results of the correlation analysis confirm the systematicity and internal logic of the ESG rating, but also reveal its limits. ESG indicators do form a coherent methodological framework, sensitive to the size of the bank, the media context and institutional capacity. However, the integration of real environmental effects, especially in the form of emissions, remains weak, which indicates the need for further improvement of the methodologies, towards taking into account climate risks and indirect impacts through financing chains and loan portfolios.

5. Cluster analysis

To identify typical bank behavior based on sustainable development and market capitalization characteristics in the dynamics of 2019-2023, the k-means method was applied with the allocation of four clusters. The choice of four clusters is justified in view of the sufficient number of observations, as well as in order to achieve a balance between excessive aggregation (with a small number of clusters) and excessive fragmentation (with a large number). Such a number allows us to

identify significant types of banks by ESG behavior without losing analytical integrity. The clustering parameters were market capitalization, ESG aggregate score, E, S and G pillar scores.

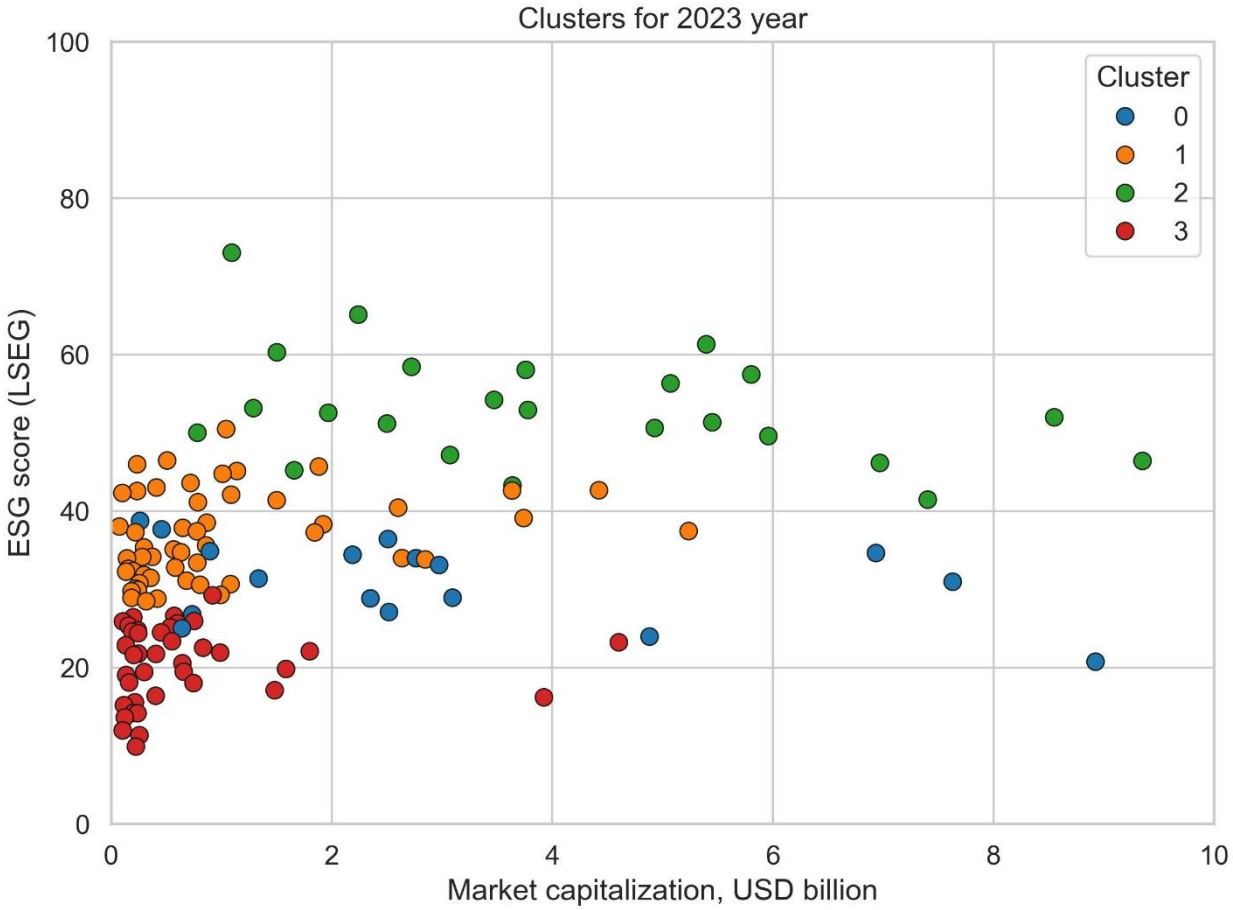

Figure 4. Distribution of the banks by clusters in 2023

Source: calculated by the authors.

Clustering of the studied small and medium-sized US banks by ESG scores and market capitalization revealed four clearly defined clusters that differ significantly both in the level of sustainable development and in the scale of activities. The main factor that distinguishes these clusters from each other is market capitalization, which is interconnected with the ESG profile of institutions. In most cases, higher ESG scores are observed in banks with larger sizes, while small institutions demonstrate weak integration of sustainable practices.

These findings resonate with the conclusions in other paper[15]. Cluster method demonstrated that variations in ESG performance are closely related to asset size and crisis resilience, with the largest banks showing both stronger ESG

baseline values and more stable recovery patterns after systemic shocks. Clustering based on a combination of ESG scores, market capitalization, and financial shock indicators reveals not only different sustainability trajectories but also the underlying capacity of banks to adapt their ESG strategies under external stress conditions.

Table 5. Average scores by cluster

Cluster	**0**	**1**	**2**	**3**
Quantity of banks	17	52	24	39
ESG aggregate score	31.0	36.7	53.2	20.5
ESG combined score	31.0	36.3	53.0	20.3
E score	25.3	19.2	48.8	16.6
S score	38.0	28.5	53.0	19.2
G score	30.6	61.1	62.6	29.8
ESG controversies	97.2	97.1	94.8	97.1
Resource use	10.8	4.3	30.3	1.0
Emissions	20.1	10.6	40.9	6.0
Ecological innovation	4.5	1.8	27.8	0.5
Workforce	35.8	26.1	51.5	16.1
Human rights	4.9	2.7	20.3	0.0
Community	61.1	48.5	78.2	34.3
Product responsibility	47.3	34.7	57.5	26.5
Management	31.7	73.2	70.7	34.8
Shareholders	36.4	58.2	47.7	32.7
CSR strategy	16.6	5.3	44.6	0.8
Market capitalization (average per cluster, $ bln)	3.0	1.0	4.1	0.7

Cluster 0. Banks of various capitalization levels with moderate ESG integration

This cluster includes 17 institutions with a wide spread of market capitalization, significantly exceeding the indicators of the two lower clusters. Moderate values are observed for most ESG scores. Environmental sub-scores remain, but the social component looks somewhat stronger, especially community sub-score. Overall, these institutions are an example of banks that maintain a basic level of ESG compliance, without excessive innovation or deep integration. Their profile suggests a focus on the considered evolution of ESG strategies with an already existing management basis.

Cluster 1. Small banks with high management sub-score

Despite having the lowest market capitalization of all groups (1.0), institutions from this cluster (52 banks) demonstrate unexpectedly high values for governance sub-scores, especially the management one. At the same time, other pillar scores remain one of the weakest: E score - 19.2, S score - 28.5. This configuration indicates a focus on internal control, transparency and formal compliance with procedures. The high level of ESG controversies (97.1) indicates limited effectiveness of this governance in real conditions. Banks in this cluster are likely to have a high degree of formalization, but do not have the resources or motivation for deeper transformation.

Cluster 2. ESG leaders with the highest capitalization

This is the strongest cluster by all major parameters, uniting 24 banks with the highest average capitalization (4.1). ESG integral scores are close to 53, and the environmental, social, and governance pillar scores are all at the highest level. The indicators for innovative and strategically important indicators are especially distinguished. These banks demonstrate a balanced, systematic approach to ESG, which combines real practice with institutional power. Despite the moderately high ESG controversies score (94.8), which is natural for larger institutions, the uniformity of the development of all ESG areas allows for effective risk management. These are the undisputed ESG leaders among US small and medium banks in our sample.

Cluster 3. The smallest and weakest banks in terms of ESG scores

This cluster includes 39 institutions with low average market capitalization (0.7). All ESG scores have minimal values among other clusters. Values in key subscores are also extremely low. Even governance elements, which in other clusters act as compensatory ones. A high level of ESG controversies (97.1) is recorded despite the low size of the institutions, which indicates significant risks and the absence of a basic ESG strategy. These are banks with extremely low integration of ESG factors, which are likely to remain out of focus for investors, customers and the public.

Conclusions.

The results of the study presented in the paper allow us to draw a number of conclusions. The first conclusion is a rather low level of ESG scores for the banks under study. The scoring values in 2023 are on average 24.6 (E pillar score), 31.4 (S pillar score), and 48.2 (G score). A comparative analysis of these values with the scoring values of large banks shows a lower level by 1.5-2 times. In addition, a feature is that the highest values are G score, then S score, and the lowest E score. This distribution of values can be partially explained by the fact that in the banking segment, the importance of Governance is higher than the other. The score values of Social are higher than those of Environmental. In particular, this is visible through the weight coefficients G, S, E scores in ESG score. Really, they are 0.36; 0.5; 0.14. Thus, the Environmental category indicates a lower weight in ESG score assessments for banks. At the same time Social category weight is 50% ESG score system. This reflects the specificity of ESG assessments of banking institutions.

The second conclusion of the study is the relationship between ESG scores and the level of market capitalization. Two points of view are discussed in the scientific literature. The first point of view is that a high level of ESG is a factor influencing the growth of bank capitalization. At the same time, the opposite point of view indicates the opposite direction - banks with high capitalization invest more efforts in ESG. In our case, it is logical to justify that banks with higher capitalization have higher ESG scores. This is explained, in our opinion, by the fact that they have more resources for this and are more interested in this from the point of view of bank business development.

The third conclusion is the presence of 0-scores for some score categories. The assessment criteria by which this situation occurs are determined. That is, banks do not yet disclose information in ESG format in a number of categories. At the same time, a clear dependency between non-disclosure of information and the level of bank capitalization is identified.

The fourth conclusion is the growing trends across all ESG assessment categories in the period 2019-2023. That is, there is a trend towards increasing

disclosure in the context of ESG, but the rate of increase is small and has a concave form of graphs.

As a fifth conclusion, it is logical to present the results of the correlation analysis. The results show which ESG score categories are correlated and to what extent. Some typical correlation dependencies were identified. The correlation dependence of ESG scores with market capitalization is also shown.

The sixth conclusion is based on the results of clustering banking institutions by ESG level and market capitalization. It allowed us to identify four clusters, among which large players with high ESG indicators and small banks focused on internal processes without sufficient resources for deeper sustainable development were clearly distinguished. Of particular note is the identification of a cluster of medium-sized institutions with high ESG ratings, which may indicate an active ESG strategy as a tool for competitive positioning.

Overall, the results of the study highlight the potential of ESG factors as a strategic management tool and a source of capitalization enhancement. In this context, a holistic ESG assessment system can serve as a guide for investors, banking consumers, analysts, and regulators seeking to identify the most promising and stable financial institutions. However, further research needs to take into account the dynamic nature of ESG metrics, the impact of external shocks, and the construction of quantitative models to verify cause-and-effect relationships.

The results of this study form an empirical basis for the further development of analytical tools in the field of sustainable banking and finance, contributing to a deeper understanding of the role of ESG in shaping long-term economic sustainability.

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