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Intellectual capital as a factor of banks' competitiveness

JEL Classification: *G21; O34; J24; M21*

Keywords: *intellectual capital; competitiveness; bank*

Abstract

Research background: The banking sector in Poland at the turn of the 21st century experienced increased competition resulting mainly from the inflow of foreign capital to this sector. In addition, there were strong general economic perturbations, including: the financial crisis of 2008 after the collapse of Lehman Barthes or the crisis as a result of the effects of the SARS COV-2 pandemic and its spread to the entire global economy. to 5.0, which meant the acceleration of technological changes, such as automation or digitization. The banks took steps to strengthen not only their economic foundations, but also to increase their attractiveness, creating the brand of the 21st century organization by using the full potential of intellectual capital.
Purpose of the article: The aim of the article is to systematize the definition of a bank's intellectual capital and to indicate its role in building a bank's long-term competitive position using multidimensional statistical analysis - classification tree (CART method).
Methods: The method used in the article are classification trees, using the rule of recursive division. This method consists in a gradual division of the multidimensional space of features (indicators) into disjoint subsets until they become homogeneous due to the distinguished feature y (indicator). Then, in each of the obtained segments, a local model for the y feature is built. The basis for the analysis of the competitiveness of banks based on classification trees will be the results of the ranking of banks, created on the basis of a proprietary synthetic measure. The three best banks in a given year (places 1-3 in the ranking) will form group A; further banks that will be ranked 4-7 in the tree-based analysis are group B; while the last three banks in the ranking (places 8-10) will form group C. The study will

be conducted on a group of 10 listed banks included in the portfolio of the WIG-banks sub-index.

Findings & Value added: The conducted analysis will allow to find rules (based on diagnostic indicators) classifying banks into separate groups (A, B, C). This will lead to the conclusion which indicators from the economic (EC) and intellectual (IC) capital layers have the greatest impact on the competitiveness of banks (2009-2020).

Introduction

In research on the competitiveness of banks, it is noted that it is important to shift the focus from research on economic capital to creating the bank's value through the development of its intellectual capital. Therefore, the operation of the bank's human resources and their innovative attitude in the field of introducing product (INN), organizational (ORG) and relational (INS) changes is of key importance. Many bank management concepts recognize the importance of knowledge, employee skills, social relations, bank image, logo, brand, etc. for creating a competitive advantage and building its value (Rosińska-Bukowska 2020, p. 292). Today, building a bank's competitive position is certainly also related to the optimization of processes and technologies for providing services, the appropriate reputation of the bank and the trust of customers. The challenge for every modern bank is not just understanding the meaning of intellectual capital, but defining its elements and determining measures that enable its effective management, leading to improving and maintaining a strong competitive position.

Nowadays, banks are also perceived as intensively developing enterprises operating in a dynamic environment. Banks' resources are perceived as their strengths, which help to compete effectively with rivals, thanks to the implementation of appropriate strategies for the implementation of the development vision. Banks stand out on the market by acquiring and accumulating unique resources and relationships (Klimontowicz, Majewska 2022, p. 107). The resource theory and concepts of the knowledge-based economy seem to be the most appropriate theoretical basis, adequate to the challenges of building competitiveness by banks in the 21st century. Based on these theories, it can be concluded that the effectiveness and efficiency of the bank, as well as its advantage over competitors, currently results, to a large extent, from the potential of the bank's intangible resources. They are a source of knowledge necessary to improve the level of customer satisfaction and to provide services and offer products that distinguish a given bank

from its competitors. a comprehensive study of the competitiveness of banks should take into account the changing theories and practices in the field of building the efficiency of banks (Rehman, Aslam, Iqbal 2022, p.475).

Over the years, researchers have pointed out that effectiveness should not be assessed only in the financial context (taking into account the cost structure), but also through the prism of the efficiency of various types of organizational resources.

Research methodology

In the light of the previously discussed changes in the banking market and due to the lack of a uniform indicator defining the competitive position, it is recommended to select indicators adequate to the adopted definition of competitiveness and to analyze competitiveness in dynamic terms, using a set of several measures. It seems reasonable to use a comprehensive multi-criteria assessment. Multi-criteria perception of competitiveness requires the use of appropriately selected measures of economic efficiency, concentration and advanced taxonomic methods (Fedaseyeu, Linck, Wagner 2018, p.116).

The article uses the method of multidimensional statistical analysis, i.e. classification trees, using the rule of recursive division. This method consists in a gradual division of the multidimensional space of features (indicators) into disjoint subsets until they become homogeneous due to the distinguished feature y (indicator). Then, in each of the obtained segments, a local model for the y feature is built. A decision tree is a graphical representation of the recursive division method. As an exploratory method, it is non-parametric, i.e. it does not assume knowledge of the distribution of features (indicators) or the analytical form of the relationship between them. The selection of features (indicators) in the analysis is automatic based on the adopted criterion, and the obtained model is easy to interpret and shows resistance to unusual observations. in this model, both quantitative and qualitative features (indicators) can be used, without the need to transform them (Park, Kim 2022, p.570)

The simplest application area of the recursive division method is discriminant analysis. When y is a nominal feature (representing a class), then the division of the feature (indicator) space is responsible for identifying (predicting) the class by determining the values of the features (indicators) that form the hyperplane limiting the fragment of space in which the objects belonging to it are located. Discriminant analysis is therefore under-

stood as the process of searching for the most precise description of the class(es), and the trees obtained then are called classification trees. If, on the other hand, the purpose of the analysis is to obtain the most accurate form of the influence of the predictors on the y feature, then the trees are called regression trees (Quan, Emiliano 2018, p. 354).

We owe the knowledge and dissemination of applications of classification and regression trees to the book by Breiman et al. (1984), in which the authors proposed a whole family of methods and algorithms for creating models in the form of CART (Classification and Regression Trees) models.

The subject of the analysis is a set of objects (called the learning set U), in which each of them is characterized by m+1 features (or indicators): [x,y], where x=[x_1,x_2,…,x_m]. multidimensional, it can be written in the form of a matrix (Pedro, Leitao, Alves, 2018, p. 318),:

$$[\boldsymbol{x}_n, y_n]_{n\times m+1} = \begin{bmatrix} x_{11} & \ldots\backslash & x_{1m}, & y_1 \\ x_{21} & \ldots\backslash & x_{2m}, & y_2 \\ \ldots\backslash & \ldots\backslash & \ldots\backslash & \ldots\backslash \\ x_{n1} & \ldots\backslash & x_{nm}, & y_n \end{bmatrix}_{n\times m+1} . \quad (1)$$

Features (indicators) describing the examined objects can be of different nature, the most simplified division is: quantitative and qualitative. According to the generally accepted convention, the indicators x_1,x_2,…,x_m are called predictors, and the feature y is called the explained (dependent) feature. With the observations of all indicators, the relationship between y and x_1,x_2,…,x_m should be found so that, based on the variability of the predictor values, it is possible to determine the values of the dependent feature (Malina, Zeliaś 1997, p.38).

One of the most important non-parametric methods of building classification and regression models is the method consisting in assembling local models built in individual subspaces of the m-dimensional feature space X^m. The course of the recursive division procedure is best represented by a tree, i.e. a connected graph without cycles - hence the name of the methods - classification or regression tree. Within the discussed method, a (non-global) model is created by assembling local models of the simplest form, built in each of the K disjoint segments into which the multidimensional feature space is divided (Ying , Yuhong 2014, p.496):

$$y = \sum_{k=1}^{K} \alpha_k I(\boldsymbol{x}_i \in R_k), \quad (2)$$

where: R_k $(k = 1, \dots, K)$ are disjoint areas (segments) in the multidimensional feature space $I(\boldsymbol{x}_i \in R_k) -$ is a pointer function. It should be noted that in the above notation of the model, $\boldsymbol{x}_i$denotes a multivariate observation, and I is an indicator function of the form. It should be noted that in the above notation of the model it means a multidimensional observation, and is an indicator function of the form:

$$I(q) = \begin{cases} 1 & when\ q\ is\ true\ (i.e. when\ \boldsymbol{x}_i \in R_k) \\ 0 & otherwise\ (i.e. when\ \boldsymbol{x}_i \notin R_k) \end{cases}. \tag{3}$$

If the feature y in the model (3) is a nominal feature, the model is called the classification (discrimination) model and is represented by the classification tree, and the parameters are α_k determined in accordance with the principle of majorization::

$$\alpha_k = \arg\max_l [p(l|k)], \tag{4}$$

where $p(l|k)$ means the probability that a certain object from the segment R_k belongs to the class l – formula (4) says that in the segment R_k the feature y takes the value l, which occurs most frequently.

The division of the multidimensional feature space $\boldsymbol{X}^m$ in the classification problem is done in order to obtain disjoint fragments (segments) of this space R_k - multidimensional cubes in which there are objects belonging to the same class represented by the dependent feature y, taking the values $l = 1, \dots, L$.

The entire analysis is carried out on the training set U, which contains correctly classified objects, and thus on its basis it is possible to find the characteristics of individual classes (model). In the next step, the discovered rules are used to classify new objects (new sets) for which class membership is unknown. Classification trees, as an exploratory method, require a large number of cases (observations) to be analyzed in order to be able to "learn the rules of discrimination" on the basis of the training set, and use the resulting model to classify new objects - the recognized set (Loh 2009, p.1715).

The main advantage of the adopted method is that there is no need to know the distribution of explanatory features (indicators) or the analytical form of the relationship between these features and the dependent feature. The model can use both quantitative and qualitative features and it is not sensitive to missing data, which enabled the inclusion in the study of data that had not been reported throughout the study period.

Results

The study of the impact of intellectual capital on the competitiveness of banks in Poland was conducted on the basis of financial and non-financial data of 10 commercial banks for the years 2009-2020. The database consisted of 26 acceptable indicators, which are presented in Table 1.

The basis for the analysis of banks' competitiveness based on classification trees were the results (places) of the synthetic measure of banks' competitiveness built by the author - ranking 5 (Table 2) - recognized as the optimal solution (author's weights, zeroed unitarization). The three best banks in a given year (places 1-3 in the ranking) formed group A; further banks ranked 4-7 in the tree-based analysis constituted group B; while the last three banks in the ranking (places 8-10) formed group C (Table 3). Thus, a qualitative dependent variable "*Group of banks (method 5)*" was created, which is the basis for the classification. The aim of the analysis was to find rules which, on the basis of diagnostic indicators used in the construction of the synthetic measure (competitiveness), would allow to classify banks into separate groups (A, B, C). Nevertheless, an additional effect of the analysis is the grouping of banks into homogeneous / or almost homogeneous groups - the results in the terminal nodes of the tree (leaves of the tree). The analysis using the STATISTICA 13 software was performed on the entire dataset (2009–2020), i.e. 120 observations.

As the optimal result, the STATISTICA program indicated tree no. 3, containing 7 terminal nodes (Table 4). Finally, the author chose tree No. 2 with 9 terminal nodes - having the same (smallest) cross-validation error SK=0.2833, but giving a lower overall classification error of 0.125 (cost of resubstitution - 12.5%). As a result of the analysis, a classification tree was obtained with a relatively low classification error, having 9 terminal nodes - thus giving 9 classification rules. The classification rules are therefore as follows (the description has been rounded to two decimal places to improve readability):

- Rule 1 (X1, X5): If the "return on assets [ROA]" is less than or equal to 0.47% and the share of "bank loans/in banking sector loans [L/SL]" is less than or equal to 5.68%, then these are banks from group C (node 4) – classified ranked 8th–10th;
- Rule 2 (X1, X5): If the "return on assets [ROA]" is less than or equal to 0.47% and the share of "bank loans/in banking sector loans [L/SL]" is greater than 5.68%, then are banks from group B (node 5) - classified in the rankings on the 4th-7th place;
- Rule 3 (X1, X15, X14, X15a): If the "return on assets [ROA]" is greater than 0.47% and the share of "bank branches/banking sector branches

[B/SB]" is less than or equal to 14, 08% and "value of training/total value of employee benefits [T/TB]" is less than or equal to 3.49% and "number of branches per 10,000 customers [B/C]" is less than or equal to 0.42, these are banks from group C (node 12) - classified in the rankings on the 8th-10th place;

- Rule 4 (X1, X15, X14, X15a): If the "return on assets [ROA]" is greater than 0.466% and less than or equal to 1.34% and the share of "bank branches/in banking sector branches [B/SB] is less than or equal to 14.08% and "training value/total value of employee benefits [T/TB]" is less than or equal to 3.49% and "number of branches per 10,000 customers [B/C]" is greater than 0.42, these are banks from group B (node 14) - classified in the rankings on the 4th-7th place;
- Rule 5 (X1, X15, X14, X15a, X7): If "Return on Assets [ROA]" is greater than 1.34% and the share of "bank branches/in banking sector branches [B/SB]" is less than or equal to 14.08% and "value of training/total value of employee benefits [T/TB]" is less than or equal to 3.49% and "number of branches per 10,000 customers [B/C]" is greater than 0.42 and the share "customers actively using online banking/total customers (in %) [EB/C]" is less than or equal to 49.73%, these are banks from group B (node 11) - classified in the rankings on the 4th-7th place ;
- Rule 6 (X1, X15, X14, X15a, X7): If the "return on assets [ROA]" is greater than 1.34% and the share of "bank branches/in banking sector branches [B/SB]" is less than or equal to 14.08% and "value of training/total value of employee benefits [T/B]" is less than or equal to 3.49% and "number of branches per 10,000 customers [B/C]" is greater than 0.42 and the share “customers actively using online banking/total customers (in %) [EB/C]” is greater than 49.73%, these are banks from group A (node 25) – ranked 1-3 in the rankings;
- Rule 7 (X1, X15, X14, X15a): If the "return on assets [ROA]" is greater than 0.47% and the share of "bank branches/banking sector branches [B/SB]" is less than or equal to 14, 08% and "value of training/total value of employee benefits [T/TB]" is greater than 3.49% and "number of branches per 10,000 customers [B/C]" is less than or equal to 0.66 these are banks from group B (no. 26) - classified in the rankings on the 4th-7th place;
- Rule 8 (X1, X15, X14, X15a): If the "return on assets [ROA]" is greater than 0.47% and the share of "bank branches/banking sector branches [B/SB]" is less than or equal to 14, 08% and "value of training/total value of employee benefits [T/TB]" is greater than 3.49% and "number of

branches per 10,000 customers [B/C]" is greater than 0.66, these are banks with group a (no. 27) - classified in the rankings on the 1st-3rd place;

– Rule 9 (X1, X15): If the "return on assets [ROA]" is greater than 0.47%, and the share of "bank branches/banking sector branches [B/SB]" is greater than 14.08%, these are banks from group A (node 9) – ranked 1–3 in the rankings.

It is also worth paying attention to the order in which the indicators appear in the tree chart and the number of nodes. Economic capital indices (X1, X5) were used as the first to discriminate banks - left branch, which helped to classify 36 bank ratings (nodes 4-5, containing 30% of observations). Subsequently, organizational capital indicators (X15, X15a) – a branch of law, which helped classify 13 bank ratings (node 9, containing 11% of observations). Then, in the middle part of the tree, in conjunction with the indicator from the innovative capital layer (X14) and further from the ORG, EC and INN layers, 71 bank ratings could be classified (nodes 12, 14, 24-27, containing 59% of observations). Based on this type of tree chart analysis, it can be concluded that in assessing the competitiveness of banks (as well as in explaining their belonging to the appropriate group A, B, C) the key factors (in order) were indicators from the economic capital (EC), organizational (ORG)) and innovative (INN), and indicators from the layer of institutional capital (INS) were not taken into account at all.

Conclusions

The concept of competitiveness is addressed in most economic schools and is constantly evolving. In recent decades, in the works of various authors, the impact of the potential of intangible resources on achieving a stable, long-term competitive position in a dynamically changing environment is increasingly emphasized. Emphasizing the key role of the bank's intellectual capital as a determinant of competitiveness in empirical research by various authors meant that the IC concept became part of the theory of managing banks as enterprises. Bank managers focus in particular on the development of innovative products and services, customer satisfaction, flexible organizational structure, systematic modernization, including making the management system more flexible, and above all, finding a way to accelerate the ability to adapt to changes. The dynamics of the environment is growing at an ever-increasing pace, and entities incapable of capturing the latest trends lose their market positions. An important observation made in the course of the conducted research is that the multidimensionality of in-

tellectual capital means that there is no adopted uniform reporting structure and IC measurement methods. Taking this into account, based on reports on the activities of the management board and the so-called In the social reports of the banks, indicators defining each of the layers of capital were created, so that they were comparable in the light of uniform parameters available for all examined facilities (10 banks) throughout the entire research period (2009-2020).

The analysis carried out using classification trees also revealed the key role of economic capital as the basis for the bank's development, because when determining the banks' affiliation to each group A, B, C (according to their places in the competitiveness ranking), the indicators from the layer of economic capital (EC), organizational capital (ORG) and innovative (INN). Therefore, the assessment of a bank's competitive position requires a multidimensional assessment of all layers of capital accumulated by the bank (including economic capital and subsystems of intellectual capital).

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Annex

Table 1. Accepted indicators included in the study

Capital	Symbol	Name	The nature of the indicator
KE	X1	ROA	S
KE	X2	ROE	S
KE	X3	NIM	S
KE	X4	CIR	D
KE	X5	loans / loans sector (L / SL)	S
KE	X6	sector deposits / deposits (D / SD)	S
INN	X7	number of clients actively using internet banking / number of clients (EB / C)	S
INN	X8	number of clients actively using the mobile application / number of clients (MB / C)	S
ORG	X9	employee benefits / number of employees (C / E)	S
KE	X10	profit / number of employees (P / E)	S
KE	X11	sales revenues / assets (S \ A)	S
INS	X12	Ranking Bankier-place in the ranking	D
INS	X12_a	Banker ranking - results in the overall ranking	S
INN	X14	value of training / employee benefits (T / C)	S
ORG	X15	number of branches / number of branches sector (B / SB)	S
ORG	X15_a	number of branches / number of clients (B / C)	S
KE	X16	capital adequacy ratio	S
KE	X17	ROS	S
ORG	X18	number of clients / number of employees (C / E)	D
INN	X19	training value / number of employees (T / E)	S
KE	X20	loans / deposits (L / D)	N
KE	X21	assets / sector assets (A / SA)	S
INS	X22	number of awards granted (INC)	S
INS	X22_a	number of awards granted / number of awards commercial banks	S
INS	X23	good CSR (GP) practices	S
INS	X23_a	good CSR practices / good practices commercial banks	S

Table 2. Synthetic measure and ranking of banks using the system of author's weights and zero unitarization

Bank	2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020	
	KB	R	KB	R	KB	R	KB	R	KB	R	KB	R	KB	R	KB	R	KB	R	KB	R	KB	R	KB	R
Alior Bank	0,2565	10	0,4003	8	0,4044	7	0,4405	8	0,3706	8	0,4073	8	0,4478	6	0,4132	7	0,4776	7	0,4138	8	0,2645	9	0,3268	9
BNP Paribas	0,4178	6	0,2965	9	0,2578	10	0,2850	9	0,2706	9	0,3449	9	0,4244	9	0,3200	10	0,3424	9	0,4358	7	0,4439	6	0,6183	3
BOŚ	0,3143	9	0,2729	10	0,2920	9	0,2517	10	0,2216	10	0,2435	10	0,2790	10	0,3693	9	0,3229	10	0,2158	10	0,1877	10	0,2025	10
Citi Handlowy	0,5791	3	0,5351	5	0,5408	4	0,5870	3	0,5294	5	0,4671	7	0,4459	7	0,3879	8	0,4134	8	0,4887	6	0,3833	8	0,4319	8
ING Bank	0,5598	4	0,5421	4	0,4866	5	0,5442	5	0,5870	3	0,4980	4	0,6215	3	0,5242	4	0,5406	4	0,6126	2	0,5005	3	0,6729	1
mBank	0,3816	7	0,5274	6	0,4329	6	0,4950	6	0,5011	6	0,4694	6	0,4437	8	0,4625	5	0,5044	6	0,5001	4	0,4624	5	0,4976	7
Millenium Bank	0,3789	8	0,4632	7	0,3579	8	0,4839	7	0,4653	7	0,4915	5	0,5085	5	0,5528	3	0,5556	3	0,5333	3	0,4403	7	0,5416	5
Pekao Bank	0,6629	2	0,5909	2	0,5654	3	0,5482	4	0,5309	4	0,5157	3	0,5543	4	0,4500	6	0,5294	5	0,3983	9	0,4842	4	0,5477	4
PKO BP	0,6947	1	0,7112	1	0,6814	1	0,7025	1	0,6447	1	0,6515	1	0,6824	1	0,6396	1	0,6997	1	0,6134	1	0,6712	1	0,6681	2
Santander Bank	0,4993	5	0,5552	3	0,6269	2	0,6318	2	0,6118	2	0,6266	2	0,6391	2	0,5898	2	0,6208	2	0,4942	5	0,5570	2	0,5048	6

Annotation. KB – value of the synthetic measure of banks' competitiveness, R – position in the ranking.

Table 3. Groups of places based on the optimal ranking (ranking 5)a

Bank	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	R	R	R	R	R	R	R	R	R	R	R	R
Alior Bank	C	C	B	C	C	C	B	B	B	C	C	C
BNP Paribas	B	C	C	C	C	C	C	C	C	B	B	A
mBank	B	B	B	B	B	B	C	B	B	B	B	B
Citi Handlowy	A	B	B	A	B	B	B	C	C	B	C	C
ING Bank	B	B	B	B	A	B	A	B	B	A	A	A
Millenium Bank	C	B	C	B	B	B	B	A	A	A	B	B
Pekao Bank	A	A	A	B	B	A	B	B	B	C	B	B
PKO BP	A	A	A	A	A	A	A	A	A	A	A	A
Santander Bank	B	A	A	A	A	A	A	A	A	B	A	B
BOŚ Bank	C	C	C	C	C	C	C	C	C	C	C	C

Table 4. STATISTICA 13. Analysis results - tree sequence

	Final nodes	SK cost	SK error	Redistribution cost	Complexity node
Tree 1	12	0,33333	0,043033	0,10000	0,0000000
Tree 2	9	0,28333	0,041136	0,12500	0,0083330
Tree 3	7	0,28333	0,411136	0,15000	0,0125000
Tree 4	5	0,31667	0,042465	0,20000	0,0250000
Tree 5	4	0,32500	0,042757	0,23333	0,0333330
Tree 6	3	0,35000	0,043541	0,30000	0,0666670
Tree 7	2	0,41667	0,045005	0,40833	0,1083330
Tree 8	1	0,60000	0,044721	0,60000	0,1916670

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Participatory budgets in a COVID-19 time: The village fund in Poland

JEL Classification: *H72; O35; Q01*

Keywords: *village fund; public participation; rural areas; participatory budgeting*

Abstract

Research background: the processes of public participation in rural areas in Poland can take various forms, but one of the most common is village fund. In the literature, it has been subjected to various analyses (paying attention to, among other things, legal, financial, or sociological aspects), which gives an accurate picture of it from the period before COVID-19. In contrast, so far no research has been undertaken on the changes that occurred in the functioning of village funds during the pandemic period.
Purpose of the article: The purpose of the article is to examine how the functioning of village funds changed during the COVID-19 pandemic. Specifically, in terms of the changes in scale and directions of disbursements.
Methods: The article uses statistical analysis of data on the scale and directions of expenditures of Polish municipalities from village funds in 2019-2021.
Findings & Value added: The analysis conducted indicates a relatively small decrease in the use of village funds during the Covid-19 pandemic in the studied group of municipalities. In a large part of municipalities the structure of village fund expenditures changed. We can distinguish three main areas of spending between which there were shifts. This mainly concerned a reduction in spending on cultural and social activities in 2020. It was pointed out that to some extent the implementation of village funds during the pandemic may be due to the low flexibility of this solution. An important added value of the article is that it comple-

ments the achievements of the theory of public participation with the empirical context of the functioning of participation mechanisms in times of crisis

Introduction

The Covid-19 pandemic has disrupted the financial management of Polish municipalities - in particular, affecting a reduction in their revenues and an increase in expenses related to the need to counteract the risks associated with it. Local governments therefore faced a significant challenge which was to adjust their financial management to the new situation. One of the areas of spending is projects selected by residents based on public participation processes. It should be noted that the use of various forms of public participation by the public administration is expected to increase its resilience to the occurrence of adverse phenomena in turbulent times. At the same time, it is supposed to increase the efficiency of its operations and improve the effectiveness of public spending by matching the types and scope of services provided to the needs of citizens (Barbera, Sicilia, & Steccolini, 2016; Creighton, 2005).

One of the most widely used forms is the participatory budget (PB) (Dias, 2018). In Poland, it is a process found mainly in cities, while in rural areas there may be a parallel alternative solution - the village (sołecki) fund (Feltynowski & Rzeńca, 2019). Both of the aforementioned solutions have been legally regulated in Poland, with the application of the village fund (FS) being limited to small local communities in rural areas (solectwo). The meaning, functions and mechanism of the FS have already been described and analyzed quite thoroughly in the scientific literature (Bednarska-Olejniczak, Olejniczak, & Svobodová, 2020; Feltynowski, 2020; Olejniczak & Bednarska-Olejniczak, 2019; Sześciło & Wilk, 2018). Therefore, it is only necessary to highlight its most important features:

- discretionary creation dependent on the municipal authorities (non-obligatory in the creation phase),
- the vital importance of the village assembly, the activity of residents and the bottom-up nature of the process,
- the occurrence of co-creation and co-production of public services through the possibility of residents' involvement in its implementation at each stage of the process,
- separation of funds (in the statutorily imposed minimum amount) from the municipal budget for tasks indicated by local communities (depletion of financial resources of the municipality),

- targeting expenditures on activities that coincide with the municipal development strategy and serve to improve the quality of life of residents,
- limited possibility to change the direction and scale of the adopted expenditures (only by the local community) and therefore limited resistance to sudden crisis situations.

In the case of participatory budgets in Poland, research has indicated a significant reduction in the number of municipalities using them, changes in spending directions, and a decrease in their scale (Baranowski, 2020; Olejniczak & Bednarska-Olejniczak, 2021). However, no similar study has been conducted to date with regard to FS. This raises the question of whether similar developments can be observed in their case. As mentioned above, expenditures from the FS are non-obligatory at the planning stage, are characterized by limited flexibility at the spending stage, and deplete the municipality's financial resources in a given fiscal year. On the other hand, the occurrence of changes can be a consequence of both the actions of municipal authorities and the activity of residents. It should be noted that the process of deciding on the establishment of a FS, determining the direction of spending and deciding on spending and then implementing the expenditure is stretched over time and decisions made in one year have their consequences only in subsequent years (Fig. 1). In practice, there are time frames in which each of the mentioned parties has the ability to influence the operation of the FS and adjust its spending structure to the changing needs of the residents.

Thus, the research was aimed at checking whether and how, as in the case of PB in cities, the use of village funds by municipalities during the pandemic has changed. Therefore, the following research questions were raised in the paper:

RQ1. *What changes have occurred in the level of use of village funds in 2019-2021 in each region and in the country?*

RQ2. *Have there been any changes in the directions of spending village funds, and what kind of changes?*

RQ3. *Did the change in the direction of spending mean that other directions of spending were abandoned?*

RQ4. *Did the changes occur at the beginning of the pandemic (2020) or only in the following year (2021)?*

Research methods

Due to the research questions posed and the aim of the article, the paper, in addition to the short literature review, primarily uses statistical analysis of data on municipal spending from FS during 2019-2021 period. The reference point is the year 2019 due to the fact that it reflects the observable proportions between the various directions of spending from 2016-2019 period, which, despite the increase in the total number of municipalities implementing village funds, were characterized by high stability. The data was obtained from the Central Statistical Office Local Data Bank (GUS BDL). The analysis covered all urban-rural and rural municipalities in Poland (2175). The following stages of the research were carried out:

- analysis of changes in the percentage of municipalities implementing the FS, taking into account the breakdown by region and type of municipality (RQ1),
- analysis of the main directions of spending of FS taking into account the main budget classifications in subsequent years (RQ2),
- analysis of the structure and changes in the main directions of expenditure of funds taking into account the main budget classifications for each municipality (RQ3, RQ4).

Due to the formula for calculating the financial means for spending of the FS in each municipality, which ties their basic size to the level of revenues of the municipality, the scale of the means involved was not analyzed. In practice, in most municipalities it does not exceed 1% of total spending.

The main limitation of the study was the lack of access to data on planned expenditures from municipal budgets within the framework of village funds in subsequent years, which limited the possibility of identifying changes occurring during the fiscal year.

Results

There are two types of municipalities in Poland that are allowed by law to use village funds. These are rural municipalities and urban-rural municipalities. In both of these types, village funds can only apply to auxiliary units such as sołectwo (usually consisting of one or more villages). The first stage of the data analysis compares the use of village funds nationally and regionally by type of municipality. The results of the analysis are presented in the table 1. The data from the Ministry of Finance and the Central Statistical Office show that until 2019 there was a systematic increase in the number of municipalities that implemented village funds. Nationwide, the

percentage of municipalities using village funds declined slightly in 2020 - 2021 compared to earlier years. On the other hand, one can see definite differences in the directions of change and the scale of the use of the village fund in different regions. In the period studied, only 50% of the surveyed municipalities in the Łódzkie and Podlaskie Voivodeships implemented village funds, both of which saw a decline in their percentage in subsequent years. In contrast, the highest percentage of municipalities with village funds was recorded in the Opolskie (90%) and Podkarpackie (above 84%) Voivodeships. It should be noted that the other regions with an initially high percentage of municipalities implementing village fund expenditures tended to record a decrease in this percentage. Analysis of the data also showed that the percentage of rural municipalities using the village fund is significantly lower than that of urban-rural municipalities in each region.

Table 2 shows the main directions of municipal spending from village funds in each year. The table includes counted for each municipality the three main directions of spending (places I-III) according to the budget classification. It should be noted that in the following years (despite the decrease in both 2020 and 2021 compared to 2019) the most common top category of spending was transportation and communications (label:600). This expenditure was also very often recorded as the second most important direction, but it is apparent that the importance of this expenditure is decreasing in subsequent years. On the other hand, the second most frequent expenditure top category was spending on culture and national heritage protection (label: 921). In this case, the decreasing importance of this direction of spending was also noted. Next, expenditures in the area of municipal management and environmental protection (label: 900) were gaining importance.

The ability to identify the three main nationwide groups of expenditures (600, 900, 921) made it possible to compare the importance of these expenditures for municipalities in each region. There are significant differences between provinces in particular in the importance of transportation and communications expenditures. In the municipalities of the regions of western and southwestern Poland, the importance of that expenditures appears to be lower than in the rest of Poland.

The occurrence of changes in the importance of the directions of spending in individual municipalities raises the question of the directions of reallocation of funds in subsequent years. Between 2019 and 2020, the most frequent shifts in expenditure directions were seen from culture and national heritage protection (921) to municipal management and environmental protection (900, in 56 municipalities). The next pair was expenses from transportation and communications (600) being replaced by expenses for

the culture and national heritage protection (921, 45 municipalities) and municipal management and environmental protection (900, 44 municipalities). For a similar analysis of changes between 2020 and 2021, there are not such significant shifts.

The analysis of data on "shifts" between major expenditure categories was supplemented by a summary of the most common combinations of expenditure pairs with the highest shares in each municipality in successive years - table 3 (about 3/4 of all combinations occurring in municipalities).

Definitely among the most significant categories of spending from village funds appearing in most local governments were culture and heritage (921) and transportation and communications (600), within the dominant five spending categories - occurring annually in about 800 "pairs." In the case of the former, there was a significant decrease in the number of "pairs" with their share in 2021. In the next place, it is possible to indicate the municipal management and environmental protection (900) expenditures whose occurrence in the combination of the two main expenditures in each municipality increased by more than 10% in the period 2020-2021 compared to 2019.

Conclusions

Based on the results presented, it is possible to indicate that it is observable that there has been a slight decrease in the percentage of municipalities using the village fund - from 71% to 68% that had possibility to implement this tool. This means that, in contrast to PB in Polish cities, the use of village funds as a tool for public participation in municipalities was maintained during the pandemic (RQ1).

At the same time, the breakdown by region shows both increases and decreases in the percentage of municipalities implementing village funds. This may indicate varying perceptions of the positive and negative consequences of village funds under crisis conditions. It may also be the result of the inertia of the adopted solutions (especially between 2019 and 2020). Nevertheless, in most regions there was a decrease in the percentage of municipalities with village funds in 2021 compared to 2019 at the same time as this was independent of the earlier percentage of municipalities implementing village funds in 2016-2019 (RQ1).

Despite the gradual changes taking place in the structure of the main directions of spending, it should be noted that in the vast majority of municipalities the changes were not radical. The research showed that changes in the structure took place mainly between the three directions of spending -

transportation and communications, culture and national heritage protection and municipal management and environmental protection, and the largest scale of changes was recorded between 2019 and 2020 (RQ2). Interestingly, the direction of change was not uniform, and the structure varied from region to region. It can be assumed that these changes were usually due to residents' decisions made during 2020 due to pandemic restrictions.

The data on the share of each direction of spending in total spending from the village fund in each municipality indicate that despite the changes made, there was only a partial change in the direction of spending (RQ3).

The analysis of the directions and scale of changes clearly indicates that in 2020 there were mainly changes consisting of shifts between the various directions of spending with almost no abandonment of village funds. While in 2021 the number of municipalities that abandoned the creation of village funds increased (RQ4).

In conclusion, it can be said that the scale and directions of use of village funds by municipalities during the pandemic period indicate that most municipalities are willing to maintain the use of village funds even under pandemic conditions, only adjusting the directions of spending to the emerging constraints.

It should be noted that the presented research results are only an analysis of quantitative data, while it would be cognitively important to supplement them with an analysis of the rationale for changes and reasons for abandoning village funds. Such research is planned as the next stage of the analysis.

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Annex

Figure 1. Key moments of village fund decision process

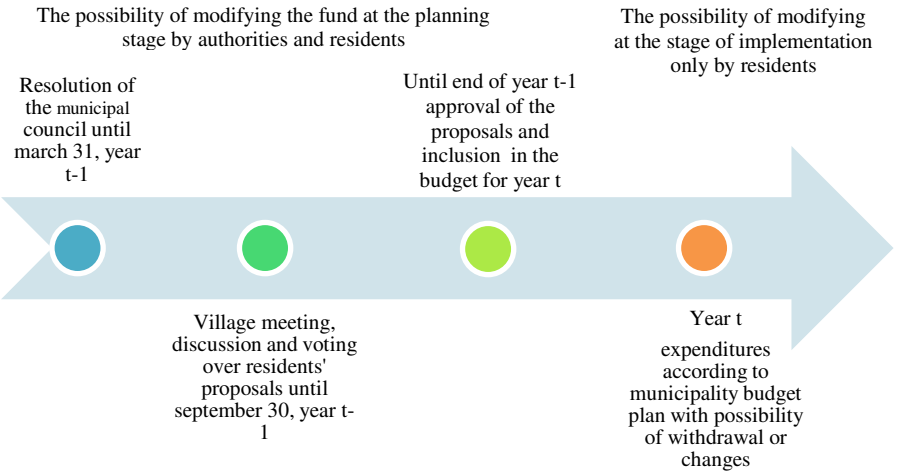

Table 1. Percentage of municipalities implementing village fund in 2019-2021 period (%)

Type of municipality	All			Urban-rural			Rural		
Region	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
Dolnośląskie	80	81	75	88	91	88	75	74	66
Kujawsko-Pomorskie	81	79	74	89	86	83	78	76	71
Lubelskie	69	75	71	71	79	80	69	74	69
Lubuskie	78	84	78	82	82	82	74	85	74
Łódzkie	52	54	47	85	79	68	46	49	43
Małopolskie	69	67	66	77	71	73	66	65	63
Mazowieckie	68	63	60	85	85	88	63	57	52
Opolskie	90	90	90	100	100	100	80	80	80
Podkarpackie	86	84	87	91	89	89	84	83	86
Podlaskie	51	52	46	78	70	63	42	46	40
Pomorskie	73	76	76	90	90	90	69	73	73
Śląskie	71	73	73	86	86	82	68	70	71
Świętokrzyskie	55	60	56	63	67	65	49	55	49
Warmińsko-Mazurskie	81	76	75	94	94	91	74	67	67
Wielkopolskie	79	78	75	81	83	79	78	74	72
Zachodniopomorskie	63	59	61	67	65	71	57	51	49
Poland	71	71	68	82	82	81	67	66	63

Source: own calculation based on data from BDL GUS.

Table 2. Distribution of top 3 main expenditure areas from village funds (selected, number of units)

	2019			2020			2021		
Area	**I**	**II**	**III**	**I**	**II**	**III**	**I**	**II**	**III**
010 - Agriculture and hunting	16	55	95	21	16	25	16	16	32
600 - Transport and communications	607	341	236	557	355	236	590	307	245
630 - Tourism	1	5	2	2	0	7	5	1	4
700 - Housing management	45	69	90	49	77	81	48	70	66
750 - Public administration	15	26	40	11	14	30	8	15	32
754 - Public security and fire protection	32	109	193	45	109	217	33	104	188
801 - Education and upbringing	12	36	77	19	29	76	17	25	54
900 - Municipal management and environmental protection	251	334	333	309	357	335	294	357	345
921 - Culture and national heritage protection	481	384	227	441	396	235	391	382	251
926 - Physical culture	86	175	227	88	155	210	82	169	177

Source: own calculation based on data from BDL GUS.

Table 3. Most frequent "pairs" of expenditures areas (number of units)

	2019					2020					2021				
1st/2nd	**600**	**754**	**900**	**921**	**926**	**600**	**754**	**900**	**921**	**926**	**600**	**754**	**900**	**921**	**926**
600	0	56	162	232	46	*0*	*57*	*167*	*198*	*48*	0	59	185	201	59
754	13	0	4	4	3	15	0	5	12	9	10	0	11	6	4
900	89	18	0	100	22	108	22	0	136	18	100	16	0	123	28
921	181	26	143	0	95	173	18	143	0	75	144	17	133	0	74
926	21	3	18	33	0	20	4	22	31	0	21	4	13	32	0

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Natural resource funds: Essence and classification

JEL Classification: *F21; O11; O23; Q32; Q38*

Keywords: *natural resource funds; stabilization funds; savings funds; future generations funds; resource curse*

Abstract

Research background: Countries rich in natural resources are achieving worse results in economic development compared to ones whose resources are negligible. This phenomenon is known as the resource curse and occurs commonly worldwide. In order to solve the problem of the resource curse, an explicit fiscal tool, the natural resource fund, was proposed. However, studies on the nature of resource funds conducted so far have delivered mixed and inconclusive results. One of the reasons for such a state of affairs is the fact that over time, the form and objectives of natural resource funds have changed significantly. The lack of a uniform, up-to-date classification of natural resource funds makes conducting reliable research difficult.
Purpose of the article: The aim of the study is to classify natural resource funds and explain the essence of their types.
Methods: In order to achieve aim of the study an extensive literature review was undertaken. A detailed analysis of individual natural resource funds types was carried out. For this purpose, 52 resource funds were thoroughly examined. Qualitative, conceptual and comparative assessment of natural resource funds was also engaged.
Findings & Value added: The main contribution of this study is providing the current classification of natural resource funds and explaining the essence of individual types of funds. Savings funds are the least researched funds in the subject literature. The conducted study shows that savings funds, or future generations' funds, which are one specific type of natural resource funds, are recently becoming an increasingly popular tool used in resource-rich countries. Savings funds are playing an important role both in counteracting the resource curse and in the inter-

national financial market. They often replace previously established stabilization funds or are created in addition to them. At the same time, it should be noted that saving funds are established in both advanced and, more and more often, in emerging, developing economies.

Introduction

The concept of the resource curse was first introduced by Auty (1993) and refers to the phenomenon of achieving worse economic development outcomes by countries specializing in exporting natural resources compared to the countries with low resource endowments. Since the early 1950s, many studies have been conducted to analyze this phenomenon from macroeconomic, political, and social perspectives. Based on research results existing in the literature, it can be concluded that the resource curse is not a law, but rather a visible tendency that occurs in many resource-rich countries, and represents a significant barrier to their long-term, stable development.

Over the past few decades, various measures have been considered for countries whose economy is based on natural resources to counteract the resource curse. Many solutions have been proposed, ranging from the radical ones such as discontinuing resource extraction in countries affected by the curse, to milder ones concerning monetary, fiscal, and investment policies, as well as controversial ones like the use of citizen's fund policies. One of the proposed solutions is also the implementation of an active national resource fund policy. When evaluating the current literature on the resource curse, it should be noted that there has been a significant increase in interest in the importance of the last mentioned economic policy measure. This is mainly due to the success of some resource funds as well as their growing importance in the global financial market.

In recent years, several interesting studies have been conducted on the effectiveness of natural resource funds in counteracting the resource curse (incl. Shabsigh & Ilahi 2007; Ossowski *et al*., 2008; Bagattini, 2011; Tsani, 2015; Sugawara, 2014; Ouoba, 2016; Allegret *et al.*, 2018; Taguchi & Ganbayar, 2022). However, the results of these studies are not clear. Some confirm the effectiveness of the funds, while others provide necessary conditions, such as high governance and robust fiscal rules, for effective functioning of the funds. There are also research that question the effectiveness of natural resource funds.

In the meantime, there has been significant development in the concept of functioning of resource funds. The stabilizing role of funds, which played an important role in case of initial forms of natural resource funds,

has been expanded in order to include a developmental function (otherwise known as long-term development). Additionally, the developmental function refers to both investment and savings functions (otherwise known as long-term savings).

Most of the studies conducted so far have focused on the stabilizing function of resource funds. There is only a limited number of studies on the effectiveness of growth (developmental) funds, including investment funds and, in particular, savings funds. At the same time, the results of the conducted research are not conclusive. The literature emphasizes the importance of further research in this area (e.g. Taguchi & Ganbayar, 2022).

One of the barriers to conducting reliable research on the effectiveness of funds is the lack of a uniform classification of funds and appropriate, up-to-date allocation of existing funds to specific types.

For this reason it was decided to conduct a detailed analysis of the essence of individual types of funds in order to provide their classification and categorization, which is the main objective of this study. Formulation of such an aim is supported by the fact that in previous studies, attention was primarily focused on the stabilization function. At the same time many researchers emphasize the need for deepening research on the savings function of resource funds.

The paper consists of two parts preceded by an introduction and summarized by a conclusion. The research methods used to assess the role of individual funds in countering the resource curse were presented in a sequential order, followed by the results concerning the classification and categorization of natural resource funds.

Research methods

This section clarifies the methodology used in order to assess the essence of natural resource funds in the context of counteracting the resource curse. The study is of a theoretical character. In order to achieve the aim of the study an extensive literature review was undertaken. For the purpose of analysis, the data was extracted from various international databases, such as Web of Science, Science Direct (Elsevier), ProQuest and EBSCO. Based on the same set of keywords, namely: natural resource funds, savings funds, stabilization funds, growth funds, resource curse, economic development, 37 studies were identified. 24 of them focused on descriptive analyses of natural resource funds, while 15 were quantitative analyses. Several studies conducted both quantitative and qualitative analysis.

Among the quantitative studies, 10 focused on a group of resource-rich countries, while the remaining ones included case studies of specific countries or conducted general analysis without concentrating on a particular group of resource-rich countries. Out of the examined literature, only 12 were related to the importance of growth funds, including savings and investment funds, for the development of resource-rich countries. The effectiveness of investment and savings funds was examined in only one quantitative study (Taguchi & Ganbayar, 2022). In case of the remaining studies, the focus was mainly on the importance of the stabilizing function of resource funds.

Based on the collected materials, a list of 48 natural resource funds was provided (Table 1), which were then subjected to analysis. Qualitative, conceptual, and comparative assessment of individual resource funds was engaged in order to understand the natural resource fund-specific concepts and present the appropriate, up-to-date classification and categorization of the resource funds.

In order to achieve research aim, mostly foreign literature (in English) was examined. Materials provided by international organizations such as the World Bank, International Monetary Fund, The Organisation for Economic Cooperation and Development, World Economic Outlook, Natural Resource Governance Institute, International Forum of Sovereign Wealth Funds, Sovereign Wealth Fund Institute were also taken into account.

Results

The main results of the conducted study are presented in Table 1.

Based on a detailed analysis of 48 natural resource funds, it is necessary to identify their following types: stabilization funds and growth funds (otherwise known as development funds and long-term development funds). Among the growth funds, there are typically investment funds, which aim to multiply the capital obtained from the sale of resources, and savings funds, also known as long-term savings funds or funds for future generations. It is noteworthy that all savings funds are also investment funds. However, long-term savings for future generations are not mentioned within the goals of typical investment funds, so they constitute a separate form of growth funds. Growth natural resource funds represent a new tool of economic policy of the state aimed at efficient use of the funds obtained from the sale of natural resources and countering the negative effects of the resource curse.

Among the examined funds, 16 are exclusively stabilization funds, 9 are exclusively investment funds, and 2 funds have both stabilization and investment roles assigned to them. There are 21 savings funds. 12 of them are funds that combine investment and savings functions. Nine of them perform all functions - stabilization, investment and savings. In Chile, Ghana, and Nigeria, two separate funds were established: a stabilization fund and a savings fund. In Saudi Arabia, there are several investment funds, while in the United States, there are several investment and savings funds.

The existing funds function in different ways. They differ in terms of the form of transferring funds to the fund, the forms and directions of subsequent investments, and the possibility of using the money of the fund to finance the state budget. Therefore, the conclusion is that there is no single universal form of a fund used in all countries rich in natural resources, which is a barrier to research their effectiveness in counteracting the resource curse. However, existing funds have some common characteristics. First of all, the motive for introducing stabilization, investment, as well as savings fund for future generations is the same in all examined funds. Additionally, the source of funding for all funds are strategic resources: fuel and/or minerals.

When analyzing the date of funds' establishment, an interesting relationship should be noticed in case of savings funds. Although the oldest savings fund among the analyzed ones, the Texas Permanent University Fund, was established in 1876, over 52% of the savings funds surveyed were created only after 2005, and over 38% after 2010 (Figure 1). Previously, most funds had a primarily stabilizing form. In the last decade, the form of some funds also has been changed from stabilization to stabilization and savings (e.g. Trinidad and Tobago Heritage and Stabilization Fund). The Copper Stabilization Fund of Chile was divided into two separate funds: a stabilization fund and a savings fund. This means that the savings form of a growth fund is a new tool. However, it has gained popularity in the last decade.

It is also increasingly being used in emerging and developing economies. Among the 18 countries where savings funds have been established, according to the International Monetary Fund classification, 3 are advanced economies, and 15 are emerging and developing economies. According to the World Bank classification, 7 are high-income economies, 5 are upper-middle-income economies, 5 are lower-middle-income economies, and one is a lower-income economy.

Attention should also be paid to the growing importance of resource-based sovereign wealth funds in the global financial market. They constitute a significant part of all sovereign wealth funds. According to data from

the Institute of Sovereign Wealth Funds (SWFI, 2023), the total value of assets managed by all SWFs in the world is around USD 10.430 billion, of which more than half are natural resource funds.

It should be noted that a resource savings fund plays a different role compared to a stabilization and investment fund, and its mechanism of operation is different. The main goal of establishing stabilization funds is to create a buffer between an unstable international market of natural resources (especially fuels) and the domestic market. The stabilization function of the fund is achieved by setting a price threshold for the exported raw material based on a detailed analysis of the market situation for the sale of a given raw material and the needs of the state budget. If the price exceeds the threshold, the surplus is accumulated in the fund's account. In a situation where the price falls below the established threshold, the resulting deficit is financed from the fund's resources. The money accumulated in the fund is most often invested both domestically and abroad in highly liquid securities (Dymitrowska, 2020).

The investment fund is an investment vehicle for the management of the natural resource capital payments generated from their extraction. Its main objective is to multiply the funds obtained from the sale of natural resources to enable the long-term development of the country. Funds can be invested both domestically and abroad.

The resource savings fund operates in a different way. The main assumption of the fund's operation is to allocate the proceeds from commodity exports to long-term, diversified domestic and foreign investments (and in some funds exclusively to foreign investments), so that the profit from sales can be used by both current and future generations. All or part of the proceeds from commodity exports are collected in the fund's account, regardless of their price levels in the international market. Only a portion of the investment income generated by the fund's activities is used domestically. The level of funds ultimately collected by the state from commodity sales for public investments is mainly dependent on the effectiveness of fund finance management rather than the situation in the global commodity market. Once natural resources in the country are depleted, the fund remains an instrument that generates revenue for future generations. In an economy primarily based on non-renewable resources, the savings fund generates renewable revenue. Therefore, the savings fund is a progressive concept that provides a source of renewable revenue for countries rich in natural resources. When commodity revenues diminish, the fund continues to grow.

Conclusions

This study aims to classify natural resource funds and explain the essence of their individual types based on an extensive literature review and detailed analysis of individual natural resource funds. This study presents the mere first stage of a process aiming at detailed qualitative and quantitative analyses of the effectiveness of resource funds for counteracting the resource curse.

Taking into consideration research results, two main types of resource funds should be distinguished: stabilization and growth (developmental) funds. Among the growth funds, there are typically investment funds and savings funds, also known as long-term savings funds or funds for future generations. All savings funds are also investment funds. However, there is no inverse relationship. Among the analyzed funds, there are specific types of them as well as mixed forms. The detailed categorization of resource funds is presented in Table 1.

It should be noted that savings funds have received the least attention in the literature, and the results regarding their effectiveness are inconclusive. Therefore, the material presented in this study is an added value, and the conclusions drawn can be used in further in-depth analysis of specific examples of natural resource savings funds.

Based on the study, it has been proven that savings funds are playing an increasingly important role both in combating the resource curse and in the international financial market. Through a detailed analysis of individual resource funds, it was found that the majority of savings funds were established after 2005, with over half being established after 2010. Therefore, this is a new tool, and its popularity has increased in recent years. At the same time, it should be noted that savings funds are established in both advanced and emerging, developing economies. The study confirms that the savings fund is a new policy measure and its role in counteracting the resource curse is important.

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Annex

Table 1. A list of natural resource funds

CC (MWF/ WB)	COUNTRY	NAME OF FUND	ESTABLISHED	TYPE OF FUND			ORIGIN
E/LMI	Algeria	Revenue Regulation Fund	2000		S		oil, gas
E/LMI	Angola	Fundo Soberano de Angola	2012	G	I		oil
A/HI	Australia	Western Australian Future Fund	2012	G	I		minerals
E/UMI	Azerbaijan	State Oil Fund of the Republic of Azerbaijan	1999	G	I/S	**FG**	oil, gas
E/UMI	Botswana	The Pula Fund	1993	G	I/S	**FG**	diamonds, minerals
E/HI	Brunei	Brunei Investment Agency	1983	G	I		oil, gas
E/LMI	Cameroon	Hydrocarbons price stabilization fund	1974		S		oil
A/HI	Canada, Alberta	Alberta Heritage Savings Trust Fund	1976	G	I	**FG**	oil, gas
E/HI	Chile	Pension Reserve Fund	2006	G	I	**FG**	copper
	Chile	Social and Economic Stabilization Fund	(1985) 2006		S		copper
E/UMI	Colombia	Fuels Prices Stabilisation Fund	(1995) 2007		S		oil
E/UMI	Equatorial Guinea	Fund for Future Generations	2002	G	I	**FG**	oil
E/UMI	Gabon	Sovereign Wealth Fund of the Gabonese Republic	1998	G	I	**FG**	oil
E/LMI	Ghana	Ghana Stabilization Fund	2012		S		oil
	Ghana	Ghana Heritage Fund	2012	G	I	**FG**	oil
E/UMI	Guyana	Natural Resource Fund	2019	G	I/S	**FG**	oil
E/LMI	Iran	National Development Fund	2011	G	I/S	**FG**	oil, gas
E/UMI	Kazakhstan	National Fund	2000		S		oil, gas, metals
E/LMI	Kiribati	Revenue Equalization Reserve Fund	1956		S		phosphates
E/HI	Kuwait	Reserve Fund for Future Generation	1976	G	I	**FG**	oil
E/UMI	Libya	Libyan Investment Authority	2006	G	I		oil
E/LMI	Mauritania	National Fund for Hydrocarbon Reserve	2006		S		oil, gas

Table 2. Continued

CC (MWF/ WB)	COUNTRY	NAME OF FUND	ESTABLISHED	TYPE OF FUND			ORIGIN
E/UMI	Mexico	Mexico Budgetary Income Stabilization Fund	2000		S		oil
E/LMI	Mongolia	Future Heritage Fund	2016	G	I	**FG**	minerals
	Mongolia	Fiscal Stability Fund	2011		S		minerals
E/LI	Nigeria	Nigeria Sovereign Investment Authority. Stabilization Fund	2011		S		oil
	Nigeria	Nigeria Sovereign Investment Authority. Future Generations Fund	2011	G	I	**FG**	oil
A/HI	Norway	Government Pension Fund Global	1990	G	I/S	**FG**	oil
E/HI	Oman	Oman Investment Authority	2020	G	I/S	**FG**	oil
E/LMI	Papua New Guinea	Papua New Guinea Sovereign Wealth Fund	2011	G	I/S	**FG**	gas
E/UMI	Peru	Fiscal Stabilization Fund	1999		S		oil, gas, minerals
E/HI	Qatar	Qatar Investment Authority	2005	G	I/S		oil, gas
E/UMI	Russia	Russian Reserve Fund	2008		S		oil, gas
E/LMI	Sao Tome and Principe	National Oil Account	2004		S		oil
E/HI	Saudi Arabia	Public Investment Fund	2008		I		oil
	Saudi Arabia	Monetary Agency	1974		I		oil
E/LMI	Timor-Leste	Timor-Leste Petroleum Fund	2005	G	I/S	**FG**	oil, gas
E/HI	Trinidad and Tobago	The Heritage and Stabilization Fund	(2000) 2007	G	I/S	**FG**	oil, gas
E/UMI	Turkmenistan	Stabilization Fund	2008		S		oil, gas
E/HI	United Arab Emirates	Abu Dhabi Investment Authority	1976	G	I		oil
A/HI	USA, Alabama	Alabama Trust Fund	1985	G	I		oil, gas
	USA, Alaska	Alaska Permanent Fund	1976	G	I	**FG**	oil
	USA, Louisiana	Louisiana Education Quality Trust Fund	1986	G	I		oil, gas
	USA, New Mexico	New Mexico State Investment Council	1958	G	I	**FG**	oil, gas
	USA, Norh Dakota	North Dakota Legacy Fund	2010	G	I	**FG**	oil, gas
	USA, Texas	Permanent University Fund	1876	G	I	**FG**	oil, gas, minerals

Table 3. Continued

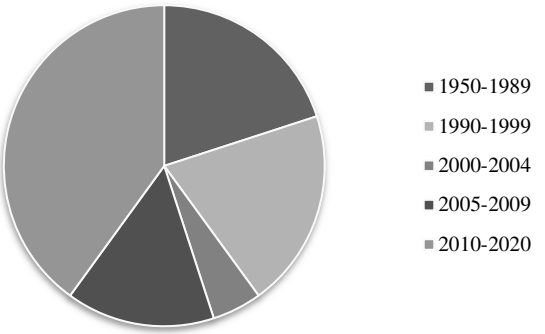
CC (MWF/ WB)	COUNTRY	NAME OF FUND	ESTABLISHED	TYPE OF FUND	ORIGIN
	USA, Wyoming	Permanent Wyoming Mineral Trust Fund	1975	G I/S	minerals
E/ND	Venezuela	Macroeconomic Stabilization Fund	1998	S	oil

G - growth fund, S - stabilization fund, I - investment fund, FG - savings (future generations) fund, A - advanced economies (MFW), E - emerging and developing economies (MFW), HI - high income economies (WB), UMI - upper middle income economies (WB), LMI - lower middle income economies (WB), LM - lower income economies (WB), ND - no data, CC - Country classification

Due to the lack of reliable data, the study did not include funds from four countries: Nauru, Chad, Ecuador, and Yemen.

Source: own study based on the data provided by the Natural Resource Governance Institute, International Forum of Sovereign Wealth Funds, Sovereign Wealth Fund Institute and official websites of individual funds.

Figure 1. Age of savings natural resource funds



Source: own study based on the data from Table 1.

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The role of accounting in non-financial reporting: Bibliometric perspective

JEL Classification: *M41; A12*

Keywords: *non-financial reporting; corporate social responsibility; management; bibliometric*

Abstract

Research background: The subject of financial reporting has been discussed for decades. The concept of non-financial reporting (NFR) arose later, and thus the study of this field began slightly later. This is currently a subject with great research potential. Both the multitude of studies of the scientific community and data obtained from business practice confirm the increase in the importance of non-financial reporting. A review of publications on this subject will indicate the state of this area of research. Particular attention will be paid to the role of NFR from an accounting point of view.
Purpose of the article: Evaluation of non-financial reporting as a new area of scientific research using bibliometric analysis of scientific publications indexed in the Web of Science database.
Methods: As part of the research, an analysis of the number of publications and the number of citations, and keyword statistics will be carried out. The database of the Web of Science, VOSviewer and the Zotero program will be the research tools.
Findings & Value added: The results will allow for assessing the research activity and the stage of development of the research in the field of non-financial reporting. What is the level of interest of accounting-related scientists in this subject? The latest correctly conducted scan of the issue of NFR will reliably summaries the current state of knowledge, providing information about gaps in the literature and the need to carry out new research. It can also be a way to identify new research areas. The bibliometric analysis of non-financial reporting from the accounting point of view will be a new and original contribution to research in this field.

Introduction

Global economic development based on sustainability is only possible through broadly understood knowledge. The term corporate sustainability is the result of understanding the three aspects: social, environmental, and economic, taking into account the costs of current decisions for future generations. The conceptual assumptions of the International Accounting Standards emphasises the importance of financial reporting, which aims to provide financial information about the reporting entity, which is useful to a wide range of stakeholders. The fundamental qualitative characteristics of useful financial information are relevance, faithful representation, comprehensibility and comparability. The concept, according to which organisations take into account social interests and environmental protection as well as relationships with other entities at the stage of building their strategy, has been around for two decades already. The combination of the high importance of information with the concept of CSR has resulted in the development of non-financial reports. In the past non-financial reporting was only a good practice of enterprises, but today it is becoming increasingly important in building relationships between enterprises and their stakeholder groups (Piersiala, 2019).

The synthetic, numerical nature of the information flowing from a company's accounting system constitutes its foundation. This generates the question of whether the generation of non-financial information is correctly assigned to accounting. The management reports is an important source of non-financial information within company reporting. This statement accompanies the financial statements of selected entities and is subject to accounting regulations and guidelines. Throughout the years, accounting has developed and expanded. Today's accounting is governed by legislation. The role of scientists operating in the area of accounting is to define the substance, scope, purpose and, in some cases, to propose the form and content of new reporting obligations, such as the contemporary non-financial report (Kawacki, 2018). The purpose of this article is to examine the impact of the accounting research community on the development of non-financial reporting. For this purpose, a bibliometric analysis of the concept will be carried out using the Web of Science database. A sample of 2099 publications from an interdisciplinary perspective will be examined and a sample of 488 items linked to accounting publications will be selected.

It can be stated that interest in non-financial reporting started more than half a century ago. The wave started in 1970 with social reporting, especially in the U.S. and Western Europe (Saini, Singhania, Hasan, Yadav, &

Abedin, 2022). Intensification covers the period after 2000. Some conclude that 2008, when their publication starts to become systematic, although the number is still very small (Fusco & Ricci, 2018). The expression "non-financial information" is used in very different contexts to describe different forms of disclosures/measures (Erkens, Paugam, & Stolowy, 2015). Synthesizing past research findings is one of the most important tasks for advancing a particular line of research (Zupic & Cater, 2015). Bibliomteric analysis is used in many scientific fields including in management and quality sciences. In recent years, articles have already been published in which a bibliometric analysis of the issue of non-financial reporting has been conducted.

Article will be divided into following sections: introduction, research methodology, results, discussions, conclusions. The first part shows the meaning of non-financing reporting in context of accountancy. The second part describes the methodology of the taken research with the particular emphasis on description of the studied samples, accepted queries. The next points presents data and calculates the level of dependence. The later phase interprets the numerical data. The entire study will be closed with a summary.

Research methodology

Bibliometric analysis is a popular method for exploring and analyzing large volumes of scientific data. The systematic and correctly conducted review reliably summarises the state of knowledge to date, reporting any gaps in the literature and the need for new research to be conducted (Mazur & Orłowska, 2018). It is also a way of discovering new research topics. These features make systematic reviews useful in many areas of science and practice, including medicine, education, psychology, management and organisation.

To ensure high quality of the analysis, the study will be divided into the following stages:

1. Planning;
2. Full search and acquiring literature;
3. Extraction and evaluation of the evidence collected;
4. Result synthesis and analysis;
5. Reporting and sharing results.

When carrying out bibliometric analyses of non-financial reporting research, the source of data for further analysis was identified in the first step. Relevant data is provided by global bibliographic databases among which

the two largest ones in terms of subject coverage are: Web of Science and Scopus. These databases range from the sciences, social sciences, humanities, medical sciences to the arts. It was decided to use WoS because of the tools it offers for the purpose of bibliometric analyses. The original, non-purified dataset was then determined. The first step in performing a bibliometric analysis is to formulate a suitable search query. An important factor to consider in this respect is the principle of precision and recall, which ensures that the final search results contain only relevant hits, while also ensuring that as many relevant hits as possible are returned (Tunger & Wilhelm, 2013).

For this purpose, a set of different phrases consisting of a combination of the words [Non-financial] [report*] [bibliometric] [account*] as well as a dash [–] and quotation marks [“”] in the widest search fields were tested. Ultimately, 2 queries were indicated.

The first one – TS=(Non-financial AND report*) searched the WoS database in the following areas: Topic i.e. title, abstract, author keywords, and Keywords Plus fields. The download took place on 6 February 2023. It provided a total of 2099 items - research sample A. Research sample A covers all publications found in the Web of Science database in the field of non-financial reporting.

Research Sample B covers publications in the WoS database related to non-financial reporting that were found in publications addressing accounting-related research. Study sample B: TS=(Non-financial AND report*) narrowed down to accounting-related *account* publications. This resulted in 488 items downloaded on 7 February 2023. The assumption when determining group B was that the accounting research community publishes mainly in accounting-related journals.

The analysis of the literature and the initially prepared research material allows the formulation of a set of research questions:

RQ1. From an accounting perspective, what keywords are associated with the term 'non-financial reporting?

RQ2. Is non-financial information reporting within the research area of the accounting research community?

Results

NFR is an interdisciplinary topic, as evidenced by articles related to the subject being found in as many as 128 WoS categories. The most represented Web of Science Categories are as follows: Business Finance, Management, Business (see Table 1.) (Di Vaio, Palladino, Hassan, & Alvino,

2020; Di Vaio, Syriopoulos, Alvino, & Palladino, 2020; Erkens et al., 2015; Kostenko, Kravchenko, Ovcharova, Oleksich, & Dmytrenko, 2021). Taking the research sample B, we now have only 10 categories. The first two places are the same as for sample A, while the third place is Green Sustainable Science Technology.

An analysis of publications regarding non-financial reporting shows that this is an interdisciplinary research area. The search indicated as many as 1,000 items. The range of subjects covered by the journals is broad. In the first instance, these are journals related to management, finance, sustainability, accounting, economics or law. They are also related to public health, the environment, quality. The largest number, namely 110 publications appeared in the Sustainability journal, followed by: Meditari Accountancy Research – 57 articles, Journal Of Financial Reporting And Accounting – 39 articles Journal Of Applied Accounting Research – 35 items. The scope needs to be narrowed in order to define the role of accounting in the area of NFR research. Therefore it is reasonable for this research to narrow the field down to accounting-related publications. A list of 488 publications in 116 different publications was created this way. The most popular is Meditari Accountancy Research – 57 items, Journal Of Financial Reporting And Accounting – 39, Journal Of Applied Accounting Research – 35, International Journal Of Accounting And Information Management – 23, Sustainability Accounting Management And Policy Journal – 22.

When analysing sample A, the first item appears in 1991, while the next two in 1994. More than 10 publications appeared only in 2005. That year can be described as the beginning of intensified research in this area. The first item in sample B appears in 2003, while 2012 (11 published articles) can be considered a period of intensified research on non-financial reporting by accounting scientists. This means that NFR was not in the scientific interest of accounting from the beginning.

The person who appears most often as an author of publications in research sample A is Khaled Hussainey, who is affiliated with the University of Portsmouth Fac Business & Law – 21 items. He is also the author of the largest number of Group B publications – 10 items. Among those with the most NFR-related publications, four of the ten samples in category B are also in category A.

The analysis of the keywords (see figure 1) indicated in sample B shows 6 clusters, illustrated in the figure by colours (red, blue, green, yellow, purple, light blue). The largest cluster (red) – 61 words – highlights the following phrases: performance, determinants, earnings management, corporate governance, impact. Second cluster (green) – contains 49 words including: disclosure, corporate social responsibility, governance, accountability, non-

financial reporting. Third cluster (blue) – contains 32 words including: financial reporting, cost, IFRS, quality, market, among others. Fourth cluster (yellow) – contains 24 words including: value relevance, earnings, accounting information. Fifth cluster (purple) – contains 21 words including: management, integrated reporting, sustainability, insights. The smallest cluster containing 16 words is the light blue cluster with the dominance of: information, assurance, sustainability reporting.

Conclusions

The adopted method of bibliometric analysis based on Web of Science has been used for many years. It was also used for the purpose of this research. The reliability and high quality of the study is ensured by dividing it into 5 stages: planning, defining the purpose of the review, full search and literature retrieval, extraction and evaluation of the collected evidence, synthesis and analysis of the results, reporting and sharing the results. Zotero, VOSviever and the WoS analysis system provided a great deal of support in the research. The research provides answers to the research questions posed. It analyses publications related to non-financial reporting.

The presented analysis is a confirmation of the growing interest in research linked to non-financial reporting. Many articles have been written relating to this issue. A very large share of them comes from an accounting-related background. There are already more than a dozen publications in the Web of Science database from the recent years summarising the topic using bibliometric analysis.

An attempt of this publication was to look at the topic from an accounting perspective. This is its unique value when compared to the previous bibliometric analyses of the concept of non-financial reporting. The topic of NFR should be regarded as interdisciplinary, but it is strongly associated with accounting as this research has demonstrated.

The material presented herein provides answers to the research questions posed. It shows the moment when research in this direction began and the time when research into the issue intensified. It also presents a map of the keyword links. On the one hand, it shows the interdisciplinary nature of research on non-financial reporting while on the other hand, the strong research contribution of the accounting research community.

It means that today's accounting cannot be limited to a synthetic numerical description of business management. It must take into account reporting sustainability goals (SDGs). The traditional approach to accounting that

reduces it to a field of science conflicts with the idea of non-financial reporting.

The material developed has some weaker points. One of them is the restriction to only a selected single repository, namely the Web of Science database. This means that it does not take into account studies published in journals that were not indexed in the database. Such as the analysis presented in the article entitled: "The importance of non-financial reporting research -a bibliometric analysis" (Ivan & Pătrînjan, 2022). As a justification for the above, one may state that the chosen database is one of the two largest databases available. A comparison of the two largest ones, i.e. WoS and Scopus, could constitute a topic for another research. The second point that may be debatable is the choice of the search query that determines samples A and B. However, in the opinion of the author, who tested various search combinations when approaching the topic, the adopted TS=(Non-financial AND report*) is the most objective and authoritative one. Study sample B was restricted using the word account* in the 'publications' field. This fact can also be subject to discussions. Referring only to European Union regulations may also constitute some restrictions. Nevertheless, it did not have an impact on the research material collected.

The research has a beyond-national reach; another area of research could be a similar analysis from the point of view of selected countries. One may also look for correlations with other related issues such as integrated reporting, Corporate Social Responsibility or other areas of management.

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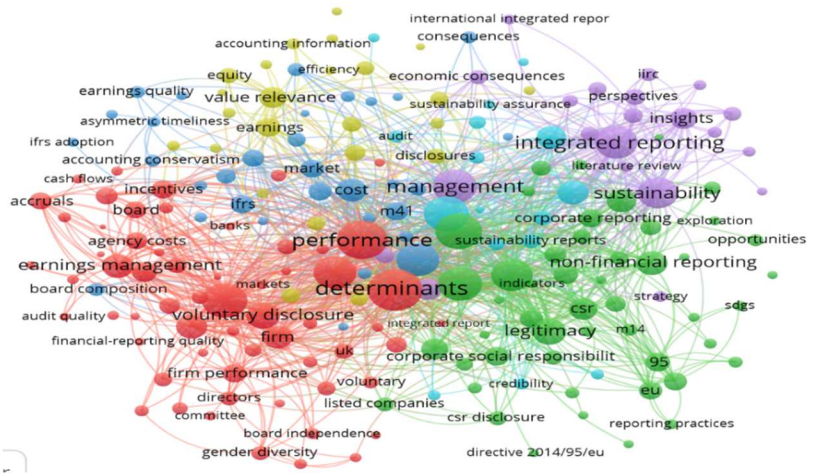
Annex

Table 1. Web of Science Categories – sample A and sample B

Web of Science Categories	Record Count	% of 2099	Web of Science Categories	Record Count	% of 488
Business Finance	680	32.396	Business Finance	455	93.238
Management	528	25.155	Management	80	16.393
Business	453	21.582	Green Sustainable Science Technology	24	4.918
Economics	354	16.865	Environmental Studies	23	4.713
Environmental Studies	213	10.148	Economics	22	4.508
Green Sustainable Science Technology	200	9.528	Business	17	3.484
Environmental Sciences	158	7.527	Public Administration	7	1.434
Law	47	2.239	Computer Science Information Systems	1	0.205
Public Environmental Occupational Health	43	2.049	Regional Urban Planning	1	0.205
Social Sciences Interdisciplinary	37	1.763	Social Sciences Mathematical Methods	1	0.205
Showing 10 out of 128 entries					

Source: own elaboration based on Web of Science data (access 06.02.23.).

Figure 1. Financial result of the transport industry, selected elements 2010-2017



Source: own elaboration based on Web of Science data and VOSviewer (access 06.02.2023).

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Does money matter, and for whom? The importance of financial motivational factors among employees of banks in Poland

JEL Classification: *G21; G41; D9*

Keywords: *motivation; banking sector; competitive advantage; gender; age*

Abstract

Research background: The organization's approach to building human capital is an essential factor in the success of market entities, and it determines a competitive advantage in the market. Due to the challenges and various market changes that banks face, building an effectively motivated multigenerational employee team and understanding employee intrinsic and extrinsic motivation is very important.
Purpose of the article: The paper aims to contribute to the literature and fill the research gap on the financial motivators available in banking and non-banking entities. The paper examines the role and importance of financial incentives, regularly used in the banking sector, in conjunction with a comprehensive analysis of their significance for representatives of different generations (X, Y, Z), gender, and career level in the sample of various institutions in the banking sector in Poland.
Methods: The analysis was made twofold: firstly, within extensive desk research, and secondly, based on the empirical survey in the form of an individual research questionnaire carried out among 418 employees of various banks and companies

from their capital groups in the time just before the pandemic in 2020. The results were examined using statistical analysis, including non-parametric tests.

Findings & Value added:

The paper outlines the opportunity to revise incentive systems in banking operations. We identified various respondents' attitudes to motivational financial factors and classified their importance concerning generation, age, and position in the organization. The study's results indicate that generational and gender differences affect the perception of bank financial incentive tools. Some financial motivational factors regularly used in banks do not equally motivate employees, which leads to the conclusion that banking institutions should inevitably include generational and gender factors in their motivational approach to employees.

Introduction

The study identifies how the bank employee's gender, generation, and career level affect the choice of preferred financial motivators. The paper examines the role and importance of financial incentives, regularly used in the banking sector, in conjunction with a comprehensive analysis of their significance for representatives of different generations (X, Y, Z), gender (women, men), and position (managerial or non-managerial) in the sample of banking sector institutions in Poland.

The analysis was made within extensive desk research and based on the empirical survey in the form of an individual research questionnaire carried out among 418 employees of various banks before the pandemic in 2020. The results were examined using statistical analysis, including non-parametric tests.

The first section of the article concerns motivation and financial motivators and tools. The second section provides a methodology and background of the empirical survey. Section three provides the research results, comparing motivator ratings with a neutral reference point and the importance of individual motivators in the analyzed groups. Section four discusses the specific financial motivators in the various groups. In conclusions, we describe the role of the financial motivators and suggest recommendations for financial incentives systems in banks adjusted to the needs of analyzed groups.

Literature review

Motivation is an issue researchers in the social sciences devote much space to in their considerations. There are many different views on this concept

and attempts to classify motivational factors and tools (Maslow, 1943; Kanfer et al., 2017; Van den Broeck et al., 2021). The difficulty in studying motivation is that it depends on employees' behavior and individual personal needs. There are few studies on motivators regarding generational diversity in the banking sector. The previous research on employee incentives in banks in Poland (Davydenko et al., 2017) showed that the motivation system is not always efficient for different employees. That study investigated the segmentation of motivation tools according to bank type, gender, and job position.

Motivation is a two-way process between the employee and the supervisor, having two perspectives – defining the goals and effectively persuading the employee to undertake and implement goals. The attribute approach describes motivation as an internal force and a state that regulates people's behavior. The functional approach is based on a specific configuration of external factors that affect people's behavior (Houkes et al., 2003; Maslow, 1943).

Motivation stems from the theory of needs and other theories of human behavior (Cerasoli et al., 2014), describing the willingness to perform actions to achieve a specific goal. The elements of intrinsic and extrinsic motivation, i.e., motivational factors and tools, are interrelated and jointly influence human behavior (Houkes et al., 2003). The Yerkes-Dodson and Birch laws describe the relationship between commitment to work and motivation level. It reveals that increased motivation is accompanied by increased task performance only to a certain extent (Broadhurst, 1957; Elbæk et al., 2022).

Banks conduct many formal activities aimed at motivational preferences. Motivators in a banking sector are distinguished. Economic motivational tools consist of financial (fixed salary, increase in salary, premiums or bonuses) and non-financial tools (contract employment and additional benefits). A type of financial motivator is medical care, paid in whole or in part by the employer, and various types of social benefits, such as subsidies to education, refund of glasses purchase cost, health or pension insurance, sports facilities, and others.

In contrast, a non-economic form may cover flexible working time, remote work, professional development opportunities, and atmosphere at work.

Banks prepare payroll systems depending on the value of specific jobs based on the descriptions of competencies and job classification. In order to achieve the right motivation through financial tools, remuneration should be appropriately linked with the effects of work (Vlacseková & Mura, 2017).

Research methodology

This study aims at identifying how the employee's gender, generation, and organizational position held affect the perception of financial motivators. Based on theoretical considerations and the practical experience of the authors, the following three research questions were formulated:

RQ1: *What financial motivators motivate employees of the banking sector representing generations X, Y, and Z in managerial and non-managerial positions, women and men, different*?

RQ2: *Does the importance of personal financial incentive tools vary depending on the gender, generation, and position of bank employees*?

RQ3: *Do generational changes in the banking sector require changes and updates of incentive systems in terms of financial motivators in banks*?

In order to achieve the assumed research goals, quantitative and qualitative research methods were used, and the bibliographic query and work experience in the banks were the basis for formulating the scope of the empirical study. It was carried out with a questionnaire for the online survey system LimeSurvey, using the CAWI (Computer Assisted Web Interview) method. 418 survey respondents were employees of various banks representing generations X, Y, and Z. The study was conducted at the turn of the 2020 pandemic.

The respondents assessed different motivators. The financial motivators being the research base were: the amount of basic salary (M1), salary increase - without changing the position (M2), salary increase with the change of position related to promotion (M3), premium or bonuses (M4), education training financed or subsidized by the employer (M5), company car or reimbursement of travel expenses by private car (M6), health insurance (M7) or supplementary pension (M8), payment for the use of sports facilities (M9) and medical care at the expense of the employer or subsidized by the employer (M10) were analyzed.

The survey results were analyzed using statistical analysis, including non-parametric tests: Wilcoxon's signed-rank test, Mann-Whitney U test, Kruskal-Wallis Test, Friedman's test, ANOVA Skillings-Mack, and Dunn's Post Hoc.

Following the research questions, five hypotheses were formulated:

H1: *Salary increase without a change of position (M2) is more important for bank employees in non-management positions than managerial positions*.

H2: *Men and people in managerial positions rate the salary increase without a change of position (M2) significantly lower than the salary increase with the change of position (M3).*

H3: *Bank employees from generation Z are not motivated by additional health insurance paid by the employer* (*M7*).

H4: *Generation Y and Generation Z valued significantly less supplementary pension insurance paid in whole or part by the employer (M8) than Generation X.*

H5: *Medical care at the employer's expense or subsidized by the employer (M10) motivates significantly higher women than men.*

An advantage of the conducted research was its unique character - few research of a similar nature have been conducted in the banking sector so far, and the universal nature of the research results from the study - banks are large employers in Poland. The methodology and findings have some limitations, as they do not consider the specificity of each bank. Banks compete through the diversity of incentive systems also by immeasurable factors such as the workplace atmosphere or the organizational culture.

Findings and value-added

The study's main objective was to determine the importance of financial tools for motivating employees with distinction for generation X, Y, and Z, women and men, and employees in managerial and non-management positions. In the survey, 239 respondents (57.15%) represented generation X, 126 (30.14%) belonged to generation Y, and 32 (7.71%) to generation Z. Employees from generation X included people born in the years 1966-1980, generation Y born between 1981 and 1990, and generation Z - people born in 1991 and later.

Each motivator M1-M10 was assigned a score from 1 to 5, where 1 means – "it motivates me the least", 4 – "it motivates me the most", and 5 – "it does not apply". The analysis was carried out using the JASP program.

First, the analysis using the non-parametric Wilcoxon's signed-rank test for one sample was carried out to determine whether the motivator's evaluation was significantly different from the neutral reference point. This test was first broken down by gender, position, and generation X, Y, and Z. People who chose the weight of 5 was excluded from the analysis, which means that the given motivator did not apply to them. The middle of the 1-4 scale, i.e., 2.5, was adopted as the neutral reference point. The results significantly lower than the reference point were treated as an expression of a negative attitude towards a given motivator. The results significantly higher than the reference point were treated as an indicator of a positive attitude.

Most motivators were rated above 2.5 on a four-point scale.

Based on the results obtained in Wilcoxon's signed-rank test, it can be concluded that the least motivating motivator, regardless of the employee group, was paying for sports facilities (M9). In addition, people from generation Z found additional health insurance (M7) or supplementary pension insurance (M8) to be of little motivation. It will prove hypothesis H3 and be the first proof of hypothesis H4.

In order to verify whether the ratings of individual motivators differ between the groups under consideration, the non-parametric independent test, the Mann-Whitney U test, was used.

The comparison of the motivators between women and men shows that the most significant differences occur in the case of motivators: medical care (M10), sports facilities (M9), and a raise without changing the position (M2). The differences in the motivators of education or training (M5) and additional health insurance (M7) are significant but not so strong. The least significant differences between women and men occur in the case of motivators connected with bonuses (M4) and supplementary pension insurance (M8). In all the cases mentioned above, women rate the examined motivator higher than men, which proves hypothesis H5. Such motivators as a company car or reimbursement of travel expenses by private car (M6) and supplementary pension insurance (M8) were rated significantly higher by persons holding a managerial position than those holding a non-managerial position. On the other hand, a salary increase without changing the position (M2) was more motivating for people not in managerial positions, supporting hypothesis H1.

In order to compare the assessments of the surveyed motivators between the three generations of employees participating in the study, a survey was conducted using the Kruskal-Wallis Test. Motivator assessment of supple-

mentary pension insurance (M8) was significantly affected by generation $H(2) = 10.325$, $p=0.006$. Similarly, the assessment of the motivator pay increase related to promotion (M3) was significantly affected by generation $H(2) = 5.778$, $p=0.056$. In the case of the second motivator, the influence was not so significant.

In the case of the motivator connected with supplementary pension insurance (M8), Dunn's Post Hoc pairwise comparisons showed that both Y and Z generations valued it significantly less ($p=0.039$ and $p=0.005$) compared to generation X. There were no significant differences between generation Y and generation Z ($p=0.125$).

In the case of the motivator "salary increase with the change of position" (M3), Dunn's Post Hoc pairwise comparisons showed that both Y and Z generations significantly valued it higher ($p=0.054$ and $p=0.075$) compared to generation X. There were no significant differences between Y and Z generations ($p=0.552$).

These results of the analysis are in line with the research question RQ1. The importance of personal financial incentive tools varies depending on the generational affiliation of bank employees, as well as their gender and position. According to RQ3, we may outline that *generational changes in the banking sector require changes and updates of bank incentive systems*.

A non-parametric alternative ANOVA, i.e., Friedman's test, was used to compare the importance of individual motivators in the groups under consideration. Friedman's test shows that the type of motivator used has a significant effect on work motivation in each of the groups.

Connor's post hoc pairwise comparisons show between which motivators there are significant differences in terms of their impact on work motivation. In the case of women, the impact of motivator M1 was significantly different compared to motivators M5, M6, M7, M8, M9, and M10 (all $p<.001$). The impact of motivator M2 was significantly different compared to motivators M5, M6, M7, M8, M9 (all $p<.001$) and motivator M10 ($p=0.004$), the impact of motivator M3 was significantly different compared to motivator M5, M6, M7, M8, M9, M10 (all $p<.001$), the influence of motivator M4 was significantly different compared to motivator M5, M6, M7, M8, M9, M10 (all $p<.001$). We interpret differences in motivators in the other groups in a similar way. This confirms that financial motivators differ for the banking sector employees representing generations X, Y, and Z, employees in managerial and non-management positions, and women and men.

Analysis shows that the first four motivators (M1-M4) are rated the highest in all groups, motivators M5, M6, M7, M8, and M10 slightly lower, and motivator M9 the lowest.

Employees of individually analyzed generations evaluate the financial motivators in different ways. Only in the Z generation motivator M9 (paying for the use of sports facilities) was rated generally equally as motivator M5 (education or training), M6 (company car or reimbursement of travel expenses), additional health insurance (M7), supplementary pension insurance (M8), medical care (M10).

Men and people in managerial positions rated the motivator M2 (salary increase without change of position) significantly lower than the motivator M3 (salary increase with the change of position). In addition, people in managerial positions evaluated the motivator M2 (salary increase without change of position) as significantly lower than the motivator M4 (premium or bonuses). These results settled the hypotheses H1 and H2 as positively verified.

There is no significant difference for managerial positions between the importance of the motivator M1 (the amount of the basic salary) and M6 (company car or reimbursement of travel expenses by private car).

All respondents assess their importance at a similar level. Taking into account the quartile range, it can be seen that the least differentiated opinions, regardless of the surveyed group, concern motivators M1 (the amount of the basic salary), M2 (salary increase without change of position), M3 (salary increase with the change of position), M4 (premium or bonuses). The motivator, which in almost all considered groups was characterized by greater diversity (Quartile range = 2), was M5 (education or training), which means that such financial motivators have different importance.

To sum up, it may be assumed that all the hypotheses (H1-H5) were verified positively.

Discussion

The study's results indicate that generational, gender, and career level differences affect the perception of bank financial incentive tools. Given the above results, the research question RQ1 was answered in detail. The answers to questions about the level of general motivation of employees, together with the justification, showed what financial motivation factors are of particular importance for each generation, with the distinction of gender, generation, and position. Concerning the research question RQ2, it is vital to differentiate the financial motivators depending on the status of a bank employee. About the research question RQ3, financial incentives in the banking sector require changes and updates. Banks may improve reward systems to enhance employee performance. The analysis of

employee motivation tools revealed the diversity in using employee incentives in banks in Poland, adding the perspective of gender, generation, and position. The paragraph above contains all the conclusions regarding the differences in the impact of motivators on individual groups.

Conclusions

The empirical study results may have practical implications. In the course of the research, the following conclusions and recommendations were formulated: incentive systems functioning in banking are not very flexible and updated to the needs of employees. Ignoring the importance of financial motivators specific to each generational group may result in poor results in achieving the assumed goals and outflow of the qualified staff.

The study covered motivators functioning in the incentive systems of the largest banks operating in Poland. It did not consider the impact of non-financial motivators, which may be an area of future research. The analysis of the motivation factors of bank employees of different generations, gender, or types of positions held should be taken into account, as it gains particular importance along with generational changes in the labor market.

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Corporate sustainability performance and the propensity to pay dividends by the top global companies

JEL Classification: *F23; G35; M14*

Keywords: *payout policy; corporate sustainability; ESG scores; global companies*

Abstract

Research background: Corporate sustainability is currently one of the most popular issues in theoretical and empirical research. It generally focuses on identifying the relationship between corporate sustainability performance (CSP) and corporate financial performance (CFP), although the CSP-CFP link is not investigated enough in the context of changes in dividend payments.
Purpose of the article: The paper aims to identify the relationship between CSP and changes in dividend payouts. To do this, a research hypothesis was formulated stating that improving CSP in environmental, social, governance, and economic dimensions increases the propensity to pay stable dividends.
Methods: The main empirical research method is the panel logistic regression model, which includes variables of corporate sustainability. Additionally, descriptive statistics and the Pearson correlation coefficients are analyzed. The empirical research was conducted using data on the top global companies listed in the Global 500 of 2021 from the period of 2011-2021. All required data were retrieved from the Refinitiv (Thomson Reuters) Eikon database.
Findings & Value added: The main conclusion of the paper is that when all dimensions of corporate sustainability are integrated in the long run, only the strong effectiveness of corporate systems and processes inside a company make board members maintain dividends at the previous levels. It means that the research hypothesis cannot be confirmed for all corporate sustainability dimensions considered

together. The value added of the paper is that the authors considered the long-term returns pillar score as one of the independent variables, which is not a commonly used approach, although economic sustainability is a key corporate sustainability dimension.

Introduction

For two decades of growing interest in the implementation of sustainable development principles and practices in companies, academics have examined, in particular, the relationship between corporate sustainability performance (CSP) and corporate financial performance (CFP) (Gilian et al., 2021, pp. 16–23). Unfortunately, multidirectional and interdisciplinary research on the CSP-CFP link does not sufficiently explain the impact of CSP on the dividend policy. What is more, none of the studies conducted in this field has considered all sustainability dimensions, usually ignoring the economic one. Such a research gap was the motivation to conduct own empirical research.

The paper aims to identify the relationship between corporate sustainability performance and changes in dividend payout. To achieve the scientific objective, a research hypothesis was formulated and verified. It states that improving corporate sustainability performance in environmental, social, governance, and economic dimensions increases the propensity to pay stable dividends. The hypothesis was empirically verified using data on the top global companies listed in the Global 500 ranking of 2021 from the period of 2011-2021. The main method of investigation is the panel logistic regression model, which includes variables of corporate sustainability representing all its individual dimensions. Additionally, descriptive statistics and the Pearson correlation coefficients have been analyzed. All required data were retrieved from the Refinitiv (Thomson Reuters) Eikon database.

The paper is structured as follows. Section 1 presents a brief literature review, while section 2 describes the research methodology. The next section presents the results of the empirical research and discusses them. The last section contains the main research findings and conclusions.

Research methodology

The research hypothesis, stating that improving corporate sustainability performance (CSP) in environmental, social, governance, and economic dimensions increases the propensity to pay stable dividends, was formulat-

ed and verified on the top global non-financial companies listed in the Global 500 of 2021. Initially, 265 corporations were qualified for the research sample, but some had to be excluded at the data collection stage, i.e., corporations with incomplete data (30 companies) or with a negative return on equity (36 companies) over the last ten years. The ten-year research period had to be shortened when corporate sustainability performance in the economic dimension was incorporated into the analysis because the long-term return pillar score, which represents economic performance, was available only for the last five years. Ultimately, the research was conducted among 138 of the largest non-financial global companiesin two different research periods:

- 2012–2021 (the ten-year period), when only environmental, social, and governance performance is considered (1,380 firm-year observations – Panel A),
- 2016–2021 (the five-year period), when the long-term returns pillar score is incorporated in the analysis (690 firm-year observations – Panel B.

To investigate the influence of corporate sustainability performance (CSP) on the propensity to pay stable dividends, a panel logistic regression is used. The authors propose the general logit model, which is described as follows:

$$P\left(Stability_{i,t}=1\right)=\frac{e^{\alpha_0+\alpha_1 Return_{i,t-1}+\alpha_2 Liquidity_{i,t-1}+\alpha_3 Debt_{i,t-1}+\alpha_4 MVBV_{i,t-1}+\beta X_{i,t-1}}}{1+e^{\alpha_0+\alpha_1 Return_{i,t-1}+\alpha_2 Liquidity_{i,t-1}+\alpha_3 Debt_{i,t-1}+\alpha_4 MVBV_{i,t-1}+\beta X_{i,t-1}}} \quad (1)$$

where:
$Stability_{i,t}$ is a dichotomous variable equal to 1 if the dividend policy is stable, which means that the rate of change of the dividend payout ratio (ΔDPR) of the i-th company between year t and year t-1 ranges from -2 to 2 percentage points, and 0 otherwise. DPR in year t is calculated as a relationship between the total dividend paid in year t+1 and net profit in year t;
$P(Stability_{i,t} = 1)$ means the conditional probability of obtaining the value of 1 by the dependent variable for the given values of the explanatory variables;
$Return_{i,t-1}$ is a return on equity of the i-th company in year t-1;
$Liquidity_{i,t-1}$ means the current ratio of the i-th company in year t-1;
$Debt_{i,t-1}$ stands for the leverage ratio of the i-th company in year t-1;
$MVBV_{i,t-1}$ is the market-to-book value ratio of the i-th company in year t-1;
$\boldsymbol{X}$ is a vector of CSP, which covers one-year lagged corporate sustainability scores;

$ESG\_Score_{i,\ t\text{-}1}$ is the overall sustainability score of the *i*-th company in year *t*-1, which is estimated based on the information about environmental, social and governance dimensions of corporate sustainability;
$E\_Score_{i,\ t\text{-}1}$ is the environmental pillar score of the *i*-th company in year *t*-1;
$S\_Score_{i,\ t\text{-}1}$ is the social pillar score of the *i*-th company in year *t*-1;
$G\_Score_{i,\ t\text{-}1}$ is the governance pillar score of the *i*-th company in year *t*-1 and
$LTR\_Score_{i,\ t\text{-}1}$ is the long-term returns pillar score of the *i*-th company in year *t*-1, which represents the ability of a company to manage its long-term economic sustainability.

Considering the general model given above, eleven sub-models are estimated. They differ from one another by the vector **X**. Models 1-5 include the variables of corporate sustainability based on the ESG scores in the ten-year research period. The research period in models 6-11 is shorter (five years) due to the additional variable (the long-term returns pillar score), which represents a company's economic sustainability performance.

Results

Table 1, which contains the coefficients of the pairwise correlation between independent variables for two different panel data sets, shows that some of the correlations are statistically significant. In the ten-year period, the strongest significant correlation among control variables is between *Return* and *Debt* (r_{yx}=0.425) – the coefficient is significant at 1% and suggests that this positive relationship is moderate. The correlation between *ESG_Score* and *Debt* is the only insignificant dependence. The statistically significant correlations for other control variables are very weak – the coefficient for *Liquidity* is negative. All correlations between the overall sustainability score and its particular pillar scores are positive and significant at 1% – the coefficient at *G_Score* (r_{yx}=0.673), which is the lowest, indicates a strong relationship.

For the five-year period, the same correlations between control variables are statistically significant. The strongest dependence is between *Return* and *Debt* (r_{yx}=0.599), but it is still moderate. The correlations between *ESG_Score* and the control variables are stronger for the five-year period than within ten years. The dependence between the overall ESG score and its particular pillar scores in the five-year period is comparable to the ten-year period, but the coefficient at *G_Score* is the one which becomes higher

than before. The long-term returns pillar score exhibits statistically significant correlations with all control variables except *MVBV* – no coefficients exceed ±0.2, and one of them is negative. The relationship of *LTR_Score* with the overall ESG score (r_{yx}=0.067), which is significant at 10%, is positive but very weak.

At the end of the correlation analysis, the independent variables chosen for individual panel logistic regression models are not strongly correlated with each other. The coefficients fall within the range from -0.8 to 0.8 (Fooladi, 2012, pp. 691–692).

Table 2 presents the estimation results of eleven logit models. In the ten-year research period (Panel A), the propensity to pay stable dividends increases along with the lower profitability. In models 1-5, the coefficient at *Return* is negative and significant at 1%. The propensity to pay stable dividends also increases along with the increase in debt. In models 1-5, the coefficient at *Debt* is positive and significant at 1%. Regarding other financial determinants, the estimation results of models 1-5 reveal no significant influence of the current ratio and market-to-book value ratio on the propensity to pay stable dividends. The coefficient at *Liquidity* is negative, and at *MVBV,* it is positive. However, they are not significant at the accepted significance levels.

Referring to the influence of corporate sustainability on the propensity to pay stable dividends, the overall ESG score has no impact on the probability of changes in dividend policy. The coefficient at *ESG_Score* is negative and insignificant (model 1). This result is in line with Cheung et al. (2018, pp. 787–816) but contradicts Matos et al. (2020, pp. 1–15) and Benlemlih (2019, pp. 114–138).

The environmental dimension of corporate sustainability has no impact on the propensity to pay stable dividends. The coefficient at *E_Score* is negative and statistically insignificant (model 2 and model 5). This can be explained by the high ability of the top global companies to avoid environmental risk. Such companies, while conducting pro-environmental activities, have been allocating high financial resources for protection of natural ecosystem for many years. Therefore, improving the environmental dimension no longer translates into the company's financial performance, including changes in dividend policy. This result coincides with Ellili (2022, pp. 1–18), but it contradicts Cheung et al. (2018, pp. 787–816) and Matos et al. (2020, pp. 1–15).

The intensification of a company's activities in the social dimension reduces the propensity to pay stable dividends. The coefficient at *S_Score* is negative and significant at 10% (model 3). It means that if the social pillar score increases, the likelihood of changing the dividend policy is

higher. This is because a company's strong reputation and its ability to inspire trust and loyalty in the workforce, customers, society, and other stakeholders consolidate its market position and maintain its market value at a high level, even if the amount of the dividend changes. This result is contrary to Ellili (2022, pp. 1–18) and Matos et al. (2020, pp. 1–15).

Concerning the impact of the governance dimension on the changes in dividend policy, the coefficient at *G_Score* is positive but insignificant in model 4. However, when the environmental, social, and governance dimensions of corporate sustainability are considered individually in the same model, the coefficient at the governance pillar score is positive and significant at 5% (model 5). It means that highly effective corporate systems and processes inside a company make the board members maintain dividends at the previous levels. They smooth out dividends to act in the best interests of long-term shareholders. This result is in line with Cheung et al. (2018, pp. 787–816) and Matos et al. (2020, pp. 1–15) but contrary to Ellili (2022, pp. 1–18).

Regarding models 6-11, which are estimated for the five-year research period (Panel B), similar results are obtained only for profitability. The propensity to pay stable dividends decreases along with a higher return on equity. In model 6 and models 8-11, the coefficient at *Return* is negative and significant at 5%. The findings are consistent with those for the 10-year research period and confirm previous results that companies attempt to maintain dividends at a similar level, even if their profitability changes. In order to do this, they smooth out dividends and signal to the market their good financial standing.

The estimation results of model 7 show that the propensity to pay stable dividends decreases with an increase in the liquidity and market value of the company. The coefficient at *Liquidity* is negative and significant at 10%, which means that if the current ratio increases, the likelihood of changing the dividend policy is higher. Moreover, the coefficient at *MVBV* is negative and significant at 10%, which means that the dividend policy becomes more unstable along with the company's size.

In addition, it should be noticed that when the research period is shortened to five years, the corporate sustainability results cease to be statistically significant. This result is in line with Lu and Taylor (2016, pp. 1–15), who suggested that corporate sustainability research should be conducted over the longest possible period. It is because ESG activities shape the overall image of the company only in the long run and positively perpetuate in the awareness of long-term stakeholders, which consequently affects financial performance. The same applies to the long-term returns pillar score. The coefficient at *LTR_Score* is positive but insignificant (models 6,

10 and 11). It should be assumed that in the longer research period, a company's ability to manage its long-term economic sustainability might significantly influence changes in its dividend policy.

Conclusions

There are four main conclusions:

- the overall ESG score does not have any significant impact on the propensity to pay stable dividends in both considered research periods,
- if particular pillar scores are considered in three different models separately, the social pillar score is the only one that is statistically significant and negative,
- if particular pillar scores are considered together in one model, the governance pillar score is statistically significant and positive,
- in the short research period, none of the particular ESG pillar scores, nor the long-term returns pillar score, are statistically significant.

It means that when all dimensions of corporate sustainability are integrated in the long period, only the highly effective corporate systems and processes inside a company make the board members maintain dividends at the previous levels - the research hypothesis cannot be confirmed for all corporate sustainability dimensions considered together.

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Annex

Table 1. Pearson correlation matrix

Specification	*Return*	*Liquidity*	*Debt*	*MVBV*	*ESG_Score*	*E_Score*	*S_Score*	*G_Score*
Panel A: variables in the ten-year research period (N = 1,380)								
Return	1.000	–	–	–	–	–	–	–
Liquidity	–0.038	1.000	–	–	–	–	–	–
Debt	0.425***	–0.071***	1.000	–	–	–	–	–
MVBV	0.298***	–0.031	0.143***	1.000	–	–	–	–
ESG_Score	0.088***	–0.090***	–0.001	0.066**	1.000	–	–	–
E_Score	0.047*	–0.048*	–0.010	0.030	0.852***	1.000	–	–
S_Score	0.099***	–0.066**	0.009	0.072***	0.894***	0.707***	1.000	–
G_Score	0.074***	–0.065**	–0.005	0.058**	0.673***	0.375***	0.385***	1.000
Panel B: variables in the five-year research period (N = 690)								
Return	1.000	–	–	–	–	–	–	–
Liquidity	–0.050	1.000	–	–	–	–	–	–
Debt	0.599***	–0.200***	1.000	–	–	–	–	–
MVBV	0.289***	–0.038	0.560***	1.000	–	–	–	–
ESG_Score	0.094**	–0.103***	0.062	0.075*	1.000	–	–	–
E_Score	0.051	–0.040	0.019	0.030	0.827***	1.000	–	–
S_Score	0.096**	–0.073*	0.067*	0.074*	0.885***	0.683***	1.000	–
G_Score	0.084**	–0.092**	0.066*	0.071*	0.688***	0.343***	0.390***	1.000
LTR_Score	0.077**	0.122***	–0.158***	0.040	0.067*	–0.054	0.077**	0.132

Note: *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Source: Own study based on the *Refinitiv* database (data access: 28.03.2022).

Table 2. Estimation results

Specification	**Estimated panel models**				
Panel A: variables in the ten-year research period (N = 1,380)					
	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	–0.747** (–2.110)	–0.734** (–2.353)	–0.646* (–1.931)	–1.351*** (–4.253)	–0.907** (–2.536)
Return	–0.023*** (–3.490)	–0.024*** (–3.592)	–0.0224*** –3.387)	–0.025*** (–3.667)	–0.024*** (–3.428)
Liquidity	–0.156 (0.338)	–0.151 (–0.943)	–0.165 (–0.985)	–0.131 (–0.772)	–0.153 (–0.900)
Debt	0.001*** (2.875)	0.001*** (2.962)	0.001*** (2.787)	0.001*** (3.078)	0.001*** (2.885)
MVBV	0.001 (0.699)	0.001 (0.366)	0.002 (0.436)	0.002 (0.328)	0.002 (0.458)
ESG_Score	–0.005 (0.263)	–	–	–	–
E_Score	–	–0.005 (–1.471)	–	–	–0.003 (–0.680)
S_Score	–	–	–0.006* (–1.753)	–	–0.007 (–1.377)
G_Score	–	–	–	0.004 (1.210	0.009** (2.119)
McFadden R^2	0.019	0.019	0.020	0.019	0.024
Accuracy, %	83.600	83.600	83.600	83.600	83.600
$\chi 2(K)$ (p-value)	22.843 (0.000)	23.752 (0.000)	24.694 (0.000)	23.079 (0.000)	29.639 (0.000)

Table 2. Continued

Specification	**Estimated panel models**					
Panel B: variables in the five-year research period ($N = 690$)						
	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
Intercept	−1.126 (−1.513)	−0.725 (−1.297)	−0.746 (−1.474)	−1.318*** (−2.776)	−0.941 (−1.571)	−1.173 (−1.540)
Return	−0.026** (−2.129)	−0.006 (−0.400)	−0.026** (−2.188)	−0.027** (−2.217)	−0.026** (−2.148)	−0.026** (−2.125)
Liquidity	−0.216 (−1.118)	−0.407* (−1.664)	−0.227 (−1.115)	−0.205 (−0.991)	−0.223 (−1.161)	−0.228 (−1.119)
Debt	0.002 (1.196)	0.001 (0.612)	0.001 (1.246)	0.002 (1.288)	0.002 (1.187)	0.002 (1.147)
MVBV	−0.015 (−0.273)	−0.165* (−1.842)	−0.012 (−0.237)	−0.016 (−0.306)	−0.014 (−0.256)	−0.013 (−0.254)
ESG_Score	0.003 (0.421)	–	–	–	–	–
E_Score	–	0.002 (0.270)	–	–	–	0.005 (0.683)
S_Score	–	–	−0.002 (−0.330)	–	–	−0.009 (−1.165)
G_Score	–	–	–	0.007 (1.334)	–	0.008 (1.466)
LTR_Score	0.001 (0.130)	–	–	–	0.001 (0.147)	0.001 (0.106)
McFadden R^2	0.029	0.041	0.028	0.031	0.028	0.033
Accuracy, %	82.200	83.300	82.200	82.200	82.200	82.200
$\chi 2(K)$ (p-value)	18.515 (0.005)	25.073 (0.000)	18.425 (0.003)	0.143 (0.001)	18.336 (0.003)	21.506 (0.006)

Note: *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively. The z-statistic is given in brackets.

Source: Own study based on the *Refinitiv* database (data access: 28.03.2022).

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Financing urban mobility resilience: Identification of problem areas

JEL Classification: *H72; R40; R51*

Keywords: *financing resilience; transport resilience; urban public transport; urban mobility*

Abstract

Research background: The efficient functioning of transportation systems is subject to various types of disruptions and risks. Transportation systems are strongly affected by all kinds of local, regional, national, or global crises. The European Union's transport policy indicates the need to build sustainable, intelligent, and resilient urban mobility systems based on public mass transit. The paradigm of resilience has gained particular importance in the context of the global crises of the last five years. Resilient urban mobility systems are intended to provide the ability to respond quickly to disruptions that occur, allowing urban organisms to achieve operational stability.
Purpose of the article: The purpose of the study is to identify the main problems with financing the resilience of public mass transit systems in Polish cities. The specific aims are the identification of the factors determining the resilience of urban mobility systems and tools supporting it, measures of resilience and ways of financing it. The study sought to verify whether the mobility systems of Polish regional cities can be considered resilient from a financial point of view.
Methods: The research is qualitative in nature. The study is based on a literature review. An analysis of legislation, strategic documents at the European and national levels, reports of national and international organisations working in the field of urban mobility, and a case study were carried out based on desk research.
Findings & Value added: Financing urban public mass transport in Poland is based on two key sources of income: fees from ticket sales and payments (compensations) made by local governments. The economic and energy crisis contributed to a significant increase in the operating costs of public mass transportation providers. In this context, the key to building resilient public mass transport systems in urban

areas is to make changes to existing models to ensure a stable PTA financing system.

Introduction

In December 2019. The European Commission has communicated the 'European Green Deal'(European Commission, 2019). The document indicates that one of the critical areas of transformation of the European Union economy in 2050 perspective will be the transition to sustainable and intelligent mobility. The objectives set out in the European Green Deal primarily address the need to decarbonise transport systems through significantly, among other things, the deployment and dissemination of zero-emission vehicles, the reduction of congestion, the improvement of public transport, multimodality, or the dissemination of intelligent communication tools to support sustainable mobility. Adopted a year later, during the COVID-19 pandemic, the "Strategy for sustainable and intelligent mobility..."(European Commission, 2020) emphasises the need to ensure the resilience of the transport system to all types of crises. It points to the need to promote resilient mobility that is at the same time sustainable, zero-emission, intelligent, multimodal, spatially, socially, and economically accessible.

The aim of the study, the results of which are presented in this article, is to determine the factors determining the resilience of urban mobility systems and the tools supporting it, the measures of resilience and the ways of financing it. The study sought to verify whether the mobility systems of Polish voivodship cities can be considered resilient from a financial point of view.

The research used a literature analysis, an analysis of legal acts, strategic documents the European and national level, reports of national and international organisations dealing with urban mobility issues and a study of selected cases based on the analysis of source documents. Particular attention was paid to the relationship between urban mobility resilience and public transport financing models, hypothesising that the main factor in urban mobility resilience is a crisis-proof urban transport financing system.

Literature review

Urban mobility is defined as the ability to carry out physical movements within an urban area. It can refer both to movements carried out by people

and can also refer to movements of goods (Vidović, Šoštarić, & Budimir, 2019). The urban mobility paradigm points to the need for cities to change their approach to mobility planning in their areas. This shift relates to shifting the burden of urban development planning from transport system infrastructure planning to integrated sustainable urban mobility plans. It should not only take into account the need for efficient transport connections within urban areas but also better spatial planning that reduces the need for individual car transport in favour of better accessibility to alternative forms of mobility (e.g. walking, cycling, personal transport devices), the development of shared mobility such as public transport, car sharing, bike sharing, carpooling (Jordová & Brůhová-Foltýnová, 2021).

The new urban mobility paradigm is based on the concept of sustainable, low- and zero-emission development (Kovačić, Mutavdžija, & Buntak, 2022)based on modern technologies (Ceder, 2021) integrated, democratic (Lanzini & Stocchetti, 2021), taking into account different needs and accessible to all. Efficient mobility systems, in turn, are to be the foundation of urban resilience.

Natural disasters caused by climate change, energy crises, economic, political and social crises, terrorist attacks or biological threats, among others, strongly affect the functioning of cities, which contributes to the growing interest of researchers in the topic of resilience (Ba, Wang, Kou, Guo, & Zhang, 2022).

In the literature, urban resilience is defined as the ability of an urban system and its components to respond adequately to factors that pose a threat to its functioning and the ability to recover once the threatening factor has subsided (Meerow, Newell, & Stults, 2016). A resilient city is able to identify potential threats, prepare for their occurrence, and when they do occur, take steps to minimise the negative impact on the various systems of city functioning (Mierzejewska & Wdowicka, 2018).

Urban resilience research focuses on identifying the vulnerability of urban systems to threats (Havko, Titko, & Kováčová, 2017). It draws attention to the need for resilience planning, developing strategies to respond to hazards and recovering from a hazard condition. It emphasises the need for an integrated approach to resilience planning, considering all stakeholders needs and addressing different areas of urban functioning (Desouza & Flanery, 2013).

The concept of urban resilience is closely linked to the concept of sustainable development (Roostaie, Nawari, & Kibert, 2019). Among the basic tools for building urban resilience, the implementation of modern ICTs that allow the monitoring of threat factors is indicated (Q. Zhou, Zhu, Qiao, Zhang, & Chen, 2021), implementing zero- and low-carbon solutions in

urban systems, building sustainable energy systems to grid urban systems, including mobility systems (Sharifi & Yamagata, 2016).

Research methodology

The research procedure used tools such as literature analysis, analysis of legal acts, strategic documents at European and national levels, reports of national and international organisations dealing with urban mobility issues and a study of selected cases based on the analysis of source materials. Particular attention was paid to the relationship between urban mobility resilience and public transport financing models, hypothesising that the main factor in urban mobility resilience is a crisis-proof urban transport financing system. Based on expert knowledge, the problems generated by the current public transport financing system in Poland were identified in relation to the need for resilient urban mobility systems.

The selected catalogue of publications was analysed to answer research questions on the definition of the concept of resilience in the context of urban mobility, the identification of tools supporting resilient urban mobility, factors influencing the resilience of urban mobility systems, methods for measuring the resilience of urban mobility systems and identified models for financing the resilience of urban mobility systems.

In the next step, an analysis of legislation, statistical data, source documents provided by public bodies and reports from urban mobility organisations was carried out to identify the main issues related to financing the resilience of urban mobility systems.

Results

Resilient urban mobility is characterised by the ability to maintain its functionality while the elements that make up the mobility system are exposed to threats (W. Ge & Zhang, 2022), as well as the ability of participants in the mobility system to cope with crises (Verlinghieri, 2020). The resilience of urban mobility based on urban public transport can also be understood in terms of the ability to absorb additional passenger numbers in the event of an emergency requiring the movement of more people than demand analyses suggest (Scheurer, 2016) or the ability to move passengers at all in the event of one or more factors preventing the regular operation of the public transport system (Moraci, Errigo, Fazia, Campisi, & Castelli, 2020).

As it turns out, the basis for building resilient mobility is the efforts to build sustainable mobility by ensuring an efficient public transport system and high availability of alternative mobility infrastructure - walking, cycling or using UTO devices (Campisi et al., 2020, 2020; Dias, Arsenio, & Ribeiro, 2021; Hasselwander et al., 2021; D. Li et al., 2022; Q. Li & Xu, 2022; Liouta et al., n.d.; Moraci et al., 2020; Nikiforiadis et al., 2020; Shaer & Haghshenas, 2021; Teixeira et al., 2021, 2022; Thombre & Agarwal, 2021; H. Zhou et al., 2021).

Rules for the operation and financing public urban transportation in Poland are regulated by the Act on Public Mass Transport ('Act of 16 December 2010 on Public Mass Transport', n.d.). According to the content of this act, public mass transport services may have the character of public utility services. The implementation of services in this model assumes that the main objective of the entities responsible for their organisation is to reduce transport exclusion and ensure the availability of other public services, e.g. education, culture, health care, trade or the labour market (Błażewski, 2020). Local authorities or their associations are responsible for organising public transport in urban areas in Poland.

The cited law identifies two critical sources of financing public service transport. These include:

- own funds of the local authority organising public transport,
- state budget funds,
- revenue from ticket sales and revenue from additional charges levied on passengers.

The analysis of budget resolutions of the Polish PTAs for 2023 conducted for the purposes of the study (Table 1.) operating in the areas of Polish voivodship cities indicates that total expenditures on the organisation of the local public transportation in the studied cities make up a significant share in the budget expenditures of the municipalities - between 4.5% and 24.2%. The only exception is the Upper Silesian Metropolitan Union (GZM), which is the PTA of the municipality boroughs for 40 municipalities in Silesian voivodeship.

On average, fare revenues cover 27.6% of the operating costs of public mass transport in their area. It means that 72.4% of expenditures of the analysed entities will be financed from the cities' budgets. When relating fare revenues to current expenditures, we note that the share of fare revenues increases to an average level of 34.1%. The remainder of the expenditure is paid directly from the budgets of the analysed entities. This means that the resilience of public transportation financing in the analysed cities depends on their budgetary stability. It should be noted, however, that the costs of organising public mass transport have been growing rapidly in

recent years. One of the reasons for this is the significant increase in the prices of key inputs for transport services ('Core inflation', n.d.), an increase in the price of fuel used to power public transport vehicles ('Reports and conferences - POPiHN', n.d.). At the same time, the total revenue of local government units increased by only 3.7% in 2022 ('Budget reports - Ministry of Finance - Gov.pl portal', n.d.). This means that local governments will have significant problems not only with the development of urban public transport but perhaps with maintaining the transport offer at the current level.

Conclusions

The study shows that Polish cities have a systemic problem with the ongoing financing of resilient mobility. While it is possible to obtain external support for investment tasks, operational expenditure must be covered by the organisers from their own revenues. Considering the significant share of expenditures on public mass transport in the overall expenditures of cities, the growing burden resulting from the crisis on the fuel and energy sources market, the low dynamics of income growth, cities will be faced with the dilemma of having to limit their current expenditures. This situation may lead to a reduction in the availability of public transport in urban areas.

This situation poses a threat of permanent destabilisation of mobility systems in cities. Without the systemic support of Polish self-governments in bearing the expenses of the day-to-day operation of PT, cities may have difficulties in building and maintaining sustainable and resilient mobility systems. To ensure the smooth functioning of urban mobility systems in crisis situations, it is worth considering the introduction of an obligation for public transport organisers to create reserve funds and a national resilient mobility fund to support mobility in disaster areas.

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Annex

Table 1. Summary of PTA expenses and receipts related to the organisation of public transportation

PTA	Total expenditure on public transportation (PLN million)	Current expenditure on public transportation (PLN million)	Property expenditure on public transportation PLN million)	Revenue from ticket sales and surcharges (PLN million)	% coverage of total expenditure from ticket revenue and surcharges	% coverage of current expenditure from ticket receipts and surcharges	Share of public transportation expenditure in the municipal budget	Current expenditure in total expenditure	Property expenditure in total expenditure
Bialystok	230,1	140	90,1	55	23,9%	39,3%	9,3%	60,8%	39,2%
Bydgoszcz	277,8	201,5	76,3	73,6	26,5%	36,5%	12,6%	72,5%	27,5%
Gdansk	633,6	564,4	69,1	165,7	26,2%	29,4%	21,0%	89,1%	10,9%
GZM	1813,6	1584,4	229,2	285,9	15,8%	18,0%	85,6%	87,4%	12,6%
Kielce	95,8	95,7	0,1	38,5	40,2%	40,2%	5,8%	99,9%	0,1%
Krakow	640,4	640,4	0,0	360	56,2%	56,2%	8,0%	100,0%	0,0%
Lublin	221	204	17,0	80	36,2%	39,2%	7,7%	92,3%	7,7%
Łódź	579,1	549,8	29,3	230,1	39,7%	41,9%	8,9%	94,9%	5,1%
Olsztyn	111	111	0,0	36,2	32,6%	32,6%	5,6%	100,0%	0,0%
Opole	62	61	1,0	24,3	39,2%	39,8%	5,6%	98,4%	1,6%
Poznan	1079,6	667,6	412,0	218,2	20,2%	32,7%	18,5%	61,8%	38,2%
Rzeszów	204,4	117,5	86,9	42	20,5%	35,7%	10,7%	57,5%	42,5%
Szczecin	619,7	272,8	346,9	70,2	11,3%	25,7%	18,8%	44,0%	56,0%
Torun	111,5	71,3	40,2	36	32,3%	50,5%	7,1%	63,9%	36,1%
Warsaw	5021,6	4012,7	1008,9	1000	19,9%	24,9%	20,6%	79,9%	20,1%
Wrocław	575,7	569,5	6,2	190,3	33,1%	33,4%	9,0%	98,9%	1,1%
Zielona Góra	122,1	56,5	65,6	11,6	9,5%	20,5%	9,2%	46,3%	53,7%
Gorzów Wlkp.	117,7	84	33,7	15	12,7%	17,9%	11,0%	71,4%	28,6%
		Medium			**27,6%**	**34,1%**	**15,3%**	**78,8%**	**21,2%**

Source: own elaboration based on budget resolutions of selected local government units for 2023.

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Effective cost management in selected business entities in Poland in light of current economic conditions

JEL Classification: *G21; G30*

Keywords: *costs; enterprises; effective management*

Abstract

Research background: Current economic conditions, including, but not limited to, the rising inflation rate, changes in electricity prices or changes in tax law significantly affect the manner of operation of business entities in Poland. The economic impact of these changes varies greatly depending on the type of business, industry or economic sector represented. These changes are also reflected in the level and structure of the entities' own costs – primarily in the when considering costs by type. The multitude of changes that Polish companies now face also indicates the importance and relevance of the concept of effective cost management in these difficult economic conditions. Therefore, the need to adapt the business to the peculiarities of the new economic reality created the basis for a thorough identification of cost information needs coming in from the cost accounting systems used in companies. This became one of the prerequisites for undertaking research on evaluating the usefulness of cost accounting systems used in business entities for effective management of their costs.
Purpose of the article: The purpose of this article is to analyze and evaluate the impact of the current economic conditions on the level and structure of own costs of selected business entities from the perspective of effective management of this economic category.
Methods: The article presents the results of a comparative analysis of the level and structure of costs by type in three business entities representing manufacturing, trade and service sectors. The analysis covers the years 2019-2022 and is set against the backdrop of key economic developments of the past period, including the COVID-19 pandemic, the energy transition and the war in Ukraine.

Findings & Value added: The main conclusion of the analysis is that the current economic conditions have a significant impact on the level and structure of own costs in business entities. Therefore, these entities need specialized economic tools to improve the efficiency of their cost management. It is because the traditional full-cost accounting system used by most business entities in Poland is proving to be inadequate in this regard.

Introduction

The current economic conditions, manifested, among other things, in the rising inflation rate, changes in electricity prices or changes in the balance sheet law, significantly affect the way all business entities in Poland operate. Although, according to the Polish Investment and Trade Agency, Poland's economy has been developing at a stable pace for more than 25 years, (Polska Agencja Informacji i Inwestycji Zagranicznych, n.d.) it has recently been determined by a number of factors, however, causing a marked slowdown in economic activity. Dynamic recent changes in the economy, triggered also by the COVID-19 virus pandemic, have negatively affected the functioning of many Polish companies. Subsequent lockdowns announced since March 2020 and government-imposed restrictions on the freedom to operate in various industries have caused the financial situation of some entities to deteriorate. The intensely changing business environment poses tremendous challenges to Polish companies, particularly in meeting their information needs. In this situation, therefore, aspects of effective cost management, including, above all, costs by type, are of particular importance. It is worth noting that traditional cost accounting systems focused on mandatory financial reporting under the balance sheet law in Poland completely ignore the ever-increasing information needs of companies in terms of cost management. This is because traditional, reportable cost accounting is insufficient to reveal significant causal relationships between costs and management objects that are or may be relevant to managerial decision-making. The cause-and-effect analysis of business entities' own costs, on the other hand, provides a basis for rationalizing costs, and thus for effective cost management. Therefore, there is a need to search for and implement such cost accounting systems in these entities, the assumptions and principles of which will meet the growing demands of their users, especially in light of the difficult economic conditions.

In the context of the above considerations, the purpose of this article is to identify the key economic changes in Poland in recent times and attempt to assess their impact on the level and structure of own costs of selected

business entities from the point of view of effective management of this economic category.

Literature review

Efficiency and its types.

Efficiency is not an unambiguous concept and is interpreted differently in social sciences, economics and also management sciences (Drucker, 1985; Helms & Thompson, 2006; Skrzypek, 2002).

In the literature, efficiency is most often defined as the result of actions taken described by the ratio of the effects obtained to the expenditures incurred (Farafonova, 2011, pp.176-177). Economic efficiency (Rokita, 2017, pp. 160-161) is, in turn, such activity of an entity that is devoid of waste and is oriented towards achieving the best result within the framework of available resources and technologies (Lockwood, 2008). In this view, economic efficiency is defined as the ability to use one's resources in such a way as to achieve a given objective in the most efficient and least wasteful manner (Onistrat, 2008, pp. 129).

The literature on the subject also distinguishes so-called cost efficiency (Seyedboveir et al., 2017; Zimkova, 2015). The term, which should be understood as an analysis of the level and structure of the business entity's own costs and benefits for its owners, consists in the selection of the cheapest possible variant of action, while maintaining the highest possible quality. The essence of cost-effectiveness, therefore, is to compare the results achieved with the cost of achieving them and to strive to achieve a given result at the lowest possible cost. This is especially important when the business entity has limited resources, including, in particular, financial resources. For the purpose of this article, it is assumed that cost efficiency is a comparison of the level and structure of the costs of the entity under study with the effects they achieve, thereby providing a basis for rational and therefore effective management of the costs incurred (Moskwa-Bęczkowska, 2019).

The concept of cost and cost accounting

According to the literature on the subject, cost is an economic category that undoubtedly affects the efficiency of an economic entity. It represents the value, expressed in money, of human labor and property resources of an enterprise consumed during a given period to produce products, provide

services and perform certain functions (Popesko & Novak, 2011). In economic theory, costs are ascribed a primary character in relation to the effects obtained. Therefore, knowledge of their level and structure plays a key role in information and decision-making processes in all business entities, regardless of the purpose these entities pursue (Novak & Popesko, 2014, pp. 91).

The efficiency of a business entity is also greatly influenced by the proper way of calculating[1] unit costs. The main purpose of cost calculation is to obtain data on the basis of which it is possible to assess the economic efficiency – actual and (or) planned – of producing (performing) a service (task) (Wagner, 2012). In view of the above, an accurate cost calculation method is the basis for effective cost management in business entities.

As mentioned, changing economic and financial conditions, both at the national and global level, have caused business entities to attach greater importance, in the context of improving their operating efficiency, to the management methods used, including cost management.

In order to increase this efficiency, some of these entities are choosing to replace traditional cost accounting systems with modern systems, such as activity-based costing and resource-process costing.

Resource and Process Consumption Accounting (RPCA)

Resource and Process Consumption Accounting is a comprehensive and systematic management costing that combines the assumptions of such concepts as German grenzplankostenrechnung and American activity-based costing. Its essence is to transform, according to strictly defined rules, financial and non-financial data into management information about the cost of resources, processes, and the cost and profitability of products, services and customers (Zieliński, 2020, pp. 48-49). The acquired information is presented in a multidimensional manner with resolution of cost information in terms of both actual and planned costs, necessary to support short-, medium- and long-term decisions at all levels of business management. RPCA is characterized by multi-stage cost accounting among 12 types of cost grouping objects (Zieliński, 2018, pp. 486-488). This approach to extracting objects and defining relationships between them provides complete resultant information at all levels of management. The main tenets of this

[1] The term cost calculation should be understood as a set of calculation activities aimed at determining the costs attributable to the object of calculation (such as a product, service, project or order).

costing allow various cost items to be considered freely as relevant or irrelevant costs for a particular decision.

This approach to the measurement and analysis of own costs in business entities can prove extremely useful for managing this economic category, especially as the current economic environment forces the need to develop insightful and reliable cost information.

Research methodology

This article carries out a comparative analysis of the level and structure of operating costs in three business entities representing manufacturing, trading and service activities. The analysis included – primarily – costs by type presented in the financial statements for 2019-2022. The survey covered randomly selected entities with an entry in the business register of the National Court Register. These were mainly commercial companies, including limited liability companies and joint-stock companies. Data of the surveyed entities was obtained from the online database of the Central Economic Information Center. The main criteria for the selection of research objects were the number of entry in the National Court Register, the main number of the Polish Classification of Business Activities and the size of employment. Next, financial statements were selected from the Financial Document Repository published by the Ministry of Justice on the basis of selected KRS numbers belonging to each type of business, i.e. commercial, service and manufacturing.

A small group of companies was included in the study, but due to the same mandatory method of recording, accounting and cost calculation under the balance sheet law in Poland in all entities, this group is sufficient for the analysis.

Results

As of 2020, Poland is facing a very difficult economic environment. Indeed, the COVID-19 virus pandemic has shaken the economic system in Poland and around the world. Companies have begun to face business constraints, a shift to remote work or problems maintaining order continuity. As a result, many were forced to cease operations, while others thrived on developing new distribution channels.

The pandemic period was a time of undeniable slowdown in economic activity. However, after a significant slowdown in the number of COVID-

19 cases and a gradual "unfreezing" of the market sector, the Polish economy has started to pick up again. The year 2021 in Poland was characterized by a rapid increase in the prices of goods and services, i.e. inflation. On the one hand, growing post-pandemic consumption, on the other hand, shortages of goods due to problems with maintaining continuity of orders and supplies have caused supply shortages in domestic markets. The situation was further exacerbated by Russia's invasion of Ukraine, which led to the imposition of sanctions on Russia thus limiting the country's ability to export goods. One of the most visible effects of the trade restrictions with Russia is the turmoil in the energy commodity market and the associated increase in electricity and gas prices.

All of the above-mentioned conditions also have a significant impact on the level and structure of individual business entities' own costs. Thus, for example: in 2021, the value of total costs incurred by enterprises amounted to PLN 5,718.3 billion, and was 16.7% higher than in 2020. Figure 1 shows total costs per 1 enterprise in Poland from 2010 to 2021.

The increase in the total cost of operating of business entities in Poland, observed in Figure 1, therefore justifies the need for a thorough analysis of their level and structure. The increase in costs is also evident for individual businesses. An analysis of operating costs in commercial, manufacturing and service enterprises showed a successive increase in total costs during the period under review in these entities. The costs of trading companies, on the other hand, showed a decreasing trend during the period under review. Table 1 shows the total cost values for the operating activities of these companies.

As can be seen from the data presented in Table 1, the year-on-year analysis showed that in 2020, compared to 2019, all entities showed a decrease in the level of costs incurred. So, it should be said that in this aspect, the COVID-19 virus pandemic and the restrictions on operations caused by it have affected the costs of these entities regardless of the type of operations. On the other hand, the costs of manufacturing and service enterprises in 2021-2022 showed an upward trend. The lack of 2019 data in the manufacturing enterprise is due to the fact that the enterprise changed its organizational and legal form in 2020, from a sole proprietorship to a limited liability company.

However, based on the overall level of costs, it is difficult to determine what caused the increase in this economic category. The results of the analysis were taken into account in the preparation of the version of the article.

From the point of view of the purpose of this article, it is important to note that knowledge of costs extracted from data derived from financial statements by type, despite a certain degree of detail, is still in aggregate

form. This means, therefore, that from the point of view of effective cost management and thus making various types of decisions, this information is of little use. Although the specifics of the operations of each of the companies presented are different, each of them indicates the need to detail the cost information received from the accounting system. This is also confirmed by the results of a survey that the author of this article conducted in 2021 on the evaluation of the usefulness of the cost accounting system of business entities for managing their costs under the conditions of the COVID-19 virus pandemic (Moskwa-Bęczkowska, 2021). The survey found that more than half of the companies analyzed indicated that the cost accounting system they use is partially useful, or not useful at all, for business management.

Conclusions

In light of the current economic conditions, it is difficult to run a cost-effective business. Rising inflation rates, disruptions in supply chains or the energy crisis determine the increase in costs incurred by companies. As can be seen from the analysis of the generic cost structure of the surveyed companies, this situation applies to all types of their operations. The main conclusion of this analysis, which is also a prelude to a broader study of the effectiveness of cost accounting systems, is that the current economic conditions have a significant impact on the level and structure of own costs in business entities. It is therefore important to know the level and, above all, the structure of the costs incurred as accurately as possible. This is because it turns out that the full cost accounting in force in business entities is not able to meet the growing, in the present time, demands of enterprises for cost knowledge. It is therefore reasonable to implement modern concepts and tools for effective cost management, such as resource & process consumption accounting.

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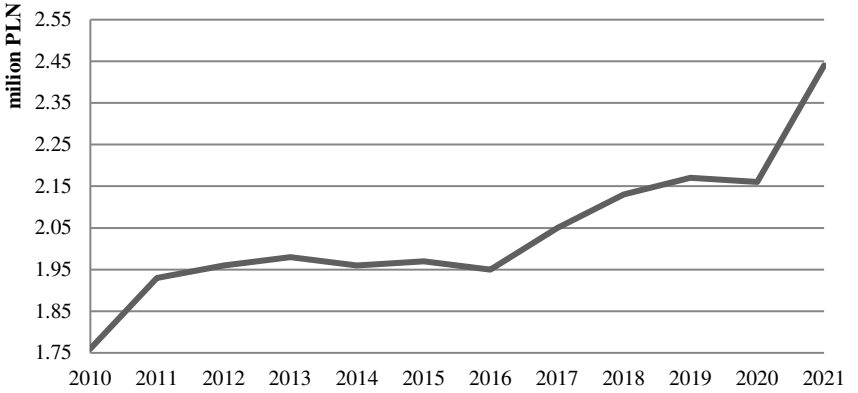
Annex

Table 1. Total value of operating expenses in trading, manufacturing and service enterprises (data in PLN)

Type of activity	2019	2020	2021	2022
trade	351,347,273.2	325,547,176.3	323,126,250.00	320,705,323.66
manufacturing	no data	1,815397.48	3,268,718.95	4,722,040.42
services	7,953473.57	7,923984.01	8,644339.62	9,364,695.23

Figure 1. Total costs per 1 enterprise in Poland in the years 2010-2021



Source: own elaboration based on Activity of non-financial enterprises in 2021.

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The performance of equity crowdfunding IPOs. Evidence from Poland

JEL Classification: *G11; G23; G41*

Keywords: *equity crowdfunding; crowdfunding; IPO underpricing; IPO overpricing, start-up; NewConnect*

Abstract

Research background: This paper contributes to the extensive literature dealing with the occurrence of the IPO underpricing phenomenon and focuses on a regional study on IPO underpricing in the still niche ECF-based IPOs.
Purpose of the article: The paper aims to analyze the effectiveness of debuts of companies that raised funds (and thus carried out their IPOs) using ECF platforms, and to find the determinants of ECF IPOs performance.
Methods: The model for testing the potential determinants of ECF-based IPO performance is based on univariate linear regressions measuring the relationship between a dependent variable which stands for ECF-based IPO underpricing and one independent variable (chosen from a set of potential explanatory variables.
Findings & Value added: The paper revealed that the effectiveness of ECF-based IPOs has mainly the cyclical nature and it depends on the stock price cycle. ECF-based IPOs are more underpriced then other IPOs only in the bull market while in the bear market they are more overpriced.

Introduction

Equity crowdfunding (equity-based crowdfunding, ECF) is one of the segments of crowdfunding, which is defined as the use of the internet to raise money through small contributions from a large number of investors (Bradford, 2012). In the case of equity crowdfunding, members of the community in exchange for financial support for the project become its co-owners by

taking shares or other ownership papers. Investors usually invest relatively small funds and in return expect, inter alia, dividends from future profits, and gains resulting from selling crowdfunded shares to other investors.

The article aims to show the development of equity crowdfunding in Poland and to analyze the debuts of companies that raised money (and thus carried out their IPOs) using ECF platforms. The hypothesis verified in the article is that crowdfunding has become an important source of financing for small companies and start-ups going public in Poland which carried out crowdfunded IPOs. The article also analyzes the effectiveness of debuts of these companies, assuming that due to the higher risk associated with - as a rule - earlier stage of their development, they should be characterized by greater overpricing compared to IPOs of other companies, compensating for the above-mentioned higher investment risk. Additionally the paper assumes that the effectiveness of ECF-based IPOs has mainly the cyclical nature.

The article consists of 5 parts. After the introduction, its second section presents the overview of the literature on equity crowdfunding. The next section presents the development of equity crowdfunding and ECF-based IPOs in Poland. The fourth section analyzes and discusses the financial performance of ECF-based IPOs compared to IPOs carried out by other companies in Poland and investigates and discusses the significance of potential determinants of ECF-based IPOs. The article ends with a summary that contains conclusions.

Literature review on equity crowdfunding

The equity crowdfunding literature is very rich. Much of the literature is devoted to the analysis of entrepreneurs' and investors' motivations for using or avoidance of ECF. The beneficiaries of crowdfunding can be, however, not only investors or companies raising capital but also crowdfunding platforms, providers of technology, micropayment systems, security systems, and advertisers. Entrepreneurs gain access to new sources of financing and new investors. The digital nature of the share purchase process makes it possible to invest in projects that, if only due to their size, would not be taken into account by institutional investors (Wang et al., 2019). Estrin et al. (2016) add that ECF allows entrepreneurs to test their products, develop their brand, build a loyal customer base, and turn customers into investors. Investors participating in crowdfunding, apart from the aforementioned expectations regarding profits from dividends and gains from the sale of shares, can often count on material rewards or tax reliefs.

For many investors, other than financial satisfaction with the investment may also be important. For platforms and technology providers, the benefits are commissions and other fees.

The main disadvantage of equity crowdfunding is the uncertainty as to the positive ending of the fundraising process. Not all campaigns are successfully completed within the earlier specified time frame. Crowdfunding capital is also associated with costs, which relatively increase in the case of raising funds smaller than expected. The process of raising funds may also be time-consuming and quite complex, requiring the preparation and implementation of a promotional campaign appropriate for ECF, which should reach as many recipients as possible. An advertising campaign requires extensive information about the project, which may be copied by the competition. Another important factor is the possible loss of credibility in the event of failure to achieve the assumed goal.

From the point of view of this article, an important direction of research is the behavior of companies after a crowdfunding campaign. As noted by Schwienbacher (2019), although a large number of studies focus on crowdfunding campaigns, only a few studies have examined what happened after the campaign is over. Walthoff-Born et al. (2018) in their studies analyzed the failure rate of equity crowdfunded start-ups and they found that they had significantly higher failure rates (17% vs. 2%) than comparable start-ups that did not use equity crowdfunding, based on industry, firm size and firm age. Successive rounds of financing from professional investors were the measure of success in the research by Hornuf et al. (2018) and Signori & Vismara (2018). Both studies showed that 1/5 of the crowdfunded British and German start-ups raised followed-up funding from professional investors.

Investor exit strategies have also been analyzed by other researchers. Vismara (2019) and Cox et al. (2019) emphasize that while a broad investor community is involved at the stage of raising capital, it is often difficult to sell shares purchased in the ECF on the secondary market later on. M&A and initial public offering (IPO) transactions are among the exit strategies that a larger number of investors can take part in. It is worth noting that in older literature it was emphasized that while an IPO might be the most lucrative exit for an ECF investor, the likelihood of a crowdfunded company going public was small in developed countries and even smaller in developing countries. Time has verified these opinions and on stock exchanges, in various parts of the world, we can find companies that conducted the first rounds of financing on equity crowdfunding platforms.

The first day returns of IPOs in Poland in 2020-2022 – preliminary research

In the three-year period (2020-2022), 79 new companies made their IPOs and went public in Poland. As many as 62 (78,5%) of them debuted on NewConnect, while 17[1] (21,5%) entered the Main Market, which is the Warsaw Stock Exchange's regulated market. More than every fourth (18 out of 62) debuted on NewConnect, and more then every fifth in Poland (18 out of 79) were preceded by a crowdfunding offer, which means that ECF became an important source of financing for companies going public in Poland.

Table [1] shows the comparison of statistics on the rates of return potentially earned by investors on IPOs during the first trading session in Poland in the period from 01/01/2020 to 30/12/2022.

Based on the data shown in the Table [1], the following conclusions can be drawn:

- Investors participating in crowdfunding IPOs could earn on average 7,00% on the first trading day (closing prices), less than investors investing in the IPOs of companies heading to the WSE (16,56%), but much less than in the case of IPOs of non-crowdfunded companies from the SME sector that debuted on NewConnect (70,95%).
- While the calculated average return for IPOs at their first trading days was positive, which may indicate an underpricing phenomenon in 2020-2022, most companies debuted on NewConnect with negative returns. An average rate of return visible on the Polish IPO market was very volatile. The standard deviation of returns in the case of the debuts preceded by a crowdfunding issue was 8,74 times higher than the average rate of return. Although the volatility coefficients are lower for the remaining IPOs on NewConnect (2.34) and IPOs on the WSE's Main Market (2,14), they still show a high risk related to investments in IPOs on the Polish market in the analyzed period.
- As already mentioned, investing in companies at an early stage of development through ECF was associated with high risk. More than half of the companies (11 out of 18) did not allow investors to earn on the first trading day. Of the remaining companies debuting on NewConnect, almost 2/3 ended their first day of trading at a loss compared to the price

[1] In the period 2020-2022, 31 companies debuted on the WSE Main Market, 14 of which changed their listing from NewConnect to the WSE Main Market. Although two of them made share issues preceding the change of the quotation market, these issues are treated as SPOs for the purposes of the article.

offered in their IPOs. For the Main Market, the majority of companies debuted in green. However, all of them did it in 2020-2021.

– Investing in an IPO could also bring above-average gains. In the case of ECF-based IPOs, three game companies gave over 100% return on their first trading days. Such rates of return could not be achieved in the case of the Main Market. In the case of debuts on NewConnect, which were not preceded by crowdfunding, 11 companies gave more than 100% return on the debut. The record holder was genXone with a rate of return on its debut equal to 761.90%, a company from the biotech industry[2].

When analyzing the statistics, a question arises about the underperformance of ECF-based IPOs in relation to other IPOs in Poland. According to the stylized fact that higher returns are associated with higher risk and vice versa, higher rates of return should be expected in the case of investments in ECF-based IPOs, especially compared to investments in IPOs on the WSE's Main Market. However, this is not so. In the case of ECF-based IPOs, the standard deviation is almost twice as high although the average rates of return is much smaller. As the result, the investors who invested in small companies, often still startups, did not receive a fair risk premium. Why? Is this a regularity in Poland, or maybe there is another factor that influenced such results?

Method, results and discussion

The research group includes all stock market debuts of companies that carried out ECF-based IPOs using equity crowdfunding platforms in Poland until the end of 2022. The potential ECF-based IPO underperformance will face IPOs of other companies debuting on NewConnect and the WSE Main Market in 2020-2022[3]. The choice of the research period was influenced by the fact that, with the exception of one debut in 2019, all the others took place after that year.

The rates of return on the first trading day (underpricing) were calculated as follows:

$$underpricing = \frac{first\ day\ closing\ price - IPO\ price}{IPO\ price} \quad (1)$$

[2] By the way, the ECF campaign carried out by genXone at the end of 2019 was not successful due to the insufficient amount of subscriptions.

[3] The analysis does not include those companies that changed the quotation market and moved from NewConnect to the WSE Main Market. For almost all of them, it was a technical process that did not involve the issue of new shares.

The model for testing the possible determinants of ECF-based IPO underpricing is based on univariate linear regressions measuring the dependent variable, which is ECF IPO underpricing, and one independent, explanatory variable selected from among the hypotheses formulated in the paper and literature. Similar approach was used by Śliwiński et al. (2022).

Based on the dataset of dependent variables y_i and explanatory variables x_i, a simple linear regressions were used:

$$y_i = \alpha + \beta x_i + \varepsilon_i \tag{2}$$

where ε_i is the random component of the regression and x_i represents a dataset of i independent variables associated with the following possible determinants of ECF-based IPO underpricing: (i) ECF-based IPO amount, (ii) market capitalization of the company, (iii) value of the shares introduced to the trading, (iv) value of free-float admitted to the trading, (iv) game or no-game group (zero-one variable), (v) mature or start-up company (zero-one variable), (vi) P/E ratio, (vii) P/Sales ratio, (viii) time of ECF-based IPO, (ix) values of NCINDEX, WIG_GAMES and WIG on the first trading session, (x) changes in NCINDEX, WIG_GAMES and WIG for four periods: change in the index price on the debut day [t], the closing price on the debut day compared to the previous day close [t/t-1], change in the closing price on the debut day compared to the close from 7 trading sessions before [t/t-7], change in the closing price on the debut day compared to the close from 30 trading sessions before [t/t-30], and change in the closing price on the debut day compared to the close from 90 trading sessions before [t/t-90]. The OLS (Ordinary Least Squares) model was used to estimate the parameters α (constant term) and β (coefficient term).

The regression results are presented in Table [2]. *T*-statistics to test whether the coefficient is statistically equal to zero are placed in parentheses, and *p*-values are marked with asterisks depending on the level of significance (*** - p<0,01, **- p<0,05, * - p<0,10).

Although the hypothesis assumes that ECF-based IPOs are underpriced compared to IPOs of other companies to attract investors to buy shares offered through ECF crowdfunding, the preliminary statistics (Table [2]) showed that in 2020-2022 ECF-based IPOs were less effective that IPOs carried out by other companies in term of mean, median and coefficient of variation.

The results of the regressions help solve this puzzle. They show that the main determinant of ECF-based IPO underpricing level was the time in which these IPOs were carried out. If we compare the dates of their debuts and the behavior of the stock exchange indices, we can see that almost all

profitable ECF-based debuts took place in the upward market. After a change in the stock market trend, all debuts, in turn, gave a loss to investors who invested in ECF-based IPOs.

As all the ECF-based companies debuted on the NewConnect and majority of them were game companies (13/19), it is not surprising that their IPO performances were also determined by the level of NCIndex and WIG_Games. The other tested dependent variables turned out to be insignificant. The results of regressions show the cyclical nature of ECF-based IPO underpricing level.

To verify the hypothesis assuming that the effectiveness of ECF-based IPOs has mainly the cyclical nature and it depends on stock price cycle, apart from the regression analysis presented above, efficiency of ECF-based IPOs versus IPOs carried out by other companies which debuted on the NewConnect and the WSE Main Market was tested once again. This time, however, in addition to the IPOs' effectiveness study for the entire period, a study was carried out for the period before the downturn on the NewConnect market (01.01.2020-30.09.2021) and after it (01.10.2021-31.12.2022). The results are presented in Table [3].

Table [3] shows two interesting things. First, it confirms the cyclicality of IPO underpricing. In the boom period, the phenomenon of IPO underpricing is common, regardless of what was the source of the initial offer or where the company was listed. During the stock market slowdown, IPOs were often overpriced. All the medians in that period were negative. This applies both to debuts on NewConnect and on the Main Market of the Warsaw Stock Exchange, and both to ECF-based and non ECF-based IPOs. Second, the effectiveness of IPOs differs in the bull and bear markets.

In bull markets, ECF-based IPOs were characterized by a higher median level, a higher share of profitable debuts than negative ones, and a better coefficient of variation, which indicates the risk-reward ratio, than other debuting companies. As the stock market fell, ECF-based IPOs proved to be the least effective. Only one in ten IPOs were underpriced and the median was -32,39%. All this confirms partly the hypothesis that ECF-based IPOs are underpriced compared to IPOs of other firms, but only in growing markets.

Conclusions

The article shows that since 2020 equity crowdfunding has become an important source of financing for crowdfunded companies going public in

Poland. Every fourth NewConnect debutant has carried out its IPO using crowdfunding platforms.

As the timeline of debuts had certainly a big influence on the presented statistics of ECF-based IPOs' effectiveness, the paper revealed that the performance of ECF-based IPOs depends on the economic cycle of the stock market and ECF-based IPOs are more underpriced then other IPOs only in the bull market while in the bear market they are more overpriced. Therefore, the hypothesis assuming that ECF-based IPOs are more underpriced than IPOs of other companies to attract investors to buy shares offered through ECF crowdfunding platforms was only partly confirmed as the effectiveness of ECF-based IPOs has mainly the cyclical nature and it depends on stock price cycle.

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Annex

Table 1. Performance of IPOs in Poland in 2020-2022

	NewConnect (ECF-based IPOs)	NewConnect (non ECF-based IPOs)	NewConnect (all IPOs)	Main Market
Mean	+7,00%	+70,95%	+52,56%	+16,56%
Median	-18,22%	+13,09%	+ 8,50%	+6,67%
Max	+118,13%	+761,90%	+761,90%	+98,34%
Min	-63,34%	-62,92%	-63,34%	-37,50%
Standard deviation	61,20%	165,69%	146,12%	35,37%
Coefficient of variation	8,74	2,34	2,78	2,14
Debuts in the plus	7	17	34	10
Debuts in the minus	11	27	28	7
Number of IPOs	18	44	62	17

Source: own elaboration based on www.stooq.pl (data retrieved 10.01.2023).

Table 2. Regressions results of ECF-based IPOs performances

Regressors	***β* coefficients**
IPO amount	9,54E-09 (0,069447)
Marketcap	-4,02E-09 (-0,943944)
The value of the shares admitted to the trading	-2,96E-09 (-0,677764)
The value of free-float admitted to the trading	-1,31E-08 (-0640657)
Game (1) vs non-Game (0)	0,3888656 (1,312261)
Mature (1) vs start-up (0)	-0,384124 (-1,349473)
P/E ratio	-0,468071 (0,1467)
P/Sales ratio	-0,0034558 (-0,748752)
Time of IPO	**-0,001287 (-4,069345)*** **
NCIndex at t	**0,002840 (2,208574)** **
WIG_Games at t	**4,24E-05 (2,372044)** **
WIG at t	1,42E-05 (0,022968)
dNCIndex t /t-1	14.27981 (1,613309)
dWIG_Games t/t-1	7,358303 (1,477041)
dWIG t/t-1	-3,755490 (-0,319659)
dNCIndex t/t-7	4,988576 (1,604983)
dWIG_Games t/t-7	-0,763659 (-0,170971)
dWIG t/t-7	-3,167633 (-0,574767)
dNCIndex t/t-30	0,844275 (0,558873)

Table 2. Regressions results of ECF-based IPOs performances

Regressors	β coefficients
dWIG_Games t/t-30	-0,041862 (-0,028594)
dWIG t/t-30	-2,655551 (-1,364837)
dNCIndex t/t-90	1,888996 (1,251881)
dWIG_Games t/t-90	-0,831116 (-0,831477)
dWIG t/t-90	0,201314 (0,171419)

Source: own elaboration based on www.stooq.pl (data retrieved 10.01.2023)

Table 3. Characteristics of the first offers rate of returns from the gaming and all sectors

Research group	Statistics	01.01.2020-	01.01.2020-	31.09.2021-
NewConnect (ECF-based IPOs)	In plus	7	**6**	1
	In minus	11	**2**	9
	Min	-63,64%	**-51,02%**	63,34%
	Max	118,13%	**118,13%**	63,27%-
	Median	-18,22%	**51,26%**	-32,39%
	Mean	7,00%	**49,88%**	-27,30%
	Standard	61,20%	**60,63%**	33,96%
	CV	8,74	**1,22**	-
NewConnect* (non-ECF-based IPOs)	In plus	25	**18**	7
	In minus	17	**7**	10
	Min	-62,92%	**-16,67%**	-62,92%
	Max	423,50%	**423,50%**	125,00%
	Median	13,08%	**18,33%**	-13,39%
	Mean	41,43%	**67,08%**	3,71%
	Standard	96,67%	**109,73%**	54,66%
	CV	2,33	**1,64**	14,75
NewConnect* (all IPOs)	In plus	32	**25**	7
	In minus	28	**9**	19
	Min	-63,34%	**-39,97%**	-63,34%
	Max	423,50%	**423,50%**	125,00%
	Median	7,19%	**18,43%**	-26,71%
	Mean	31,29%	**63,25%**	-10,51%
	Standard	88,80%	**98,49%**	49,28%
	CV	2,84	**1,56**	-

Table 3. Continued

Research	Statistics	01.01.2020-	01.01.2020-	31.09.2021-
Main Market	In plus	10	**9**	1
	In minus	7	**4**	3
	Min	-37,50%	**-37,50%**	-17,35%
	Max	98,34%	**98,34%**	3,04%
	Median	6,67%	**11,70%**	-3,42%
	Mean	16,56%	**23,28%**	-5,28%
	Standard	35,37%	**37,76%**	7,58
	CV	2,14	**1,62**	-

* Excluded were two companies which debuted on NewConnect: genXone and Spyrosoft, which represented outliers.
Biotech company genXone, which e.g. makes tests for COVID-19, had a return of 523.2% in August, 2020, when debuting on NewConnect in the COVID-19 pandemic. In the case of Spyrosoft, 620.0% underpricing results from a specific IPO made at non-market prices and aimed only at employees in the amount of PLN 100,000.

Source: own elaboration based on www.stooq.pl (data retrieved 10.01.2023)

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