

Article

Sustainability Performance. A Comparative Analysis in the Polish Banking Sector

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Abstract: This article analyses the Polish banking sector's involvement with sustainable development through a multidimensional evaluation applying the technique for order preference by similarity ideal solution (TOPSIS) method with different weight vectors. Our results highlight numerous shortcomings in the sustainability performance of commercial banking activities. In fact, there was backsliding during the analysed period (2015–2017), which suggests that supporting sustainability performance was not one of the priorities of the Polish banking sector. However, we found a dichotomy between national and foreign banks. The government-owned banks and national banks showed greater commitment to this issue than did the banks with foreign capital. This finding suggests that banks with foreign capital were not fully interested in sponsoring activities aimed at sustainable development.

Keywords: banking sector; commercial banks; sustainable development; sustainability performance; multidimensional comparative analysis

1. Introduction

Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs [1]. For the financial sector, sustainable development is based on the concept of achieving the main aim of banking activity, i.e., to create value for shareholders, whilst respecting the environment and social development. According to the Agenda for Sustainable Development and the European Commission [2,3], the most important elements of sustainable development are protecting the environment; ensuring access to modern and sustainable energy; developing innovation; using new, environmentally friendly technologies and production methods; improving conditions for enterprise development; and raising consumer awareness.

Understanding the critical roles that banks play in the economy is fundamental to theoretical economics and finance. Despite the financial crises, the importance of banks in modern economies varies significantly. According to Allen and Carletti (2010) [4], cross-country comparisons, individual country studies, and industry- and firm-level analyses reveal a positive link among the sophistication of the banking system, economic growth and sustainable development. The connections between sustainable development and banking activities date back to the 1990s [5], when banks increasingly began to incorporate environmental requirements directly through their operational activities and indirectly through the products and services they offered [6,7]. The direct environmental impact of banks is measured by their consumption of utilities (electricity, water, heat, natural gas and others), use of typical office supplies (paper, toner, etc.) and generation of municipal waste and air pollution. The indirect environmental impact of banks results from services rendered to reduce environmental

risks based on identified threats. The concept of sustainability in the banking industry has also been considered to be a philanthropic act whereby banks—through their activities in culture, art, sport, education or assisting local communities—support values that protect the well-being of the local society [8]. A bank's sponsorship of charitable activities aims to enhance its image as an open and modern institution that is close to the customers and communities in which it operates. Educating existing and potential clients and employers is another activity that, while not obligatory, fits perfectly into the effort to provide security and accessibility of sustainable banking products and services.

The fundamental question about the purpose of business activity—whether a bank should maximise value for shareholders or instead focus on a broader spectrum of goals resulting from the expectations of other stakeholders—grew in importance as a result of two serious global financial crises. The first one was caused by subprime lending and the other by the debt problems of Eurozone countries. The unprecedented scale of these crises highlighted the imperfections of business activity, which was indiscriminately subordinated to maximising value for shareholders. Along with revealing the weaknesses of banking activity (such as warning systems and risk management models, inadequate ratings and the bad recommendations of specialist consultancy firms, among others), the entire philosophy of modern banking suffered a defeat.

One should note, however, that the role of banks in contemporary economies imposes on them responsibility for issues connected with the problems of sustainable development. Focusing banking activity on a much broader range of goals and social responsibility does not compromise the bank's overriding aim of maximising value for its owners but instead draws attention to the fact that it may be more difficult to create value for owners if the goals of other stakeholders are not taken into account. As Kilroy and Schneider (2017) [9] emphasise, these doctrines are complementary. It is not possible to maximise value for shareholders without respecting the interests of the other groups. Conversely, other groups are more prosperous when the ultimate goal of business management is to create value for shareholders.

This article analyses the Polish banking sector's involvement with sustainable development through a multidimensional comparative analysis. For this purpose, we analyse whether commercial banks operating in Poland improved their positions in terms of sustainable development during the period from 2015 to 2017. We also look for differences between national and foreign-owned banks.

The Polish banking sector was the largest among those of the ten countries joining the EU (EU 10) in 2004. At the end of October 2018, it was composed of 33 commercial banks, 30 foreign branches of credit institutions and 550 cooperative banks [10]. The stability of the banking system, which accounts for two-thirds of the Polish financial system's assets, is critical to the financial system's stability. Banks are crucial for financing the economy and settling payments. A vast majority of institutions achieved positive financial results. At the end of October 2018, the net result of the banking sector totalled PLN 12.7 billion, higher by more than PLN 1.0 billion (by 8.7%) compared to the same period in 2017. Banking sector assets grew to PLN 1.9 trillion, a 6.1% increase over 2017 (the increase of PLN 108.5 billion) [10]. European Banking Authority (EBA) stress tests indicated Polish banks would be highly resilient to a theoretical macroeconomic shock.

The impact of sustainability on competitiveness and a bank's financial-economic success has been strongly debated. One of the main observations is that the banking service lacks common methodologies and standards to address sustainability, despite the existence of many general standards [11]. Thus, we focus on evaluating commercial bank operations in the international sustainability context, according to GRI G4 Sustainability Reporting Guidelines by the Global Reporting Initiative (GRI) [12].

To complete our study, we applied the technique for order preference by similarity ideal solution (TOPSIS) method [13] and analysed disclosures about financial sustainability, energy consumption and savings, social sustainability and product responsibility. Furthermore, the impact of the different weight vectors on the final results of the analysis was studied.

Our results show a general backsliding in banking activity concerning sustainable development during the analysed period, which suggests that supporting sustainability performance is not a key priority for Polish banking. It is also symptomatic that all the banks whose main shareholder, directly or indirectly, is the Government and most banks controlled by national shareholders showed a greater commitment to this issue than did banks with foreign capital. This dichotomy between national and foreign shareholders may suggest that banks with foreign capital are not fully interested in activities aimed at sustainable development, such as sponsoring national culture and charities or providing local communities with financial assistance. Studying such a recent period offers us a clear vision of the current situation regarding Polish banking's role in sustainable development.

This article contributes to the existing literature by providing a more extensive view of the relationship between shareholder value creation and sustainability performance when used as a proxy for the goals of other stakeholders. To the best of our knowledge, this is the first comprehensive review of the Polish banking sector in the area of sustainable development. Our findings can be applied broadly, both as a tool to support decision-making and to evaluate the banking sector.

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 results obtained. Section 5 summarises and presents the main conclusions.

2. Literature Review

Integrating sustainability into banking activity is an increasingly necessary but extremely challenging issue facing financial institutions [14]. This integration has essentially taken two forms: (i) socially and environmentally responsible initiatives (e.g., support for cultural events, charitable donations, recycling programmes and improvements in energy efficiency); and (ii) integration of environmental and social considerations into product design, mission and business strategies (e.g., the integration of environmental criteria into investment and lending strategies) [15].

In this context, Carnevale and Mazzuca (2014) [16] test the direct effects of the sustainability report on stock prices for a sample of European banks. Their results show that investors appreciate the additional and complementary disclosure provided by the sustainability report and that this disclosure has a positive effect on stock prices. Similar results are obtained by Weber (2016) [17], who analyses the sustainability performance of Chinese banks and the connection between their sustainability performance and financial indicators. His results suggest that the environmental and social performance of Chinese banks increased significantly between 2009 and 2013. Furthermore, Weber demonstrates that institutional pressure influences Chinese banks to integrate environmental and social issues into their business strategies, products and services. Saxena and Kohli (2012) [18] examine the impact of CSR on corporate sustainability (CS), defined in terms of an organisation's financial performance, in the Indian banking industry. They seek to establish a relationship between an organisation's CSR rating and its financial performance based on indicators such as profit after tax (PAT) and earnings per share (EPS). The study tries to sensitise managers in the banking sector or other organisations to probe further and gain a deeper understanding of the impact of CSR on sustainability when making decisions about investing in CSR.

Some studies focus on the importance of disclosing sustainability reporting in its three dimensions of environmental, social and corporate governance (ESG). Sobhani et al. (2012) [19] find that disclosure of the social dimension is higher than that of the economic and environmental dimensions. Disclosure of environmental issues is widely neglected by all listed banks. A similar analysis was conducted by Nobanee and Ellili (2016) [20]. They measured corporate sustainability disclosure using annual data for banks in the UAE financial markets. The results show that overall sustainability disclosure based on sustainability reporting for banks in the UAE is low. Many studies confirm that Islamic finance principles support socially inclusive, environmentally friendly and development-promoting activities. However, in practice, the industry's contribution to these objectives has been below its potential [21–23]. In the Indian banking sector, adoption of the international sustainability code of conduct is still nascent [24].

The research indicates that sustainability issues of highest priority for the banks are those directly related to their business operations: questions such as financial inclusion, financial literacy and energy efficiency. Banks are more focused on addressing the social dimension of sustainability than on important dimensions of sustainable banking such as environmental management, development of green products and services and sustainability reporting. Aras et al. (2018) [25] investigate multidimensional corporate sustainability practices and establish a corporate sustainability performance evaluation model for Turkish banks. They analyse 12 sustainability reports published by four Turkish deposit banks from 2012 to 2014 covering the dimensions of economic, environmental, social governance and financial corporate sustainability. The performance scores reveal that each bank has different performance scores each year. Aras et al. (2018) [25] conclude that improving performance in all dimensions provides a more substantial contribution to the bank's overall score and ranking than having the highest score in one or more dimensions.

A completely different aspect is emphasised by Carè [26]. She evaluated the disclosure practices of the six banks in Europe listed in the Global 100 Sustainable Companies Ranking. Carè specifies that 50% of the sampled banks did not adopt (or cite) GRI in 2016. Sustainability reports are not easily accessible and are often comprised of other documents that do not provide an immediate overview of what banks do in terms of sustainability.

Despite empirical evidence that sustainability disclosures have a positive effect on stock prices, most papers show low disclosure of environmental, social and corporate governance (ESG) factors by banks. For that reason, we think that the Polish banking sector will have involvement similar to that of banks in other European countries, e.g., Germany, France and Spain, but insufficient for current European Union requirements. Therefore, we propose the following hypothesis:

Hypothesis 1. *Polish banks do not have a relatively high level of involvement with sustainable development.*

Moreover, the nationality of the strategic investor influences the scope of sustainability-related actions by the banks, but the nature of the effect is not clear. Thus, we formulate two opposing hypotheses to be tested.

Hypothesis 2a. *Banks with foreign capital are more interested in sustainability performance than are national banks.*

Hypothesis 2b. *Banks with foreign capital are less interested in sustainability performance than are national banks.*

Finally, additional research on this subject includes Rebai et al. (2016) [27], who generate a new performance evaluation model for banks, integrating a sustainability concept that measures the well-being of multiple stakeholders. This model is based on a multi-attribute utility approach. It accounts for the interests of a bank's various stakeholders in a win-win paradigm. Raut et al. (2017) [28] develop an integrated multi-criterion decision-making model (MCDM) to evaluate sustainability practices in banking services from four perspectives: financial stability, customer relationship management, internal business process and environment-friendly management system. Their model integrates the balanced scorecard, fuzzy analytic hierarchy process (fuzzy AHP) and fuzzy TOPSIS. The authors aimed to verify their model on a sample of banks from the Indian banking sector. Following these authors, we have applied the TOPSIS method to analyse different attributes related to sustainable development.

Our paper is closely connected with this research and contributes to the literature by using a complex analysis of commercial banks' sustainability performance in the Polish banking sector.

3. Sample and Methodology

3.1. Sample

Our analysis was conducted on a sample of banks operating in the Polish banking sector from 2015 to 2017. For this purpose, the information presented by the banks in their annual reports and on their websites was analysed. It allowed us to identify 17 commercial banks from a total of 35 commercial banks operating in Poland at the end of 2017. The other banks were excluded from the analysis because they do not inform their stakeholders about their sustainability performance. This means that less than 50% of Polish banks report on sustainable development. Three banks were removed from the sample because they focus on sustainable development. For example, Bank Ochrony Środowiska S.A. is the main bank in Poland financing environmental protection and operates based on corporate social responsibility. Finally, 14 commercial banks were analysed and we obtained a final dataset consisting of a balanced panel with 420 observations. Table 1 shows the list of commercial banks analysed in the study.

Table 1. List of commercial banks analysed in the study

Name of the Bank (Alphabetical Order)
Alior Bank S.A.
Bank Gospodarstwa Krajowego
Bank Handlowy w Warszawie S.A.
Bank Millennium S.A.
Bank Pocztowy S.A.
Bank Polska Kasa Opieki S.A.
Bank Zachodni WBK S.A.
BGŻ BNP Paribas S.A.
Getin Noble Bank S.A.
Idea Bank S.A.
ING Bank Śląski S.A.
mBank S.A.
Powszechna Kasa Oszczędności Bank Polski S.A.
Raiffeisen Bank Polska S.A.

Note: The list is presented in alphabetical order. A different order was applied in the analysis.

The banking sector's commitment to sustainable development can be influenced by the nationality of a bank's shareholders. Hence, we divided our sample according to the nationality of major shareholders. Table 2 presents the Polish banking system and the banks studied according to the nationality of major shareholders.

Table 2. Number of commercial banks in Poland as of 31/12/2017, according to the nationality of major shareholders and number of banks analysed.

Specification	Total Banks	Number of Banks Analysed
National banks with dominating share of Polish capital	14	7
National banks with dominating share of foreign capital	21	7

Note: Three banks were removed from the analysed sample because they focus on sustainable development.

In the analysed period, the share of commercial banks controlled by Polish shareholders increased by 13.5 percentage points. The key change in the structure of the Polish banking sector in 2017 was that Polish investors exceeded a 50% share of the assets. The change resulted from Powszechny Zakład Ubezpieczeń SA and Polski Fundusz Rozwoju SA taking control of Bank Pekao SA. For the first time since 1999, the share of Polish investors in sector assets became greater than the share of foreign investors. At the end of 2017, local investors owned 54.5% of total assets and controlled 14 commercial banks and all the cooperative banks whereas foreign investors controlled 21 commercial banks and all

the foreign branches. Controlling interests were owned by investors from 19 countries, with investors from Germany, Spain, France, Holland and Portugal playing a major role [29]. Table 3 presents the percentage of shares owned by main shareholders for foreign banks in the analysed period.

Table 3. Percentage of shares owned by main shareholders of foreign banks in the analysed period.

Bank	End of the Year	Foreign Ownership	National Ownership	Minority Shareholders
Bank B	2015–2017	88.33%		11.70%
Bank C	2015–2017	75.00%		25.00%
Bank E	2015	50.10%		49.90%
	2016	40.10%		59.90%
	2017		32.80%	67.20%
Bank F	2015–2016	69.41%		30.59%
	2017	69.34%		30.66%
Bank I	2015–2017	75.00%		25.00%
Bank J	2015	69.50%		30.50%
	2016–2017	69.40%		30.60%
Bank K	2015–2017	50.10%		49.90%
Bank M	2015–2017	100.00%		0.00%

3.2. Methodology

The banks were analysed using the linear ordering method, which allows us to rank objects according to the ordering criterion adopted. For this purpose, the TOPSIS method developed by Hwang and Yoon in 1981 [13] was applied. This approach is employed for four reasons [30]: TOPSIS logic is rational and understandable, the computation processes are straightforward, the concept permits the pursuit of the best alternatives for each criterion depicted in a simple mathematical form [31], and the importance weights are incorporated into the comparison procedures.

In spite of its many advantages, the TOPSIS method, like many multi-attribute decision-making methods, can produce “rank reversal” outcomes, as several authors have described [32–34]. In this phenomenon, the alternatives’ order of preference changes when an alternative is added to or removed from the decision problem. In some cases, this may lead to what is called total rank reversal; the order of preferences is totally inverted, whereby the alternative that is considered the best becomes the worst with the inclusion or removal of an alternative from the process. To reduce this problem, we considered a representative sample of banks operating in the Polish banking sector in the analysed period with a large number of variables (10) and four possible weights. This gives robustness to our results since it is very difficult or even impossible to find another combination of attributes (banks) that could change our ranks in the analysed period.

Using this method, we assumed that in the decision matrix $X_{m \times n}$ the rows define the investigated objects while the columns describe diagnostic variables, i.e., x_{ij} is a value of j -th variable ($j = 1, \dots, n$) on i -th object ($i = 1, \dots, m$). The decision matrix is normalised according to the following formula:

$$z_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}} \quad (1)$$

where:

$$i = 1, 2, \dots, m,$$

$$j = 1, 2, \dots, n.$$

Then, the vector of weighting indicators is determined for individual diagnostic variables:

$$W = \{w_1, w_2, \dots, w_n\}, \text{ where } \sum_{j=1}^n w_j = 1 \quad (2)$$

Elements of the normalised decision are weighted:

$$v_{ij} = z_{ij} \times w_j, \quad \text{for } i = 1, 2, \dots, m \text{ and } j = 1, 2, \dots, n.$$

Next, the positive ideal point (PIS) and the negative ideal point (NIS) are found using:

$$PIS = A^+ = \{v_1^+, v_2^+, \dots, v_n^+\} = \left\{ \left(\max_i v_{ij} \mid j \in S \right), \left(\min_i v_{ij} \mid j \in D \right) \right\} \quad (3)$$

where $j = 1, 2, \dots, n$; and:

$$NIS = A^- = \{v_1^-, v_2^-, \dots, v_n^-\} = \left\{ \left(\min_i v_{ij} \mid j \in S \right), \left(\max_i v_{ij} \mid j \in D \right) \right\} \quad (4)$$

where $j = 1, 2, \dots, n$.

However: S denotes a set of variables that are stimulants, and D denotes the destimulants.

The next step is to calculate the separation of test objects from the PIS and the NIS. The separation values can be measured using the Euclidean distance, which is given as:

$$d_i^+ = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^+)^2}, \text{ for } i = 1, 2, \dots, m \quad (5)$$

and

$$d_i^- = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^-)^2}, \text{ for } i = 1, 2, \dots, m \quad (6)$$

Determination of relative similarity of each object to the ideal solution can be derived as:

$$d_i = \frac{d_i^-}{(d_i^+ + d_i^-)} \quad (7)$$

where:

$$d_i \in [0, 1] \forall i = 1, 2, \dots, m \quad (8)$$

3.3. Diagnostic Variables and Weighting Indicators

At the first stage of the multidimensional comparative analysis, diagnostic features were chosen. Following the GRI G4 Sustainability Reporting Guidelines and previous research in this field [35–37], we selected ten indicators. These indicators were divided into those whose greater values imply a better position of a bank in terms of the analysed phenomenon (stimulants— S) and those where a lower level is desired (destimulants— D). The indicators were divided into three groups: financial sustainability disclosures, energy consumption and saving disclosures, and product responsibility disclosures. Table 4 shows the selected diagnostic variables.

Table 4. Selected diagnostic variables.

Symbol	Selected Diagnostic Variables	Description	Variable Profile
Financial Sustainability Disclosures			
Z1	C/I	The ratio of costs to income	Level of incurred operating costs and depreciation to operating income <i>D</i>
Z2	C/A	The ratio of costs to assets	Level of incurred operating costs and depreciation to asset value <i>D</i>
Z3	Donation/assets	Amount of donations allocated to bank assets in a given financial year	Donation value to asset value <i>S</i>
Z4	Donation/net profit	Amount of donations made in a given year to net profit in a given financial year	Donation value to generated net profit <i>S</i>
Energy Consumption and Saving Disclosures			
Z5	Energy saving policies	Bank environmental strategies, energy saving results, annual sustainability report	Five assessment levels on a 1 to 5 scale, where level 5 is the highest and level 1 is the lowest <i>S</i>
Z6	Environmental financing	Environmental credit risk assessment procedures, initiatives to provide sustainability products and services, support of businesses adopting environment-friendly practices	<i>S</i>
Social Sustainability Disclosure			
Z7	Financial assistance	Number of social initiatives aiming to help the poor, the disabled, the elderly, children in children's homes, charitable activities, own foundation	Five assessment levels on a 1 to 5 scale, where level 5 is the highest and level 1 is the lowest <i>S</i>
Z8	Development incentives	Creating job opportunities for unemployed youth, loans for start-ups and fostering development for women	<i>S</i>
Z9	Sponsorships	Initiatives in culture, sport, education and science supported in a given year by the bank	Ten assessment levels on a 1 to 10 scale, where level 10 is the highest and level 1 is the lowest <i>S</i>
Product Responsibility Disclosures			
Z10	Responsibility for banking products and services	Non-compliant products and services	Number of penalties and sanctions imposed by supervisory bodies due to unlawful activity <i>D</i>

A higher weighting indicator corresponds to an indicator whose values have a higher mean coefficient of variation. The variables were subjected to statistical verification based on the coefficient of variation. Invariably, the coefficient of variation was above 10%, which indicates that the chosen variables may be considered to be diagnostic. Table 5 shows the coefficient of variation.

Table 5. Value of variability coefficient for diagnostic indicators during the period analysed.

Specification	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10
2015										
Arithmetic mean	0.575	0.021	0	0.085	1.500	1.000	2.429	0.714	12.286	0.214
Standard deviation	0.108	0.007	0	0.243	2.103	1.617	1.785	1.139	14.226	0.579
V(x) variability coeff.	0.188	0.308	0.856	2.852	1.402	1.617	0.735	1.594	1.158	2.702
2016										
Arithmetic mean	0.528	0.019	0	0.017	2.143	0.714	2.214	0.571	11.429	0.786
Standard deviation	0.106	0.007	0	0.039	2.179	1.437	1.968	0.938	14.070	1.051
V(x) variability coeff.	0.200	0.363	1.139	2.226	1.017	2.012	0.889	1.641	1.231	1.338
2017										
Arithmetic mean	0.504	0.019	0	0.077	4.143	1.214	2.857	1.286	11.429	0.786
Standard deviation	0.082	0.007	0	0.266	1.956	1.578	2.214	1.637	10.097	0.699
V(x) variability coeff.	0.163	0.347	1.221	3.469	0.472	1.299	0.775	1.274	0.884	0.890

TOPSIS is one numerical method of the multiple-criteria decision making (MCDM) technique. These methods require definitions of quantitative weights for the attributes, but the definition of weights is not precise [38–40]. Numerous methods have been suggested in the MCDM literature to determine the weights of attributes and can be grouped into three categories: subjective, objective and integrated [41]. The subjective approaches determine the weights of attributes in terms of the decision maker's (DM's) subjective preference information, including the direct rating (DR) method, point allocation (PA) method, ranking ordering method of attributes, eigenvector method, Delphi method, linguistic terms, interval numbers and others. The objective approaches determine the weights of attributes using objective decision matrix information, including the entropy method, standard deviation, coefficient of variation, the maximising deviation method, and the ideal point method. The integrated approaches determine the weights of attributes using both DM's subjective information and objective decision matrix information [42].

Weighting indicators were determined both from the subjective method and from objective methods based on statistical procedures, according to Olson (2004) [43] and Huang et al. (2012) [44]: where:

- w_1 system—identical weights were adopted for all variables, i.e.:

$$w_k = \frac{1}{q} \quad (9)$$

where: k —indicator number ($k = 1, 2, \dots, q$).

- w_2 system—weights were determined using the expert method where the highest weights were attached to the indicators that were in the least degree connected with creation of value for the shareholders, such as the highest ratio of donations to generated net profits and charitable activities. Moreover, relatively high weight was attached to the Z10 indicator, responsibility for banking products and services, which is determined by the number of penalties and sanctions imposed by supervisory bodies for a bank's unlawful activities.
- w_3 system—weights were determined using coefficients of variation:

$$w_k = \frac{\sum_{t=2015}^{2017} |w_{kt}|}{3} \quad (10)$$

where:

$$w_{kt} = \frac{|v_{kt}|}{\sum_{k=1}^q |v_{kt}|} \quad (11)$$

v_{kt} —coefficient of variation of indicator ($k = 1, 2, \dots, q$) in the year $t = 2015, 2016, 2017$.

- w_4 system—weights were determined using the correlation coefficient:

$$w_k = \frac{\sum_{t=2015}^{2017} |w_{kt}|}{3} \quad (12)$$

where:

$$w_{kt} = \frac{\sum_{i=1}^q |r_{ikt}|}{\sum_{i=1}^q \sum_{k=1}^q |r_{ikt}|} \quad (13)$$

r_{ikt} —elements of the R correlation matrix between individual variables ($k = 1, 2, \dots, q$) in year $t = 2015, 2016, 2017$ [45].

However, substantive assessment of the indicators obtained as a result of mutual correlation of the features indicates that the weight system achieved in this way is not proper. Therefore, it was omitted from further calculation procedures.

One should note that statistical approaches are based on information about features inherent only in the data matrix itself and that they use the analysis of feature variability and the analysis of correlation between the features. K. Kukuła [46] (p. 70) notes that its specific feature is a mechanical approach to the problem of weighting, while disregarding the real position of a given feature determined by substantive premises.

Eventually, three weighting indicators were adopted in the calculation: w_1 , w_2 and w_3 . Table 6 presents the values of weighting indicators for every selected variable.

Table 6. Values of weighting indicators.

Weights	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10
w_1	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
w_2	0.085	0.085	0.085	0.200	0.050	0.085	0.120	0.085	0.085	0.120
w_3	0.015	0.028	0.090	0.240	0.078	0.136	0.067	0.124	0.090	0.132

4. Results

To analyse the banks' sustainability performance scores, values of the relative similarity of each bank to the ideal solution were determined along with bank rankings. For this purpose, we divided the sample according to the nationality of major shareholders in the years 2015–2017 and took into account three procedures according to different weighting indicator structures, i.e., w_1 , w_2 and w_3 , determined based on TOPSIS. Table 7 shows the results.

The data in Table 7 show that no bank decisively improved its position in terms of sustainability performance during the period analysed. Although a certain systematic improvement is noted in the operations of Bank A, because it is the only bank to improve across the years for the three weights, we must consider that in the ranking prepared from w_1 and w_2 weights, it came last in 2015 and 2016. Similarly, Bank L was the only bank that improved in 2017 with respect to 2015 for the three weights. We confirm our first hypothesis: the Polish banks did not have a relatively high level of involvement with sustainable development, a result in line with previous studies [20–26].

A substantial decline was clearly seen, on the other hand, in the operations of Bank F and Bank K, whose synthetic measure values decreased during the period analysed; note that both banks had foreign shareholders. In this regard, all banks with foreign shareholders had worse scores in 2017 than in 2015 for the three weights. This suggests that banks with foreign capital were not fully interested in financing activities aimed at sustainable development. Our results corroborate this hypothesis (H2b): the banks with foreign capital were less interested in sustainability performance than are national banks.

The distance between individual banks and the model and anti-model of banks' commitment to the issues of sustainable development determined using the TOPSIS method, taking into account the different weight systems, is presented in Figures 1–3.

Bank G was the top ranked in 2015 according to the calculation based on all weights, and again in 2017 based on w_2 and w_3 weights. This is a result, first and foremost, of dedicating resources to activities connected with sustainable development, despite generating a relatively low net profit. The bank had a high score in the variable Z4 (donation/net profit), which had a very strong impact on the ranking result. This leads us to think that Bank G had a high commitment to sustainable development.

Essentially, a certain regression is noted in the results obtained. Only four banks improved their results at the end of the period analysed compared to the year 2015 according to the calculations that used the w_1 weighting. Three improved according to the w_2 weighting, and five improved according to the w_3 weighting.

When analysing the data in Table 6, note that the results obtained using the TOPSIS method, taking into account the different weighting indicators, were close to one another. The bank ranking results obtained using the TOPSIS method with the w_1 – w_3 weights was also compared using Pearson's correlation coefficient (Table 8).

Table 7. Overall sustainability performance scores and ranks.

Weight W_1			2015		2016		2017	
			Scores	Rank	Scores	Rank	Scores	Rank
Polish shareholders	state-owned	Bank A	0.133	14	0.147	14	0.215	11
	state-owned	Bank D	0.317	9	0.464	2	0.464	2
	state-owned	Bank E			0.224	10	0.277	9
		Bank G	0.486	1	0.208	11	0.208	12
		Bank H	0.214	13	0.239	9	0.239	10
	state-owned	Bank L	0.417	2	0.565	1	0.565	1
	state-owned	Bank N	0.385	5	0.351	4	0.351	3
Foreign shareholders		Bank B	0.385	6	0.408	3	0.304	6
		Bank C	0.334	7	0.321	6	0.321	5
		Bank E	0.324	8				
		Bank F	0.416	3	0.337	5	0.337	4
		Bank I	0.254	11	0.183	13	0.183	14
		Bank J	0.314	10	0.303	7	0.303	7
		Bank K	0.397	4	0.286	8	0.286	8
		Bank M	0.239	12	0.206	12	0.206	13
Weight W_2			2015		2016		2017	
			Scores	Rank	Scores	Rank	Scores	Rank
Polish shareholders	state-owned	Bank A	0.083	14	0.105	14	0.155	10
	state-owned	Bank D	0.240	8	0.639	1	0.102	14
	state-owned	Bank E			0.224	7	0.219	4
		Bank G	0.678	1	0.179	12	0.654	1
		Bank H	0.184	13	0.198	9	0.152	11
	state-owned	Bank L	0.295	3	0.411	3	0.331	2
	state-owned	Bank N	0.277	4	0.273	4	0.290	3
Foreign shareholders		Bank B	0.356	2	0.466	2	0.188	5
		Bank C	0.238	9	0.242	6	0.144	12
		Bank E	0.262	6				
		Bank F	0.274	5	0.255	5	0.162	7
		Bank I	0.209	11	0.155	13	0.159	8
		Bank J	0.217	10	0.223	8	0.158	9
		Bank K	0.261	7	0.193	10	0.139	13
		Bank M	0.204	12	0.188	11	0.175	6
Weight W_3			2015		2016		2017	
			Scores	Rank	Scores	Rank	Scores	Rank
Polish shareholders	state-owned	Bank A	0.079	11	0.092	10	0.103	9
	state-owned	Bank D	0.160	8	0.695	1	0.076	13
	state-owned	Bank E			0.150	7	0.145	7
		Bank G	0.692	1	0.083	11	0.685	1
		Bank H	0.030	14	0.066	12	0.082	11
	state-owned	Bank L	0.227	4	0.332	3	0.306	2
	state-owned	Bank N	0.251	3	0.243	4	0.247	3
Foreign shareholders		Bank B	0.326	2	0.520	2	0.218	4
		Bank C	0.200	7	0.213	5	0.155	5
		Bank E	0.137	9				
		Bank F	0.206	6	0.168	6	0.152	6
		Bank I	0.068	12	0.039	13	0.064	14
		Bank J	0.132	10	0.140	8	0.077	12
		Bank K	0.214	5	0.135	9	0.110	8
		Bank M	0.061	13	0.031	14	0.090	10

Note: Bank E changed ownership in 2016, from foreign shareholders to national shareholders.

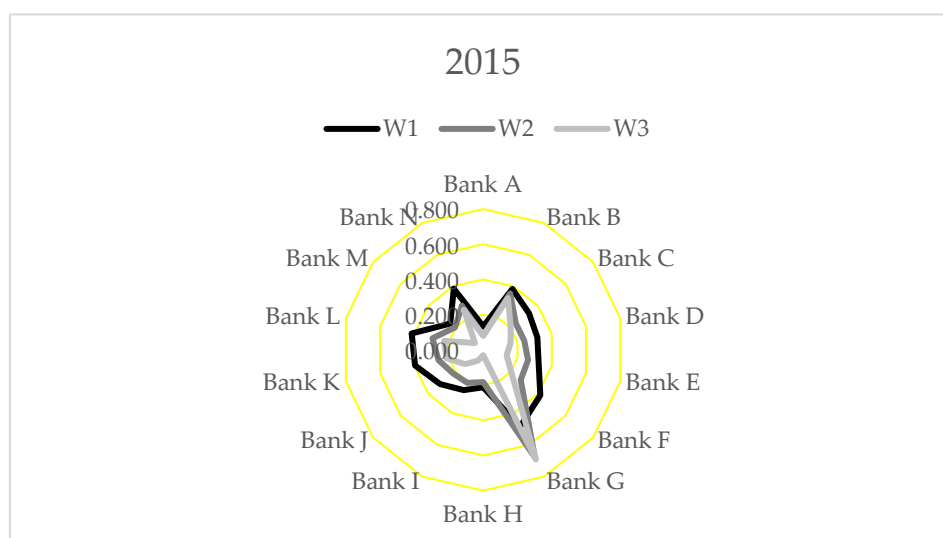


Figure 1. Distance between banks and the model and anti-model of sustainable development in 2015 determined using the TOPSIS method, taking into account the different weight systems.

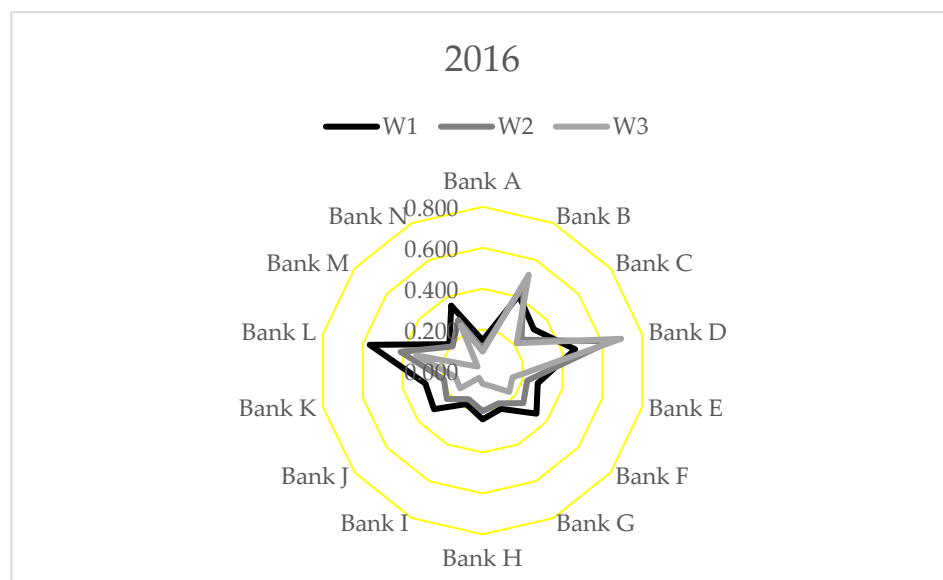


Figure 2. Distance between the banks and the model and anti-model of sustainable development in 2016 determined using the TOPSIS method, taking into account the different weight systems.

Table 8. Values of Pearson's linear correlation coefficient determined for the synthetic measure of the banks because of the w_1 – w_3 weights adopted in the years 2015–2017.

Pearson's Correlation	2015	2016	2017
w_1 – w_2	0.912	0.960	0.732
w_2 – w_3	0.908	0.916	0.675
w_1 – w_3	0.895	0.916	0.916

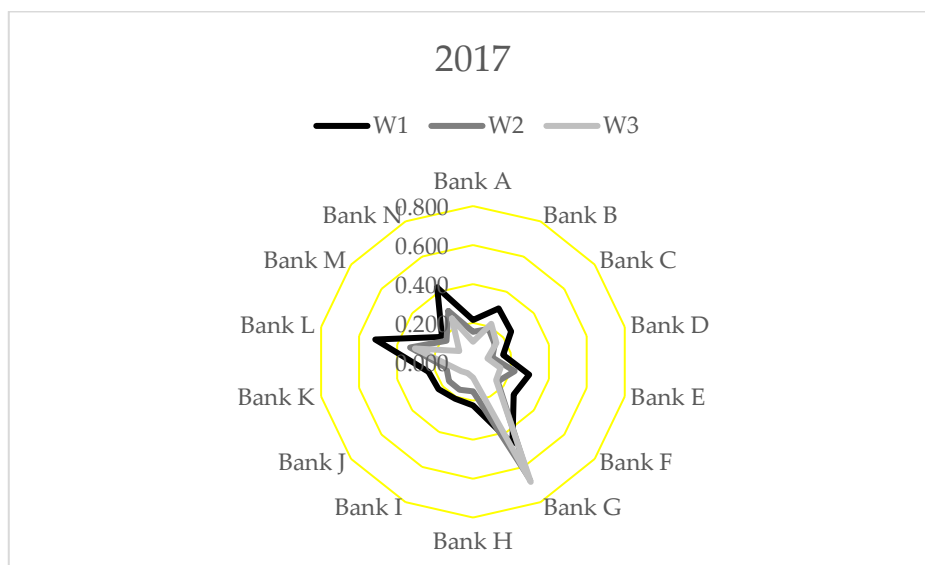


Figure 3. Distance between banks and the model and anti-model of sustainable development in 2017 determined using the TOPSIS method, taking into account the three different weight systems

The values obtained for Pearson's correlation coefficient confirm the earlier observations, i.e., orderings achieved using three different weights were very close to each other.

5. Summary and Conclusions

The foundation of market discipline in the banking sector is up-to-date and reliable information that market players can use to assess a given bank's economic and financial standing, results, business activity and risk profile. Banking transparency guarantees stability and is a trust-building indicator for the entire sector. In this context, disclosing sustainability reporting should be considered an important activity for commercial banks, which are institutions of public trust. This paper empirically analyses the commitment of Polish banks to sustainable development in the period 2015–2017 through bank disclosures about this matter. To this end, we have conducted a multidimensional evaluation applying the TOPSIS method with different weight vectors to reduce the limitations of the model.

Policymakers and supervisors may benefit from our findings since the European Union is examining how to integrate sustainability considerations into its financial policy framework, of which the banking sector is a fundamental pillar. Our findings provide banks with guidance on important issues by considering sustainable development in the conduct of their business activities. Our analysis indicates that most commercial banks do not disclose sustainability reporting, nor do they publish it on their websites. This suggests that bank management is focused on the essential goal of modern banks, i.e., the creation of value for shareholders, and does not fully appreciate the importance of such activities. Moreover, part of the information is disclosed with considerable delay. However, the commercial banks that received high scores for disclosing materials are usually the largest banks in the Polish banking sector in terms of assets and net profit; they are quoted on the Warsaw Stock Exchange. Therefore, these banks appear more committed to sustainable development.

It is also symptomatic that a commitment to sustainable development is observed among all the banks that are directly or indirectly government owned and those mostly owned by national shareholders. This dichotomy between national and foreign shareholders suggests that banks with foreign capital are not fully interested in financing activities such as Polish culture and art and charities or in assisting local communities.

Concerning evolution over time, we detected some backsliding in banks' sustainability performance during the period under consideration. Only four banks improved their scores by the end of 2017 compared to 2015 according to the calculations that used w_1 weight. Three improved

according to w_2 weight, and five improved according to w_3 weight. Although during 2015–2017 banks incurred additional expenses due to the implementation of new capital requirements regulations, additional banking taxes and the restructuring of currency mortgages, they still achieved relatively good financial results in this period.

In conclusion, our evaluation of the Polish banking sector in terms of commercial banks' commitment to sustainable development has allowed us to highlight numerous shortcomings in this area. In most cases, banks focus on creating value for shareholders, and this will undoubtedly remain the dominant model for commercial banking strategies. However, the concept of value created for shareholders is not perfect, and long-term costs resulting from reputational damage among stakeholders will always lead to a decline in the bank's value. The problem that remains is how to find an optimum relationship between maximising increases for shareholders and attending to the interests of other groups surrounding the bank. Another issue is the question posed by Fiordelisi and Molyneux [47] (p. 34) as to whether maximising value for shareholders is proper for all commercial banks and whether the operations of all banks should be indiscriminately subjected to this aim.

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