

# CONTEMPORARY ISSUES IN ECONOMY

11

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FINANCE

**EDITED BY**

ADAM P. BALCERZAK

ILONA PIETRYKA

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# **Contemporary Issues in Economy**

**11**

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**edited by  
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## FinTech digital inclusion of society - selected aspects of the banking environment

**JEL Classification:** *G21; I25*

**Keywords:** *FinTech; digital inclusion; banking*

### Abstract

**Research background:** The digitization of banking services in recent years has had a substantial impact on banking distribution channels. The increasing use of the Internet in mobile or pocket devices presents a significant challenge for the banking sector.

**Purpose of the article:** The purpose of the article is to analyse the impact of the banking environment factors on the FinTech digital inclusion of society. The explanatory variables were divided into four groups, which include the macroeconomic and technological environment of the banking sector, the infrastructure of the banking system and selected measures of the banking sector effectiveness.

**Methods:** As part of the research, an analysis of factors was carried out from the broadly understood banking environment influencing the FinTech digital inclusion of society in the European Union countries in 2012-2019. The data for the research was obtained from the IMF (Financial Access Survey), ECB (Statistical Data Warehouse), Eurostat, BIS, ESMA databases.

**Findings & Value added:** The article specifies the essential relationship between the explanatory variables and FinTech digital inclusion of society, confirming the previous literature research and indicating new variables affecting digital inclusion - including the functioning of the innovation hub and the level of employment in the area that uses information and communication technology - ICT.

## **Introduction**

The changing banking environment has a substantial impact on the level of digital inclusion of society. Consumers of financial services increasingly prefer electronic distribution channels for banking services. Numerous banking regulations, a crisis of confidence in financial institutions and, among others conservatism of traditional banks has enabled the dynamic development of new entities in the market that provide a personalized offer that meets the needs of a modern consumer. Solutions based on new technologies most often rely on providing services through the use of the Internet and mobile devices.

The purpose of the article is to analyse the impact of the banking environment factors on the FinTech digital inclusion of society. The explanatory variables were divided into four groups, which include the macroeconomic and technological environment of the banking sector, the infrastructure of the banking system and selected measures of the banking sector effectiveness. Therefore, the article verified the research hypothesis (H1): the banking sector environment has a substantial impact on FinTech digital inclusion. Dynamic panel models based on fixed and random effects were used to verify the hypothesis. The research sample consisted of the European Union countries (27), and the research period covered the years 2012 - 2019.

The article reviews national and world literature and describes the research methodology. Then the most significant research results were presented, and the article ended with the presentation of conclusions and recommendations.

## **Literature review**

The reasons that have the greatest impact on financial exclusion include: the technical gap, changes in the labour market, income inequality, and the problem of costs (European Commission, 2008). For that reason, one of the possible solutions to improve the availability of financial services and products is digital banking. It enables serving the rural population and people living in remote areas, especially among customers with a small current account balance, low income and irregular income generated in the grey economy (Low Income ..., 2015). Traditional banks, noticing the changing environment for conducting banking activity, define in their strategies the framework of financial integration through distribution channels available to the public: convenient, inexpensive, ensuring dignity and consumer pro-

tection (The business ..., 2016). The digital exclusion is associated with the access to and use of information and communication technologies in all spheres of economic activity (OECD, 2001). A key element influencing digital exclusion is access to the Internet, which considerably influences the classification of society in terms of digitization. In digital and financial exclusion, two groups of reasons for exclusion/inclusion of society can be distinguished: voluntary and involuntary (Beck et al., 2009).

As a result of the progressive digitization of the banking market, household access to the Internet is a key condition for accessibility of society to financial products and services. There are fewer and fewer people in the EU society who do not have access to the Internet. In 2012 it was 23% of the population, while in 2019 it was only 9% [Eurostat]. The activities of new companies in the financial market, the changing macroeconomic environment and the change in consumer preferences lead to numerous challenges related to the determinants influencing the improvement of digital inclusion of society. FinTechs and BigTechs gain their competitive advantages by providing financial services via mobile data transmission channels. For that reason, traditional financial institutions have been directing the distribution of financial services via mobile access channels for several years. As a result, FinTech digital inclusion is defined as the % of people using mobile devices or pocket devices to access the Internet while away from home or work, of the population in general. A mobile and pocket device is most often understood as a smartphone and a tablet. Consequently, there is a growing number of consumers in the financial sector, referred to as "mobile only".

Among the numerous literature studies on the impact of explanatory variables on digital inclusion of society, the impact was emphasized of economic growth (Nowicka, 2019), the Herfindahl-Hirschman concentration index (NBP, 2020), loans granted by FinTech companies (Cornelli et al., 2020), regulatory sandbox and innovation hub (ESMA, 2018), banking system infrastructure (Beck et al., 2008), ROE ratios and university graduates aged 25 to 34 (Folwarski, 2021).

## **Research methodology**

As part of the research, an analysis of factors was carried out from the broadly understood banking environment influencing the FinTech digital inclusion of society in the European Union countries in 2012-2019. The data for the research was obtained from the IMF (Financial Access Survey), ECB (Statistical Data Warehouse), Eurostat, BIS, ESMA data-bases. Ulti-

mately, 27 EU countries (excluding the UK) were included in the study in eight-year time series. In order to carry out statistical tests, it was decided to use dynamic panel models. Statistical inference regarding the significance of model parameters was carried out on the basis of one-step estimation. The Hansen test and the AR(1) and AR(2) autocorrelation tests were used to verify the validity of the dynamic model application. As a result of the research and attempts to build a dynamic model, it turned out to be impossible, because the Hansen statistics and/or the AR(2) statistics turned out to be significant. Therefore, dynamic panel models based on fixed and random effects were used for the research. The choice of fixed or random effects was made on the basis of the Hausman test, which determined the selection of effects on the basis of significance studies. Standard error resistance was additionally used in the selection of the fixed (non-random) effects.

In order to verify the H1 hypothesis, model 1 was created - describing panel studies, where the dependent variable was FinTech digital inclusion (**FT\_WL\_CYF**) defined as y1, which is defined as the % of people using mobile devices or pocket devices to access the Internet out-side their home or work, in general population.

- the macroeconomic environment of the banking sector, within which the following were distinguished:
  - a. economic growth -  $\Delta$ PKB,
  - b. economic growth per person - PKB\_p.c. the variable, as a result of high correlation with other variables, was not included in the panel study,
  - c. index Herfindahla-Hirschmana - HHI,
  - d. loans in commercial banks - BANK\_KRED,
- technological environment of the banking sector, within which the following were distinguished:
  - a. loans granted by FinTech companies - FINTECH\_KRED,
  - b. the employment level in the knowledge-based services sector - an area that uses information and communication technology - ICT - ZAT,
  - c. regulatory sandbox - SANDBOX - a variable determining the functioning of the regulatory sandbox in a given EU country. Variable 0 (no regulatory sandbox), 1 (existence of a regulatory sandbox),
  - d. innovation hub - IH - a variable determining the functioning of the innovation hub in a given EU country. Variable 0 (no innovation hub), 1 (existence of an innovation hub),
- banking system infrastructure, within which the following were distinguished:

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- a. the number of cards per 1 million inhabitants - L\_KART,
- b. the number of commercial bank branches per 100 thousand people - L\_ODDZ,
- c. number of ATMs per 100,000 adults - L\_BAN,
- selected measures of banking sector efficiency - purpose of implementing innovative solutions in banks:
  - a. return on Equity - ROE,
  - b. return on Assets - ROA, the variable, due to high correlation with other variables, was not included in the panel study,
  - c. administrative costs of the banking sector - KA,
  - d. Cost to Income - C/I.

## **Results**

The analysis of the impact of the banking environment (explanatory variables) on FinTech digital inclusion (dependent variable) concerned the verification of the research hypothesis H1 in model 1.

The results of the panel study carried out with the estimation of the determined random effects for model 1, within which the relationship between the explanatory variables and the dependent variable was analyzed:

the statistical significance was confirmed of all variables of the macroeconomic environment of the banking sector. It was shown that GDP growth and greater concentration of the banking sector (HHI) have a positive impact on the FinTech digital inclusion of society. Furthermore, it was shown that the high level of bank loans in the financial sector does not improve FinTech digital inclusion. This may be a contribution to a further analysis in which the stream of bank loans should be identified granted in the bank branch, as well as through electronic distribution channels,

in variables explaining the technological environment of the banking sector, the positive, statistical relationship was confirmed between the level of employment in the knowledge-based services sector (ZAT) and the functioning of the innovation hub (IH),

among the variables explaining the banking system infrastructure, the positive statistical impact of the number of ATMs (L\_BAN) and the negative impact of the number of bank branches (L\_ODDZ) were confirmed,

within the selected banking sector efficiency measures, considered as the aim of implementing innovative solutions, a positive impact of the return on equity ratio on FinTech digital inclusion was demonstrated.

Model 1 did not indicate a statistically significant relationship between loans granted by FinTech companies (FINTECH\_KRED), the functioning

of the regulatory sandbox (SANDBOX), the number of cards per 1 million inhabitants (L\_KART), administrative costs of the banking sector - (KA) and the Cost to Income ratio ( C/I).

## **Conclusions**

The article verified the research hypothesis (H1): the banking sector environment has a substantial impact on FinTech digital inclusion, through panel studies used to develop model 1. As a result of the analysis of explanatory variables, a substantial positive impact of economic growth on FinTech digital inclusion was shown. The results of this study confirm the results of research carried out in the literature on the subject, indicating an increasing number of people using mobile devices or pocket devices to access the Internet while away from home or work, in dynamically developing countries. Additionally, it has been proven (as in the research of, among others, NBP) that the greater the concentration of the banking sector, the higher the potential % of people using mobile or pocket devices to use the Internet. Among the macroeconomic indicators of the banking sector, a significant, nevertheless negative correlation between loans granted by the banking sector and FinTech digital inclusion of society was shown. This may be pointed by a very large number of loans (especially mortgage loans) granted through traditional distribution channels for banking products. Consequently, the market of long-term loans (especially mortgage loans) will be dominated by traditional financial institutions in the coming years. The study showed a very significant, positive-impact relationship between the level of employment in the knowledge-based services sector and the FinTech digital inclusion of society. This clearly indicates the direction in which national labour markets should follow, so as to meet the expectations of consumers in terms of banking services and products. Among the technological factors having a significant impact on the dependent variable, the functioning of innovation hub has been pointed out. Regulated environments that favour the implementation of innovative solutions may enable a dynamic increase in consumer confidence in the FinTech sector, and thus the increasingly common use of banking products and services in a mobile or pocket device, which so far was dominated by traditional distribution channels. The statistical significance between regulatory sandboxes and FinTech digital inclusion has not been confirmed. Only the development of these solutions in national financial security networks may have a significant impact on this. Model 1 also showed a positive, statistically significant impact of the ROE ratio on FinTech digital

inclusion - thus confirming the conclusions of the NBP survey. Moreover, it was specified that limiting the number of bank branches has a positive impact on the increasing use of the Internet through mobile and pocket devices, and on the positive effect of the number of ATMs on the dependent variable.

The above conclusions resulting from the panel study enable a positive verification of the H1 research hypothesis - confirming that the banking sector environment has a significant impact on FinTech digital inclusion.

The analysis of the European Union countries in terms of FinTech digital inclusion enables the verification of the H1. However, EU countries are at different levels of economic and banking development. Moreover, there are significant differences in the level of development of the FinTech market among the EU countries. As a result, as part of future research on FinTech digital inclusion of society, the impact of the explanatory variables should be targeted with dependent variable considering the innovation level of countries - e.g. by dividing the EU countries into innovation leaders and moderate innovators.

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## Annex

**Table 1.** Descriptive statistics of variables

|              | Mean    | Median  | Minimum | Maximum | Std. Dev. |
|--------------|---------|---------|---------|---------|-----------|
| L_ODDZ       | 30,15   | 27,77   | 1,43    | 83,89   | 17,12     |
| L_BAN        | 81,32   | 68,55   | 31,69   | 186,37  | 36,05     |
| L_KART       | 1,57    | 1,50    | 0,68    | 4,97    | 0,63      |
| ROE          | 2,60    | 6,25    | -164,87 | 21,53   | 19,28     |
| CI           | 58,20   | 58,55   | -51,65  | 135,58  | 13,01     |
| KA           | 0,69    | 0,59    | 0,24    | 2,38    | 0,34      |
| ZAT          | 3,73    | 3,50    | 1,60    | 7,00    | 1,23      |
| FINTECH_KRED | 110,50  | 2,45    | 0,00    | 3742,90 | 348,57    |
| SANDBOX      | 0,06    | 0,00    | 0,00    | 1,00    | 0,25      |
| IH           | 0,28    | 0,00    | 0,00    | 1,00    | 0,45      |
| BANK_KR      | 64,19   | 52,88   | 19,55   | 198,12  | 34,28     |
| HHI          | 1177,20 | 1026,50 | 245,00  | 3310,00 | 663,55    |
| PKB          | 2,34    | 2,20    | -7,30   | 25,20   | 2,86      |
| FT_WŁ_CYF    | 56,52   | 59,00   | 7,00    | 93,00   | 19,18     |

**Table 2.** Results of a panel study on FinTech determinants of digital inclusion, in the years 2012-2019, EU countries

|              | factor   | value "p" |
|--------------|----------|-----------|
| const        | -16,3469 | 0,4826    |
| PKB          | 0,8796   | *         |
| HHI          | 0,0115   | ***       |
| BANK_KR      | -0,1563  | **        |
| FINTECH_KRED | 0,0007   | 0,7223    |
| ZAT          | 14,7789  | ***       |
| SANDBOX      | 2,0496   | 0,5083    |
| IH           | 6,2488   | ***       |
| L_KART       | 3,9182   | 0,5203    |
| L_ODDZ       | -0,5367  | ***       |

**Table 2.** Continued

|   | <b>factor</b> | <b>value "p"</b> |        |
|---|---------------|------------------|--------|
| ROE   | 0,0846        | ***              | 0,0000 |
| KA  | 7,0385        |                  | 0,1054 |
| CI  | 0,0366        |                  | 0,4583 |
| within R-kwadrat                                |               |                  | 0,7779 |
| number of observations                          |               |                  | 216    |
| units of time                                   |               |                  | 8      |
| number of cross-sectional data<br>per unit time |               |                  | 27     |

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**The supervisory model and level of implementation  
of the BCBS Core Principles for Effective Banking Supervision:  
are they determinants of bank financial stability?**

**JEL Classification:** *G21; G28*

**Keywords:** *financial supervision; bank financial stability; Core Principles for Effective Banking Supervision*

**Abstract**

**Research background:** In recent years, there has been a significant increase in interest in the topic of financial stability around the world. It is perceived as the fundamental value of financial systems and even as a common welfare. The literature indicates the diversity of its determinants, which shows that financial stability is complex and ambiguously defined.

**Purpose of the article:** Analysing the impact of the features of prudential supervision over the financial market in selected European Union countries on the financial stability of banks operating in them.

**Methods:** Research methods used in this paper include domestic and foreign literature review, statistical analysis of data of banks operating in selected European Union countries and econometric analysis tools (random effects regression for panel data). The paper presents the results of panel study on the factors affecting the financial stability of 2108 banks in 12 selected European countries, carried out using data obtained from the BankFocus, EUROSTAT and ECB databases. The study covered the years 2011-2018.

**Findings & Value added:** An analysis of compliance with the Core Principles for Effective Banking Supervision by selected European countries was carried out and the shape of supervision over the financial markets in these countries was described in the paper. The paper positively verified the hypothesis regarding the occurrence of a statistically significant impact of the supervisory model, its location towards the central bank and the level of implementation of the BCBS Core Principles for Effective Banking Supervision on financial stability (measured using capital adequacy ratios and the Z-score and MLPS indices) in the countries studied.

## **Introduction**

In recent years, there has been a significant increase in interest in the subject of financial stability on a global scale. This is primarily due to the economic, regulatory and social consequences of the 2007-2009 financial crisis. The COVID-19 pandemic and its effects' impact on the financial sector and the real economy have once again confirmed that financial stability ought to be seen as a fundamental value of financial systems, and even as a public good.

With regard to the concept of operation of the financial security net, a particular role in ensuring the banks' financial stability (in macro and microeconomic terms) is played by the organizations supervising the credit institutions. In the European Union countries, financial supervision functions in various structures and models. Individual models differ from each other, inter alia, in the number of institutions supervising the financial market or the degree of central bank's involvement in these activities. Each of these solutions, in the light of the theory of literature, has certain advantages and disadvantages, and the effectiveness of their conduct depends, among others, on a number of characteristics of the financial systems of individual countries or the banks themselves.

The main purpose of this article is therefore to examine the impact of the features of prudential supervision over the financial market in selected European Union countries on the financial stability of the banks operating on their territories. The research methods used in the work include a literature review, statistical analysis of banks' data operating in selected European Union countries, and tools for econometric analysis (panel studies).

## Literature review

There is no clear position in the study results concerning the impact of the supervisory model, quality and supervisory powers on the financial stability of banks. Doubts in this respect result primarily from the issue of the moral hazard phenomenon, consisting one of the most important problems in the operation of the financial safety net. The research most often assesses the official supervisory power – defined as a degree to which the national banking supervision authority is permitted to undertake specific actions. Studies of Shehzad & Haan (2015, pp. 15-24) showed that a strong supervisory power (manifested by a large authority in the scope of impact on the banks' governing bodies) brings benefits to the banks' stability through a better quality of credits and lesser temptation to abuse, without this dependency for systematically significant banks. In the research carried out among 1050 commercial banks it was shown that the importance of the influence of supervisory powers on financial stability can also be conditioned by the institutional factors, inter alia the level of a country's political stability, the scale of corruption or the effectiveness of judiciary activity (Bermpei et al., 2018, pp. 255-275). Interesting conclusions can also be drawn from studies on the impact of supervisory effectiveness on the stability of banks, which showed that the relationship between the frequency of supervisory inspections and banking risk is U-shaped (Delis & Staikouras, 2011, pp. 511-543).

The literature indicates a number of universal functions that should be performed by institutions exercising supervision - regardless of the degree of their involvement and the fact of which one of these entities (central bank or institution outside the structures of the central bank) has supervisory powers. According to the systematics proposed by D. Llewellyn (2006), the activities of a supervisory institution should include at least the following areas: organization of a financial safety net; prudential supervision and regulation, conduct of business regulation, supervision over the running of financial institutions, conduct of business supervision, stability and integrity of payment systems, actions against insolvent institutions, liquidity support for the purpose of maintaining financial stability of the entire system, anti-crisis solutions, issues related to the integrity of the financial market.

Supervision over the financial system in individual European countries is not uniform. In majority of European Union countries, central banks are the only institutions responsible for prudential supervision. In seven countries they perform this function in cooperation with other authorities. In turn, seven countries indicate that banks' prudential supervision falls within

the remit of institutions other than their central banks. Currently, the most common supervisory model is integrated supervision (13 countries), while the least frequent - sector supervision (4) and twin peaks (4). The vertical model is present in Cyprus, Greece, Spain and Slovenia, while the bipolar model is present in Belgium, Finland, France and the Netherlands (The World Bank, 2019).

### **Research methodology**

The research method presented in this part of the work is used to verify the research hypotheses put forward by the authors. The main hypothesis states that the type of supervisory model, its placement in relation to the central bank and the level of implementation of the Core Principles of Effective Banking Supervision (CPEBS) are statistically significant determinants of financial stability in the selected European states. The detailed hypotheses were formulated as follows: a higher level of efficiency assessment of the CPEBS by the banking supervision in a given country results in a higher level of stability of the banks operating within a given area; placement of supervision in the central bank positively influences the level of stability of supervised banks, use of centralized supervisory model instigates higher than in other models stability of banks.

The research leading to verification of hypotheses was carried out based on the unitary data obtained from the databases of BankFocus, EURO-STAT and ECB. The research period covered the years 2011-2018. 2108 banks from 12 European Union countries were included in the scope of the study.

The data used is panel data, which allows for the observation and analysis of changes simultaneously across units and time. For statistical tests, it was planned to use dynamic panel models, estimated with the use of the GMM, in the GMM-SYS version (Blundell & Bond, 1998, pp. 115-143). However correct instrumentalization of variables in the GMM-SYS method turned out to be impossible (Hansen's statistic turned out to be significant). Therefore, static models were used to verify the hypotheses. Due to the significance of the Hausman statistics for each model, static models with random individual effects were used, the general notation of which takes the form:

$$STAB_{it} = a_0 + a_1 \times V.MAKRO_{i(t, t-1)} + a_2 \times V.MIKRO_{i,t} + a_3 \times V.S_{it} + v_{it}$$

where: STAB<sub>it</sub> – measure of financial stability of the banks and in the period t, V.MAKRO<sub>i(t,t-1)</sub> - vector of macroeconomic var. in period t or t-1 V.MIKRO<sub>it</sub> - vector of control var. characterizing the specifics of activities of a particular cooperative bank in period t, V.S<sub>it</sub> – vector of experimental var. concerning the features of prudential supervision (model, location in relation to the central bank, level of implementation of CPEBS), and v<sub>it</sub> - a random component, being the sum of the individual u<sub>i</sub> effect unchanged over time and the pure random error ε<sub>i,t</sub>.

The description of variables used in the study was presented in the Table 1. One of the significant tools for assessing the functioning of supervision in individual countries are the evaluations of the implementation of the CPEBS, prepared regularly by the International Monetary Fund (IMF). There are significant differences in the level of IMF ratings across individual countries.

To assess the implementation of the rules, the IMF uses a four-level scale, where: C– means full compliance with the rule; LC – is compliance with the CPEBS to a large extent, MNC – indicates significant non-compliance, NC – signifies non-compliance. In order to improve the comparability of IMF conclusions (different number of rules assessed in individual years) for all analysed countries, for the purposes of this work, a separate assessment scale was created, ranging from 0 to 1. The relationships between them and the IMF notes are as follows: C – 1, LC – 0.7, MNC – 0.3, NC – 0. There is a strong variation in the degree of implementation of the CPEBS in individual countries (Belgium - 89%; Bulgaria - 68.28%).

## Results

In the panel study (Tab. 2) the significance of the impact of macroeconomic, microeconomic and experimental variables related to supervision of the stability of banks was assessed through the prism of capital adequacy. For this purpose, various measures of stability were used - the total capital ratio (TCR) and the Tier 1 capital ratio (T1R). In the next part of the work (Conclusions), the analyses were extended to include the assessment of financial stability determinants measured with the use Z-score, MLPS and E\_A ratio. The modelling process included separate measures related to supervision

(type of supervisory model and supervisory powers of the central bank), which was required due to their significant correlation.

A significant positive impact of the supervisory model on the financial stability of banks measured by the TCR was confirmed in the case of twin peaks supervisory model. Banks in countries applying this supervisory model were characterized by a higher level of capital adequacy in relation to credit institutions supervised by entities operating in a different supervisory model. On the other hand, the opposite direction of the impact was observed in the case of the fully integrated model (Table 2).

Three models also identified a significant positive effect of the NBC variable on the dependent variable TCR. As a consequence, this means that, in principle, the location of supervision (to the full extent) in the central bank significantly contributes to the growth of the TCR. However, this regularity does not occur when only a part of supervisory powers is delegated to the central bank. In the case of the IMF\_EWZN variable, a significant, positive impact of the level of implementation of the CPEBS was observed only in one model.

Among the macroeconomic variables, GDP dynamics turned out to be significant at the level of 1%, as it had a positive effect on stability in every model. In all models the negative impact of the inflation rate on the financial stability of banks in the EU countries was confirmed.

On the other hand, among the microeconomic variables, one can notice a significant negative impact of the bank's size on the level of capital adequacy, which confirms the validity of imposing additional buffers on large systemically important institutions that are characterized by a greater reluctance to voluntarily increase solvency ratios. A statistically significant positive relationship was confirmed for the C\_I and the LA\_D ratios. The share of net loans in total assets negatively influenced the financial stability in each of the constructed models.

In the case of financial stability measured by the T1R, a significant negative impact on it with regard to the application of the integrated supervision model (both variants concerning the role of the central bank) can be observed. This means that banks in countries applying this supervisory model were characterized by a lower level of capital adequacy (in terms of the highest quality capitals) in relation to credit institutions supervised by entities operating in a different supervisory model.

The variable determining the degree of effective fulfilment of the CPEBS turned out to be positively significant in six models. A higher level of compliance of the actual supervision model with the postulates of effective supervision results in a higher level of capital adequacy (in terms of

T1R). In the case of the sectoral and twin peaks models, the full location of banking supervision within the central bank results in a higher level of capital adequacy.

## **Conclusions**

The article positively verified the hypothesis regarding the existence of a statistically significant impact of the supervisory model, its location in relation to the central bank and the level of implementation of the BCBS's CPEBS on financial stability in the analysed countries.

In order to assess whether the selection of the variable characterizing the microeconomic stability of banks influences changes in the significance of stability determinants, supplementary studies were carried out using other variables Z-score, MLPS, E\_A.

Conclusions regarding the detailed hypothesis, which constitute a positive impact of the high level of assessment of the effectiveness of the implementation of CPEBS on banks financial stability, are ambiguous. In the case of adopting as a measure of financial stability indicators based on capital adequacy and capitalization (TCR, T1R or E\_A ratio), the hypothesis was verified positively. However, in the case of using measures based not only on capital and risk, but also on long-term profitability to assess financial stability, it was shown that more complete compliance with the BPBES in the analysed countries had a negative impact on the stability of banks expressed by the Z-score, as well as the MLPS (in the case of presence of the supervision or twin peaks sector in a country). As a consequence, it can be seen that focusing the regulatory approach on a strong capital base, although it guarantees a greater buffer for loss absorption in the short term, may have a long-term negative impact on the ability to generate profits, and thus deprive the bank of the possibility of increasing capitalization in the future.

Also the hypothesis of the positive impact of placing the supervision in the central bank on the financial stability of the supervised banks has not been verified unambiguously. In the case of measures based on capital adequacy, in all models for which the NBC variable turned out to be a statistically significant determinant of financial stability, the direction of its impact was positive, which means that in countries where supervision was assigned to the central bank, the bank's regulatory ratios have higher values, whilst an inverse relationship was shown in the case of stability measure based on capitalization in accounting terms (E\_A).

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The hypothesis, according to which the application of the integrated model of supervision influences the higher stability of banks than in other models, has been verified negatively. A positive and significant influence of the integrated model was observed only in the case of stability expressed by the Z-score and MLPS indicators. However, in the remaining panel models, the decrease in the level of financial stability was most often identified in the case of using the indicated supervisory model. The twin peaks model turned out to be a model of financial market supervision, which clearly had a significant positive impact on the financial stability of banks in the analysed countries for all stability indicators.

The presented research results can be treated as a guideline for public authorities in the context of modelling the shape of supervision in individual countries. Nevertheless, it should be noted that the obtained results concern only the group of developed countries of the European Union, and the period of analyses covered a specific period after the crisis of 2007-2009.

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## Annex

**Table 1.** Characteristics of variables used in panel studies of bank stability in selected European Union countries in 2011–2018

| Variable   | Description of variable   | Data source                                     |
|--|---|---|
| <b>Explained variables</b>                                   |   |   |
| TCR  | Total Capital Ratio   | BankFocus                                       |
| TIR  | Tier 1 Capital Ratio  |   |
| Z-score  | Measure of bank's distance from bankruptcy  | Own calculations based BankFocus                |
| MLP score  | Multi-Level Performance Score – stability measure - author's concept by Miklaszewska and Kil (2016)   |   |
| E_A  | Equity to total assets  | BankFocus                                       |
| <b>Explanatory variables - macroeconomic characteristics</b> |   |   |
| GDP  | Annual average GDP dynamics in the country  | EUROSTAT  |
| HICP   | Harmonized Index of Consumer Prices   |   |
| HHI  | Herfindahl-Hirschman Index  | ECB   |
| <b>Explanatory variables - microeconomic characteristics</b> |   |   |
| LN_A   | Logarithm of total assets   | BankFocus                                       |
| NIM  | Net interest margin   |   |
| ROA  | Average rate of return on assets  |   |
| ROE  | Average rate of return on equity  |   |
| C_I  | Cost to Income ratio  |   |
| L_D  | Share of net loans in deposits and short-term sources of financing  |   |
| L_A  | Share of net loans in total assets  |   |
| LA_D   | Liquid assets to deposits and short-term sources of financing   |   |
| NPL  | Share of impaired loans in a bank's loan portfolio  |   |
| FB   | Binary variable specifying the organizational and legal form of banking activity: 1 - commercial banks, 0 - cooperative and savings banks   |   |
| <b>Explanatory variables – supervision</b>                   |   |   |
| IMF_EWZN   | The level of implementation of the CPEBS in the assessment of IMF reports   | Own calculations based on the data of the IMF   |
| NBC  | Binary variable specifying the supervisory powers of the central bank: 1 - the central bank fully responsible for prudential supervision, 0 - the central bank does not have supervisory powers or has them to a limited extent | WB (The Bank Regulation and Supervision Survey) |
| NBC_CZ   | Binary variable specifying the limited supervisory powers of the central bank: 1 - the central bank has limited supervisory powers, 0 - other cases   |   |
| MN_S   | Binary variable specifying the application of the sectoral supervision model: 1 - the country uses model, 0 - the country does not use  |   |
| MN_TP  | Binary variable specifying the use of the twin peaks supervision model: 1 - the country uses the model, 0 - the country does not use the model  |   |
| MN_Z   | Binary variable specifying the application of the integrated supervision model: 1 - the country uses the model, 0 - the country does not use the model  |   |
| MN_M   | Binary variable specifying the application of the mixed supervision model: 1 - the country uses the model, 0 - the country does not use the model   |   |

**Table 2.** The results of the panel study – determinant of the banks' stability (TCR variable)

| Dependent variable | TCR                          |                            |                               |                               |                             |                               |                               |                             |
|--------------------|------------------------------|----------------------------|-------------------------------|-------------------------------|-----------------------------|-------------------------------|-------------------------------|-----------------------------|
|                    | SECTORAL MODEL               |                            | TWIN PEAKS MODEL              |                               | INTEGRATED MODEL            |                               | MIXED MODEL                   |                             |
| MN                 | <b>0.57</b><br><i>2.26</i>   | <b>0.90</b><br><i>2.39</i> | <b>6.14***</b><br><i>2.06</i> | <b>5.46***</b><br><i>1.88</i> | <b>-0.50</b><br><i>1.15</i> | <b>-1.81**</b><br><i>0.81</i> | <b>-2.67</b><br><i>1.63</i>   | <b>-0.27</b><br><i>1.14</i> |
| NBC                | <b>1.46**</b><br><i>0.71</i> | -                          | <b>3.22***</b><br><i>0.88</i> | -                             | <b>1.22</b><br><i>0.94</i>  | -                             | <b>3.53**</b><br><i>1.44</i>  | -                           |
| NBC_CZ             | -                            | <b>1.32</b><br><i>1.44</i> | -                             | <b>-1.84</b><br><i>1.36</i>   | -                           | <b>2.16</b><br><i>1.35</i>    | -                             | <b>1.04</b><br><i>1.51</i>  |
| IMF_EWZN           | <b>0.17</b><br><i>0.10</i>   | <b>0.09</b><br><i>0.14</i> | <b>0.03</b><br><i>0.13</i>    | <b>0.04</b><br><i>0.14</i>    | <b>0.12</b><br><i>0.08</i>  | <b>-0.06</b><br><i>0.11</i>   | <b>0.34***</b><br><i>0.08</i> | <b>0.11</b><br><i>0.13</i>  |
| Const              | 17.05*<br><i>8.86</i>        | 24.43**<br><i>11.31</i>    | 26.07**<br><i>10.70</i>       | 28.97**<br><i>11.60</i>       | 20.95***<br><i>7.75</i>     | 37.94***<br><i>9.96</i>       | 3.013<br><i>7.31</i>          | 23.08**<br><i>9.83</i>      |
| GDP                | 0.34***<br><i>0.06</i>       | 0.34***<br><i>0.06</i>     | 0.34***<br><i>0.06</i>        | 0.34***<br><i>0.06</i>        | 0.34***<br><i>0.06</i>      | 0.34***<br><i>0.06</i>        | 0.33***<br><i>0.06</i>        | 0.34***<br><i>0.06</i>      |
| HICP               | -0.19*<br><i>0.10</i>        | -0.19*<br><i>0.10</i>      | -0.18*<br><i>0.10</i>         | -0.18*<br><i>0.10</i>         | -0.19**<br><i>0.10</i>      | -0.19*<br><i>0.10</i>         | -0.18*<br><i>0.10</i>         | -0.19*<br><i>0.10</i>       |
| HHI                | -33.9<br><i>22.76</i>        | -36.3<br><i>23.61</i>      | -29.6<br><i>21.64</i>         | -40.8*<br><i>23.40</i>        | -34.5<br><i>21.99</i>       | -35.9<br><i>22.78</i>         | -28.2<br><i>21.42</i>         | -36.2<br><i>23.44</i>       |
| LN_A               | -1.36***<br><i>0.24</i>      | -1.44***<br><i>0.27</i>    | -1.50***<br><i>0.27</i>       | -1.49***<br><i>0.27</i>       | -1.36***<br><i>0.24</i>     | -1.44***<br><i>0.26</i>       | -1.43***<br><i>0.26</i>       | -1.44***<br><i>0.27</i>     |
| NIM                | 0.17<br><i>0.53</i>          | 0.16<br><i>0.53</i>        | 0.16<br><i>0.53</i>           | 0.15<br><i>0.53</i>           | 0.17<br><i>0.53</i>         | 0.16<br><i>0.53</i>           | 0.17<br><i>0.53</i>           | 0.16<br><i>0.53</i>         |
| ROA                | 0.64<br><i>0.41</i>          | 0.64<br><i>0.41</i>        | 0.64<br><i>0.41</i>           | 0.64<br><i>0.41</i>           | 0.64<br><i>0.41</i>         | 0.64<br><i>0.41</i>           | 0.64<br><i>0.41</i>           | 0.64<br><i>0.41</i>         |
| C_I                | 0.02***<br><i>0.01</i>       | 0.02***<br><i>0.01</i>     | 0.02***<br><i>0.01</i>        | 0.02***<br><i>0.01</i>        | 0.02***<br><i>0.01</i>      | 0.02***<br><i>0.01</i>        | 0.02***<br><i>0.01</i>        | 0.02***<br><i>0.01</i>      |
| L_D                | 0.01<br><i>0.01</i>          | 0.01<br><i>0.01</i>        | 0.01<br><i>0.01</i>           | 0.01<br><i>0.01</i>           | 0.01<br><i>0.01</i>         | 0.01<br><i>0.01</i>           | 0.01<br><i>0.01</i>           | 0.01<br><i>0.01</i>         |
| L_A                | -0.11***<br><i>0.02</i>      | -0.11***<br><i>0.02</i>    | -0.11***<br><i>0.02</i>       | -0.11***<br><i>0.02</i>       | -0.11***<br><i>0.02</i>     | -0.11***<br><i>0.02</i>       | -0.11***<br><i>0.02</i>       | -0.11***<br><i>0.02</i>     |
| LA_D               | 0.11***<br><i>0.03</i>       | 0.11***<br><i>0.03</i>     | 0.11***<br><i>0.03</i>        | 0.11***<br><i>0.03</i>        | 0.11***<br><i>0.03</i>      | 0.11***<br><i>0.03</i>        | 0.11***<br><i>0.03</i>        | 0.11***<br><i>0.03</i>      |
| NPL                | 0.02<br><i>0.08</i>          | 0.02<br><i>0.08</i>        | 0.02<br><i>0.08</i>           | 0.02<br><i>0.08</i>           | 0.02<br><i>0.08</i>         | 0.02<br><i>0.08</i>           | 0.02<br><i>0.08</i>           | 0.02<br><i>0.08</i>         |
| FB                 | 1.60<br><i>1.45</i>          | 1.43<br><i>1.44</i>        | 2.13<br><i>1.55</i>           | 1.81<br><i>1.50</i>           | 1.60<br><i>1.44</i>         | 1.48<br><i>1.41</i>           | 1.84<br><i>1.53</i>           | 1.46<br><i>1.43</i>         |
| Nb. of obs.        | 11285                        |                            |                               |                               |                             |                               |                               |                             |
| Nb. of banks       | 1868                         |                            |                               |                               |                             |                               |                               |                             |

Note: \*\*\* significance level 1%, \*\* 5%, \* 10%. Heteroscedastic standard errors are in italics.

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## **Banking sector development and economic growth of counties in Poland. Is Schumpeter right?**

**JEL Classification:** *E44; G21; O16; O47; R51*

**Keywords:** *banking network; banking services; regional economic growth*

### **Abstract**

**Research background:** A well-developed network of banking branches is a basic condition for local financial development and the availability of credit and other banking services for enterprises. The link between financial development and economic growth advocated by Schumpeter has become the subject of extended research. In most cases, however, it concerned the economy of the entire country.

**Purpose of the article:** The subject of this study is to assess the impact of the development of banking network and accessibility of banking services on the economic situation of counties in Poland between 2014 and 2019.

**Methods:** The linear model of panel data was estimated using the FGLS method, which is resistant to autocorrelation and heteroskedasticity across panels. We evaluated the development of the banking network by the number of branches per 1,000 inhabitants and per 1 km<sup>2</sup>, while the economic situation is assessed by the

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\* The opinions expressed herein are those of the author and do not necessarily represent those of the National Bank of Poland.

value of production per one inhabitant and the number of employees per 1,000 inhabitants of a county. Data on the number of bank branches within counties come from Inteliace Research and macroeconomic data from the Central Statistical Office.

**Findings & Value added:** The obtained results confirmed the validity of the Schumpeter paradigm at the county level, although the strength of the relationship between financial development and growth depends on the size and population density of the county. We have found a strong positive impact of the branch density on the level of employment in all types of counties and on the value of production in low and medium urbanized counties. The scale of this relationship is significantly influenced by investment expenditure of the local governments, human capital and technical infrastructure of a county. Our findings underline the fundamental role which banks play in supporting financial intermediation activities in counties, largely achieved through an extensive branch network.

## Introduction

The positive impact of the availability and scope of services offered by the financial system, mostly banks, on economic growth was noticed at the beginning of the 20th century. Schumpeter stated that entrepreneurs can best transform the available capital into innovative products leading to a higher production of the firm, and to an increase in the economic potential of the region and the country. The positive relationship between financial development and economic growth is also confirmed by studies conducted, among others by King and Levine (1993, pp. 717–737) and Levine and Zervos (1998, pp. 537-558). When examining large samples of countries in the second half of the 20th century, they found, that better developed banking sectors more effectively collected savings of individual and institutional clients and transferred them into loans granted to the economy. The experience and a high expertise in a risk assessment enabled banks to better select prospective and high-profitable projects proposed by enterprises. According to Aizenman *et al.* (2007), such skills have high economic effects and caused that countries with a highly developed financial sector effectively redistribute local savings to the economy and grew faster than those that financed the economy mostly with foreign investments.

There are also studies that find the negligible or negative impact of financial development on economic growth. Andresen and Tarp (2003, pp. 189-209) indicated that in countries with too high a level of competition and low institutional development, banks do not effectively conduct the financial intermediation function and direct local savings sometimes to non-prospective enterprises. Additionally, Arcand *et al.* (2015, pp. 105-

148) found that the relationship between the size of the banking sector and the state of the country's economy is non-linear and could even have a negative character.

In the research to date, economists have most often focused on checking the finance-growth relationship for the national economy. Their analyses mainly took into account factors relating the entire country, i.e. monetary aggregates, the amount of credit granted to the private sector, capitalization of the stock market or the bond market (e.g. Levine and Zervos, 1998, pp. 537–558).

The aim of the research is to check whether, assumed by Schumpeter, the positive impact of the financial development and the availability of credit and other banking services on the local economy takes place in smaller administrative units such as counties in Poland in 2014-2019. The linear model of panel data was estimated using the feasible generalized least squares (FGLS) method. Data on bank branches were obtained from Inteliace Research, while macroeconomic data from the Central Statistical Office (CSO) and the National Bank of Poland (NBP). The results of the research are important for the regional development, and particularly for the operations of micro- and small enterprises, which are most interested in acquiring external funds, primarily from the banking sector.

The rest of the article is structured as follows. The next section presents the research methods used and the results. The entire analysis is summarized in the conclusions.

## **Research methodology**

To investigate the finance-growth relationship a data panel was built covering 380 counties in Poland for the period 2014-2019 and containing variables describing the level of banking and the economic situation of the counties.

### *State of the county's economy*

The state of county's economy is represented by the value of production counted per one inhabitant (PROD) as the Local Data Bank of the CSO limits the GDP data to the voivodship level. The number of employees per 1,000 inhabitants (EMPL) was adopted as an alternative measure of the county's economy.

### *The level of the banking development*

Focusing the research area to the county level significantly limits the possibilities of estimating the level of the banking sector development. The CSO and the NBP do not provide data on deposits and loans to the non-financial sector in the division into counties. For this reason, following the example of Jayaratne and Strahan (1996, pp. 639-670) and Petersen and Rajan (2002, pp. 2533-2570), the numbers of bank branches operating in a given county per 1000 inhabitants (BR.1000) and per 1 km<sup>2</sup> (BR.SQR) were adopted as measures of the banking sector development. Data on number of branches came from Inteliace Research. The imperfection of the measures adopted is that they do not take into account the differences in the size of outlets and the scale of their credit and debit activities. Moreover, banking services are gradually being transferred to the Internet and mobile channels. However, in the less urbanized areas, significant share of banking services to micro- and small enterprises are realized at physical locations. On the other hand, it is the only measure of bank presence in individual counties which is publicly available in Poland.

The share of employees of financial institutions in the total number of employees (FIN.EMP) is an additional measure of the financial sector development in a county.

### *Control variables*

One of the most important factors influencing the finance-growth relationship is the human capital. In the study, the measure is represented by the share of students attending school in the total number of the young persons (EDU). Based on Kendall (2012, pp. 1548-1562), a positive impact to the economic growth was expected.

Recognized by Kendall (2012, pp. 1548-1562) the positive impact of public support for the economic growth is measured by the share of funds allocated to investment activities in the local government budget (GOV.INV). The technical infrastructure, represented in the study by the length of roads per 10 km<sup>2</sup> (ROADS) and the share of people with Internet access (INTRNT) were expected to positively contribute to the growth of the trade with domestic and international partners and the physical and virtual mobility of the society (Herwartz and Walle, 2014, pp. 417-427).

The interest rate on loans to individual entrepreneurs (INT.RATE) published by the NBP is a factor at the national level. A negative correlation with the growth was expected.

The research used the model applied by Herwartz and Walle (2014, pp. 417-427). It has the following formula:

$$y_{it} = \beta x_{it} + \gamma z_t + u_{it}, t = 1, \dots, T, i = 1, \dots, N$$

where:  $i$  – county index,  $t$  – year,  $y_{it}$  = (PROD, EMPL),  $x_{it}$  = (BR.1000, BR.SQR, FIN.EMPL, EDU, ROADS, GOV.INV, INTRNT),  $z_t$  = INT.RATE,  $u_{it}$  – random component,  $\beta$  and  $\gamma$  – parameters to be estimated,  $T = 6$ ,  $N = 380$ .

## Results

There are 380 counties in Poland, including 66 largest cities which also have county rights (informally called township counties) and 314 so called rural counties. The sample includes all counties in Poland, and the annual data cover the years 2014-2019. The short time series resulted solely from the availability of data on bank branches. In order to examine the characteristics of the finance-growth relationship in counties with different levels of urbanization, the sample was additionally divided into three groups according to the level of population density. The group (GR1) consists of 94 least urbanized counties with a population density below the first quartile (Q1) of the county distribution. The GR2 comprises 191 counties based in medium-sized cities with a population density between Q2 and Q3. The GR3 of 95 counties with a population density higher than Q3 consists of township counties and about thirty counties directly or indirectly adjacent to the largest cities, incl. Warsaw, Kraków, Poznań and Wrocław.

The values of descriptive statistics (see Tab. 1) show that the sample is significantly diversified in terms of the variables: PROD, BR.1000, BR.SQR, FIN.EMPL, and ROADS. For this reason, to limit the impact of heteroscedasticity all variables were logged with the natural logarithm. The values of the correlation indicators (see Tab. 1) suggest that variables representing the growth of county's economy (PROD and EMPL) are positively and statistically significantly correlated with the majority of explanatory variables, what signals that the banking sector development and some control variables are stimuli of the county's economy.

For the selection of the panel regression estimation method, diagnostic tests were performed to check the existence of autocorrelation (the Wooldridge test) and heteroscedasticity (the Breusch-Pagan test). Taking into account the presence of autocorrelation and heteroscedasticity in a sample, a linear panel model estimated by the feasible generalized least

squares (FGLS) method was used for the study. It allows for the estimation of the panel with confirmed AR (1) autocorrelation, cross-sectional correlation and heteroskedasticity across panels. Econometric calculations were conducted using the STATA 16.0 statistical program.

Table 2 presents the results of the model 1 estimation, where the county's economic situation was represented by the production sold per capita (PROD), and the level of bank availability by BR.1000 (columns 1-4) and BR.SQR (columns 5-8). The results indicate that the number of branches across the country, both in terms of the number of inhabitants and the area of the county, was negatively correlated with the PROD variable, although this dependence varied with the county's urbanization level. In the case of groups GR1 and GR2, the BR.SQR variable was positively correlated with the PROD variable, while negative in the counties belonging to GR3.

In turn, table 3 presents the results of the model 1 estimation, where the county's economic situation is measured by the EMPL variable. They show that the bank accessibility represented by BR.1000 and BR.SQR positively impacted the economy of all counties as well as counties in three separate groups. The results proved that easier access of households and micro- and small enterprises improves the state of the local labor market. They are consistent with the research of Guiso *et al.* (2004, pp. 929-969) and Jayaratne and Strahan (1996, pp. 639-670) who found a positive impact of bank presence on the value of the production of local enterprises and total social and economic development of the region.

## **Conclusions**

The relationship between the development of the banking sector and the availability of banking services and the economic development at the local level applies primarily to micro- and small enterprises. A significant number of large enterprises use corporate banking centers organized by banks in major industrial centers. For this reason, the organization and accessibility of the network of bank branches is not particularly important to them.

In the case of micro- and small enterprises, the positive relationship between availability of banking services and their production volume and the level of employment underlines the important role that banks play for the local community and the economy. Maintaining an appropriate and functional network of bank branches, which facilitates a convenient access of households and micro- and small enterprises to banking services, is therefore one of the basic conditions for equalizing opportunities for development and convergence of the economy within the country. Such a positive

impact can be strengthened by the improvement of the level of education and increased access to the Internet, as well as greater involvement of local governments in financing economic projects. Support from the road infrastructure for the positive impact of the availability of banking services on economic development is particularly important for the least populated counties, which are usually located at a greater distance from large economic centers and are particularly interested in the possibility of selling products manufactured there.

A more precise examination of the relationship between the development of the banking sector and the counties' economic growth requires taking into account the scale of services offered by individual bank branches, as well as the degree of use of internet and mobile banking by households and entrepreneurs. However, data on this subject are not publicly available, inter alia, due to the need to maintain commercial and banking confidentiality. They can be partially estimated using a survey conducted among entrepreneurs, which may become the next stage of the current research.

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## Annex

**Table 1.** Descriptive statistics and correlations

|                        | Y1                | Y2                | X1                 | X2                 | X3                 | X4                | X5                 | X6                 | X7                | X8    |
|------------------------|-------------------|-------------------|--------------------|--------------------|--------------------|-------------------|--------------------|--------------------|-------------------|-------|
| Descriptive statistics |                   |                   |                    |                    |                    |                   |                    |                    |                   |       |
| Median                 | 2.949             | 5.193             | 0.030              | 0.350              | 5.610              | 5.765             | 4.583              | 4.454              | 2.695             | 4.316 |
| Mean                   | 2.905             | 5.227             | 0.151              | 0.361              | 5.807              | 5.928             | 4.587              | 4.546              | 2.663             | 4.306 |
| St. Dev.               | 0.865             | 0.359             | 0.286              | 0.106              | 0.415              | 1.035             | 0.094              | 0.648              | 0.373             | 0.059 |
| Min                    | 0.111             | 4.331             | 0.010              | 0.100              | 5.360              | 3.738             | 4.100              | 2.991              | 0.956             | 4.174 |
| Max                    | 5.363             | 6.375             | 1.770              | 0.930              | 6.600              | 11.738            | 4.942              | 6.220              | 3.835             | 4.430 |
| Obs                    | 2,280             | 2,280             | 2,280              | 2,280              | 2,280              | 2,280             | 2,280              | 2,280              | 2,280             | 2,280 |
| Correlations           |                   |                   |                    |                    |                    |                   |                    |                    |                   |       |
| Y1                     | 1                 |                   |                    |                    |                    |                   |                    |                    |                   |       |
| Y2                     | 0.68 <sup>a</sup> | 1                 |                    |                    |                    |                   |                    |                    |                   |       |
| X1                     | 0.19 <sup>a</sup> | 0.59 <sup>a</sup> | 1                  |                    |                    |                   |                    |                    |                   |       |
| X2                     | 0.02              | 0.30 <sup>a</sup> | 0.41 <sup>a</sup>  | 1                  |                    |                   |                    |                    |                   |       |
| X3                     | -0.03             | -0.02             | 0.02               | 0.08 <sup>a</sup>  | 1                  |                   |                    |                    |                   |       |
| X4                     | 0.42 <sup>a</sup> | 0.73 <sup>a</sup> | 0.66               | 0.17 <sup>a</sup>  | 0.01               | 1                 |                    |                    |                   |       |
| X5                     | 0.23 <sup>a</sup> | 0.53 <sup>a</sup> | 0.60               | 0.49 <sup>a</sup>  | -0.03              | 0.49 <sup>a</sup> | 1                  |                    |                   |       |
| X6                     | 0.27 <sup>a</sup> | 0.51 <sup>a</sup> | 0.75               | 0.14 <sup>a</sup>  | -0.01              | 0.59              | 0.49 <sup>a</sup>  | 1                  |                   |       |
| X7                     | 0.07 <sup>a</sup> | -0.02             | -0.14 <sup>a</sup> | -0.19 <sup>a</sup> | 0.27 <sup>a</sup>  | -0.04             | -0.19 <sup>a</sup> | -0.07 <sup>a</sup> | 1                 |       |
| X8                     | 0.21 <sup>a</sup> | 0.18 <sup>a</sup> | 0.01               | -0.25 <sup>a</sup> | -0.08 <sup>a</sup> | 0.11 <sup>a</sup> | 0.11 <sup>a</sup>  | 0.17 <sup>a</sup>  | 0.08 <sup>a</sup> | 1     |

Note: Y1 represents PROD; Y2 – EMPL; X1 - BR.SQR; X2 - BR.1000; X3 - INT.RATE; X4 - FIN.EMPL; X5 - EDU; X6 - ROADS; X7 - GOV.INV; X8 – INTRNT.

**Table 2.** Results for estimation of the finance-growth relationship (production sold)

|           | Total<br>(1)                   | GR 1<br>(2)                    | GR 2<br>(3)                    | GR3<br>(4)                     | Total<br>(5)                   | GR 1<br>(6)                    | GR 2<br>(7)                    | GR3<br>(8)                     |
|-----------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| BR.1000   | -0.217 <sup>a</sup><br>(0.019) | -0.244<br>(0.196)              | -0.019<br>(0.029)              | -0.486 <sup>a</sup><br>(0.038) |                                |                                |                                |                                |
| BR.SQR    |                                |                                |                                |                                | -0.056 <sup>a</sup><br>(0.009) | 0.097 <sup>a</sup><br>(0.028)  | 0.062 <sup>a</sup><br>(0.015)  | -0.264 <sup>a</sup><br>(0.018) |
| INT.RATE  | -0.279 <sup>a</sup><br>(0.023) | -0.231 <sup>a</sup><br>(0.050) | -0.324 <sup>a</sup><br>(0.031) | -0.234 <sup>a</sup><br>(0.053) | -0.3 <sup>a</sup><br>(0.024)   | -0.3 <sup>a</sup><br>(0.056)   | -0.32 <sup>a</sup><br>(0.031)  | -0.25 <sup>a</sup><br>(0.055)  |
| FIN.EMPL  | 0.31 <sup>a</sup><br>(0.006)   | 0.536 <sup>a</sup><br>(0.032)  | 0.27 <sup>a</sup><br>(0.016)   | 0.147 <sup>a</sup><br>(0.007)  | 0.326 <sup>a</sup><br>(0.008)  | 0.584 <sup>a</sup><br>(0.03)   | 0.277 <sup>a</sup><br>(0.015)  | 0.254 <sup>a</sup><br>(0.016)  |
| EDU       | 0.432 <sup>a</sup><br>(0.059)  | 0.233<br>(0.177)               | 1.063 <sup>a</sup><br>(0.114)  | 0.386 <sup>a</sup><br>(0.103)  | 0.417 <sup>a</sup><br>(0.062)  | 0.188<br>(0.192)               | 1.096 <sup>a</sup><br>(0.119)  | 0.791 <sup>a</sup><br>(0.114)  |
| ROADS     | 0.062 <sup>a</sup><br>(0.012)  | 0.170 <sup>a</sup><br>(0.058)  | -0.129 <sup>a</sup><br>(0.029) | 0.159 <sup>a</sup><br>(0.023)  | 0.130 <sup>a</sup><br>(0.016)  | 0.182 <sup>a</sup><br>(0.065)  | -0.142 <sup>a</sup><br>(0.028) | 0.449 <sup>a</sup><br>(0.038)  |
| GOV.INV   | 0.079 <sup>a</sup><br>(0.005)  | 0.036 <sup>a</sup><br>(0.010)  | 0.103 <sup>a</sup><br>(0.008)  | 0.048 <sup>a</sup><br>(0.011)  | 0.084 <sup>a</sup><br>(0.006)  | 0.051 <sup>a</sup><br>(0.011)  | 0.103 <sup>a</sup><br>(0.008)  | 0.050 <sup>a</sup><br>(0.012)  |
| INTRNT    | 0.854 <sup>a</sup><br>(0.049)  | 0.634 <sup>a</sup><br>(0.103)  | 0.804 <sup>a</sup><br>(0.065)  | 0.719 <sup>a</sup><br>(0.125)  | 1.002 <sup>a</sup><br>(0.047)  | 0.799 <sup>a</sup><br>(0.108)  | 0.838 <sup>a</sup><br>(0.064)  | 0.907 <sup>a</sup><br>(0.123)  |
| CONST     | -4.807 <sup>a</sup><br>(0.312) | -4.694 <sup>a</sup><br>(0.910) | -6.115 <sup>a</sup><br>(0.59)  | -3.652 <sup>a</sup><br>(0.622) | -5.702 <sup>a</sup><br>(0.35)  | -4.842 <sup>a</sup><br>(1.021) | -6.197 <sup>a</sup><br>(0.61)  | -8.489 <sup>a</sup><br>(0.708) |
| N (GR)    | 2280<br>(380)                  | 546<br>(94)                    | 1164<br>(191)                  | 570<br>(95)                    | 2280<br>(380)                  | 546<br>(94)                    | 1164<br>(191)                  | 570<br>(95)                    |
| Wald chi2 | 915.2                          | 394.8                          | 827.7                          | 1352.8                         | 971.6                          | 502.4                          | 957.2                          | 721.8                          |
| p-value   | 0.00                           | 0.00                           | 0.00                           | 0.00                           | 0.00                           | 0.00                           | 0.00                           | 0.00                           |

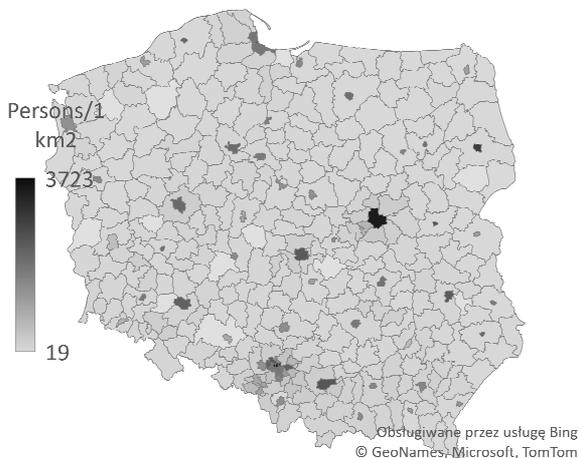
Source: own calculations based on data of CSO, NBP and Inteliace Research.

**Table 3.** Results for estimation of the finance-growth relationship (employment)

|           | Total<br>(1)                   | GR 1<br>(2)                    | GR 2<br>(3)                    | GR3<br>(4)                     | Total<br>(5)                   | GR 1<br>(6)                    | GR 2<br>(7)                    | GR3<br>(8)                    |
|-----------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-------------------------------|
| BR.1000   | 0.094 <sup>a</sup><br>(0.008)  | 0.021 <sup>c</sup><br>(0.012)  | 0.025 <sup>b</sup><br>(0.011)  | 0.199 <sup>a</sup><br>(0.015)  |                                |                                |                                |                               |
| BR.SQ     |                                |                                |                                |                                | 0.085 <sup>a</sup><br>(0.004)  | 0.015 <sup>c</sup><br>(0.009)  | 0.035 <sup>a</sup><br>(0.007)  | 0.058 <sup>a</sup><br>(0.006) |
| INT.RATE  | -0.065 <sup>a</sup><br>(0.008) | -0.044 <sup>b</sup><br>(0.019) | -0.096 <sup>a</sup><br>(0.012) | -0.036 <sup>c</sup><br>(0.02)  | -0.074 <sup>a</sup><br>(0.009) | -0.045 <sup>b</sup><br>(0.019) | -0.101 <sup>a</sup><br>(0.012) | -0.022<br>(0.017)             |
| FIN.EMPL  | 0.186 <sup>a</sup><br>(0.003)  | 0.201 <sup>a</sup><br>(0.007)  | 0.158 <sup>a</sup><br>(0.005)  | 0.131 <sup>a</sup><br>(0.003)  | 0.152 <sup>a</sup><br>(0.003)  | 0.202 <sup>a</sup><br>(0.007)  | 0.159 <sup>a</sup><br>(0.005)  | 0.126 <sup>a</sup><br>(0.003) |
| EDU       | 0.693 <sup>a</sup><br>(0.026)  | 0.447 <sup>a</sup><br>(0.058)  | 0.511 <sup>a</sup><br>(0.046)  | 0.824 <sup>a</sup><br>(0.036)  | 0.559 <sup>a</sup><br>(0.025)  | 0.487 <sup>a</sup><br>(0.055)  | 0.554 <sup>a</sup><br>(0.046)  | 0.738 <sup>a</sup><br>(0.036) |
| ROADS     | 0.03 <sup>a</sup><br>(0.003)   | -0.163 <sup>a</sup><br>(0.013) | -0.118 <sup>a</sup><br>(0.01)  | 0.086 <sup>a</sup><br>(0.008)  | -0.049 <sup>a</sup><br>(0.006) | -0.181 <sup>a</sup><br>(0.013) | -0.157 <sup>a</sup><br>(0.01)  | 0.019 <sup>a</sup><br>(0.012) |
| GOV.INV   | 0.01 <sup>a</sup><br>(0.002)   | 0.005<br>(0.004)               | 0.01 <sup>a</sup><br>(0.003)   | 0.02 <sup>a</sup><br>(0.004)   | 0.013 <sup>a</sup><br>(0.002)  | 0.005<br>(0.004)               | 0.009 <sup>a</sup><br>(0.003)  | 0.017 <sup>a</sup><br>(0.004) |
| INTRNT    | 0.394 <sup>a</sup><br>(0.018)  | 0.444 <sup>a</sup><br>(0.036)  | 0.375 <sup>a</sup><br>(0.025)  | 0.417 <sup>a</sup><br>(0.05)   | 0.401 <sup>a</sup><br>(0.019)  | 0.452 <sup>a</sup><br>(0.035)  | 0.382 <sup>a</sup><br>(0.024)  | 0.336 <sup>a</sup><br>(0.039) |
| CONST     | -0.724 <sup>a</sup><br>(0.125) | 0.705 <sup>b</sup><br>(0.284)  | 0.98 <sup>a</sup><br>(0.217)   | -1.251 <sup>a</sup><br>(0.213) | 0.594 <sup>a</sup><br>(0.131)  | 0.591 <sup>b</sup><br>(0.286)  | 1.026 <sup>a</sup><br>(0.229)  | -0.237<br>(0.222)             |
| N (GR)    | 2280<br>(380)                  | 546<br>(94)                    | 1164<br>(191)                  | 570<br>(95)                    | 2280<br>(380)                  | 546<br>(94)                    | 1164<br>(191)                  | 570<br>(95)                   |
| Wald chi2 | 9838.1                         | 1733.5                         | 2239.3                         | 5049.8                         | 9927.7                         | 1497.1                         | 2065.7                         | 8366.6                        |
| p-value   | 0.00                           | 0.00                           | 0.00                           | 0.00                           | 0.00                           | 0.00                           | 0.00                           | 0.00                          |

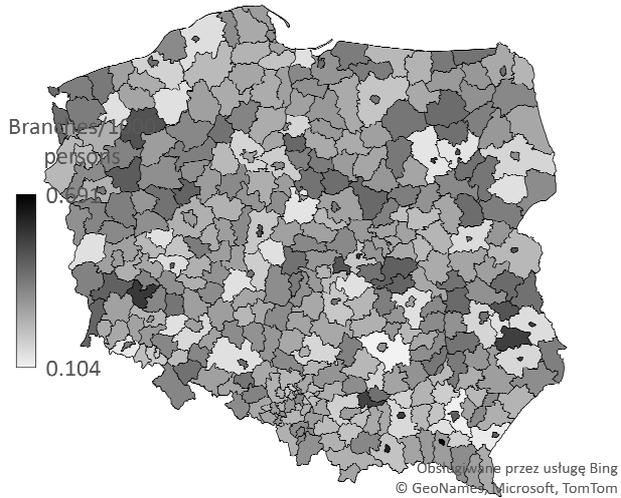
Source: own calculations based on data of CSO, NBP and Inteliace Research.

**Figure 1.** Counties in Poland by population density



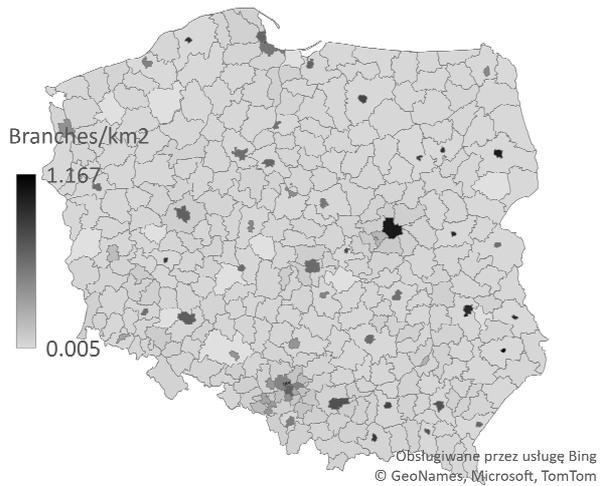
Source: own calculations based on data of CSO.

**Figure 2.** Counties in Poland by the number of bank branches per 1000 inhabitants



Source: own calculations based on data of CSO and Inteliace Research.

**Figure 3.** Counties in Poland by the number of bank branches per 1 km<sup>2</sup>



Source: own calculations based on data of CSO and Inteliace Research.

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## External financing sources in the innovative activity of SMEs

**JEL Classification:** *O31, L20, G32*

**Keywords:** *innovation; sources of financing; external financing sources; SMEs*

### Abstract

**Research background:** Effective management of innovation processes, regardless of the business size, is the main element in building a competitive advantage. Operating in a changing environment, enterprises wanting not only to stay on the market, but also to constantly develop, must undertake innovative activities. Their implementation, however, requires significant financial outlays, and the return on invested funds from this type of investment takes place only after several years. Own financial resources are insufficient, especially in smaller business entities, hence the necessity to use funds from outside the enterprise. However, due to the high risk accompanying innovative activity, access to external sources of financing, especially for entities from the SME sector, is often difficult and limited, which unfortunately translates into the scale of innovative activity of this group of enterprises.

**Purpose of the article:** The aim of the paper is to analyze the extent to which the various sources of financing are used by small and medium-sized enterprises in the implementation of innovative projects, and to show the relationship between not only own, but most of all external sources of funding sources and the scale of innovative activity of SMEs in Poland.

**Methods:** Based on the method of analysis and criticism of literature, the article presents the most important issues related to the subject matter. Then, on the basis of statistical methods, the scope and sources of financing the innovative activities of enterprises in the SME sector in Poland were analyzed and the indexes of dependence between the examined values will be estimated.

**Findings & Value added:** Analyzes and research will confirm the great importance of external financing sources in the innovative activity of enterprises from the SME sector. The structure and dynamics of the studied quantities will be

shown. The relationship between funding sources and innovative inputs will be clearly outlined.

## **Introduction**

For years, the key role in economies of not only individual countries but also regions has been played by small and medium-sized enterprises, the development of which is regarded as one of the measures of economic growth and the manifestation of healthy competition in the economy. Their significance results both from the dominance in terms of the number of entities and participation in creating the national income or job creation. Enterprises of the SME sector, due to often limited range of trade links or greater stability in the operational area, despite their small size, are flexible, by means of which they adapt more easily to any situation resulting from the operation of the market, thus using opportunities (Audretsch, 2002, pp. 13-40; Norek & Arenhardt, 2015, pp. 155-181; Vasilescu, 2014, pp. 35-47). However, functioning in a constantly changing environment is significantly dependent on capital, which, unfortunately, is not always available.

One of the main problems of the operation, which additionally limits the possibility of improving technologies or products in enterprises of the SME sector is the availability of external sources of financing, which plays a significant role in firm-level innovation (Wellalagea & Fernandez, 2019). The limitation of the financial capacity of small and medium-sized enterprises results both from the characteristics of the credit and capital market. Therefore, the basic challenge of the SME sector in Poland constituting the main obstacle to its development and implementation of innovative solutions is limited access to external capital. Among the factors hindering access to financing, it should be mentioned above all high uncertainty, information asymmetries, a lack of internal financing and collateral, the higher risk associated with SME activities, the transaction costs in handling SME financing, institutional and legal factors and constraints on the SME side related to the quality of projects, negative attitude towards equity financing or inability to use the available source of financing (Bertonia *et al.*, 2018, pp. 371-384; Vasilescu, 2014)

The aim of the study is to analyze the innovative activity of small and medium-sized industrial and service enterprises operating in Poland and to assess the sources of financing for the innovations implemented by them in 2009-2018. Particular attention is paid to external sources of financing, access to which, due to limited own resources, often enables the implementation of costly innovative projects by enterprises from the SME sector. The

article first examines the structure and dynamics of changes in the studied quantities based on simple statistical methods. Further considerations are aimed at examining the relationship between the level of expenditure on innovations of small and medium-sized enterprises and external sources of financing for implemented projects. In this regard, the usefulness of the Pearson coefficient as a research tool allowing to determine the correlation of the presented data will be verified.

### **Research methodology**

The initial stage of the elaboration begins with a critical analysis of the literature and reports relating to the issues raised. The presentation of the most important issues is the basis for the study of numerical data using statistical methods. The publication uses data published by the Central Statistical Office. Selected information on the innovative activities of enterprises in the SME sector and sources of financing innovation by small and medium-sized enterprises comes from the annual reports of the Central Statistical Office for 2009-2018.

The research into innovation was carried out in two groups: among industrial and service companies of selected sections of Polish Classification of Activity. Moreover, the research covered enterprises of the SME sector, i.e., small-sized economic entities, in which the number of employees amounted to 10-49 as well as medium-sized ones (the number of employees amounted to 50-249). In order to assess innovative activities, the results achieved by SMEs, both industrial and service ones, were subjected to the analysis, in terms of the size and sources of financing of expenditure incurred on innovation in the years 2009-2018. According to the data by the Central Statistical Office, expenditure on innovative activities is measured as expenditure incurred by the company in a given year on innovative activities carried out over the last three years. On the other hand, sources of financing of implemented innovation include own funds and external financing in the form of:

- national assets received from institutions with public funds (from the state budget),
- assets from abroad (non-refundable), of which from European Union,
- bank credits, loans and other financial liabilities from financial institutions,
- others.

The first stage of the research part was to analyze the data by the Central Statistical Office concerning the range and mode of financing innovative activities of SMEs. In particular, the level, structure and dynamics of expenditure on innovation as well as the sources of its financing were examined, taking into account the range of operation and type of activity. Subsequently, in the study, the following hypothesis was subjected to the analysis, i.e., which of external sources of financing innovation in the SME sector have the greatest and the least impact on innovative activities?

One of the most commonly used statistical techniques in research is correlation aimed at exploring the degree of relationship between two variables in consideration. The most widely correlation methods used to measure dependence between two variables is the Pearson correlation coefficient. Correlation is meant for Correlation coefficient is the measure to quantify such degree of relationship of the variables (Goodwin & Leech, 2006; Ambusaidi *et al.*, 2014, pp.77–86).

The mathematical formula for this coefficient developed by Pearson is:

$$r_{xy} = \frac{C(X, Y)}{\sqrt{S_x^2 \cdot S_y^2}} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 \cdot \sum_{i=1}^n (y_i - \bar{y})^2}} = \frac{C(X, Y)}{S_x \cdot S_y}$$

$C(X, Y)$  – covariance between features X i Y,

$S_x^2$  covariance features X,

$S_y^2$  covariance features Y,

$S_x$  standard deviation X,

$S_y$  standard deviation Y.

The Pearson product-moment correlation coefficient describes the size and direction of linear relationship between two continuous variables (generically represented by X and Y), and range from -1.0 (perfect negative relationship) to +1.0 (perfect positive relationship); if no relationship exists between the two variables, the value of the correlation is zero (Goodwin & Leech, 2006, pp.249–266).

In the published sources there are assumed various ranges of the coefficient absolute value to assess the relationship strength. The following ranges of absolute values can be assumed to evaluate the strength of dependence:

$|r| = 0$  - no correlation

$0.0 < |r| \leq 0,1$  – faint correlation

$0.1 < |r| \leq 0.3$  – weak correlation

$0.3 < |r| \leq 0.5$  – average correlation

$0.5 < |r| \leq 0.7$  – high correlation

$0.7 < |r| \leq 0.9$  – very high correlation

$0.9 < |r| < 1.0$  – almost full correlation

$|r| = 1$  – full correlation.

These cutoff points are arbitrary and inconsistent and should be used judiciously. While most researchers would probably agree that a coefficient of  $<0.1$  indicates a negligible and  $>0.9$  a very strong relationship, values in-between are disputable (Schober *et. al.*, 2018 pp. 1763-1768). Moreover, the correlation coefficient defines the relationship between two features, it gives no indication as to whether one of them is the source of the other. Therefore, it should be remembered that each model has its limitations and will not recreate a perfectly complex economic reality.

## Results

The study of the relationship between the degree of use of external financing sources and the value of innovative expenditure of small and medium-sized enterprises in Poland resulted from the lack of publications directly indicating the impact of individual sources of financing on the innovative activity of SMEs in Poland. In the first place, however, the scope of innovative activities of small and medium-sized enterprises operating in Poland was presented, indicating internal and external sources of financing. When analyzing the level of expenditure on innovation in enterprises of the SME sector, it can be noticed that the lowest value was recorded in the first year covered by the research (6669.7 mln zł), whereas the highest value was recorded in 2014 (12474.1 mln zł). In the years 2009-2014 the expenditure indicated an upward trend (it increased by 87%), mainly due to innovative activities of industrial companies. However, in the years 2012 and 2014 the expenditure on innovation in entities of the service sector grew faster than in industrial companies. In the years 2015-2016 the trend was reversed and the value of expenditure on innovation in the entire SME sector decreased at first by 16% and then by 20% in relation to the previous year. In 2015, the negative trend was the result of a drastic decline in the activities of service companies and in the subsequent year it was also due to a significant decrease in expenditure in industrial units. In the last two years of the research period the expenditure on innovative activities of small and medium-sized enterprises increased again and finally amounted to PLN 9812.2

million, nearly 60% of which was the expenditure by industrial companies and the expenditure of medium-sized enterprises exceeded the expenditure of entities employing less than 50 people by nearly 67%.

Taking into account all the years of the research period, the expenditure in industrial companies was twice as high as in service ones, which must have been related to the fact that, in the first group of enterprises, most of all, product and process innovation is implemented, which certainly more financial resources ought to be allocated for than in the case of marketing or organizational innovation which the entities of the service sector focus on. Significant capital needs with limited access to resources and also often lower propensity to take risk translated, in turn, into fewer innovative activities of smaller enterprises, operating mainly in the industrial sector, the expenditure of which ranged from 20% in 2016 to 33% in the last year covered by the research. On the other hand, among service companies, in which much less capital-intensive non-technological innovation is implemented, the difference in the level of expenditure on innovation in small and medium-sized enterprises was not so large. Moreover, in 2014 the expenditure was higher in these smaller entities, since it amounted to 63% of the total innovation expenditure in service SMEs. However, due to a larger range of operation and thus larger own resources and easier access to external resources, in the total number of small and medium-sized economic entities, the largest expenditure has been borne and still is by entities employing more than 50 people, whereas an increase in innovative activities of small enterprises, the expenditure of which doubled in the research period, should be highlighted.

Too low level of equity with limited access to external financing does not affect the propensity to invest. The dominant role of own funds in the financing innovation was mainly evident in the case of service companies since their share ranged from about 50% in 2012 to more than 80% in 2016, whereas, on average, they represented 65-75%. Medium-sized entities of the service sector benefited from their own funds to the greatest extent. Small service companies, during the implementation of innovative projects, use external financing slightly more often, in particular EU funding (taking into account the extreme research years, their share increased almost four-fold). In some years covered by the research one could observe a greater interest in leasing or bank credit, however, the value of these sources of financing varied with no possibility of indicating a clear trend. On the other hand, industrial companies were much more willing to use external financing. The opportunity to access external forms of financial support positively affected innovative activities of mainly small-sized entities of the industrial sector (the share of external funds often exceeded the share of equity). In

medium-sized industrial companies, own funds dominated in the structure of sources of financing innovation (except for the year of 2015, in which they amounted to only 44.5%). However, the share of external financing was not low, and it was, on average, at the level of more than 40%. However, EU programs constituting the main source of support for innovative activities of enterprises of the SME sector were of the greatest significance.

Further research aims to determine the relationship between the use of external financing and the degree of innovation of enterprises in the SME sector in Poland. However, before analyzing the relationship using the Pearson correlation coefficient, hypotheses will be formulated regarding the existence of interdependencies between the studied variables.

The correlation results confirmed that the use of external financing is associated with greater innovative activity of small and medium-sized enterprises. The existence of this interdependence was the basis for in-depth research and to indicate whether the correlation is determined by the size and type of activity, as well as to determine which of the external sources of financing has the greatest impact on the innovative activity of SMEs.

## **Conclusions**

Innovative activities of SMEs largely depend on access to external sources of financing. The possibility of covering the costs of implemented projects not only with own funds but also with external ones has a positive effect on the range of innovative activities of enterprises. In the research period, expenditure on innovation in all entities of the SME sector increased by PLN 3142.5 million. While taking into account the size of the business, the largest (almost two-fold) increase was recorded in small-sized entities, whereas, while considering the type of activity, the largest increase was recorded in service companies. External sources of financing mostly supported innovative activities in industrial companies, especially small ones, in which the share of external financing often exceeded equity. The existence of the dependence in this area was confirmed by the study of the correlation, which was close to one.

Among external forms of financial support, regardless of the size and type of the conducted activity, the largest impact on innovative activities of SMEs was exerted by resources from abroad, including primarily funding under EU programs. The largest relationship between these variables was again in small-sized entities, although it was also very high in medium-sized ones. This was undoubtedly due to the fact that the beneficiaries of many EU programs supporting projects involving the implementation of

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innovation was enterprises of the SME sector. The conducted analyses indicate that service companies also used the support granted by the National Center for Research and Development and the national budget in the form of targeted subsidies.

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## Annex

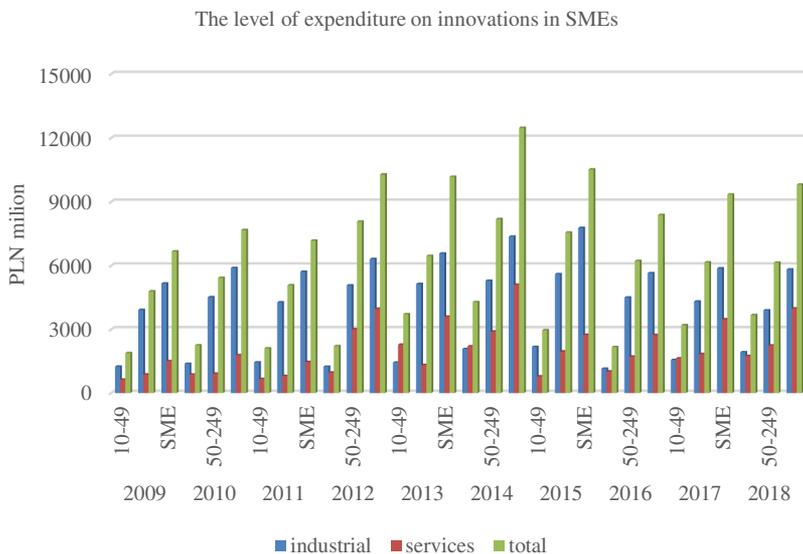
**Table 1.** Correlation table of external financing and expenditure on innovation in SMEs

| Correlation       |    | Type of business |      |      |      |          |      |      |      |      |
|-------------------|----|------------------|------|------|------|----------|------|------|------|------|
|                   |    | Industrial       |      |      |      | Services |      |      |      |      |
|                   |    | IS*              | ES*  |      |      | IS*      | ES*  |      |      |      |
| Scope of business | S* | 0,72             | 0,94 |      |      | 0,95     | 0,88 |      |      |      |
|                   | M* | 0,29             | 0,91 |      |      | 0,88     | 0,89 |      |      |      |
| SME               |    | 0,32             | 0,95 |      |      | 0,92     | 0,89 |      |      |      |
| Correlation       |    | A*               | B*   | C*   | D*   |          |      |      |      |      |
| Scope of business | S* | 0,51             | 0,36 | 0,92 | 0,42 | S*       | 0,17 | 0,64 | 0,89 | 0,35 |
|                   | M* | 0,10             | 0,17 | 0,80 | 0,84 | M*       | 0,33 | 0,64 | 0,82 | 0,86 |
| SME               |    | 0,32             | 0,02 | 0,90 | 0,80 | SME      | 0,42 | 0,50 | 0,85 | 0,65 |

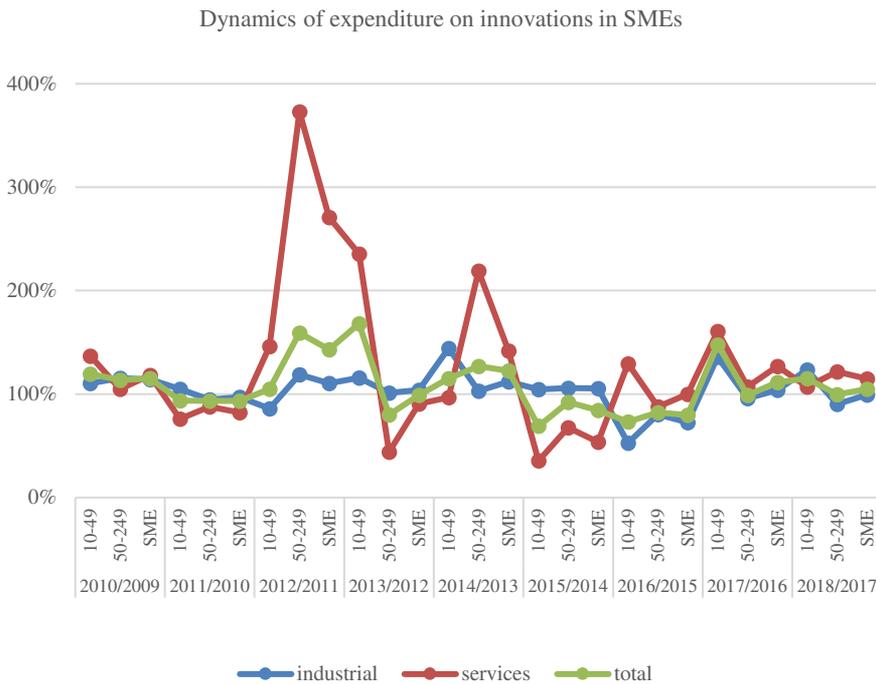
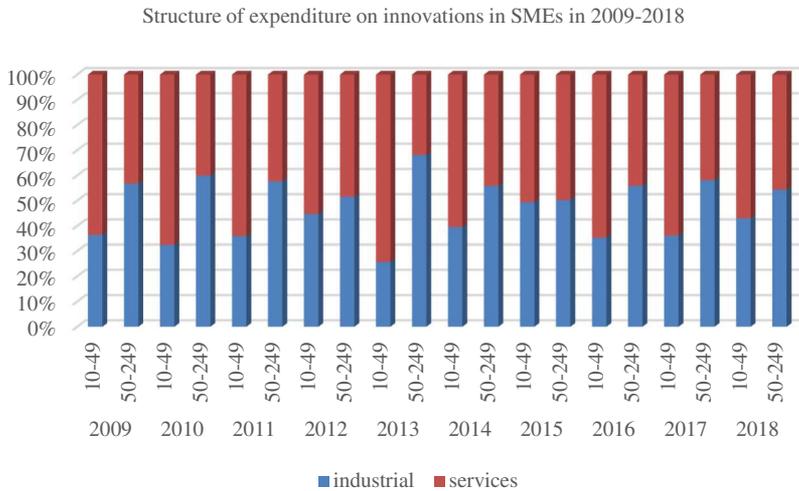
\* S– small bussines; M– medium-sized enterprise; IS– Internal sources; ES– External sources; A – bank credits; B – from the state budget; C – from abroad; D – others

Source: own calculations based on COS (2009-2019).

**Figure 1.** The level, structure and dynamics of expenditure on innovations in SMEs in 2009-2018

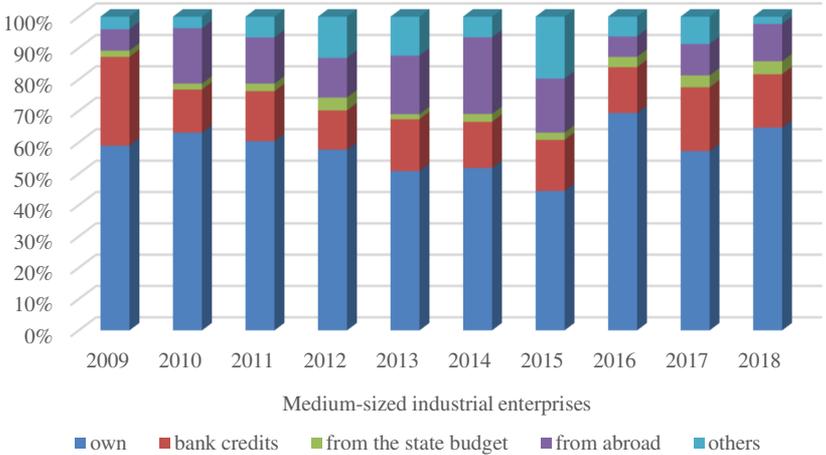
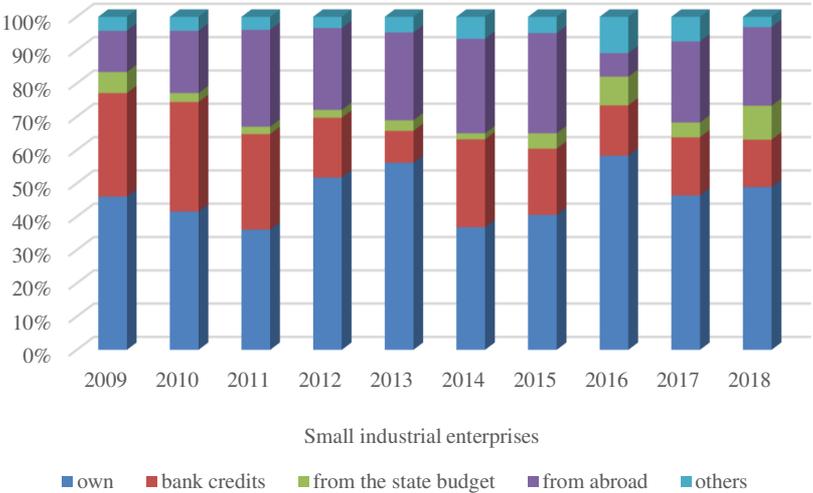


**Figure 1. Continued**

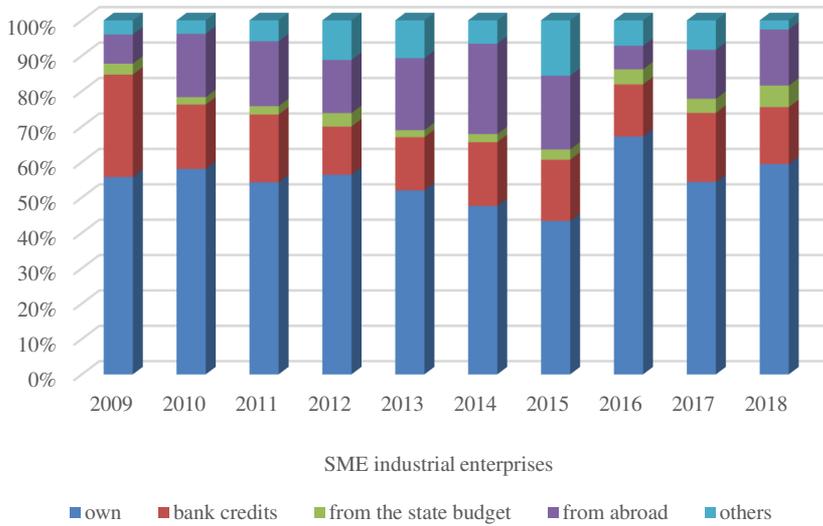


Source: The study based on <https://www.stat.gov.pl> (29.12.2020).

**Figure 2.** Structure of the financing sources of innovation in industrial SMEs in 2009-2018

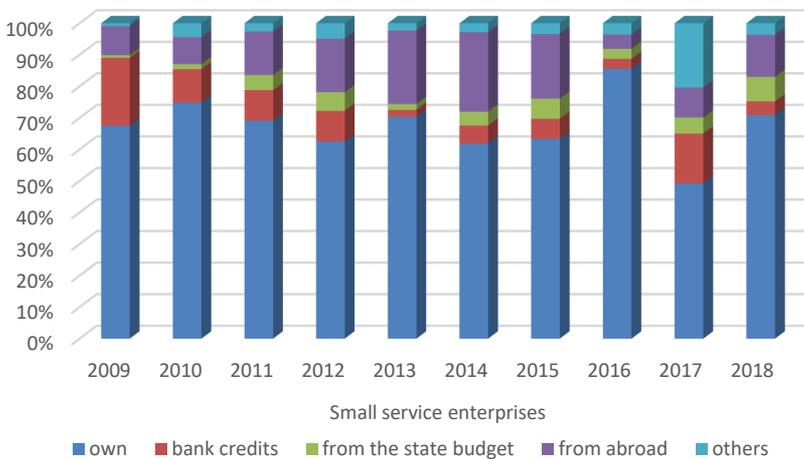


**Figure 2. Continued**

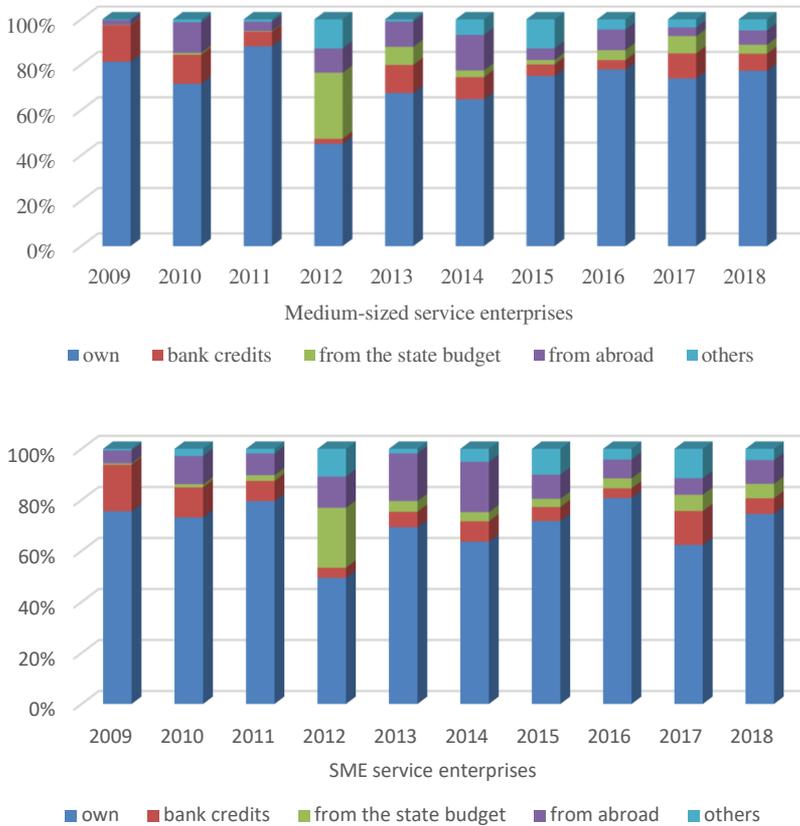


Source: The study based on <https://www.stat.gov.pl> (29.12.2020).

**Figure 3. Structure of the financing sources of innovation in service SMEs in 2009-2018**



**Figure 3. Continued**



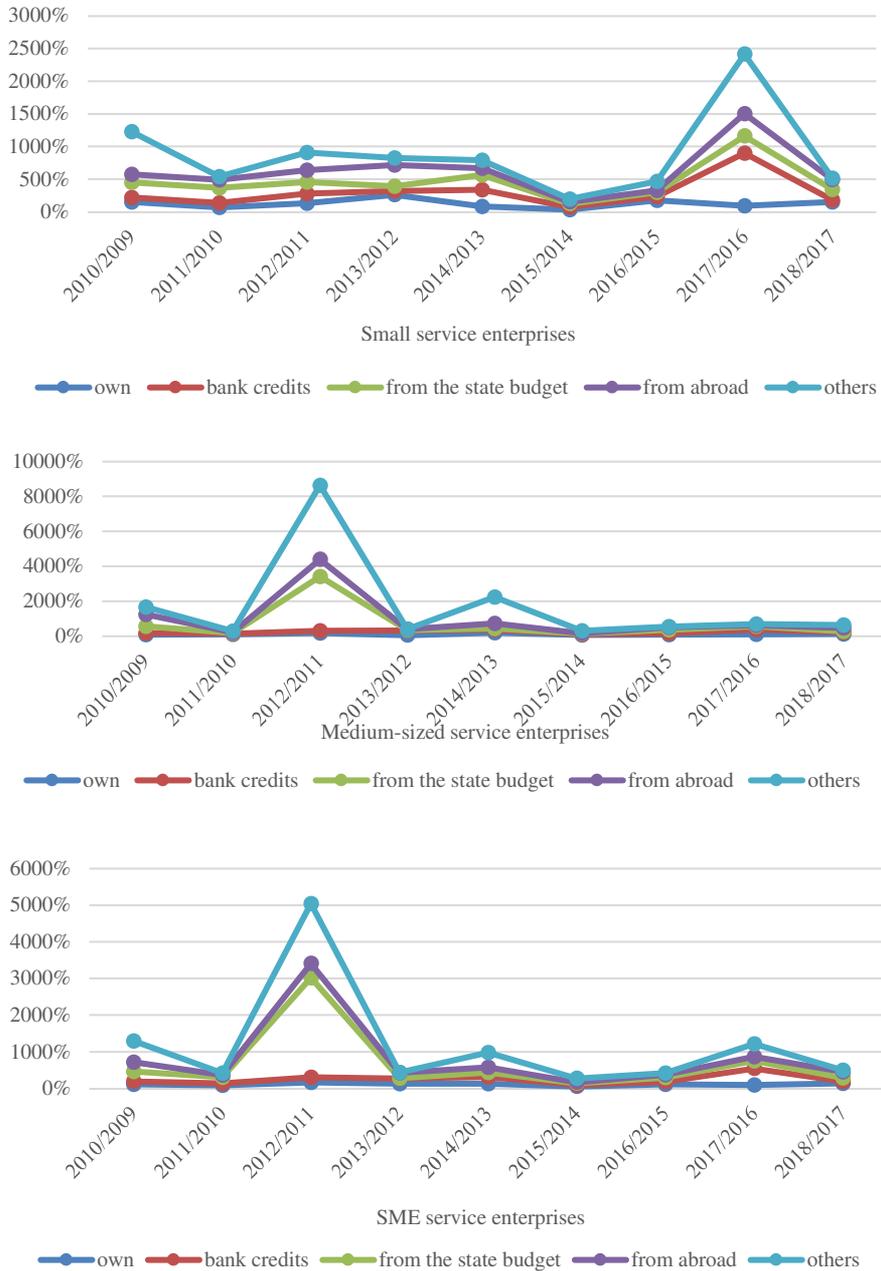
Source: The study based on <https://www.stat.gov.pl> (29.12.2020).

**Figure 4.** Dynamics of the financing sources of innovation in industrial SMEs in 2009-2018



Source: The study based on <https://www.stat.gov.pl> (29.12.2020).

**Figure 5.** Dynamics of the financing sources of innovation in service SMEs in 2009-2018



Source: The study based on <https://www.stat.gov.pl> (29.12.2020).

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## Role of cost-benefit analysis in making decisions about the development of electromobility in urban public transport

**JEL Classification:** *A11; D61; R41*

**Keywords:** *cost-benefit analysis; decision making; zero-emission buses; urban public transport*

### Abstract

**Research background:** Polish act on electromobility and alternative fuels obliges 83 cities to prepare every three years cost-benefit analysis (CBA) using zero-emission buses (ZEB) in urban public transport. First-time obligated institutions prepared them in 2018. Almost all prepared CBAs showed that implementing ZEB in public transport systems required Polish law from the financial and the economic perspective is not justified. However, these Polish cities develop ZEB in their public transport systems.

**Purpose of the article:** The research aims to detect the main advantages and disadvantages of using CBA as a tool in the decision-making process of implementing ZEB in urban public transport in Poland. It is also essential to define conditions for limiting the uncertainty of their results.

**Methods:** The research used a synthetic review of the literature that focuses on the main advantages and disadvantages of using CBA in transport investment decisions. It also used a comparative analysis of the methodology used to prepare CBAs by the six most prominent public transport authorities (PTA) in Poland.

**Findings & Value added:** CBA is the primary tool used to evaluate transportation projects in Poland. It is an obligatory attachment in European Funds applications, so the methodology should not be alien. The analysis of documents shows that Polish cities use a different procedure in their CBAs. It makes the results of CBAs prepared by the analysed institutions incomparable. Economic and financial indicators important in the decision-making process omitted in some analysed CBAs. The lack of systematic guidelines for preparing CBAs to implement the ZEB decrease their objectivity and increase decision uncertainty.

## Introduction

One of the European policy objectives is to eliminate greenhouse gas emissions by all economic sectors and make their functioning independent from fossil fuels. The European Commission's communication COM/2019/640 "The European Green Deal" assumes that by 2050 the European economy will reach zero net greenhouse gas emissions. Transport is a high-carbon sector. It is estimated that in 2018, 21.2% of greenhouse gas emissions within the European Union were related to transport (EEA Greenhouse Gas - Data Viewer - European Environment Agency). Meeting the emission targets requires the implementation of appropriate programmes to support the development of low-emission transport systems. In Poland, the flagship programme for the development of low-emission transport has become the "Electromobility Development Plan" adopted by the Council of Ministers in 2017, an operational document indicating the expected directions of activities supporting the development of zero-emission urban public transport.

Implementing zero-emission transport systems in urban areas is often understood as replacing bus fleets or developing battery trolleybuses. It is directly related to the provision of Article 36 of the Act of 11 January 2018 on electromobility and alternative fuels, in which the legislator refers exclusively to the car transport system. Replacement of the fleet with zero-emission buses requires significant financial outlays related to the purchase of the investment and the construction of the relevant recharging infrastructure. These investments are financing by public funds, requiring an appropriate level of transparency of the decision-making process and proper techniques and methods to evaluate decision-making options.

The Act on Electromobility and Alternative Fuels obliges the most prominent communities responsible for the organisation of urban public transport to prepare cost-benefit analyses of zero-emission buses' implementation regularly. In November 2020, in its information on the results of the audit "Support for electromobility development", the Supreme Chamber of Control indicated that in only 3 out of 26 audited cases, the cost-benefit analysis result confirms the rationale for implementing zero-emission bus transport. Despite this, most of the examined entities are conducting activities to replace the fleet with external financing sources.

This paper aims to present the role of cost-benefit analysis in the decision-making process realised by the Polish organisers of urban public transport concerning the implementation of zero-emission buses.

## Research methodology

The identification of the research problem is the result of observations concerning the practice of preparing and using the benefit-cost analysis by the organisers of public transport in Poland in the field of implementing zero-emission buses. Authorities responsible for the organisation of public transportation in urban areas use this method in two cases:

- as an element of application documentation, connected with applying for co-financing of investment projects from external sources (e.g., European Union funds),
- in connection with the need to fulfil obligations arising from Article 37 of the Act of 11 January 2018 on electromobility and alternative fuels.

The study covered six public transport authorities in urban areas, i.e., Warsaw, the Communal Transport Union of the Upper Silesian Industrial Region (KZK GOP; from 2019 lows and duties took over the Metropolis GZM), Krakow, Poznan, Lodz and Wroclaw. To prepare analysis were selected these, who used to serve transportation services by the most significant number of buses.

The study was prepared using the desk research technic. The first stage of the study included a literature review, which allowed to identify the primary conditions for applying cost-benefit analysis and identifying the advantages and limitations of its use. The second stage consisted of analysing the surveyed entities' benefits and costs to implement zero-emission buses in urban public transport. The study's main focus was on issues related to the assumptions used to prepare the economic analysis. The results of the economics analysis play an essential role in the decision-making process. The literature research has also shown that this analysis is vulnerable and raises important questions regarding its reliability.

## Results

Transport investments are undertakings requiring high initial investment and generating high operating costs. Most often, these investments are financed from public funds. Investment decisions in the field of transport are often the subject of discussion and social assessment, especially in the context of efficient use of public funds and their social and environmental impact. It means that decisions made by public finance sector entities require a solid factual basis and objective rationale. This condition may be fulfilled by using appropriate methods and techniques for evaluating investment projects in the decision-making process.

The most commonly used methods for evaluating transport projects are multi-criteria analysis and cost-benefit analysis (Annema et al., 2015, pp. 788-797). Assessing the objectivity of both tools and the conditions of their use are fundamental research problems. Research on this area focuses primarily on:

- establishing the conditions of application of both methods in the transport area (Eliasson & Lundberg, 2012; Grunicke et al., 2020; Jones et al., 2014, pp. 400-409),
- the competence and skills of public sector decision-makers with a critical role in transport policymaking in being able to use the tools as mentioned earlier in decision-making (Annema et al., 2015, pp. 788-797; Damart & Roy, 2009, 200-212; Vigren & Ljungberg, 2018, 560-567),
- identifying the advantages and limitations of both tools (Beria et al., 2012, pp. 137-152).

Both multi-criteria analysis and CBA are tools that assess both the project developer's internal costs and benefits and the impact of the investment on the environment (Annema et al., 2015, pp. 788-789). However, the CBA method is considered a much more formalised and potentially more objective method (Vigren & Ljungberg, 2018, p. 560). The CBA is the prevailing methodology for evaluating large investment projects implemented with the support of EU funds. It is also the leading method in European Union countries in assessing transport projects.

CBA is a tool based on its integrated approach to assessing decision-making options, taking into account the financial efficiency of projects from the investor's point of view and economic efficiency in the form of the impact of the proposed project on the socio-economic environment. A characteristic feature of CBA is the assessment of external impact through the analysis of monetised economic effects. This analysis is basing on multi-year projections of expected external results over an assumed reference period, subject to a discounting procedure (Beria et al., 2012, pp. 139-140). CBA pointed out these features as a tool providing more certain arguments in the decision-making process than, for example, the multi-criteria method. Nevertheless, CBA seems to be a complex procedure that requires the involvement of qualified human resources. This makes it used primarily to assess the effectiveness of large investment projects.

The greatest challenge in using CBA as a decision support tool is the reliable identification of potential external benefits and costs and how to value them. In the case of transport projects, e.g., modal shift between modes and modes of transport, impact on greenhouse gas emissions and environmentally harmful substances, noise emissions, time savings, availability of certain services and markets, the safety of traffic participants may be of

crucial importance for the assessment of the project. Implementation of transport investments may influence the attractiveness of space, competitiveness and economic development. However, such an influence from similar effects of other investment projects makes it challenging to identify the analysed projects' actual impact. Therefore, the use of CBA requires the application of clear procedures for impact identification and the establishment of standardised methods for its valuation (Damart & Roy, 2009, pp. 202-203).

However, the CBA method has been subject to justified criticism in numerous studies. Among its application's main limitations is the possibility of subjective selection of analysed externalities and their valuation technique. The valuation of intangible effects is a matter of debate. Researchers also have doubts about the reliability of discounting monetised but uncertain economic impact in the long term (Jones et al., 2014, pp. 400-409).

Cost-benefit analysis is commonly used in the process of applying for support for transport projects from European funds. The applicable methodology for preparing CBA in this respect is presented in the "Guide to Cost-Benefit Analysis of Investment Projects Economic appraisal tool for Cohesion Policy 2014-2020". Considering that Polish public transport authorities and operators have had the opportunity to apply for support for their investment projects since 2004, it could be hypothesised that this tool is well known, which increases the likelihood of its correct application. However, the analysis of the CBAs studied does not support this hypothesis. The CBA methodology is sometimes confused with, for example, the method of multi-criteria analysis. The study also identified cases of indicative methodological errors that contradict the essence of this tool.

The legislator, for unknown reasons, refrained from issuing guidelines for the development of a CBA for the implementation of zero-emission bus fleets in urban public transport. Thus, it left the obliged entities a wide field of interpretation and great freedom in identifying external impacts, the applicable principles for their monetisation, the directions for discounting economic flows, or the indication of the relevant reference period. The principles of differentiation of decision-making options were also not indicated, which may significantly impact the reliability of assessing investment projects' economic effectiveness.

The majority of the surveyed entities declare that the documentation was prepared based on the guidelines used to prepare CBAs to apply for co-financing of transport projects from the EU funds. The exception is the study of the City of Krakow, which does not indicate the basis for the adopted methodology for preparing the document. However, the study

identified some differences in the approach to assessing the economic efficiency of implementing zero-emission buses (Table 1).

Analysis of the documentation indicates that the CBA contractors approached identifying potential externalities of the assessed projects very similarly. Almost all entities took into account the economic benefits consisting of avoided costs:

- air pollution,
- climate change, resulting from CO<sub>2</sub> emissions,
- noise emissions.

The KZK GOP departed from this rule by not assessing the benefits related to noise reduction. The procedure for estimating the identified benefits was based on the data of the National Centre for Balancing and Emission Management – KOBiZE (Poznan, Krakow, Wroclaw, Warsaw and Lodz) or by using the emission calculator developed by the Centre for EU Transport Projects (KZK GOP). Monetisation was most often performed based on unit cost tables for use in CUPT cost-benefit analyses.

The tool for assessing the economic efficiency of implementation alternatives in most cases studied was the determination of ENPV, ERR and B/C ratios. The analysis conducted for the city of Lodz uses the dynamic unit cost method to assess economic efficiency. Interestingly, in Wroclaw's case, the analytical process was terminated at the stage of estimating benefits related to the reduction of greenhouse gas emissions and noise pollution. There was no monetisation of the identified effects and no assessment of the analysed alternatives' economic efficiency, which means that this document does not meet the criteria for preparing a CBA.

## **Conclusions**

Despite the high level of structuring of the procedure and an integrated approach to evaluating investment projects, the cost-benefit analysis does not eliminate uncertainty in decision-making processes. This problem was raised, among others, by Flyvbjerg (2009, pp. 344-367), who proved that the results of CBA depend primarily on the reliability of the assumptions made for the analysis. The study indicates that this uncertainty may also be generated by the legislator, who has neglected to issue clear frames using this method.

It was noted that despite the lack of legislator guidance, PTA tried to apply the framework for drawing up analogous studies. They use frames for project applications from EU funds by identifying similar areas of impact, adopting the principles of monetisation of results established there, or ap-

plying a similar rate of discounting economic flows. The most significant doubts may raise by the manner of selection of alternative variants for the analysis. The analysis of the prepared CBAs shows that it is possible to apply various criteria for this differentiation, and the choice of these criteria may base on subjective premises. Allowing the possibility of using biased assumptions undermines the objectivity of the tool under examination. Thus, it undermines its role in the decision-making process concerning the implementation of ZEB. It may also give the impression of steering the results of analyses through the intentional selection of assumptions allowing, e.g., avoidance of the need to incur high investment outlays for implementing zero-emission buses.

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## Annex

**Table 1.** Identified assumptions for preparing economic analyses within the framework of the examined CBAs.

|  | <b>KZK GOP</b>  | <b>Krakow</b>                                      | <b>Lodz</b>                    | <b>Poznan</b>                  | <b>Warszawa</b>                                      | <b>Wroclaw</b>                 |
|--|---|--|--------------------------------|--------------------------------|--|--------------------------------|
| <i>Discount rate</i>   | 4.5%  | 4.0%   | 4.0%                           | 4.5%                           | 4.5 %  | -                              |
| <i>Base year</i>   | 2019  | 2018   | 2019                           | 2019                           | 2017   | 2019                           |
| <i>The reference period of economic analysis</i>                 | 15 years  | 15 years   | 15 years                       | 15 years                       | 15 years   | 25 years                       |
| <i>The criterion for differentiating decision-making options</i> | Organisational and financial model of investment implementation | Vehicle power technology model; Grid system model. | Vehicle power technology model | Vehicle power technology model | Vehicle power technology model; Fleet renewal period | Vehicle power technology model |
| <i>Analysed ZEB systems</i>                                      | BEV   | BEV  | BEV; CNG                       | BEV; FCEV                      | CNG; Hybrid  | BEV                            |
| <i>Indicators for assessing economic efficiency</i>              | ENPV; ERR; B/C  | ENPV; ERR; B/C                                     | DGC                            | ENPV; ERR; B/C                 | ENPV; ERR; B/C                                       | -                              |

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## **Is it possible to predict merger outcomes? The case of the Czech Republic**

**JEL Classification:** *G34; L25*

**Keywords:** *merger and acquisition; predictors; synergistic effects; Kendall's Tau correlation; Czech Republic*

### **Abstract**

**Research background:** Available and relatively cheap financial resources motivate company managers and private investors to look for atypical ways of their appreciation. One such option are mergers and acquisitions (M&As). Executing an M&A is, however, associated with the risk that the merger will fail and the return on the invested capital will therefore be negative.

**Purpose of the article:** The main objective of this article is to identify financial ratios that can be used to predict merger outcome. Such financial ratios could then be used to predict the value of the synergy effect (expected return) achieved through the merger.

**Methods:** The research sample consists of 50 mergers implemented between private companies in the Czech Republic. They were divided into two groups based on the development of their sales and profits into successful (in which sales and profits grew) and unsuccessful (with no growth in sales or profits). Financial ratios were calculated for each of the merging companies and for each merger. The increase/decrease in the value of the companies achieved by their combination were then calculated. The financial ratios that correlated with an increase/decrease in value following the combination of the companies were subsequently identified using Kendall's Tau correlation coefficient.

**Findings & Value added:** Our research identified ratios that positively correlate with synergy values. They are ratios based on cash flow (namely CF to Assets, CF to Sales and CF to Interest), the Return on Assets and the Added Value to Labor Cost. When planning a merger, these ratios can be used to estimate the merger effects and/or the amount of appreciation of the capital invested.

## Introduction

Recent years have seen attempts to support growth of the economy by reducing the price of money. Quantitative easing increases the availability of cheap financial resources and makes it possible for companies to realise riskier investments that can assure them higher appreciation. This situation is described by the results of analysis of data from thirteen countries published in 2020. Interest rates are extremely low (for example 0.7 % in the Czech Republic), with six of the analysed countries having ten-year bonds at negative interest (Shkodina *et al.*, 2020, pp. 513-521). Quantitative easing is accompanied by a large number and volume of mergers and acquisitions (M&As) which, although they represent investments with long-term return, may also bring high appreciation on the invested capital. The risk of M&As increases if an investor is incapable of estimating in advance all the risks that may be associated with a merger. These need not be merely risking of an economic nature, but first and foremost risks arising from an information asymmetry between the seller and the buyer or resulting from insufficient communication.

The ability to attain synergy, i.e. whether the merger of companies will make it possible to attain over the long term a profit greater than the profit that would have been attained by the companies operating independently, is crucial to the success of M&As. Two basic approaches to the measurement of the synergy arising from M&As can be identified in the literature. The first is based on evaluation of the change in financial ratios such as profitability, asset management, etc. before and after the merger. The second is based on calculation of the value of synergy, i.e. by how much the value of the stand-alone companies increased following their merger. Our research is concerned with determination of the value of synergy. All approaches of synergy valuation are based on estimation of changes to cash flows (see Mukherjee *et al.*, 2004, pp. 7-24); their differences lie in the definition of cash flow. Houston *et al.* (2001, pp. 285-331) used the indicator net present value of merger to calculate the synergetic effects of M&As. They quantified the effect of the investment as the sum of the cost savings (resulting from economies of scale and organisational changes) and additional income

after income tax and compared them with the costs associated with the merger of the companies (their restructuring). They applied a standard two-stage method in the calculation of the NPV of the merger. The first stage represented the actual values attained in the four years after the merger. For the second stage of their calculations, they used a growth in sales at the anticipated inflation rate. Their results indicate that the value of synergy is positive (13.06% increase of the value).

Bernile & Bauguess (2011) used the discounted free cash flow method to calculate synergy, though they used the prognoses of the owners of the newly created company for its determination. This approach to the synergy assessment comes up against the problem of the availability of information, since not every investor is capable of predicting accurately the cash flow for each year and the corresponding discount rate. Similarly, they also applied a two-stage method. They anticipated that the first stage would be four years long, i.e. development would stabilise four years after completion of the merger. The conclusions reached by their research also indicate the creation of synergy and the value of the newly-formed company being 14% higher than the sum of the values of the original companies (before merger).

Ruback (2002, pp. 85-103) also used determination of the value of synergy on the basis of discounted cash flow. In contrast to the above approaches, he recommends quantifying the value of synergy arising from operational activity and from financial activity separately. The independent calculation of synergy from financial activity is based on the expectation that the merger of the companies is funded through debt and that a substantial change to the indebtedness of the combined company occurs after the merger, which is reflected in a marked growth in the interest tax shield. Ruback defined the so-called capital cash flow (CCF) for this purpose. The CCF was first used for the calculation of the value of synergy by Devos *et al.* (2009, pp. 1179-1211). The authors anticipated that after the merger the companies should be capable of taking advantage of the effect of the interest tax shield, the increased leverage resulting from the change in the method of financing or other advantages leading to increased profit for its owners. The discount rate is equal to the cost of equity.

The conclusion reached by their research indicates that the value of the newly combined company is, on average, 10.03% higher than the value of the stand-alone companies. The anticipated creation of financial synergy was not confirmed.

In our research, we are concerned both with determining the value of synergy and with identifying the decisive generators of value (value drivers), i.e. the factors that affect the value of synergy in a decisive manner.

Our aim is, then, to identify financial ratios that we could use to predict the value of synergy arising in M&A transactions.

## Research methodology

Our research can be summarised in the following steps:

### *1. Determining the value of synergy*

The value of each studied company was first determined separately, i.e. before the merger. The stand-alone principle, i.e. the expectation that all the factors that might influence the value of the companies are known and that the future development of these companies can be estimated on the basis of analysis of their past results, was used to determine their value. The calculated value of the companies was used to determine the value of the combined company as the sum of the values of the merging companies (VA + VT). The result was the value of the newly combined company “without synergy” (i.e. its theoretical value).

The value of the company formed by the merger was then determined on the basis of its real results for a certain number of years after the merger (VAT).

The value of the companies was determined by the discounted CCF method (Devos *et al.*, 2009, pp. 1179-1211), with the CCF being defined as follows:

$$CCF = [S \cdot OM \cdot (1 - T)] - \Delta FA - \Delta NWC + I \cdot T \cdot D$$

where S – sales; OM – operating margin; T – tax rate;  $\Delta FA$  – net investment in fixed assets;  $\Delta NWC$  – investment in net working capital; I – interest rate on debts; D – debts.

We also used a two-stage method. We set the length of the first stage as three years and then as five years. In this way, we aimed to determine whether the results in various periods change and subsequently to deduce thereby after how many years the effect of synergy can best be identified. In calculating terminate values, we assumed a growth in the value of the CCF to the level of anticipated inflation. By comparing the calculated values of VAT – (VA + VT) we determined whether the merger created synergy (a positive difference) or not (a negative difference).

## 2. *Determining the significance of financial ratios*

In addition to identifying synergy, we also aimed to discover which factors influence the creation of synergy, i.e. the value of the difference  $VAT - (VA + VT)$ .

In line with previous research (see Režňáková *et al.*, 2020, pp. 168-187) we analysed, first and foremost, indicators of operational performance and indicators of indebtedness. We wanted to use their analysis to monitor changes in the production inputs ratio and profitability of business activities and in the indebtedness of companies and the method of financing mergers. We also incorporated indicators constructed on the basis of cash flow into the research in view of the fact that cash flow is considered an indicator directly influencing the value of the company.

To obtain information about which factors may be important to the success of a merger, we looked for correlation between the synergy value (positive or negative) and selected financial ratios. We used Kendall's Tau correlation coefficient, which is a non-parametric rank correlation test, for the purposes of testing. According to Dehling *et al.* (2017, pp. 1352-1386), this test is suitable for small research samples; they consider it suitable for use in the analysis of financial ratios.

## 3. *Data*

We conducted this research on the basis of data on private companies in the Czech Republic. The research sample was determined on the basis of the following criteria:

- the merger was realised by companies based in the CR in the years 2004 to 2011
- the merger was the only merger for each company over a period of 9 years (three years before the merger, the year of the merger, and five years after the merger)
- the financial statements of the purchased and purchasing companies are publicly available (published on the portal [www.justice.cz](http://www.justice.cz)).

Forty-nine mergers that took place in engineering were selected on the basis of the given criteria. One hundred companies took part in these mergers. Twenty-five mergers took place in the form of horizontal integration, i.e. the merger of entities operating in the same field, and twenty-four in the form of vertical integration, i.e. a merger between a supplier and a customer.

## Results

It was first necessary to determine the value of the synergetic effect of the individual transactions. The results after three years show that the value increased in 18 combined companies, i.e. they created positive synergies, and decreased in the remaining 31 combined companies, i.e. they created negative synergies. This means that a fall in value occurred in more than 63% of the companies as a result of the merger realised. Five years after merger, synergy was created in just 15 companies, with a negative synergy being created by the remaining 34 mergers. A change in synergetic effect occurred in a total of 11 mergers. In 7 of these a negative synergetic effect was created, while a positive synergetic effect was newly identified in four mergers. It is clear that the realisation of a merger does not bring the anticipated effect in increasing the owners' capital either after three years or after five years. The average value of the companies that took part in a merger fell by 18.07%.

Our results demonstrate different conclusions to those given in previous research by the cited authors (Devos *et al.*, 2009, pp. 1179-1211; Bernile & Bauguess, 2011). This discrepancy will be the subject of our further research.

We also searched for a relationship between the value of synergy and the financial ratios. We tried in this way to identify the ratios that have a decisive effect on the value of synergy, that may signal the size of future synergy, and that may be used to predict synergy. We looked for possible predictors of the value of synergy both among the ratios for individual companies before merger and among the ratios for companies after merger, i.e. over a total period of 7 and 9 years. Kendall's Tau correlation coefficient was used for this purpose. We tested a total of 20 financial ratios. The results of calculations for selected financial ratios are given in Table 1 for the value of synergy five years after merger. Ratios that were statistically significant in at least one year during both evaluations, i.e. after three years and after five years, are given in the table. Correlations that are statistically significant to 5% are given in bold.

The results of the correlation test show that extending the timespan for the assessment of the success of mergers by two years led to us obtaining more ratios correlated with the value of synergy: there were originally 14 such ratios (of the total number of 140 ratios), though this number rose to 35 (of a total of 180 ratios) after five years. In contrast to the original three-year period, a more significant correlation was seen between the value of synergy and the ROA, which is statistically significant in all three years before merger (in contrast to the previous result, in which it was statistical-

ly significant only in the third year before merger). A similar finding also applies to the group of ratios based on cash flow. With the exception of the cash flow to interest ratio a year before merger, all the other ratios are statistically significant in all three years before merger. A new statistically significant negative correlation was discovered between the value of synergy and the added value to labour cost ratio (AV/LC), this for all three years prior to merger. We hasten to add that no correlation was demonstrated for this ratio in previous research. A similar conclusion applies to the leverage ratio, which is positively correlated in the third year prior to merger and then in the first two years after merger. Another ratio positively correlated with the value of synergy is the production consumption to sales ratio (in the third year prior to merger).

All the ratios mentioned above can be considered predictors that can signal in advance whether a merger will create a positive synergy value or not, i.e. whether it will result in the appreciation of the capital invested for the investor.

A statistically significant correlation with the value of the synergy attained is expressed in other ratios following realisation of the merger. There is a statistically significant negative correlation for the net working capital to sales ratio, i.e. it has a negative effect on the value of the synergy obtained, for the entire period following realisation of the merger. We would note that this finding is in line with the assessment made after three years. In contrast, the inventory turnover indicator is positively correlated with the synergy value. These results indicate that the standard of operating assets management has a fundamental effect on the synergy value.

The only ratio that was statistically significant during assessment three years after merger but is no longer significant after five years is the net working capital to assets ratio, which was originally statistically significant in the first year after merger. We would note that this indicator also has a negative effect on the synergy value (but is not statistically significant).

## **Conclusions**

It can be stated on the basis of our results that a statistically significant correlation exists between the value of the synergetic effect attained and the financial ratios.

This paper presents the results of ongoing research focusing on the assessment of the effectiveness of mergers. We have presented in this paper the results of research focusing on analysis of the effect of the length of the timespan on the synergy value, i.e. if a positive effect of a merger realised

is manifested after a larger number of years. We extended the studied period by two years as compared to the previous research. The results obtained clearly show that differences exist in the assessment of the success of a merger depending on the number of years since the merger. We demonstrated this by comparing the synergy value after three years and after five years. A change in the synergy effect occurred in almost one quarter of mergers; the overall negative effect of mergers increased.

We also found that the number of financial indicators correlated with the synergy value increased during the period prior to merger, i.e. in the period in which owners are considering mergers (in our research one to three years before merger). This was a secondary aim of our research. These indicators can be used to predict the synergy value. According to our results, the decisive value drivers are the return on assets, cash flow to assets, cash flow to sales, cash flow to interest and added value to labour costs. These indicators will be used in further research for the construction of models predicting whether a planned merger will result in a positive or negative value of the synergetic effect, i.e. whether investors will appreciate their capital or not.

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## Annex

**Table 1.** Kendall's Tau correlation coefficient for the value of synergy and selected financial ratios

|       | -3             | -2             | -1             | 0              | 1              | 2              | 3              | 4              | 5              |
|-------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| PC/S  | <b>0.1935</b>  | 0.0612         | 0.1429         | 0.1249         | 0.1478         | 0.0482         | 0.1004         | 0.0792         | 0.0661         |
| NWC/S | -0.0645        | -0.0727        | -0.1739        | <b>-0.2571</b> | <b>-0.2620</b> | <b>-0.2898</b> | <b>-0.2180</b> | <b>-0.2669</b> | <b>-0.2261</b> |
| NWC/A | -0.1069        | -0.0645        | -0.1331        | -0.1820        | -0.1592        | -0.1690        | -0.1576        | -0.1592        | -0.1151        |
| S/Inv | 0.0196         | 0.1111         | 0.1535         | 0.1797         | 0.1716         | <b>0.2336</b>  | <b>0.2254</b>  | 0.1422         | 0.0926         |
| AV/LC | <b>-0.2996</b> | <b>-0.2359</b> | <b>-0.2980</b> | <b>-0.1984</b> | -0.1706        | 0.0367         | 0.0131         | -0.0621        | -0.1078        |
| D/S   | -0.1314        | -0.1331        | -0.1543        | <b>-0.2082</b> | <b>-0.2131</b> | <b>-0.2049</b> | <b>-0.2016</b> | -0.1878        | -0.1241        |
| ROA   | <b>-0.3567</b> | <b>-0.2424</b> | <b>-0.3029</b> | -0.1494        | -0.0922        | 0.1445         | 0.1543         | 0.0563         | 0.0171         |
| LR    | <b>0.2392</b>  | 0.1592         | 0.1118         | <b>0.2114</b>  | <b>0.1935</b>  | <b>0.2098</b>  | 0.1739         | 0.1184         | 0.0547         |
| CF/A  | <b>-0.3208</b> | <b>-0.3257</b> | <b>-0.2849</b> | -0.1886        | -0.1151        | 0.1249         | 0.1722         | 0.0449         | 0.0073         |
| CF/I  | <b>-0.3593</b> | <b>-0.1943</b> | -0.1620        | -0.1604        | <b>-0.2005</b> | -0.0618        | -0.0472        | -0.0388        | <b>-0.1997</b> |
| CF/S  | <b>-0.3029</b> | <b>-0.2800</b> | <b>-0.2669</b> | <b>-0.1918</b> | -0.1771        | 0.0302         | -0.0041        | -0.0400        | -0.1118        |

Note: PC/S - production consumption/sales; NWC/S – net working capital/sales; NWC/A – net working capital/assets; S/Inv – Inventory turnover; AV/LC – added value/labour cost; D/S – depreciation/sales; ROA – return on assets; LR – leverage ratio; CF/A – CF/assets; CF/I – CF/interest; CF/S – CF/sales.

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## The impact of shareholders interactions on the adjustment of payout to investor sentiment for dividends

**JEL Classification:** *G30; G32; G35; G41*

**Keywords:** *dividend payout; catering effect of dividend; contestability & collusion of the largest shareholders; market sentiment for dividends*

### Abstract

**Research background:** Dividend payouts have been the subject of scientific research for many years. Although many studies focus on the impact of ownership on dividend payouts, there is still a lack of research on the influence of the contestability and collusion of the largest shareholders on the catering effect of dividends. This research gap motivated us to investigate this issue and determine whether the interactions between large shareholders have an impact on aligning dividends with investor sentiment.

**Purpose of the article:** The article assesses the impact of the relationship between the largest shareholders (i.e., contestability or collusion) on the adjustment of dividend payouts to investor sentiment. The following research hypothesis has been formulated: If there is contestability between the first and second-largest shareholders, the strength of the catering effect of the dividend is greater than in the case of collusion, both in the years of positive and negative dividend premiums.

**Methods:** The main research method is a panel regression model (pooled OLS and fixed effects). We use the F test, the Breusch-Pagan test, and the Hausman test. Our research is supplemented with descriptive statistics and the Pearson correlation coefficient. The research sample consists of Polish companies from the electromechanical industry sector listed on the main market of the Warsaw Stock Exchange (WSE) in the years 2009-2020.

**Findings & Value added:** We propose pioneering research concerning the catering effect in the context of interactions between the largest shareholders. The main research results are as follows: a) if a dividend premium is positive and the second-largest shareholder holds many shares, the strong catering effect of dividends is

observed; b) in the years of a negative premium, both the catering effect and the impact of interactions between major shareholders on dividend payouts are not observed.

## Introduction

The dividend policy is one of the most frequently investigated issues in the field of corporate finance. Since the 1950s, when Lintner (1956, pp. 97-113) published his research on dividends, the dividend puzzle has still not been solved. When finding an answer to the question of why companies pay out dividends, researchers focus on the determinants and implications of payout. One of them is the ownership concentration in the context of collusion and contestability between the largest shareholders. If the activities of the first-largest shareholder are monitored by non-dominant large shareholders to prevent wealth expropriation, this interaction between them is called contestability. Conversely, if the largest shareholders collaborate with one another to increase the efficiency of private benefits extraction, this coalition is named collusion. Jiang *et al.* (2019, p. 17) found that Chinese companies with multiple large shareholders are more likely to pay out dividends. The propensity to pay a dividend increases if the largest shareholder cooperates with others. Ramli (2009, p. 97) demonstrated that the presence of a substantial second-largest shareholder has a positive impact on the dividend payout of Malaysian companies. López-Iturriaga *et al.* (2015, p. 519) also showed that coalitions of shareholders in Spanish companies affect payout policy negatively. Furthermore, Rossi *et al.* (2018, p. 531) proved that contestability dampens the expropriation of benefits to Italian minority shareholders.

It is worth noting that very little research has investigated the impact of shareholder interactions on the catering effect of dividends. So far, research has focused mainly on the relationship between managerial ownership and the catering effect. Gyimah & Gyapong (2021) examined US companies and found evidence that managerial entrenchment negatively impacts dividend payments, and the dividend is paid when there is external investor demand for payouts. Pieloch-Babiarz (2020, p. 467) showed that in Polish companies, the catering effect of the dividend weakens if the manager is the largest shareholder. Neves (2014, p. 35) also found that concentrated managerial ownership negatively affects the catering effect. Moreover, she demonstrated that the second-largest shareholder moderates the extent to which firms cater to investor sentiment. Finally, she demonstrated that contestability and collusion between large shareholders influence the catering

to investor sentiment for a dividend. The research carried out by Neves is, so far, the only investigation that recognizes these issues in such a complete and comprehensive way.

A relatively new line of research is related to dividends in the context of behavioral finance, in particular, to the catering theory of dividends. This theory, proposed by Baker and Wurgler (2004, p. 1125), assumes that stock investors behave irrationally (i.e., they make investment decisions based only on dividends), while managers' behavior is rational (i.e., they analyze the market and pay out dividends if dividend payers are valued higher than non-payers). This adjustment of dividend payouts to investor sentiment for the dividend is called the catering effect. The catering theory of dividends has been developed by several authors. Li and Lie (2006, p. 293) demonstrated that dividends increase in years of high dividend premiums. Jiang *et al.* (2013, p. 36) showed that stock investors prefer share buy-backs to dividends when the repurchase premium is positive. However, there is still a lack of research on the impact of interactions between large shareholders on the catering effect of dividends.

The research gap motivated us to investigate whether the contestability and collusion of large shareholders have an influence on aligning dividends with investor preferences. Therefore, the goal of this paper is to assess the impact of the relationship between the largest shareholders (i.e., contestability or collusion) on the adjustment of dividend payouts to investor sentiment. Understanding the impact of shareholders' contestability and collusion on adjusting the dividends to investor sentiment is vital both for a stock investor who wants to receive regular dividends, and for a listed company that, through an appropriately implemented dividend policy, can affect its market value. The main method of our research is a panel regression model. To choose the appropriate one, we use the F test, the Breusch-Pagan test, and the Hausman test.

The remainder of this article is structured as follows. Section 2 describes the research methodology. Section 3 presents the research results. Section 4 highlights the conclusions. The last section contains the annex.

## **Research methodology**

The research was conducted on companies from the electromechanical industry sector that were listed on the main market of the Warsaw Stock Exchange (WSE) in the years 2009-2020. To get the final research sample,

we conducted pairwise deletion of missing data<sup>1</sup> and received 324 firm-year observations.

We assumed that the strength of the catering effect depends on whether there is contestability or collusion between the first and second-largest shareholders. Therefore, the research hypothesis is: *If there is contestability between the first and the second-largest shareholder, the strength of the catering effect of the dividend is greater than in the case of collusion, both in the years of positive and negative dividend premiums.*

The impact of interactions between the largest shareholders on the strength of the catering effect of dividends was investigated using the pool OLS (for the years of negative premium) and fixed effects model (for the years of positive premium). The decision to use the above models instead of the random effects model was made based on results of the F-test, the Breusch-Pagan test, and the Hausman test.

In order to study the interactions between the owners and to investigate the existence of the catering effect in the context of contestability and collusion between the first and second-largest shareholders in the years of positive and negative dividend premium, we propose estimating two models given in two versions (i.e., a and b). Model 1 is represented by the following equation:

$$\begin{aligned} Dividend_{i,t} = & \gamma_0 + Cater_{i,t-2}(\gamma_1 + \omega_1 CollusionI_{i,t-1}) + \\ & + \gamma_2 Return_{i,t-1} + \gamma_3 Size_{i,t-1} + \gamma_4 Leverage_{i,t-1} + \gamma_5 Years_{i,t-1} + \varepsilon_{i,t} \end{aligned}$$

where:

*Dividend* – the dividend payout ratio of the *i*-th company in year *t* computed as total dividend over net earnings;

*Cater* – the dividend premium used as a proxy for catering effect (Baker & Wurgler, 2004, pp. 1125-1165);

*CollusionI* – a proxy for collusion/contestability computed as the number of shares held by the second-largest shareholder over the number of shares held by the first-largest shareholder, i.e.,  $P2/P1$  (Jara *et al.*, 2019, p. 261). It is a dummy variable that takes a value of 1 if the number of shares held by the second-largest shareholder to the number of shares held by the first-largest shareholder is at the level at least equal to the mean (model 1a) or to the third quartile (model 1b), i.e.,  $P2/P1 > Mean$  or  $P2/P1 > Q3$ , respectively (collusion), and 0 otherwise (contestability). Coefficient of catering variable is  $\gamma_1$  for companies in which there is a contestability between the

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<sup>1</sup> Due to missing data, we had to delete 5 companies.

largest shareholders (since *Collusion1* takes value 0), and  $\gamma_1 + \omega_1$  otherwise. The coefficient  $\gamma_1$  is expected to be positive and statistically significant. The coefficient  $\gamma_1 + \omega_1$  is expected to be positive and statistically significant, however lower than  $\gamma_1$ . If the coefficients of the dummy variables are statistically significant, a linear restriction test is needed (null hypothesis  $H_0: \gamma_1 + \omega_1 = 0$ );  
control variables: *Return<sub>i</sub>* – the return on assets; *Size<sub>i,t-1</sub>* – the company’s size; *Leverage* – the debt ratio; *Years* – the company’s age;  
 $\varepsilon_{i,t}$  – a random component.

Alternatively, in order to verify the research hypothesis, model 2 is given by the following regression:

$$\begin{aligned} Dividend_{i,t} = & \gamma_0 + Cater_{i,t-2}(\gamma_1 + \theta_1 Collusion2_{i,t-1}) + \\ & + \gamma_2 Return_{i,t-1} + \gamma_3 Size_{i,t-1} + \gamma_4 Leverage_{i,t-1} + \gamma_5 Years_{i,t-1} + \varepsilon_{i,t} \end{aligned}$$

where:

*Collusion2* – a proxy for collusion/contestability, computed as the difference between the number of shares held by the largest shareholders squared, i.e.,  $(P1-P2)^2$  (Jara *et al.*, 2019, p. 261). It is a dummy variable that takes a value of 1 if this difference is lower than mean (model 2a) or third quartile (model 2b), i.e.,  $(P1-P2)^2 < Mean$  or  $(P1-P2)^2 < Q1$ , respectively (collusion), and 0 otherwise (contestability). The coefficient of catering variable is  $\gamma_1$  for companies in which there is a contestability between the largest shareholders (since *Collusion2* takes value 0), and  $\gamma_1 + \theta_1$  otherwise. Coefficient  $\gamma_1$  is expected to be positive and statistically significant, while  $\gamma_1 + \theta_1$  should be positive and statistically significant, although lower than  $\gamma_1$ ; and the other designations as above.

In order to carry out the studies we use data from the Notoria Service database, Stock Market Yearbooks and companies year reports. The empirical research was conducted using Statistica and Gretl software.

## **Results**

The coefficients of pairwise correlation between the variables are given in Table 1. In the case of a positive premium, there is a significant correlation between the dependent variable and all explanatory variables. The highest

and most statistically significant correlation is observed for *Dividend* and *Cater* ( $r_{yx} = 0.70$ ), which indicates that dividend payouts are adjusted to investor sentiment. There is a positive and statistically significant correlation between *Dividend* and the explanatory variables used to determine the catering effect in the case of interactions between the main shareholders. The Pearson correlation coefficient indicates the positive relationship between the number of shares held by the second-largest shareholder and dividend payouts. Furthermore, a positive and statistically significant correlation is observed between *Dividend* and three control variables (*Return*, *Size*, and *Years*), while a negative correlation occurs for *Leverage* ( $r_{yx} = -0.32$ ). In turn, in the case of a negative premium, the Pearson correlation coefficients computed for *Dividend* and the explanatory variables are not statistically significant, except for *Size* ( $r_{yx} = -0.03$ ).

In Table 2, we present the estimation results of eight models used to test the strength of the catering effect depending on whether there is contestability or collusion between the first and second-largest shareholders. Focusing first on four models that relate to the periods with a positive dividend premium, it should be noted that the coefficient at *Cater* is positive and statistically significant ( $\alpha = 0.05$ ). Our findings confirm that companies cater to investor sentiment for dividends, which means that managers analyze market reactions and investor preferences to pay out dividends if that payment is expected.

Model 1a, estimated for a positive dividend premiums, allows us to analyze the strength of the catering effect depending on the interactions between the main shareholders. The respective coefficient at *CaterCollusion1* ( $\omega_1 = -0.137$ ) proved not to be statistically significant at the accepted levels of significance. Thus, if the dividend premium is positive and the relationship between the share of the second and first-largest shareholders is, at least, average, our hypothesis is not supported. However, if the second-largest shareholder holds more shares (i.e.,  $P2/P1 > Q3$ ), the coefficient at *CaterCollusion1* is positive and significant at 10% ( $\omega_1 = 0.167$ ), and  $\gamma_1 + \omega_1$  is, contrary to our assumptions, positive and higher than  $\gamma_1$  (i.e.,  $\gamma_1 + \omega_1 = 0.954$ ). This result means that if the second-largest shareholder holds more shares, the catering effect is stronger. Furthermore, the research carried out for positive premium using model 2 (a and b) provides similar findings. If  $(P1 - P2)^2 < Mean$ , the parameter at *CaterCollusion2* ( $\theta_1 = -0.126$ ) is not statistically significant. However, if the share of the second-largest shareholder is higher (i.e.,  $(P1 - P2)^2 < Q1$ ), this parameter is positive ( $\theta_1 = 0.175$ ) and statistically significant at 10%. Moreover, the parameter  $\gamma_1 + \theta_1$  is positive and higher than  $\gamma_1$  (i.e.,  $\gamma_1 + \theta_1 = 0.958$ ), so if the second-largest share-

holder holds many shares, the strong catering effect is observed. This indicates that main owners do not collude.

When estimating results in the case of a negative dividend premium, it should be noted that in each model, the value of parameter at *Cater* is negative but not significant, so the catering effect is not observed. Furthermore, the parameters at *CaterCollusion1* and *CaterCollusion2* are not significant either. Thus, the hypothesis is not supported for the years of negative premiums.

## Conclusions

The paper shows the results of novel research into the catering theory of dividends concerning the impact of interactions between major shareholders on adjusting the dividend payout to investor sentiment. In order to verify the hypothesis, we conduct a study on listed companies from the electromechanical industry sector, dividing the research period into the years of positive and negative dividend premiums. There are two main conclusions. First, if the dividend premium is positive, the analyzed companies cater to investor sentiment for dividend, which means that managers analyze stock market reactions to decide about dividends. Furthermore, if the second-largest shareholder holds many shares, the strong catering effect of dividends is observed. This indicates that the interactions between the largest shareholders should be seen as contestability (strong monitoring and control of the first-largest shareholder enable the objectives of minority shareholders to be achieved). This finding may be especially useful for stock investors who are interested in dividends. In conclusion, if the dividend premium is positive and the second-largest shareholder holds many shares, the research hypothesis is supported. Second, in the years of negative premiums, both the catering effect and the impact of interactions between the largest shareholders on dividend payouts are not observed. Thus, if the dividend premium is negative, the research hypothesis is not supported.

The results cannot be generalized due to some limitations. First, our study covers only one sector on the WSE. Second, in the adopted period, there are only two years of negative premium, which does not allow us to conclusively state that the catering effect does not occur then. Third, we only considered the number of shares, without control leverage or pyramid structures. Therefore, further research on this issue is required. As the study should be considered preliminary, we recommend extending the research period and considering other sectors.

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## Annex

**Table 1.** Pearson correlation matrix – years of positive and negative premium

| <i>Spec.</i>         | <i>Dividend</i> | <i>Cater</i> | <i>Cater-Coll.1a</i> | <i>Cater-Coll.1b</i> | <i>Cater-Coll.2a</i> | <i>Cater-Coll.2b</i> | <i>Return</i> | <i>Size</i> | <i>Leverage</i> | <i>Years</i> |
|----------------------|-----------------|--------------|----------------------|----------------------|----------------------|----------------------|---------------|-------------|-----------------|--------------|
| <i>Dividend</i>      | 1.00            | -0.16        | 0.12                 | 0.07                 | -0.11                | 0.07                 | 0.12          | -0.03**     | 0.09            | 0.02         |
| <i>Cater</i>         | 0.70***         | 1.00         | 0.48***              | 0.36***              | 0.62***              | 0.36***              | -0.03**       | -0.18       | -0.51***        | 0.16**       |
| <i>Cater-Coll.1a</i> | 0.42***         | 0.67***      | 1.00                 | 0.76***              | 0.77***              | 0.76**               | -0.17         | -0.19       | 0.08            | 0.06         |
| <i>Cater-Coll.1b</i> | 0.39***         | 0.44***      | 0.67***              | 1.00                 | 0.58**               | 0.83***              | -0.14         | -0.19       | 0.09            | 0.04         |
| <i>Cater-Coll.2a</i> | 0.55***         | 0.63***      | 0.80***              | 0.53***              | 1.00                 | 0.58**               | -0.10**       | -0.07       | 0.03            | 0.08**       |
| <i>Cater-Coll.2b</i> | 0.40***         | 0.44***      | 0.69***              | 0.98***              | 0.54***              | 1.00                 | -0.15**       | -0.18       | 0.13            | 0.06         |
| <i>Return</i>        | 0.34***         | 0.37***      | 0.33***              | 0.28**               | 0.39***              | 0.28***              | 1.00          | 0.21        | -0.39***        | -0.14        |
| <i>Size</i>          | 0.11*           | -0.01        | -0.15***             | -0.23***             | -0.11                | -0.24***             | -0.09         | 1.00        | 0.17            | 0.06         |
| <i>Leverage</i>      | -0.32***        | -0.35***     | -0.39***             | -0.35***             | -0.34***             | -0.37***             | -0.43***      | 0.15**      | 1.00            | -0.04        |
| <i>Years</i>         | 0.24***         | 0.25***      | 0.20***              | 0.08                 | 0.18***              | 0.07                 | 0.02          | 0.24***     | 0.13*           | 1.00         |

\*, \*\*, \*\*\* – statistical significance at the 10%, 5%, and 1% levels

All coefficients under the main diagonal of this matrix are calculated for positive premium years, while those above it are for negative ones.

**Table 2.** Estimation results

| Specification              | Positive dividend premium |          |          |          | Negative dividend premium |          |          |          |
|----------------------------|---------------------------|----------|----------|----------|---------------------------|----------|----------|----------|
|                            | Model 1a                  | Model 1b | Model 2a | Model 2b | Model 1a                  | Model 1b | Model 2a | Model 2b |
| <i>Intercept</i>           | 0.061                     | -0.105   | 0.029    | -0.118   | 0.738                     | 0.991    | 0.738    | 1.015    |
| <i>Cater</i>               | 0.883**                   | 0.787**  | 0.913**  | 0.783**  | -1.089                    | -0.654   | -1.089   | -0.669   |
| <i>Cater:Collusion1</i>    | -0.137                    | 0.167*   |          |          | 1.137                     | 0.629    |          |          |
| <i>Cater:Collusion2</i>    |                           |          | -0.126   | 0.175*   |                           |          | 1.137    | 0.630    |
| <i>Return</i>              | 0.091                     | 0.144    | 0.139    | 0.151    | 0.972                     | 1.030    | 0.972    | 1.015    |
| <i>Size</i>                | -0.009                    | 0.005    | -0.007   | 0.006    | -0.102                    | -0.130   | -0.102   | -0.129   |
| <i>Leverage</i>            | -0.229**                  | -0.148   | -0.198*  | -0.143   | -0.017                    | 0.438    | -0.017   | 0.387    |
| <i>Years</i>               | 0.021***                  | 0.017*** | 0.020*** | 0.017**  | 0.043                     | 0.043    | 0.043    | 0.041    |
| <i>F</i> test              | 2.452                     | 2.536    | 2.502    | 2.535    | 1.139                     | 1.323    | 1.139    | 1.291    |
| <i>p</i> -value            | 0.000                     | 0.000    | 0.000    | 0.000    | 0.387                     | 0.263    | 0.387    | 0.281    |
| Breusch-Pagan, $\chi^2(1)$ | 14.072                    | 16.274   | 15.238   | 16.419   | 0.043                     | 0.004    | 0.043    | 0.003    |
| <i>p</i> -value            | 0.000                     | 0.000    | 0.000    | 0.000    | 0.835                     | 0.950    | 0.835    | 0.960    |
| Hausman, $\chi^2(K)$       | 23.267                    | 21.668   | 25.891   | 21.324   | 9.367                     | 13.179   | 9.368    | 12.605   |
| <i>p</i> -value            | 0.001                     | 0.001    | 0.000    | 0.002    | 0.153                     | 0.040    | 0.154    | 0.050    |
| Linear restriction test    | x                         | 85.185   | x        | 86.929   | x                         | x        | x        | x        |
| <i>p</i> -value            | x                         | 0.000    | x        | 0.000    | x                         | x        | x        | x        |

\*, \*\*, \*\*\* – statistical significance at the 10%, 5%, and 1% levels

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## The relationship between executive compensation and financial performance of listed companies – the case of Poland

**JEL Classification:** G32; G38; M41; M52

**Keywords:** *executive compensation; financial performance; comprehensive income; Polish market*

### Abstract

**Research background:** The level of compensation offered to chief executive officers (CEOs) and the relationship between executive pay and companies' financial performance are among the issues that the corporate governance literature deals with the most often. According to the existing evidence, organizations' financial performance has a significant effect on the compensation of their senior executives. However, there are academics who question the rationality of making executive compensation contingent on the financial performance of their companies.

**Purpose of the article:** This paper analyzes the relationship between executive compensation and the financial performance of companies listed on the Warsaw Stock Exchange (WSE). In particular, the role and effect of comprehensive income and net income on executive compensation are analyzed and compared.

**Methods:** In order to study executive compensation, a sample of 205 Polish companies selected from the 421 organizations listed on the Warsaw Stock Exchange on 1 October 2019 was assembled. The role and effect of accounting financial measures on executive compensation are analyzed based on three regression models. The period of analysis spanned ten years, from 2009 to 2018.

**Findings & Value added:** There are three conclusions that can be drawn from the study. Firstly, executive compensation in the analyzed companies largely depends on the accounting measures of financial performance, based on net income and

comprehensive income (excluding return on equity). Secondly, its level is significantly and positively influenced by the company's size, book to equity ratio, market capitalization, debt ratio, and dividend rate. Thirdly, comprehensive income has a stronger effect on executive compensation than net income.

## Introduction

Many studies conducted in the last several decades presented conflicting evidence about whether a company's financial performance has a positive effect on CEO pay. For instance, in one of their earliest papers, Jensen and Murphy (1990) reported a positive relationship between financial performance and executive compensation, having analyzed a 1974–1986 sample of US companies. Boschen and Smith (1995), who examined the relationship between performance and executive compensation in 16 US firms in the years 1948–1990, found a significant correlation between them, although varying in time. After analyzing a fifteen-year panel data set of CEOs in the largest, publicly-traded US companies between 1980 and 1994, Hall and Liebman (1998) confirmed a significant and positive correlation between organizations' financial performance and CEO pay.

In the study by Ozkan (2011), the effect of a company's financial performance on executive compensation was also positive but non-significant. A few empirical studies failed to find any relationship between CEO pay and the company's profits. Brick *et al.* (2006) established a negative association between a company's financial performance and stock returns and executive compensation.

The main purpose of this paper is to determine the relationship between executive compensation and organizational financial performance based on a sample of companies listed on the Warsaw Stock Exchange (WSE). In particular, the effect of net income and comprehensive income on executive compensation is analyzed and compared.

Because Polish listed companies appear to be especially compliant with corporate governance and executive compensation rules, we assume there is a positive relationship between executive compensation and financial performance. So, the first hypothesis was formulated as follows: *There is a positive relationship between the financial performance of listed companies in Poland and the total compensation of their executives (H1).*

This naturally leads us to another question about which corporate income (operating, net, comprehensive, etc.) is likely to have the optimal motivating effect on managers. Comprehensive income seems a better instrument for determining CEOs' rewards than net income because it shows

shareholders' wealth and explains companies' financial performance better than net profit. Accordingly, the second hypothesis was formulated as follows: *Comprehensive income has a stronger effect on executive compensation than net income* (H2).

Additionally, comprehensive income (in contrast to net income) is generally beyond the control of managers and hinders active earnings management (Chambers *et al.*, 2007, p. 561). In the earnings management can use a variety of methods and techniques to legal profit manipulation. This global phenomenon is focused on a lot of accounting measures, e.g.: EBIT, EBITDA, EBT, or EAT etc. (Kliestik *et al.*, 2020). Whereas, based on comprehensive income components shareholders can assess some of the managerial activities more accurately and can recognize the managers' engagement in both earnings management and the manipulation of executive compensations.

## **Research methodology**

In order to study executive compensation, a sample of 205 Polish companies selected from the 421 organizations listed on the Warsaw Stock Exchange on 1 October 2019 was assembled. The period of analysis spanned ten years, from 2009 to 2018.

The compensation can be studied empirically with respect to total compensation, cash compensation, or salary. The fact that the board activity reports of the sampled companies used as the source of information on CEOs' pay only presented aggregate amounts without detailing the values of particular pay components somewhat hindered the interpretation of the research results.

The values of all variables, including the total compensation, are stated as at the end of the accounting year. The regression models were built using the natural logarithms of the absolute values of executive compensation (EC). After a careful review of other studies (Jensen & Murphy, 1990; Mäkinen, 2005; Raithatha & Komera, 2016; Yamina & Mohamed, 2017), ROA, ROE, SIZE (total assets) and debt ratio (DR) were selected as the accounting measures of companies' performance, and BVMV, the market capitalization (CAP) and the dividend rate (DIV) as the market-based measures. Three other market ratios, i.e., the annual stock return and the risk ratio that the authors of earlier theoretical and empirical works used (Raithatha & Komera, 2016) were also estimated but were rejected as statistically non-significant.

Considering that the financial effectiveness of a company depends on the productivity of inputs (such as assets) and is determined by their profitability, the net income (NI) and comprehensive income (CI) values used in the models were adjusted for companies' total assets to separate them from the influence of business volumes.

Additionally, three binary variables were used in the econometric models:

- a) SECTOR – indicating a company's specific sector and taking a value of 1 for financial companies and a value of 0 for other sectors (Yamina & Mohamed, 2017),
- b) GENDER – identifying gender diversity among CEOs, which can influence EC; it takes a value of 0 for a male-only group of CEOs and 1 for companies in which at least one CEO is a woman,
- c) NEG – to distinguish between periods when a company made profits and when it incurred losses as recommended by conditional conservatism; it takes a value of 1 for a loss and 0 for a profit.

The comparison of CI and NI in terms of their associations with executive compensation was performed using a three-step procedure. In the first step, the key variables were analyzed by means of descriptive statistics (the measures of location and variation). The next part of the analysis focused on correlations between both accounting and market variables and EC. In total, 1950 observations were identified, of which 1918 were subjected to analysis. The reason for the difference was the quantitative approach to data collection: all missing observations were not replaced by, e.g., arithmetic averages but were removed in pairs. Outliers were few, so they were retained for analysis. Lastly, using the regression analysis and three one-equation models (M1–M3) built for NI (M1) and CI (M2), and one (M3)<sup>1</sup> that measures both, the effect of both types of income on EC was determined to test hypotheses H1 and H2:

$$M1: EC_t = \alpha_0 + \alpha_1 NI_t + \alpha_2 SIZE_t + \alpha_3 ROE_t + \alpha_4 BVMV_t + \alpha_5 CAP_t + \alpha_6 DR_t + \alpha_7 DIV_t + \alpha_8 SECTOR_t + \alpha_9 GENDER_t + \alpha_{10} NEG_t + \varepsilon_t,$$

$$M2: EC_t = \alpha_0 + \alpha_1 CI_t + \alpha_2 SIZE_t + \alpha_3 ROE_t + \alpha_4 BVMV_t + \alpha_5 CAP_t + \alpha_6 DR_t + \alpha_7 DIV_t + \alpha_8 SECTOR_t + \alpha_9 GENDER_t + \alpha_{10} NEG_t + \varepsilon_t,$$

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<sup>1</sup> Because both measures (CI and NI) were highly correlated to each other, we additionally controlled for their joint impact on EC.

$$M3: EC_t = \alpha_0 + \alpha_1 NI_t + \alpha_2 CI_t + \alpha_3 SIZE_t + \alpha_4 ROE_t + \alpha_5 BVMV_t + \alpha_6 CAP_t + \alpha_7 DR_t + \alpha_8 DIV_t + \alpha_9 SECTOR_t + \alpha_{10} GENDER_t + \alpha_{11} NEG_t + \varepsilon_t.$$

The effect of the organization's financial performance on EC was estimated by the ordinary least square method (OLS). Additionally, because the data concerned a relatively smaller number of companies and spanned a long period, the fixed effect estimators (FE) were also computed. The outcomes produced by both estimation procedures were relatively similar.

## Results

Executive compensation varied widely in the sampled companies, as shown by the values of its natural logarithms, which range from as low as 0.182 to as high as 9.132. Significant differences in the levels of executive compensation are also confirmed by a standard deviation of 1.111 (see Table 1).

Despite theoretical expectations, the ROA values obtained for comprehensive income spanned a narrower range than those calculated for net income (-1.536 and 6.364 compared with -1.976 and 12.771; standard deviations of 0.223 and 0.403, respectively). The minimum and maximum values of variable SIZE (0.001 and 19.482; standard deviation of 2.094) indicate that the sampled companies varied strongly in size. The range of ROE values was much wider (from -61.232 to 77.269; standard deviation of 5.353), but what differentiated them most was BVMV, whose values ranged from 0.005 to 602.973 (standard deviation of 66.398). The value of CAP ranged between 0.131 and 10.922, with a mean of 5.635. As for the debt ratio (DR), its mean value of 0.268 and standard deviation of 0.583 indicate that the companies were relatively similar in their use of external funding. What differentiated the EC least was DIV, whose values ranged from 0.000 to 1.079 (standard deviation of 0.040).

Net income and comprehensive income turned out to be weakly but positively correlated with executive compensation (see Table 2). Slightly stronger correlations were determined between CI and EC than between NI and EC. Interestingly, the correlation coefficient between EC and SIZE was as much as 0.528. Weak but positive and statistically significant relationships were also found between EC and ROE, as well as EC and DR. The values of the correlations between EC and market measures were statistically significant, but in the case of BVMV, it was a negative relationship. It is worth emphasizing that the correlation coefficient between EC and CAP was quite high (0.5), and between CAP and SIZE, it was as much as 0.852.

An interesting finding, given the purpose of the paper, was that the correlation coefficient between NI and CI was very high (0.9) and statistically significant. This result is consistent with the character of CI, which consists of NI and OCI. Compared with the results of studies on major capital markets in Europe, the correlation between CI and NI was also very high (over 0.8) and was probably related to the character of the companies' sector. The differences between the values of NI and CI of WSE-listed companies were rather small. Because both measures (CI and NI) were highly correlated to each other, we additionally controlled for their joint impact on EC (M3).

The variables used in models M1 and M2 were employed to perform a regression analysis of EC to determine the effect of companies' financial results on top managers' earnings (H1). The effect of all measures, both accounting and market, was positive in these models (see Table 3).

It is important to note that the parameters on CI, SIZE, BVMV, CAP, DR, and DIV were statistically significant at the 5% or 1% level of significance. By contrast, the effects of NI and ROE were not statistically significant. The dummy variables varied in their effect on EC. The statistically significant parameter estimates indicated a negative effect of the variables SECTOR and GENDER. The effect of NI and CI on EC was evidently positive, but slightly stronger for CI (M2) than NI (M1). Additionally, it is important to note that the parameter on NI was not statistically significant at  $p=0.01$  or  $p=0.05$ .

The estimation of the third model (M3), showed that CI positively influenced CEO pay (the values of the parameters on this variable were statistically significant). The effect of NI was negative, but the parameter on this accounting measure was not statistically significant. Other variables had a similar effect on EC as in the M1–M2 models.

Our findings are consistent with what other authors have reported in that they, too, confirm a positive effect of companies' financial results on top managers' earnings (e.g., Mäkinen, 2005). A statistically significant and positive effect of variable SIZE (company's total assets) on executive compensation has also been observed in our study. The control variables varied in their effect on executive compensation. The statistically significant parameter estimates indicated a positive effect of market measures (e.g., BVMV, CAP, DIV) or the negative effect of SECTOR. These findings are basically consistent with the results reported by the authors of recent empirical studies (Raithatha & Komera, 2016; Yaminaa & Mohamed, 2017). Compared to other authors, debt ratio (DR) has a significant positive influence on the EC of companies listed on the WSE.

## Conclusions

The study examined the relationship between the level of total executive compensation in organizations and selected accounting and market-based performance measures using regression models. The findings of empirical studies that analyzed the relationships between executive pay and widely-used financial indicators have so far been inconclusive. Our analysis found major differences among Polish listed companies in the compensation of their executives. Interestingly, however, the correlation coefficients pointed to weak but positive and, more importantly, significant associations between executive compensation and the companies' return on assets, or on equity, debt ratio, market capitalization, as well as the size of the enterprise. The correlation between CEO pay and the book-to-equity ratio was negative but significant. The estimation of the econometric models, too, showed that both accounting measures and market ratios positively influenced CEO pay, but the values of the parameters on NI and ROE variables were statistically non-significant. Therefore hypothesis 1 was partially confirmed. Hypothesis 2 was also confirmed because the influence of comprehensive income on CEO pay proved slightly stronger compared with net income. In model M3, which took into account both measures, NI had a negative effect on EC.

The results of our study are based on a sample of Polish listed companies, so they should not be used as a basis for general reflections and conclusions about other markets. Unquestionably, they can be useful as a 'starting point' for innovative theoretical and empirical research on the influence of comprehensive income on executive compensation. A wider use of quantitative research and, for instance, qualitative methods would certainly help better assess the usefulness of comprehensive income for designing effective executive compensation plans.

Overall, our findings suggest that Polish companies appreciate corporate governance standards and follow best practice codes and international recommendations, emphasizing the need to tie executive compensation to organizational performance and reduce the potential for conflicts of interest between managers and shareholders. Our study is probably one of the first efforts to determine how CEO pay is influenced by comprehensive income, which better shows shareholders' wealth and accounts for more value sources than net income, as well as being more resistant to managers' manipulations. However, because its findings are based on a sample of Polish companies, the relationship between comprehensive income and executive compensation should also be studied for other East-Central European countries as a comparison.

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## Annex

**Table 1.** Selected statistics on the analyzed companies

| Variable | Mean   | Median | Maximum | Minimum | Std. Dev. |
|----------|--------|--------|---------|---------|-----------|
| EC       | 6.121  | 6.184  | 9.132   | 0.182   | 1.111     |
| NI       | 0.052  | 0.037  | 12.771  | -1.976  | 0.403     |
| CI       | 0.038  | 0.036  | 6.364   | -1.536  | 0.223     |
| SIZE     | 13.034 | 12.696 | 19.482  | 0.001   | 2.094     |
| ROE      | 1.083  | 0.028  | 77.269  | -61.232 | 5.353     |
| BVMV     | 18.810 | 1.128  | 602.973 | 0.005   | 66.398    |
| CAP      | 5.635  | 5.373  | 10.922  | 0.131   | 2.010     |
| DR       | 0.268  | 0.116  | 7.928   | 0.000   | 0.583     |
| DIV      | 0.019  | 0.000  | 1.079   | 0.000   | 0.040     |

**Table 2.** Correlation matrix

| Variable | EC    | NI     | CI      | SIZE    | ROE     | BVMV     | CAP      | DR      | DIV      |
|----------|-------|--------|---------|---------|---------|----------|----------|---------|----------|
| EC       | 1.000 | 0.021* | 0.052** | 0.528** | 0.147** | -0.091** | 0.524**  | 0.057** | 0.135**  |
| NI       |       | 1.000  | 0.908** | -0.010  | -0.018  | 0.016    | -0.013   | -0.009  | -0.015   |
| CI       |       |        | 1.000   | -0.011  | 0.018   | 0.000    | 0.050*   | -0.011  | 0.020    |
| SIZE     |       |        |         | 1.000   | 0.210** | -0.227** | 0.852**  | 0.036   | 0.087**  |
| ROE      |       |        |         |         | 1.000   | -0.032   | 0.216**  | -0.025  | 0.043    |
| BVMV     |       |        |         |         |         | 1.000    | -0.275** | 0.074** | -0.064** |
| CAP      |       |        |         |         |         |          | 1.000    | 0.025   | 0.158**  |
| DR       |       |        |         |         |         |          |          | 1.000   | -0.049*  |
| DIV      |       |        |         |         |         |          |          |         | 1.000    |

\* Significant at the 5% level of significance; \*\* significant at the 1% level of significance.

**Table 3.** Results of the Panel Least Squares regression

| Variable                   | M1                   | M2                   | M3                   |
|----------------------------|----------------------|----------------------|----------------------|
| NI                         | 0.090<br>(1.681)     |                      | -0.145<br>(-1.132)   |
| CI                         |                      | 0.221*<br>(2.256)    | 0.472*<br>(2.002)    |
| SIZE                       | 0.162**<br>(8.491)   | 0.179**<br>(9.211)   | 0.182**<br>(8.919)   |
| ROE                        | 0.004<br>(1.584)     | 0.003<br>(1.459)     | 0.003<br>(1.448)     |
| BVMV                       | 0.001**<br>(2.514)   | 0.001**<br>(3.162)   | 0.001**<br>(2.568)   |
| CAP                        | 0.151**<br>(7.545)   | 0.133**<br>(6.524)   | 0.128**<br>(5.977)   |
| DR                         | 0.077*<br>(2.144)    | 0.071*<br>(1.997)    | 0.075*<br>(2.096)    |
| DIV                        | 1.716**<br>(3.215)   | 1.693**<br>(3.173)   | 1.665**<br>(3.125)   |
| SECTOR                     | -0.116*<br>(-2.222)  | -0.127**<br>(-2.453) | -0.112*<br>(-2.132)  |
| GENDER                     | -0.152**<br>(-3.538) | -0.124**<br>(-2.898) | -0.150**<br>(-3.480) |
| NEG                        | -0.059<br>(-1.168)   | -0.062<br>(-1.234)   | -0.054<br>(-1.058)   |
| CONSTANT                   | 3.238**<br>(18.793)  | 3.103**<br>(17.892)  | 3.097**<br>(17.165)  |
| Time-specific effects      |                      | No                   |                      |
| Companies-specific effects |                      | No                   |                      |
| Adj-R <sup>2</sup>         | 0.313                | 0.312                | 0.313                |
| F-statistic                | 88.075               | 87.906               | 79.332               |
| (p value)                  | (0.000)              | (0.000)              | (0.000)              |
| N                          |                      | 1918                 |                      |

\* Significant at the 5% level of significance; \*\* significant at the 1% level of significance.

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## Negative impact of financial innovation – evidence from the FX options debacle in Poland

**JEL Classification:** *G12; G23; G32; L20*

**Keywords:** *derivatives debacle; financial innovation; FX options*

### Abstract

**Research background:** Numerous academic studies have reported cases in which financial institutions shrouded some aspects of innovative securities or took advantage of information asymmetry to exploit uninformed clients. However, little attention has been paid by scholars to the FX options debacle in Poland in 2008–09 as to a phenomenon induced by neglected risks of financial innovation. In this paper we take an attempt to fill this research gap..

**Purpose of the article:** The paper provides a comprehensive analysis of the FX options debacle in Poland from the perspective of the negative consequences of financial innovation. The research focuses on two main aspects of the debacle: the marketing of the financial instruments (product design and distribution) as well as the scale and nature of the negative consequences which they led to, making both of them well-embedded in the situational context of the analysed phenomenon.

**Methods:** A qualitative content analysis (QCA) has been employed, preceded by a thorough literature review. The research sample embraces over 750 documents from three sampling units: press releases, public authorities' accounts, and corporate statements.

**Findings & Value added:** The research provides evidence of the dark side of financial innovations through an analysis of a countrywide case on an emerging market. It documents that the FX options debacle was caused by financial institutions which offered unsuitable financial instruments to clients who were incapable

of evaluating the riskiness of the products. The study confirms that both adequate legal regulations and proper operational risk management are crucial to mitigate risks related to derivatives.

## **Introduction**

Since the beginning of the 1990s, we have witnessed a number of derivatives debacles – Barings Bank, Metallgesellschaft AG, Procter & Gamble, Amaranth Advisors LLC, Societe Generale SA, Codelco, Sumitomo Corp., Daiwa Bank, National Australia Bank Ltd., and Allied Irish Bank PLC, to name a few (see e.g. Marthinsen, 2018). Those described so far in academic literature almost exclusively focus on a single organisation operating in a mature market. All of them highlight the importance of operational risk management, since the materialisation thereof used to be the main cause of financial losses. Most of them evoke the discussion about preventative regulations, while some contribute to the debate on financial innovation.

Our paper aims to provide an examination of the 2008–09 FX options debacle on the Polish emerging market from the perspective of the negative consequences of financial innovation. The phenomenon we consider deserves the attention of scholars for at least four reasons. First, the scale of that debacle was unheard of, since it affected not only an individual company, but a significant part of economy. Therefore, it is an example of a situation in which operational risk at the company level can be a trigger of systemic risk. Second, there is a limited number of papers examining corporate crises caused by derivatives in emerging markets. This can be partially explained by the fact that those markets are less transparent and that often a language barrier makes it difficult to analyse media releases, legal documents or corporate reports. Third, the undeveloped institutional framework of the Polish capital market played an important role in the escalation of the derivatives debacle. Fourth, there is a research gap when it comes to analysing the phenomenon by exposing the aspects of the dark side of financial innovation, and by applying the rigour of textual analysis to the sources of information available to public opinion in the mass media, and reflecting the outlooks of various stakeholders (entrepreneurs, financial institutions and public authorities, among others).

Based on a thorough primary qualitative content analysis (QCA) of over 750 documents (including press releases, public authorities accounts and corporate statements), our paper depicts the genesis and mechanism of engagement in currency options, in particular asymmetrical option strategies, applied to numerous companies that faced significant losses and teetered at

the verge of bankruptcy due to the derivatives portfolio they owned. The study explains the toxicity of derivatives in terms of product design, the distribution process (including the characteristics of a seller), transaction execution, and the negative consequences of the deals concluded.

In order to understand the scale and depth of the 2008–09 FX options debacle, as well as to underline the importance of the study, it is worth mentioning that close to 30% of domestic companies listed on the Warsaw Stock Exchange in 2008 experienced losses that put them at risk of insolvency. The mean of various estimates of total derivative-related losses recorded by Polish companies (including non-listed ones) is close to EUR 30 billion.<sup>12</sup> This makes the Polish case probably the greatest derivative debacle in history.<sup>3</sup>

Despite its size, the Polish FX options debacle has received astonishingly little attention from academics, and sources of existing publications are limited to Polish journals or academic monographs. Our study contributes to those works by shedding more light on the characteristics and the negative consequences of FX options strategies as financial innovation, as well as by reconstructing public opinion of the event. By doing so, it supplements the prior analyses of one of the greatest corporate failures in modern Polish history.

The remainder of the paper is organised as follows. The subsequent section briefly describes the methodology of the research. It is followed by the presentation of the study's results and conclusions.

## **Research methodology**

The aim of the research is to provide a comprehensive presentation of the FX options debacle in Poland in 2008–2009 from the perspective of the negative consequences of financial innovation, which fits snugly into the background setting of this phenomenon. Such a goal is both inspired by and related to the hypothesis about the dark side of financial innovation, which assumes that financial institutions conceal some aspects of innovative securities or introduce complexity to exploit uninformed investors (see e.g.

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<sup>1</sup> We use the annual average PLN/EUR exchange rate of 2008, which is PLN/EUR 3.5132, counted based on the daily weighted average exchange rates published by the National Bank of Poland.

<sup>2</sup> Various estimates were reported by the Polish Financial Supervision Authority, mass media, and business associations.

<sup>3</sup> The biggest losses on derivative deals to date have been recorded by Societe Generale SA in the amount of USD 7.16 billion.

Gabaix & Laibson, 2006; Diaz-Rainey & Ibikunle, 2012) - in other words, they design financial products to capitalise on investors' valuation errors (Henderson and Pearson, 2011). It is worth mentioning that this hypothesis has not been tested on emerging markets so far.

Taking into account the existing academic literature, we seek answers to the following research questions regarding the derivatives debacle on the Polish emerging market in 2008–2009: (Q1) How were the derivative products designed? (Q2) How were the derivative products distributed? (Q3) In what manner were the transactions executed? (Q4) What were the negative consequences of the transactions? Additionally, to set up the context for our findings, we describe the economic background of the debacle, and the response of public authorities to the crisis as a follow-up.

Our study is of descriptive-exploratory nature, which endorses qualitative methodology. This is why, in order to answer the research questions, qualitative content analysis (QCA) is exercised, which allows for a systematic and rigorous approach to analysing documents obtained in the course of the research. QCA 'focuses on creating a picture of a given phenomenon that is always embedded within a particular context, not on describing reality objectively' (White & Marsh, 2006, p. 38), which makes this method suitable for the subject of the study.

The data utilised in our research are broken into sampling units and units of analysis (coding units). The sampling units are press releases, public authorities' accounts, and corporate statements, limited to those available online in the period when empirical research data were collected, which is July – September 2019. Units of analysis are individual documents derived from the sampling units by applying time and keyword restraints. The size and diversity of our research sample are briefly introduced in Table 1.

The QCA of press releases and the accounts of public authorities allowed for the identification of 69 companies which had been negatively affected by derivatives (52 listed and 17 non-listed enterprises), representing 16 different industries according to the Global Industry Classification Standard (GICS) 2018. Those enterprises were further analysed based on documents from the corporate statement sampling units.

The sampling in the case of our QCA was purposive and dynamic. New units were identified in the course of the research and added accordingly. This refers in particular to corporate statements, which were added after the identification of the companies involved in the debacle in press releases. Purposive sampling is one of the advantages of QCA – the selection of data may continue throughout the project, allowing for complete and accurate answers to research questions and the presentation of the big picture (White & Marsh, 2006). To enhance the study's credibility and confirmability, we

adopted triangulation based on multiple data sources for the analysed phenomenon, as well as for a single aspect of a research question (White & Marsh, 2006).

The applied methodology certainly has some limitations. First, the research sample is limited to texts available online, the sources of which have been chosen by the researchers based on their knowledge and experience. Second, coding in QCA is subjective by definition. Third, the transferability of the research may be restricted due to the focus on a single economy and a specific moment in time, which constitute unique situational conditions.

## Results

To signal our research results we begin with a short review of the events leading to the debacle, and follow with a brief descriptive answer to each research question.

### *The economic setup of the debacle*

From May 2004 to July 2008, the Polish zloty had been appreciating, until it reached a maximum of PLN/EUR 3.20 at the end of July 2008. It was then that a couple of the largest Polish banks massively offered a panacea for the strong PLN, not only to exporters *sensu stricto*, but to most companies whose business operations required any transactions in foreign currency. The panacea was in the form of the so-called zero-cost currency option strategies that were structured in favour of banks, and hence became highly toxic to entrepreneurs, who at that time were mostly inexperienced in terms of derivatives.

The Polish currency remained strong in August 2008 as well, but then within seven months the exchange rate rocketed to PLN/EUR 4.90 (as of 18 February 2009) at which point the debacle reached its peak. The Polish zloty fell against other currencies as well: USD, GBP and CHF, which were paired with PLN in option contracts, albeit a minor part thereof. Derivatives positions as part of hedging led to losses which threatened the very existence of companies.

Back in 2008, the Polish capital market was by all means an emerging one, and remains so according to the MSCI classification. The market for derivatives, in particular, was at a very early stage of development. In 2008, however, OTC derivatives trading grew rapidly. The FX options average

daily net turnover on the OTC market reached EUR 523.74 million, which represented 50% growth year-to-year (NBP, 2010).

*The dark side of zero-cost OTC FX option structures*

The marketed currency option structures (also called strategies), which should be viewed as financial innovation from the position of Polish entrepreneurs back in 2008, were toxic in three respects: product design, distribution, and transaction execution, and brought a series of negative consequences. We signal the main findings on each respect below.

*Product design*

The FX options strategies consisted of companies purchasing put options and simultaneously issuing call options to the bank in order to compensate for premiums due to the other party to an agreement. The product was advertised as a zero-cost structure (and in fact was an illusion of free hedging) and seemed easily affordable. In reality, the compounded put and call options were highly asymmetrical – far beyond the normal asymmetry of rights and obligations embedded in this type of derivative. First, the strike prices were different. Second, the options had only the knock down-and-out barrier (which made the potential losses at a company limitless in the case of PLN depreciation). Third, call options were leveraged (usually two-to threefold). The products turned out to be substantially overpriced, and according to a standard model of portfolio selection, such products would be rationally purchased by an investor only if their returns covaried positively with the investor's marginal utility (Merton, 1982). Finally, the FX option structures hardly corresponded to hedging needs of investors, as the product was not tailored to any cash-flow figures of a single company, nor any non-financial enterprise.

*Distribution*

The derivatives were distributed by the banks which cooperated directly with the affected companies. That meant they were usually offered by key account managers, who took part in its everyday financial operations. The timing of the product launch was crucial. The persuasion process illuminating a burning need for hedging was based on showing savvy forecasts and reports indicating further inevitable and long-term PLN appreciation. Banks also emphasised the herd behaviour of entrepreneurs in their marketing communication. In addition to providing distorted analytical data to customers, no thorough information or details about the risk, product structure or mechanism were delivered.

### Transaction execution

Transactions valued at millions of EUR were usually concluded over the phone and authorised by just one person – someone from middle or top management or their subordinates. The information asymmetry between the parties was considerable. Not only did a company not have any instruments to value the options and risk management procedures in place for derivatives, but it was unaware of its exposure to that risk. The accessible manner in which the options strategies were traded, together with the dubious authorisation of individual transactions, could have given the impression that nothing risky and potentially harmful was happening. The operational risk was unprecedented and the moral hazard was even magnified during the very first months of those activities when companies recorded profits on option transactions due to the still appreciating Polish zloty.

### Negative consequences of the deals

The adverse effects on enterprises arising from derivative contracts consisted primarily of a dramatic deterioration in their financial condition in terms of debt levels, profitability and liquidity. Under the prudent valuation principle, companies were required to recognise the valuation of financial instruments in their balance sheets. This increased their liabilities, resulting in a deterioration of debt ratios. The loss of profitability was clearly visible in the net results for 2008. There was also a subsequent fall in the market value of companies as a result of falling share prices. The expiration of the options as well as margin calls challenged companies' cash-flows. A sudden and profound loss of liquidity led to the obligation to declare bankruptcy and, in the case of better financial standing, to restructuring proceedings.

The management consequences of the crisis were manifested in various anti-crisis measures, such as: conducting composition proceedings with creditors and remedial proceedings; internal restructuring, e.g. redundancies; adopting a concentration strategy and limiting outsourcing; reducing costs and stocks; and improving debt collection.

The exact number of companies affected by the currency options crisis in Poland in 2008–2009 is unknown. Press releases have indicated that at least several hundred or even several thousand companies may have experienced adverse consequences. Estimates of the amount of derivative-related losses are extremely divergent as well and often juxtaposed with the negative valuation of options or with results from financial activities. For example, according to Statistics Poland (GUS), in Q4 2008 alone, the corporate sector incurred more than EUR 4.6 billion in losses on financial

activities, and in Q1 2009 another EUR 2.8 billion.<sup>4</sup> The Polish Financial Supervision Authority estimated the negative valuation of currency options at EUR 1.6 billion at the end of 2008 and at EUR 2.6 billion in 2009. The President of the Polish Business Roundtable valued the losses arising from options at EUR 14.2 billion. The Association for the Defence of Polish Enterprises – an initiative aimed at protecting Polish enterprises from the negative consequences of the crisis – estimated the losses on derivatives at approximately EUR 57 billion. The exact amount of losses, however, has never been measured.

Our examination reveals, however, that the total derivative-related losses as of 2008 of only 37 companies, the data of which were available, amounted to EUR 762.7 million. The financial data of the analysed sample of enterprises affected by the debacle illustrate the levels of financial distress and prove that the concluded deals were totally unrelated to the companies' hedging needs. There were cases when the derivatives valuation to annual sales revenues ratio was as high as 50%, the derivative-related loss to annual sales revenues ratio reached 71%, or the derivative-related loss was over five times greater than the market capitalisation of a given company.

## Conclusions

There are three outstanding features of the FX options debacle in Poland – predatory financial innovation, neglected operational risks, and the lack of regulations, which to some extent mirrors the causes of the 2007–2008 global financial crisis (Afzal & Gauhar, 2020). Our analysis, primarily focusing on the first one, provides evidence of the dark side of financial innovation traded on an emerging market, and offers proof against financial innovation as an 'engine of economic growth'. The case falls into all three categories of the negative impact of financial innovation proposed by Diaz-Rainey & Ibikunle (2012): FX options strategies were toxic with respect to product design, product distribution and transaction execution, and although they may not have been a predatory innovation *per se*, the use thereof was certainly predatory. The products were missold without explaining (or by obscuring) the associated risks. All of that together exploited customers' cognitive limitations and abused information asymmetries. Finally,

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<sup>4</sup> Factors other than the loss on derivatives may also have affected the result from financial activities.

the deals concluded had unintended consequences that spread contagiously through industries and market networks, affecting the economy.

Risk is inherent in all financial products, but when some risks are neglected, ‘securities are over-issued relative to what would be possible under rational expectations’ (Gennaioli *et al.*, 2012, p. 5). The FX option debacle in Poland is an example of neglecting risks – market, operational and credit – which, once materialised, took by surprise both buyers (companies) and sellers (banks), who probably could not have anticipated the scale of the disastrous micro- and macroeconomic consequences of the deals concluded.

Debacles have always prompted calls for legal and regulatory reforms. Ironically, the Markets in Financial Instruments Directive (MIFID), which was supposed to have been implemented in Poland by Nov. 1, 2007, was delayed by two years. It is believed that those regulations would or could have prevented the debacle. But no matter what amount of regulation is in force, risk cannot be removed from financial markets. This is why a second crucial component – (operational) risk management and corporate governance - is necessary to mitigate the risks embedded in financial innovation . The Polish derivative debacle revealed the existence of disturbing operational weaknesses among the companies involved. Such an experience should encourage companies to scrutinise their risk management practices — not only in the area of derivatives, but in other areas of their operations as well. The study therefore contributes to management practice, but it may as well enrich or verify the theoretical aspects of financial innovation.

We conclude with the apt observation that ‘financial innovation... is only as good as the people who employ its use’ (Afzal & Gauhar, 2020, p. 9).

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## Annex

**Table 1.** Characteristics of the research sample

| SAMPLING UNITS                  | TYPES OF DOCUMENTS                                 | NO. OF UNITS OF ANALYSIS |
|---------------------------------|--|--------------------------|
| Press releases                  | daily newspaper release*                           | 296                      |
|                                 | magazine**   | 41                       |
|                                 | web service***                                     | 225                      |
| Public authorities accounts**** | statement  | 9                        |
|                                 | announcement                                       | 3                        |
| Corporate statements*****       | report   | 10                       |
|                                 | balance sheet                                      | 54                       |
|                                 | profit and loss account                            | 54                       |
|                                 | introduction and notes to the financial statements | 54                       |
|                                 | statutory auditor's opinion                        | 1                        |
|                                 | letter from the management board or other          | 1                        |
|                                 | report of the management board on its activities   | 5                        |
|                                 | current report (other than annual)                 | 2                        |
| <b>Total</b>                    |  | <b>755</b>               |

Note: \*Dziennik Zachodni, Gazeta Wyborcza, Rzeczpospolita; Gazeta Prawna, Gazeta Polska Codziennie, Puls Biznesu, Głos Wielkopolski, Gazeta Lubuska \*\*Polityka, Polska Times, Wprost; \*\*\*bankier.pl, podatki.gazetaprawna.pl, prawo.gazetaprawna.pl, finanse.gazetaprawna.pl, biznes.gazetaprawna.pl, gosc.pl, finanse.wp.pl, finanseosobiste.pl, forsal.pl, infor.pl, korporacyjnje.pl, mojafirma.infor.pl, money.pl, moneymarket.pl, pap.pl, parkiet.com, polskieradio.pl, prawo.pl, prnews.pl, stockwatch.pl, tvn24.pl, tvn24bis.pl, wiadomosci.onet.pl, wnp.pl, wszystkoofinansach.pl, wyborcza.biz.pl; \*\*\*\* Polish Financial Supervision Authority (KNF), Polish parliament, Polish Scientific Bibliography, Statistics Poland (GUS), Supreme Audit Office (NIK); \*\*\*\*\*data retrieved from companies' official websites, bankier.pl, parkiet.pl, gpw.pl.

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## Persistence of pre-IPO earnings in CEE stock markets

**JEL Classification:** G34; G32; G23

**Keywords:** *Earnings quality; Financial reporting; Earnings management; Initial Public Offering; Profitability*

### Abstract

**Research background:** A company's earnings are one of the main determinants of investment decisions on the stock market. Thus, the reliability of disclosed financial information is crucial for the efficient allocation of capital. Unfortunately, reported earnings are an economic category susceptible to manipulation. This problem grows especially in the case of an initial public offering, as there is significant information asymmetry.

**Purpose of the article:** The main aim of the paper is to assess the persistence of earnings reported by companies in the IPO process and to empirically identify financial characteristics associated with persistence of earnings. The usefulness of financial information is directly related to the issue of earnings quality. Therefore, this paper contributes to the stream of study on the quality of financial reporting of new stock companies.

**Methods:** I employ a simple single-factor regression model to recognize the earnings persistence in new stock companies. Pre-IPO earnings are the explanatory variable. Then, I use multiple regression analysis to identify factors that influence this metric of reported earnings quality.

**Findings & Value added:** Using a sample of companies from stock exchange markets in Central and Eastern Europe (i.e., Warsaw Stock Exchange, Bulgarian Stock Exchange, Bucharest Stock Exchange, Belgrade Stock Exchange, Prague Stock Exchange) that went public between 2010 and 2018, I find that, generally, pre-IPO earnings hold higher persistence compared to earnings reported in the year of the IPO. Profitability seems to be a factor that significantly influences this feature.

## Introduction

In this study, I address the predictive value of earnings reported by companies that go public. Thus, the main aim of the study is to investigate the persistence of earnings disclosed by new stock companies in the financial statement published before their initial public offering (IPO). The main question is whether these unique and fast-growing companies can sustain earnings over time rather than just this particular corporate event. Additionally, I examine the role of pre-IPO profitability for earnings persistence. This study fits into the literature on the quality of earnings published by companies in CEE countries. Previous research focused mainly on earnings management (Callao et al., 2017). Companies operating in Poland have already attracted the attention of researchers (Piosik & Strojek-Filus, 2013), and such activity was also addressed by IPO studies (Lizińska & Czapiewski, 2018). Although there is evidence that companies operating in the Czech Republic, Slovakia, Hungary (Siekelova et al., 2020), and Bulgaria (Krastev et al., 2021) undertake earnings management initiatives, and empirical studies have confirmed the use of upward earnings manipulation (Kliestik et al., 2020), knowledge on earnings quality is still relatively scarce.

The high quality reporting results in efficient capital investment decision-making (Dechow et al., 2010, p. 352). In this context, particular attention is focused on earnings quality, and among its attributes, earnings persistence seems to be crucial. Earnings persistence denotes the likelihood a company's reported earnings levels will recur in subsequent periods (Ebaid, 2011, p. 175). Concerns about the credibility of financial disclosures made in the IPO have always been present. The managers of such companies have many incentives to boost their financial numbers and influence the valuation of shares. Nevertheless, there is no shortage of voices in the debate that point to the rather limited ability of IPO companies to implement earnings management. The most common argument is that their financial statements are thoroughly audited (Alhadab & Clacher, 2018). Moreover, one issue is usually highlighted in the discussion on changes in the financial standing of new stock companies, i.e., profitability. The timing of going public is generally not random and managers choose it to be associated with periods of remarkably good performance levels. This reasoning leads me to the following hypotheses:

*H1: Pre-IPO earnings are more persistent compared to the IPO year earnings.*

H2: *The persistence of earnings performance in IPO companies is attributed to pre-IPO profitability.*

## Research methodology

The study sample consists of CEE companies whose IPOs took place on one of the five EU-regulated stock exchanges located in CEE. All IPO events are from 2010-2018, as such a time frame allows me to avoid the possible influence of economic crises on the results. The financial data covers the years 2009-2019. Consequently, the selection requirements lead to a final sample of 83 IPO companies.

Table 1 provides insights into the composition of the study sample. Analyzing the sectoral cross-section, one can generally see that the sample is quite diverse, with a slight predominance of companies from the consumer goods sector. There is no significant concentration over time, although there are small waves of IPO activity. Geographically, Polish companies outnumber the others significantly.

The study focuses on evaluating earnings persistence around an IPO. Following previous studies, earnings persistence is measured by the coefficient  $\alpha_1$  from the equation, in which current earnings ( $EAT_t$ ) are explained by past earnings ( $EAT_{t-1}$ ):

$$EAT_t = \alpha_0 + \alpha_1 EAT_{t-1} + \varepsilon_t$$

Coefficient  $\alpha_1$  is the main interest of the study, as a higher value generally indicates an increase in earnings quality (Dechow et al., 2010), and the closer coefficient  $\alpha_1$  is to one, the greater the persistence of earnings (Ebaid, 2011). I use two different measures of earnings, i.e., net income before extraordinary items (*NIBEI*) and net income after taxes (*NIAT*).

To address the issue of the influence of the pre-IPO profitability on earnings persistence, I include in the above model variable *ROA*, which is the return on assets ratio, and the interaction term,  $EAT \times ROA$ .

$$\begin{bmatrix} EAT_{t_0} \\ EAT_{t+1} \end{bmatrix} = \beta_0 + \beta_1 EAT_{t-1} + \beta_2 ROA_{t-1} + \beta_3 EAT_{t-1} \times ROA_{t-1} + \gamma \begin{bmatrix} INDUSTRY \\ COUNTRY \\ YEAR \end{bmatrix} + \varepsilon_t$$

Coefficient  $\beta_3$  captures whether the pre-IPO profitability influence the persistence of pre-IPO earnings. To control for industry effect, country

effect, and time-series correlations, I also include industry, country, and year dummies to the model (not reported). The subscript  $t_0$  denotes the IPO year,  $t-1$  and  $t+1$  identify the previous and the next year, respectively.

In his influential study, Sloan (1996) noticed that various components of earnings are characterized by unequal persistence. Thus, I next employ a widely accepted and often-used approach and decompose  $EAT$  into two main components, namely cash flow and accrual:

$$EAT_t = CFO_t + ACC_t$$

represented by cash flow from operations ( $CFO$ ) and current accruals ( $ACC$ ). Therefore, to investigate if the persistence of earnings around an IPO is due to  $CFO$ , or rather  $ACC$ , I estimate the model written as follow:

$$EAT_t = \alpha_0 + \alpha_1 CFO_{t-1} + \alpha_2 ACC_{t-1} + \varepsilon_t$$

where the slope coefficients  $\alpha_1$  and  $\alpha_2$  indicate the associations between the future earnings and earnings components  $CFO$  and  $ACC$ , respectively.

Then, I employ the above partition into earnings components to examine the role of pre-IPO profitability for the persistence of cash flow and accruals, and specify the following regression model:

$$\begin{bmatrix} EAT_{t_0} \\ EAT_{t+1} \end{bmatrix} = \beta_0 + \beta_1 CFO_{t-1} + \beta_2 ACC_{t-1} + \beta_3 ROA_{t-1} + \beta_4 CFO_{t-1} \times ROA_{t-1} + \beta_5 ACC_{t-1} \times ROA_{t-1} + \gamma \begin{bmatrix} INDUSTRY \\ COUNTRY \\ YEAR \end{bmatrix} + \varepsilon_t$$

The data necessary for the research were retrieved from the Refinitiv database. All coefficients are estimated using ordinary least squares regression.

## Results

First, the changes of the earnings persistence in the period around the IPO are assessed, and the results are presented in Table 2. By analyzing the  $\alpha_1$  coefficients from the model where future year earnings are regressed on past earnings, it can be seen that the earnings reported before the IPO have information content, as all estimated coefficients are positive and statistically significant. However, earnings achieved in the IPO year are somehow distorted. These findings for both *NIBEI* and *NIAT* are shown in Panel A in

Table 2. The  $\alpha_1$  coefficients decrease as the forecast horizon increases, and the  $AdjR^2$  value declines noticeably. Nevertheless, the  $\alpha_1$  coefficients for the earnings in the IPO year vary significantly from this pattern. Thus, earnings in the IPO year are less persistent, and the H1 hypothesis holds. Earnings persistence has been considered by quite a few studies that take into account different markets or research periods (Calegari & Maretno, 2005; Ebaid, 2011; Li, 2019). Although my research relates to a unique sample of IPOs from the CEE market, obtained results are consistent with the prior literature.

Panel B of Table 2 provides results where post-IPO earnings are regressed on the accrual and cash flow components. First, for the IPO year in the *NIBEI* and *NIAT* models, both coefficients,  $\alpha_1$  for *ACC* and  $\alpha_2$  for *CFO*, are positive and highly significant, but  $\alpha_2$  is greater than  $\alpha_1$ . Consistent with the prior literature (Calegari & Maretno, 2005; Ebaid, 2011; Li, 2019) it suggests that the cash flow component is more persistent than accruals.

The second strand of the analysis is focused on looking for relationships between earnings persistence and pre-IPO profitability and Table 3 reports the results. In all *NIBEI* and *NIAT* models, the coefficients for the pre-IPO earnings proxies are positive and statistically significant, suggesting that earnings reported before the company goes public remain informative of future earnings when controlling for profitability. But the main concern in the study is the coefficient on the interaction term *EAT*×*ROA*. For earnings disclosed in the IPO year, only the coefficient on *NIAT*×*ROA* is significant at the 0.05 level. The positive sign indicates that profitability achieved prior to going public can support the persistence of earnings in the IPO year. However, this finding does not hold later. These results provide strong support for H2 as well, and they show that higher profitability before an IPO negatively affects earnings persistence. The negative impact of higher pre-IPO profitability on the persistence of previously reported earnings is channeled mostly through its negative impact on *CFO* rather than on accruals.

## Conclusions

In this paper, I focused on whether data on a company's performance presented to the public prior to an IPO maintains its informational utility thereafter. The findings generate several interesting insights.

Financial information from the period before the IPO can be considered quite a reliable source of information about future performance. However, the extraordinary occurrences taking place around an IPO cause a disruption in the persistence of earnings. In this regard, the pre-IPO data prevail

over the information disclosed in the financial statement for the IPO year. Moreover, my research indicates that higher profitability reported before an IPO positively affects the ability to use pre-IPO earnings to predict IPO year earnings, and it significantly reduces this ability for the following year's earnings.

This study is not free from limitations. The methodology adopted in the study is heavily influenced by data availability limited to one year before the IPO. Breaking this barrier would make it possible to investigate associations between the quality of financial information and earnings management. In light of the results presented in this paper about the role of the cash and accrual component, studies on real earnings management can provide especially valuable insights.

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## Annex

**Table 1.** Structure and characteristics of the study sample

| <b>Panel A: Sample structure</b> |           |               |          |           |               |                        |           |               |   |           |  |
|----------------------------------|-----------|---------------|----------|-----------|---------------|------------------------|-----------|---------------|---|-----------|--|
| TRBC economic sector             | N         | Share         | IPO year | N         | Share         | Country of headquarter | N         | Share         | N | Share     |  |
| Basic Materials                  | 10        | 0.1205        | 2010     | 14        | 0.1687        | Poland                 | 72        | 0.8675        |   |           |  |
| Consumer Cyclicals               | 18        | 0.2169        | 2011     | 14        | 0.1687        | Czech Republic         | 2         | 0.0241        |   |           |  |
| Consumer Non-Cyclicals           | 9         | 0.1084        | 2012     | 7         | 0.0843        | Slovakia               | 1         | 0.0120        |   |           |  |
| Energy                           | 2         | 0.0241        | 2013     | 8         | 0.0964        | Romania                | 5         | 0.0602        |   |           |  |
| Healthcare                       | 5         | 0.0602        | 2014     | 10        | 0.1205        | Bulgaria               | 3         | 0.0361        |   |           |  |
| Industrials                      | 15        | 0.1807        | 2015     | 9         | 0.1084        | Serbia                 | 0         | 0.0000        |   |           |  |
| Real Estate                      | 5         | 0.0602        | 2016     | 12        | 0.1446        |                        |           |               |   |           |  |
| Technology                       | 13        | 0.1566        | 2017     | 5         | 0.0602        |                        |           |               |   |           |  |
| Utilities                        | 6         | 0.0723        | 2018     | 4         | 0.0482        |                        |           |               |   |           |  |
| <b>Total</b>                     | <b>83</b> | <b>1.0000</b> |          | <b>83</b> | <b>1.0000</b> |                        | <b>83</b> | <b>1.0000</b> |   | <b>83</b> |  |





**Table 3.** Association between the persistence of pre-IPO earnings and profitability

| <b>Panel A: Dependent variable: NIBEI</b> |             |             |        |             |             |        |                                       |             |             |        |             |             |        |
|---|-------------|-------------|--------|-------------|-------------|--------|---------------------------------------|-------------|-------------|--------|-------------|-------------|--------|
|   | t0          |             |        | t+1         |             |        | t0                                    |             |             | t+1    |             |             |        |
| Variable                                  | Coefficient | t-Statistic | Prob.  | Coefficient | t-Statistic | Prob.  | Variable                              | Coefficient | t-Statistic | Prob.  | Coefficient | t-Statistic | Prob.  |
| <i>Intercept</i>                          | 37883425    | 3.1187      | 0.0028 | 37341772    | 2.0809      | 0.0418 | <i>Intercept</i>                      | 51642667    | 5.8072      | 0.0000 | 22129371    | 1.1539      | 0.2533 |
| <i>NIBEI<sub>t-1</sub></i>                | 0.9450      | 8.6015      | 0.0000 | 1.2064      | 7.4332      | 0.0000 | <i>ACC<sub>t-1</sub></i>              | -0.1576     | -1.0748     | 0.2870 | 0.8406      | 2.6584      | 0.0102 |
| <i>ROA<sub>t-1</sub></i>                  | -22534118   | -1.7699     | 0.0819 | 14801621    | 0.7869      | 0.4345 | <i>CFO<sub>t-1</sub></i>              | 0.1369      | 1.1084      | 0.2724 | 1.0376      | 3.8968      | 0.0003 |
| <i>NIBEI</i> × <i>ROA<sub>t-1</sub></i>   | 1.2845      | 1.6426      | 0.1058 | -3.1392     | -2.7172     | 0.0086 | <i>ROA<sub>t-1</sub></i>              | -10443499   | -1.2854     | 0.2039 | 10909354    | 0.6226      | 0.5360 |
|   |             |             |        |             |             |        | <i>ACC</i> × <i>ROA<sub>t-1</sub></i> | 2.4968      | 2.7057      | 0.0090 | -2.4506     | -1.2315     | 0.2232 |
|   |             |             |        |             |             |        | <i>CFO</i> × <i>ROA<sub>t-1</sub></i> | 4.7907      | 8.3733      | 0.0000 | -2.7746     | -2.2489     | 0.0284 |
| <i>Adj</i> R <sup>2</sup>                 | 0.9283      |             |        | 0.7750      |             |        |                                       | 0.9688      |             |        | 0.7911      |             |        |
| F-statistic                               | 47.17       |             |        | 13.28       |             |        |                                       | 102.73      |             |        | 13.42       |             |        |
| Prob (F-statistic)                        | 0.0000      |             |        | 0.0000      |             |        |                                       | 0.0000      |             |        | 0.0000      |             |        |
| N   | 83          |             |        | 83          |             |        |                                       | 83          |             |        | 83          |             |        |
| <b>Panel B: Dependent variable: NIAT</b>  |             |             |        |             |             |        |                                       |             |             |        |             |             |        |
|   | t0          |             |        | t+1         |             |        | t0                                    |             |             | t+1    |             |             |        |
| Variable                                  | Coefficient | t-Statistic | Prob.  | Coefficient | t-Statistic | Prob.  | Variable                              | Coefficient | t-Statistic | Prob.  | Coefficient | t-Statistic | Prob.  |
| <i>Intercept</i>                          | 41878651    | 3.4440      | 0.0011 | 37649561    | 2.1137      | 0.0388 | <i>Intercept</i>                      | 52564677    | 5.8107      | 0.0000 | 26196053    | 1.3676      | 0.1768 |
| <i>NIAT<sub>t-1</sub></i>                 | 0.8687      | 8.8619      | 0.0000 | 1.1005      | 7.6641      | 0.0000 | <i>ACC<sub>t-1</sub></i>              | 0.0255      | 0.2059      | 0.8376 | 0.8489      | 3.2432      | 0.0020 |
| <i>ROA<sub>t-1</sub></i>                  | -25110790   | -2.0065     | 0.0494 | 12190648    | 0.6650      | 0.5086 | <i>CFO<sub>t-1</sub></i>              | 0.2916      | 2.8479      | 0.0061 | 1.0055      | 4.6371      | 0.0000 |
| <i>NIAT</i> × <i>ROA<sub>t-1</sub></i>    | 1.6373      | 2.2535      | 0.0280 | -2.6527     | -2.4925     | 0.0155 | <i>ROA<sub>t-1</sub></i>              | -11983437   | -1.4506     | 0.1524 | 8561139     | 0.4894      | 0.6264 |
|   |             |             |        |             |             |        | <i>ACC</i> × <i>ROA<sub>t-1</sub></i> | 1.7633      | 1.8300      | 0.0725 | -2.1229     | -1.0405     | 0.3025 |
|   |             |             |        |             |             |        | <i>CFO</i> × <i>ROA<sub>t-1</sub></i> | 4.0399      | 7.9809      | 0.0000 | -2.5373     | -2.3672     | 0.0213 |
| <i>Adj</i> R <sup>2</sup>                 | 0.9342      |             |        | 0.7934      |             |        |                                       | 0.9696      |             |        | 0.8009      |             |        |
| F-statistic                               | 51.59       |             |        | 14.69       |             |        |                                       | 105.79      |             |        | 14.19       |             |        |
| Prob (F-statistic)                        | 0.0000      |             |        | 0.0000      |             |        |                                       | 0.0000      |             |        | 0.0000      |             |        |
| N   | 83          |             |        | 83          |             |        |                                       | 83          |             |        | 83          |             |        |

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**The assessment of market abuse regulations by SMEs traded  
on alternative markets in Poland (NewConnect)  
and Germany (m:access)**

**JEL Classification:** *G15; G18*

**Keywords:** *ATS; SME; NewConnect; m:access*

**Abstract**

**Research background:** Limitations in access to finance are an important barrier to the development of SMEs. One of the methods of bridging the capital gap is SME access to the stock markets, in particular to an alternative market (MTF). Compared to regulated markets, MTFs offer more liberal entry conditions and in many cases prior to MAR implementation they proposed more liberal disclosure requirements.

**Purpose of the article:** The aim of the article is an analysis of disclosure requirements resulting from MAR directive and to test their perception by issuers listed on the alternative markets in Poland (NewConnect) and Germany (m:access).

**Methods:** A study based on CAWI was carried out involving two research samples - 74 issuers of the NewConnect market and 23 issuers of the m:access market. The study was conducted from September 6, 2017 to March 2, 2018.

**Findings & Value added:** Since the analyzed markets are subject to MAR, as a rule, there are no differences in the reporting requirements. There is, however, a difference in perceiving them in both countries. The analysis of German issuers shows that, unlike Polish companies, most of them defined their disclosure obligations as simple. This may result from better knowledge of the regulations and more their implementation among issuers in Germany than in Poland.

## Introduction

Limitations in access to finance are an important barrier to the development of small and medium-sized enterprises. The phenomenon of the mismatch between the demand for capital reported by SMEs and the supply of financial institutions and the capital market is described in the literature as a financial gap, or an equity gap (Harper, 2005). There are many ways to reduce the financial gap – ranging from debt financing to equity financing. One of the methods of bridging the equity gap is SMEs access to the stock markets, in particular to alternative markets (Multilateral Trading Facilities). According to FESE (2020) alternative market is a stock exchange market with less restrictive listing requirements comparing with main markets (Regulated Markets). While with the help Alternative markets of SMSs make it easier to raise capital and help reduce costs of issuance, there is a risk of lowering investors' protection should information asymmetry emerge. This mainly applies to disclosure requirements imposed on listed companies.

Information asymmetry (Akerlof, 1970) in financial markets relates to the idea that one party of a transaction has better information than the other (Bhattacharya *et al.*, 2013). The phenomenon of information asymmetry contributes to widening the capital gap as it can be associated with the lack of knowledge of potential investors about available investments leads to a disagreement between the company requesting financing and investors who have the capital.

The development of SME markets must consider the balance between is the appropriate level of investor protection and reduced disclosure requirements. As the result there was a discussion of if and how to regulate this sphere. La Porta *et al.* (2006) analyzed three main different approaches to regulation of capital markets including: (i) to leave securities market unregulated, or (ii) to standardize the private contracting framework, the violation of which can be the basis for initiating court proceedings or (iii) for engagement of the public supervisory regulator.

Both literature and practice have generally departed from the proposal to unregulated capital markets by government although especially in older papers there is a branch of literature that says that optimal government policy is to leave capital markets unregulated (Macey, 1994). The arguments behind that idea included political intervention leading to higher costs in the case of regulated markets (Romano, 2001). In turn, private enforcement of standardized regulations takes time and is often too expensive especially for individual investors. According to Glaeser and Shleifer (2003) courts are vulnerable to subversion, especially in an environment of significant

inequality of wealth and political power. This cannot be solved only by standardization of law. The solution to this problem is regulatory activity and public enforcement of securities law by the specialized government regulator.

The European Union countries followed this path. First, the organization and functioning of alternative trading systems in the European Union member states has been regulated by the implementation of MiFID II. The purpose of the directive was to increase the level of transparency and trust, to provide investors with better protection and to grant supervisory authorities appropriate powers. Second, a unified market abuse rules (MAR) were introduced to ensure equal and efficient access to information in the EU countries. According to MAR the national supervisory authorities are responsible to detect and protect against market abuse and are entitled to impose sanctions against not-compliant market participants.

The aim of the article is an analysis of disclosure requirements resulting from MAR directive and to test their perception by issuers listed on the alternative markets in Poland (NewConnect) and Germany (m:access). A study based on Computer Assisted Web Interviewing (CAWI) was carried out involving two research samples - 74 issuers of the NewConnect market and 23 issuers of the m: access market. The study was conducted from September 6, 2017 to March 2 2018. The main research question was the assessment of difficulties in performing disclosure requirements and checking whether there is a difference in perceiving the scale of difficulties in fulfilling disclosure duties in both countries.

The results of the research, apart from their contribution to the discussion on the asymmetry of information in the capital market, may be also of practical importance to alternative market organizers.

The structure of the article is as follows. After the introduction, which includes a brief review of the literature on the subject, the second part analyzes MAR directive in terms of disclosure requirements, the third part describes the research, the fourth part presents and interprets the research results, and the last part contains conclusions.

## Market Abuse Regulation – brief overview

On July 3, 2016, the provisions of the Regulation of the European Parliament and the EU Council No. 596/2014 of April 16, 2014 on market abuse<sup>1</sup> (the so-called MAR - Market Abuse Regulations) entered into force, which significantly influenced the supervision over alternative markets in UE and the principles of disclosure reporting by listed issuers.

The MAR directive aims to improve investor protection and ensure integrity and increase confidence in the EU's financial markets. The provisions of the regulation are directly applicable in all Member States, which means that there was no need to implement them into the national legal order. The applicable regulations cover not only the regulated market, but also alternative trading platforms. As a result, MTF issuers, which so far had been subject to the regulations issued by market organizers, are now subject to unified MAR regulations.

An important change resulting from the regulation is the unification of the concept of inside information. According to Article 7 of MAR, inside information should be: (i) precise, (ii) non-public and (ii) if it were made public would be likely to have a significant effect on the prices of the issuer's financial instruments or related derivative financial instruments. Therefore, the definition of inside information requires the issuer to assess circumstances and events in terms of meeting the conditions of the definition, in the context of interpretation, market practice and other available guidelines. The issuer must inform the public as soon as possible of any inside information relating directly to them. Article 17 of MAR states that the issuer shall ensure that the inside information is made public in a manner which enables fast access and complete, correct and timely assessment of the information by the public and, where applicable, in the officially appointed mechanism<sup>2</sup>. MAR clearly states that the disclosure of inside information to the public cannot be combined with the marketing of its activities. The issuer's additional duty is to post and maintain on its website for a period of at least five years, all disclosure information.

In terms of disclosure obligations, MAR also introduced changes to the rules for drawing up lists of persons having access to inside information, so-called insider list (Article 18), changes in the procedure for delaying the publication of inside information (Article 17 sec. 4), changes in the rules of

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<sup>1</sup> The MAR directive repealed so called Market Abuse Directive (MAD) 2003/6/EC of the European Parliament and of the Council and Commission Directives 2003/124/EC, 003/125/EC and 2004/72/E.

<sup>2</sup> Referred to in Article 21 of Directive 2004/109/EC of the European Parliament and the Council.

reporting on transactions concluded by persons discharging managerial responsibilities and persons closely related to them (Article 19) and modifications in closed periods, that is in periods in which insiders cannot conduct any transactions on their own account or for the account of a third party, directly or indirectly, relating to the shares or debt instruments of the issuer or to derivatives or other financial instruments linked to them (Article 19). The MAR regulation defines not only a common regulatory framework for market abuse, but also a catalog of measures to prevent it. Until MAR was effective, in case of MTFs, issuers provided inside information on the basis of the rules of the alternative markets, and the fulfillment of their disclosure obligations was supervised by its organizer. In accordance with MAR, the supervision of the correct fulfillment of disclosure obligations by MTF issuers has been directly carried out by the national supervisory authorities (e.g. KNF in Poland, BaFin in Germany) with the help of the MTF organizers. Listed companies (or entities applying for introduction to trading) are subject to administrative penalties for violation of the provisions of the regulation imposed by the supervisor.

## **The research design and characteristic of respondents**

### *Methodology*

The subject of the research is the assessment of disclosure requirements by companies listed on two alternative markets: NewConnect in Poland and m:access in Germany. The survey (based on Computer Assisted Web Interviewing - CAWI)<sup>3</sup> was conducted from September 6, 2017 to March 2, 2018. Invitations to take part in the study were sent to 407 companies listed on NewConnect and 52 companies listed on m:access. To increase the correctly completed questionnaires, a classic telephone interview was introduced alongside the Internet questionnaire. Ultimately, the total number of respondents was 74 companies listed on the NewConnect market (18.18% of all listed companies on this market) and 23 companies listed on the m:access market (44.23%).

The survey questionnaire consisted of 30 questions, 4 of which were devoted directly to assessment of disclosure requirements (Table [1]). Its form and content were consulted with the most active NewConnect authorized

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<sup>3</sup> The CAWI survey method is an interview conducted with the use of an online questionnaire, the completion of which takes place on-line. More about the CAWI survey method, among others de Leeuw (2012).

advisor (INC SA) and representatives of the Börse München (Munich Stock Exchange).

*Characteristics of respondents - NewConnect issuers*

The study covered 74 companies listed on the NewConnect market. The debuts of the surveyed issuers took place in 2007-2017. This means that the research sample represents almost the entire period of operation of the Polish alternative trading system. The most numerous group are small enterprises - 41.7%. On the other hand, micro and medium-sized enterprises account for 33.3% and 25% of the surveyed companies, respectively<sup>4</sup>. Polish respondents raised a total of PLN 521.1 million in primary and secondary issues, including PLN 54.2 million for micro, PLN 253.7 million for small businesses and PLN 201.2 million for medium-sized enterprises. The analysis of the value of the capital raised shows that most companies raised capital in the range of PLN 1 to 3 million (28 respondents). This range is most frequently represented by micro-enterprises. Distribution of surveyed issuers in terms of size and value of the company's total capital raised is presented in Table [2].

*Characteristics of respondents – m:access issuers*

The survey covered 23 issuers listed on the m:access market. The respondents' debuts took place in 2005-2017, excluding 2006 and 2008. The analysis of issuers shows that 11 respondents belong to small and 11 to medium enterprises. Not a single microenterprise appeared among the surveyed issuers. Respondents raised a total of EUR 655.9 million from primary and secondary issues, including small entrepreneurs EUR 142.2 million and medium-sized entrepreneurs EUR 482.7 million. Most issuers, first of all small enterprises, raised funds up to EUR 10 million. In turn, the capital above EUR 21 million was raised mainly by medium-sized entrepreneurs (Table [3]). Due to the regional nature of m:access, respondents are characterized by less geographic diversification than in the case of NewConnect. Almost two thirds have their headquarters in Bavaria.

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<sup>4</sup> The classification of respondents to the appropriate category of micro, small and medium-sized enterprises was carried out on the basis of Commission Regulation (EC) No 364/2004 of February 25, 2004 amending Regulation (EC) No 70/2001 as regards extending its scope to include aid for research and development (Official Journal of the European Laws L 63/22, February 28, 2004), Annex I: Definition of micro, small and medium-sized enterprises.

In addition, the two issuers are registered abroad, in the Netherlands and Switzerland.

## **Results**

The disclosure obligations for the majority of the surveyed NewConnect issuers were difficult (slightly over 60% of respondents). Less than 15% of companies described it as simple, and nearly 11% as very difficult. Only one issuer indicated that its disclosure obligations were very simple (Chart [1]). Interestingly, for 65% of the surveyed micro, 54% of small and 88% of medium-sized enterprises the listing obligations were difficult or very difficult. In the group of companies for which the disclosure obligations were easy, a large group were companies from the service industry, whose activities are related to the capital market.

In contrast to Polish companies, more than half of the respondents listed in m:access described their disclosure obligations as simple or very simple (70% of respondents), and only 30% as difficult (Chart [1]). The respondents who assessed the duties as simple or very simple slightly dominated in the group of medium-sized companies (60% of the surveyed companies), similar to the group of small companies (71% of the surveyed companies).

The issuers were also asked to comment on the new regulations of MAR. The scope of questions included: (i) the knowledge of the new regulations, (ii) the degree of their implementation and (iii) assessment of their impact on the existing disclosure obligations. The vast majority of entrepreneurs listed on the NewConnect market (almost 98% of the surveyed companies) were familiar with the new regulations. Only one third of the respondents expressed their readiness to implement them. Only for two NewConnect companies the new regulation facilitated the implementation of listing obligations and made it significantly more difficult for nearly 80% of the surveyed companies. The rest of respondents had no formed opinion on the subject.

All respondents listed on the m:access market declared knowledge of the new provisions of the MAR Regulation, and only one company was unprepared for MAR implementation. As in the case of Polish respondents, for the vast majority of German issuers, the new regulations made it difficult to fulfill the listing obligations (almost 87% of the surveyed companies).

## Conclusions

The study showed that issuers in both countries are familiar with the regulations of MAR, which, however, in their opinion, made it more difficult to fulfill disclosure obligations. This may be due to the fact that – from the issuers' point of view - the new provisions of MAR define inside information in an imprecise form<sup>5</sup>, while at the same time giving supervision over the correct performance of the disclosure duties to supervisory authorities. Before their introduction, NewConnect and m:access issuers were responsible for offenses in this respect to the organizers of alternative markets on which they were listed. Administrative sanctions, in line with MAR, much higher than before, may apply to both the issuer and individual members of the company's management board, in case of gross breach of disclosure obligations. It is also important in the perception of the disclosure requirements that, despite the introduction of the MAR regulation, they must be compliant with the MTF rules. This applies, for example, to periodic information and current information that does not meet the definition of inside information according to MAR. The compliance with the provisions of the alternative market regulations is still supervised by the MTF organizers.

The survey results show that almost two years after the MAR regulations came into force, only 1/3 of Polish issuers were ready to implement them in their own organizations. This may be worrying, but after the implementation of the MAR regulations, issuers in Poland were attacked by a massive information campaign (or more disinformation), in which there was a lot of black PR and black scenarios. Due to such attitude towards MAR, most Polish respondents could be convinced that fulfilling their disclosure obligations would be difficult, unlike m:access issuers. On the Bavarian stock exchange, almost all companies declared their readiness to implement the new regulations and considered fulfilling disclosure obligations easy.

The practical conclusion from our research concerns the need for greater and better education of companies listed on alternative markets. The Warsaw Stock Exchange in particular should to a greater extent organize various discussions and training sessions on listing regulations including disclosure requirements and influence more publications explaining the cor-

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<sup>5</sup> The company's management board must consider whether a given situation and event is already subject to reporting. There are potential interpretative problems in determining whether the information is already precise enough to fall under the definition of inside information, the information indirectly or directly affects the company, or the information have an insignificant or significant effect on the share price.

rect, compliant behavior of listed companies, which will counterbalance the black PR that appears in Polish media.

The results presented in the paper encourage further research which should among others concern the relationship between the assessment of disclosure obligations by NewConnect and m:access issuers and: (i) the time spent on fulfilling them, (ii) using the issuers' human resources, and (iii) the assessment of cooperation with authorized advisors who help companies meet the public company criteria.

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## Annex

**Table 1.** Selected questions from the survey questionnaire for companies listed on NewConnect and m:access.

|   |           |                   |              |                   |
|---|-----------|-------------------|--------------|-------------------|
| 1. How complicated do you find information obligations?   |           |                   |              |                   |
| a) very simple  | b) simple | c) no opinion     | d) difficult | e) very difficult |
| 2. Are you aware of the changes to the regulations concerning disclosure obligations that entered into force in the MAR Regulation? |           |                   |              |                   |
| a) yes  |           | b) no             |              |                   |
| 3. How do you assess the impact of these changes on the fulfillment of disclosure obligations?                                      |           |                   |              |                   |
| a) made it difficult  |           | b) made it easier |              | c) no opinion     |
| 4. If the answer in question 2 is YES, do you feel prepared for these changes?  |           |                   |              |                   |
| a) yes  |           | b) no             |              |                   |

**Table 2.** NewConnect respondents sorted by the size of a company and by the raised capital

|               | <1M PLN   | (1-3]M PLN | (3-10]M PLN | (10-20]M PLN | >20 M PLN | SUM        |
|---------------|-----------|------------|-------------|--------------|-----------|------------|
| <b>Micro</b>  | 6         | 11         | 4           | 1            | 0         | <b>23</b>  |
| <b>Small</b>  | 6         | 10         | 9           | 3            | 5         | <b>33</b>  |
| <b>Medium</b> | 3         | 5          | 4           | 3            | 3         | <b>18</b>  |
| <b>Sum</b>    | <b>15</b> | <b>27*</b> | <b>17</b>   | <b>7</b>     | <b>8</b>  | <b>74*</b> |

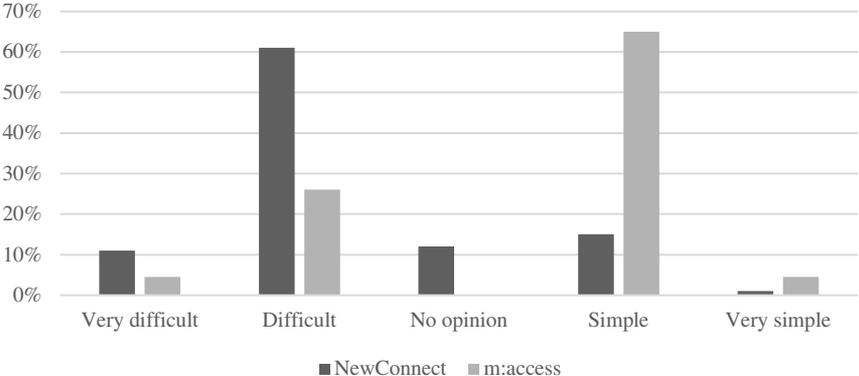
\* One company stayed anonymous and was not assigned to the size category.

**Table 3.** m:access respondents sorted by the size of a company and by the raised capital.

|               | <10M EUR  | (10-20]M EUR | >20M EUR  | SUM        |
|---------------|-----------|--------------|-----------|------------|
| <b>Micro</b>  | 0         | 0            | 0         | <b>0</b>   |
| <b>Small</b>  | 6         | 4            | 1         | <b>11</b>  |
| <b>Medium</b> | 4         | 3            | 4         | <b>11</b>  |
| <b>Sum</b>    | <b>10</b> | <b>7</b>     | <b>6*</b> | <b>23*</b> |

\* One company stayed anonymous and was not assigned to the size category.

**Figure 1.** Perception of disclosure obligations by NewConnect and m:access issuers.



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## Business angels: the current state of research in the Czech Republic and Poland

**JEL Classification:** *E44; G23; G32*

**Keywords:** *business angels; informal venture capital; structured literature review; policy implications*

### Abstract

**Research background:** Research on business angels has attracted the attention of a growing number of researchers in recent years. This might be evidenced by an increasing number of scientific articles when searching for relevant keywords in Web of Science and Google Scholar. The vast majority of research papers on informal venture capital document the situation in well-developed markets including the USA, Great Britain, and, increasingly, in emerging markets. The Chinese market (mainland) has been focused in particular. To our knowledge, just a little attention is, however, paid to the local angel markets in Central and Eastern Europe.

**Purpose of the article:** In this paper, we provide a structured literature review of research papers on business angels in the Czech Republic and Poland published between 2010 and 2021. We intend to contribute the academic literature regarding the issue which generations of research has been covered and where notable knowledge gaps exist.

**Methods:** The main methodological tool used in this paper consists in creating a comprehensive data set based on searching for relevant terms in Web of Science and Google Scholar. The citation analysis was used to find the most cited papers. Based on the content analysis, the papers were subsequently classified into research generations identified in previous studies.

**Findings & Value added:** Our contribution identifies topics which have been tackled in prior studies on one side and topics which deserve attention of researchers and policy makers on the other side when studying the local angel markets in the Czech Republic and Poland.

## Introduction

Small and medium-sized enterprises (SMEs) form over 99 % of the total number of all business entities in most developed countries worldwide. In the EU, SMEs make up one half of the added value generated by the business sector (Filipe *et al.*, 2016). SMEs have difficult access to financial resources, and this can have a negative impact on their development. Explanation is offered in the theories of asymmetric information, moral hazard and adverse selection (Glücksman, 2020; Joudi *et al.*, 2019; Landström; 2017; Gompers & Lerner 2004; Akerlof, 1970). In addition to financing through bank loans the segment of venture capital was established in the financial market which is in its informal (or non-institutional) form represented by business angels (BAs) and business angel networks (BAN). Besides family, friends and fools (3F), informal venture capital is another important source of financing namely technology-oriented and innovative start-ups (Mason & Harrison, 2008).

Research into venture capital and its individual areas is gaining importance which is documented by a growing number of scientific publications in specialised databases such as Web of Science. A prevailing number of scientific publications covering the informal venture and seed capital document the condition and development of markets in the USA, Great Britain and continental Europe (White & Dumay, 2017). A growing number of publications on this topic are appearing in some emerging markets (Li *et al.*, 2016). Authors address a wide range of research questions with a marked categorisation of existing research studies. For example, White and Dumay (2017) divide the research of informal VC in the market undertaken so far into four generations based on the research by Mason and Harrison (1999) who defined three generations of research into business angels. The first generation of studies is of a descriptive nature focusing on the profiles of markets and investors; the second deals with decision-making processes, monitoring of post-implementation stage investments and exit strategies; the third generation looks into the typology of investors, business angel networks, demographic aspects and technology companies. The fourth generation of research studies deals with government support to

angel investments, crowdfunding, changing business angel market, gender issues and emerging markets (White & Dumay, 2017).

The venture capital market in the Czech Republic and Poland is usually described as under-developed and under-researched (e.g., Zinecker *et al.*, 2021a; Zinecker *et al.*, 2021b). To our knowledge, there is a lack of empirical evidence on research issues dealing with informal venture capital markets in both countries. Hence, this paper aims at bridging this research gap. Building on the methodology introduced by White and Dumay (2017), we search for business angel papers related to the Czech and Polish informal venture capital markets published between 2010 and 2021. Relevant studies are subject to content analysis and then classified according to the four-generation approach.

The results suggest that so far the research in both markets is limited to the identification of institutional factors developing the market development and the recognition of business angel profiles, i. e. research falling in the first generation of research studies. According to our findings, the research lacks questions typical of the second, third and fourth generation, namely the review of business angel networks, investment processes and post-investment relationships, gender issues or research emphasising the demand side perspective.

The two research questions for this paper are as follows: (1) How has the informal venture capital research agenda developed in recent years? (2) What is the status quo of business angel research in the Czech Republic and Poland?

In the first part, a theoretical framework on informal venture capital research is developed. Next, the research methodology is introduced followed by the research results. Finally, we provide a discussion and propose a new agenda for the follow-up research.

## **Theoretical background**

Increased interest in research of business angels (BAs) dates back to 1999 when Mason and Harrison (1999) defined individual areas of interest and outlined three generations of research studies (cited in White & Dumay, 2017). The first generation constituted in the 1980s deals with an estimate of the size of the informal VC market and the profile of a typical business angel in the USA (see, e.g., Wetzel, 1983; Gaston & Bell, 1986; Aram, 1989). As regards the topics of the second generation, they focus on documenting the investment process, post-investment relations, business angel networks and application theories (White & Dumay, 2017). The third gen-

eration covers four categories of interest: methodical, analytical, theoretical and political, focusing primarily on the BA's typology, market organisation, demography, expansion of the informal venture capital phenomenon outside North America, Great Britain and Nordic countries, the role of business angels in technology companies and the demand side perspective (White & Dumay, 2017).

White and Dumay (2017) followed up on the research by Mason and Harrison (1999) offering an extensive analysis of research studies in the period 2000 to 2013. They used Google Scholar for this purpose. The results of the citation analysis are represented by 95 relevant articles. The research results suggest that the literature on the topic is multifarious and it would be appropriate to identify the fourth generation of research to extend the framework of already defined areas. The fourth generation includes government programmes in support of the offer and demand sides, crowd investing, gender issues, developing markets as well as phenomena such as localisation and internationalisation.

According to the current state of scientific knowledge, the fourth generation of research defined above is increasingly relevant. In the framework of government policy and its programmes efficiency the research efforts of authors aim at supporting BA investments or at identifying barriers to the development of this financial market segment (Mason & Harrison, 2015). In most cases the research concentrates on the support to informal venture capital through co-investment public funds, funding initial operating costs or alleviation of tax burden (Mason & Harrison, 2015).

Crowdfunding is researched for example by Grundy and Ohmer (2016) who define it as obtaining resources from a large number of people using mostly internet platforms (see also White & Dumay, 2017). Ordanini *et al.* (2011) identified two motivations of investors to participate in crowdfunding. The first is a desire to test a new type of investment and to interact with companies and other consumers, the second is an expectation of the highest possible return on invested capital.

As far as the changing BAs market is concerned, research confirms that the business angel market is changing significantly (Harrison & Mason, 2019). Business angels more and more invest in controlled angel groups rather than individually and thus the traditional model of BA as a middle-aged man with high net worth is changing (Mason *et al.*, 2019). Angel groups reduce the BA market inefficiencies because, as compared to individually operating business angels, they are more transparent in relation to start-ups. Unlike individual BAs, angel groups can be interesting for investment funds and can offer follow-up funding to businesses (Mason *et al.*, 2016).

As regards the research of gender issues, the total number of citations has been growing since 2015 which fact is confirmed by OECD research stating a significant gender imbalance among informal venture capital investors (OECD, 2016). The imbalance is explained by differences in the level of experience, by a gender-biased attitude to evaluating creditworthiness and stereotypes in the world of investments. Generally, the persisting stereotype is that of a male investor, not a female as a business person (Alsos & Ljunggren, 2017).

Research into the relationship of a business investor concentrates on the investment phases. In the pre-investment phase, a BA investment is evaluated in a comprehensive way using various models, such as decision-making or elimination. However, the post-investment phase is no less important and according to White and Dumay (2017) a research gap exists here.

Emerging markets were identified as the last area of interest within the fourth generation of BA research. Angel investments grow in the conditions of such markets and, along with the phenomenon of internationalisation, they are a stimulus for studying markets outside Great Britain, Western Europe and North America (White & Dumay, 2017). Business angels in emerging markets develop different investment strategies mostly based on establishing Business Angels Networks, thorough due diligence and post-investment analyses (see for example Scheela, 2015).

## **Research methodology**

The article has been prepared following the methodology proposed by White and Dumay (2017), specifically a literature review, citation analysis and subsequent content analysis of professional articles on research into informal venture capital market in the Czech Republic and Poland. The databases used as sources of relevant studies are Web of Science (WOS) and Google Scholar. The combinations of keywords using the Boolean logical operators were the following: 1) Studies relating to the Czech informal venture capital market: Business angels AND Czech Republic/Czechia; Angel investor AND Czech Republic/Czechia; Informal venture capital AND Czech Republic/Czechia; 2) Studies relating to the Polish business angels market: Business angels AND Poland/Polish; Angel investor AND Poland/Polish; Informal venture capital AND Poland/Polish. A summary of search results is shown in Table 1.

The analysis focuses on academic articles published in 2010 – 2021, or sources with the highest relevance for the defined topic including refer-

ences to authors, year of publishing, number of citations and the journal where the selected articles are published. The relevant keywords are chosen with regard to frequency and, subsequently, sorted and ordered according to the number of citations of individual articles in the Google Scholar database.

## Results

The informal venture capital agenda in the Czech Republic and Poland was developing very slowly in the period in question (2010 to 2021) which is documented by the low number of publication outputs in the Web of Science database. Using a combination of selected keywords filtered for all results “by topic”, after removing duplicate sources, we found ten studies (as of March 2021) of which seven were articles published in academic journals and three were published in conference proceedings. The results suggest the scientific community’s growing interest in informal venture capital despite the low number of available studies. This is documented by the fact that nine of ten articles were published in the period 2015–2021.

As regards the academic journals where the scientific outputs are published, the results for the (1) Czech and (2) Polish informal venture capital markets are as follows: regarding the Czech informal venture capital market (1), of the total three articles two were published in *Economic Research – Ekonomika Istrazivanja*, namely publications by Zinecker *et al.* (2021a) and Zinecker *et al.* (2021b). Subject of this research were external factors affecting angel investments and investment profiles of BAs operating in the Czech market respectively. The third article was published by Durda and Kljucnikov (2019) in *Economics & Sociology* with an emphasis on the identification of social groups that support start-ups in their development and on an analysis of relationships with this social group, including the use of their knowledge, skills and contacts. The situation in the Polish informal venture capital market (2) is documented in four publications: two scientific articles were published in *Ekonomia i Prawo – Economics and Law*, specifically an article by Gorackowska (2017), and Gorackowska and Tomaszewski (2019), where the authors focused on innovation activities in SMEs. One article was published in the *Sustainability* journal. Szczukiewicz and Makowiec (2021) offer a basic characteristic of Polish accelerators. The last article looking into crowdfunding was published by Frydrych and Kinder (2015) in *Problemy Zarzadzania – Management Issues*.

In addition to WOS search we also performed a research in the Google Scholar database using identical combinations of keywords. If we had lim-

ited the search to keywords in the paper title, we would have found only three sources outside the publications in WOS. In particular, these are two scientific articles for business angel market in the Czech Republic and one scientific article for the Polish market. Both scientific articles for the Czech business angel market were published in *Trends Economics and Management*, for details see Bortlová (2015) and Skalická Dušátková (2015). These articles evaluated the basic characteristics of activities as well as the business angel environment. As regards the description of the Polish informal venture capital market, we found a publication by Lewandowska (2011) in the journal *Comparative Economic Research* which discusses the innovation as a strategic tool increasing the competitiveness of companies and economy and supporting the growth of GDP with regard to the involvement of business angels.

In addition to articles in scientific magazines, the above-mentioned keywords were instrumental in finding two conference papers: one for the Polish and one for the Czech informal VC market.

A much larger number of results was obtained from the search of keywords with random filtering in the paper. In this way the Google Scholar database yielded the following outputs for the Czech informal venture capital and the following combinations of keywords: (1) Informal venture capital 17,200 results; (2) Business angels and Czech Republic 17,100 results; (3) Informal venture capital and Czech Republic 17,000 results; (4) Angel investor and Czech Republic 8,910 results; (5) Business angels and Czechia 294 results and (6) Angel investor and Czechia 187 results. The same search criteria applied on the Polish informal venture capital found: (1) Business angels and Polish 18,000 results; (2) Informal venture capital and Poland 16,900 results; (3) Informal venture capital and Polish 16,900 results; (4) Business angels and Poland 16,400 results; (5) Angel investor and Poland 13,300 results and (6) Angel investor and Polish 8,520 results.

As regards the publication form, they are scientific articles, conference proceedings, expert books and interviews with top representatives of business angel organisations, such as Lewiatan Business Angel Network which is the largest and most active BA network in Poland. Information on the number of published studies which were searched through the keywords and their combinations following the strategies described above on Web of Science and Google Scholar are shown in Table 1 – Identification of publications by selected keyword. Table 2 - Bibliographic identification of selected publication outputs, provides a summary of selected articles including the authors' names, scientific magazine and database in which the source was found.

Table 3 – Content analysis of selected sources, presents results of a content analysis of selected scientific articles and relevant studies. The WOS database search by topic found only three results published in scientific magazines analysing the issue of business angels in the Czech Republic. Zinecker *et al.* (2021a, b) focused on the research into the institutional environment and profiles of angel investors. Authors rely on survey based research where data was collected through semi-structured interviews with results processed by content analysis and descriptive statistics. The results deliver evidence on the profile of a typical angel investor and how they perceive and evaluate the external conditions for BA activity in the Czech Republic. In conclusion, the authors recommend to direct further research toward reducing the market failure of informal venture capital or studying business angels over a long time span. Durda and Kljucnikov (2019) who focus on the start-up ecosystem, specifically social media that help these companies to grow, also adopted the survey based research approach. The authors identified the above-mentioned social groups and analysed the relationship between the investor and the entrepreneur. They recommend to orientate future research in the field on evaluating the relationship between social media and start-up success rate.

As regards the scientific studies which are the result of Google Scholar search by topic, we emphasise the World Bank Study (2018) in the Czech Republic. It offers a systematic evaluation of business angel activities in the local market. The study uses secondary data from Invest Europe, European Commission, OECD and World Bank as well as primary data in the form of interviews with stakeholders, e.g. business angel networks, accelerators or incubators. The research shows that the BA market in the Czech Republic is small both in terms of the number of investors and the amount of invested funds. In its conclusion the World Bank Group (2018) recommends further research, namely to systemise the collection with the aim to document a summary of offer and demand for angel investments. Further, we would like to emphasise the publication by Skalická Dušátková (2015) which based on secondary data from the European Private Equity and Venture Capital Association (EVCA) and the Czech Statistical Office looked into the relationship between the venture capitalist activity in the Czech Republic and macroeconomic indicators. Skalická Dušátková (2015) formulated recommendations for an adaptation of the institutional framework in support of the VC investment. Bortlová (2015) published a case study with the aim of surveying, comparison and descriptive analysis of business angels in the Czech Republic and the USA. For this purpose, she used as secondary sources data published by EVCA and the Czech Venture Capital Association. The collection of primary data took the form of interviews and

a questionnaire survey. The key conclusions are that the US business angels are older compared to those in the Czech Republic, they have more experience and achieve higher education. Czech BAs perceive investment as a full-time job, their portfolio includes approximately eight companies, and their main motivation is to invest in order to pass knowledge to younger generations.

As regards the informal venture capital market in Poland, the WOS search by topic and Google Scholar search by title focus mostly on crowdfunding. For example, Frydrych and Kinder (2015), using a citation and content analysis, documented the current level of scientific knowledge about crowdfunding with an emphasis on the market development which is interpreted as a part of the venture and seed capital. Crowdfunding is a relatively new direction of research and, according to the authors, it requires deeper analysis, for example of using this form of funding by various types of applicants. The current level of knowledge was also supported by Gorączkowska (2017) and Gorączkowska and Tomaszewski (2019) who analysed the influence of institutions on supporting business in Poland but also the impact of these institutions (technology parks, incubators, etc.) on innovation activity of entrepreneurs. In their articles they used primary data from a questionnaire survey and secondary data from the Statistical Offices of Poland. The authors see potential in further research in an analysis of the importance of intellectual rights for companies with high level of innovation or, on the contrary, in research into the reasons for intentional use of less innovative technology. Lewandowska (2011) in her article discusses innovation as a strategic tool which helps entrepreneurs to increase competitiveness. The author used secondary data drawn from the Polish Private Equity Association and the European Business Angel Network. The key result of this research is a confirmation that innovation is the main driver of accelerated growth of both companies and economies of individual countries and that business angels are one of the vehicles of innovation. Further research is recommended to identify the means in support of innovation by the Polish government on the European scale.

Selected publications also provided a basic overview of the research generations distribution in Poland and Czech Republic in 2010 – 2021. Most often the studies focus on topics which, according to the White and Dumay method (2017), are subject to the first generation research. Results describe profiles of angel investors and their environment. There are few topics falling in the third and fourth generation of research. As regards the second generation, looking for example into the decision-making processes

or the monitoring of investments in the post-implementation phase, our conclusions point out to a gap in empirical research.

Results of the content analysis are summarised in Table 3.

## Conclusions

The results of literature review and subsequent content analysis of relevant scientific articles on informal venture capital clearly show that both Czech and Polish informal venture capital markets deserve greater attention. In terms of the White and Dumay (2017) method, the research of informal VC market is limited mostly to the first generation of research questions while the following generations of research (e.g., business angel networks, crowdfunding) are marginal. The least researched is the second generation of questions dealing with decision-making processes, investment monitoring in the post-implementation phase and exit strategies.

The selection of a keyword combination and logical operators is a limiting element in the research. The summary of relevant studies is potentially incomplete. Another limitation is the fact that in this paper we are presenting results from two databases: Web of Science and Google Scholar. Studies prepared by e.g. Invest Europe, Business Angel Networks and other institutions are not analysed in this paper (with the exception of the World Bank Study, 2019).

We recommend that further research concentrate on questions that have not yet been researched in the Czech Republic and in Poland, for example the lifecycle of angel investments, crowdfunding, ecosystems supporting BAs, demand side perspective (e.g., mentoring and education of entrepreneurs).

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## Annex

**Table 1.** Identification of publication outputs according to selected keywords

| <b>Czech Republic</b>                       |                       |
|---|-----------------------|
| <b>Web of Science (Searching for Topic)</b> |                       |
| <b>Keywords</b>                             | <b>No. of outputs</b> |
| Business angels AND Czech Republic          | 4                     |
| Informal venture capital AND Czech Republic | 2                     |
| Informal venture capital AND Czechia        | 1                     |
| Business angels AND Czechia                 | 1                     |
| Angel investor AND Czech Republic           | 1                     |
| Angel investor AND Czechia                  | 0                     |
| <b>Poland</b>                               |                       |
| <b>Web of Science (Searching for Topic)</b> |                       |
| <b>Keywords</b>                             | <b>No. of outputs</b> |
| Business angels AND Poland                  | 6                     |
| Business angels AND Polish                  | 3                     |
| Angel investor AND Poland                   | 1                     |
| Angel investor AND Polish                   | 0                     |
| Informal venture capital AND Poland         | 0                     |
| Informal venture capital AND Polish         | 0                     |
| <b>Czech Republic</b>                       |                       |
| <b>Google Scholar (Searching for Topic)</b> |                       |
| <b>Keywords</b>                             | <b>No. of outputs</b> |
| Informal venture capital AND Czechia        | 17,200                |
| Business angels AND Czech Republic          | 17,100                |
| Informal venture capital AND Czech Republic | 17,000                |
| Angel investor AND Czech Republic           | 8,910                 |
| Business angels AND Czechia                 | 294                   |
| Angel investor AND Czechia                  | 187                   |
| <b>Poland</b>                               |                       |
| <b>Google Scholar (Searching for Topic)</b> |                       |
| <b>Keywords</b>                             | <b>No. of outputs</b> |
| Business angels AND Polish                  | 18,000                |
| Informal venture capital AND Poland         | 16,900                |
| Informal venture capital AND Polish         | 16,900                |
| Business angels AND Poland                  | 16,400                |
| Angel investor AND Poland                   | 13,300                |
| Angel investor AND Polish                   | 8,520                 |
| <b>Czech Republic</b>                       |                       |
| <b>Google Scholar (Searching for Title)</b> |                       |
| <b>Keywords</b>                             | <b>No. of outputs</b> |
| Business angels AND Czech Republic          | 3                     |
| Business angels AND Czechia                 | 1                     |
| Angel investor AND Czech Republic           | 0                     |
| Angel investor AND Czechia                  | 0                     |
| Informal venture capital AND Czech Republic | 0                     |
| Informal venture capital AND Czechia        | 0                     |

**Table 1.** Continued

| <b>Poland</b>                               |                       |
|---|-----------------------|
| <b>Google Scholar (Searching for Title)</b> |                       |
| <b>Keywords</b>                             | <b>No. of outputs</b> |
| Business angels AND Poland                  | 2                     |
| Business angels AND Polish                  | 0                     |
| Angel investor AND Poland                   | 0                     |
| Angel investor AND Polish                   | 0                     |
| Informal venture capital AND Poland         | 0                     |
| Informal venture capital AND Polish         | 0                     |

**Table 2.** Bibliographic identification of publication outputs

| <b>Czech Republic</b>               |  |  |                |
|-------------------------------------|--|--|----------------|
| <b>Author</b>                       | <b>Article</b>   | <b>Journal</b>                           | <b>Data</b>    |
| Zinecker <i>et al.</i> (2021)       | Business angels in the Czech Republic: characteristics and classification with policy implications   | Economic Research-Ekonomska Istrazivanja | WOS            |
| Zinecker <i>et al.</i> (2021)       | Identifying the impact of external environment on business angels activity   | Economic Research-Ekonomska Istrazivanja | WOS            |
| Durda and Kljucnikov (2019)         | Social networks in entrepreneurial startups development  | Economics & Sociology                    | WOS            |
| Skalická Dušátková (2015)           | Macroeconomic Factors Influencing Business Angles Activity and Fomation of Venture Capital in the Czech Republic                           | Trends Economics and Management          | Google Scholar |
| Bortlová (2015)                     | Business angels environment in the Czech republic and the USA – Case study   | Trends Economics and Management          | Google Scholar |
| <b>Poland</b>                       |  |  |                |
| <b>Author</b>                       | <b>Article</b>   | <b>Journal</b>                           | <b>Data</b>    |
| Goraczkowska (2017)                 | Technical advancement and the stimulation of companies innovation activity by business support organisations in developer regions          | Ekonomia i Prawo - Economics and Law     | WOS            |
| Goraczkowska and Tomaszewski (2019) | Support of innovation activity in small and medium-size enterprises in the Greater Poland Voivodeship                                      | Ekonomia i prawo - Economics and Law     | WOS            |
| Szczukiewicz and Makowiec (2021)    | Characteristics and specificities of local innovation accelerators: A case of Poland   | Sustainability                           | WOS            |
| Frydrych and Kinder (2015)          | How new is crowdfunding? The venture capital evolution without revolution – Discourse on risk capital themes and their relevance to Poland | Problemy Zarzadzania – Management Issues | WOS            |
| Lewandowska (2011)                  | Venture capital and business angels and the creation of innovative firms in Poland   | Comparative Economic Research            | Google Scholar |

**Table 3.** Content analysis of selected sources

| <b>Czech Republic</b>              |  |           |          |
|------------------------------------|--|-----------|----------|
| <b>Durda and Kljucnikov (2019)</b> |  |           |          |
| <b>Title</b>                       | Social networks in entrepreneurial start-ups development   | <b>C*</b> | <b>G</b> |
| <b>Purpose</b>                     | (1) Identification of social groups that provided start-ups with funds<br>(2) Analyse their perceived benefits<br>(3) Analyse the relationship between the type of contact and the assistance provided   | 6         | 4        |
| <b>H/RQ</b>                        | What is the role of social networking in the development of start-up companies in the Czech Republic?  |           |          |
| <b>Data sources</b>                | (1) Primary data sources<br>(2) Questionnaire survey of start-up founders  |           |          |
| <b>Data processing</b>             | (1) Descriptive and two-dimensional statistical analysis<br>(2) Fisher's exact test  |           |          |
| <b>Results</b>                     | (1) Key groups include business partners or investors in the form of, for example, business angels and friends<br>(2) Investor contacts, knowledge and advice are key to the company's success<br>(3) The important role of business incubators  |           |          |
| <b>Future research</b>             | An important direction of the further research may explore the contribution of networks to the success of start-up companies   |           |          |
| <b>Zinecker et al. (2021a)</b>     |  |           |          |
| <b>Title</b>                       | Business angels in the Czech Republic: characteristics and a classification with policy implications   | <b>C*</b> | <b>G</b> |
| <b>Purpose</b>                     | Identification of a typical profile of the business angel in the Czech Republic  | 0         | 1        |
| <b>H/RQ</b>                        | (1) What are the demographic profiles, professional backgrounds and education of Czech BAs?<br>(2) What are their investment skills to conduct informal VC investments?<br>(3) How do the surveyed BAs perceive their wealth and the level of involvement?<br>(4) What are the attitudes of informal VCs to co-operation and structuring the deals in terms of sources used?<br>(5) Do the Czech BAs differ significantly from their peers in well-developed markets in terms of the share of VC investments on total assets, the level of involvement in investee companies and investments in equity and debt? |           |          |
| <b>Data sources</b>                | (1) Primary data sources<br>(2) Semi-structured interviews (face-to-face)  |           |          |
| <b>Data processing</b>             | (1) Descriptive analysis<br>(2) Content analysis   |           |          |
| <b>Results</b>                     | BAs:<br>(1) Are there usually middle-aged men with a secondary education and other educational courses, such as an MBA<br>(2) They have experience in business or top management<br>(3) They provide advice, skills and knowledge to companies.<br>(4) They offer debt financing and, as a rule, these investments in information and communication technologies flow<br>(5) They very often cooperate with each other, resulting in further business transactions   |           |          |

**Table 3.** Continued

|                                   |  |           |          |
|-----------------------------------|--|-----------|----------|
| <b>Future research</b>            | (1) Reduction of market failure in the early phase of the project when new companies enter the market<br>(2) Study of BAs in the Czech Republic in a long-term perspective with a larger sample of respondents<br>(3) Increasing the number of BAs and the volume of their investments in a wider range of industrial areas<br>(4) How to support BAs through training and mentoring   |           |          |
| <b>Zinecker et al. (2021b)</b>    |  |           |          |
| <b>Title</b>                      | Identifying the impact of external environment on business angel activity  | <b>C*</b> | <b>G</b> |
| <b>Purpose</b>                    | Identification of the impact of external environment on the activity of business angels in Czechia   | 0         | 1        |
| <b>H/RQ</b>                       | (1) What are the perceptions of Czech BAs in terms of exogenous factors affecting the informal VC market?<br>(2) What are their perceptions in terms of the economic growth, monetary policy, taxation, law quality, investment protection, capital market, and doing business ecosystem?  |           |          |
| <b>Data sources</b>               | (1) Primary data sources<br>(2) Semi-structured interviews (face-to-face)  |           |          |
| <b>Data processing</b>            | (1) Descriptive analysis<br>(2) Content analysis   |           |          |
| <b>Results</b>                    | (1) Business angels pay little attention to the impact of the general macroeconomic conditions, as well as the role played by the capital market<br>(2) BAs refer to 'critical' issues related to the difficult predictability of legislative changes and dissatisfaction has also been expressed with the functioning of the public administration<br>(3) BAs also consider the current situation on the labour market and public education policy to be serious barriers to business development in the Czech Republic |           |          |
| <b>Future research</b>            | Extend the data experiment to other points in time and survey respondents from other non-institutionalized venture capital markets in the CEE region with a significant BA activity  |           |          |
| <b>Frydrych and Kinder (2015)</b> |  |           |          |
| <b>Title</b>                      | How new is crowdfunding? The venture capital evolution without revolution – discourse on risk capital themes and their relevance to Poland   | <b>C*</b> | <b>G</b> |
| <b>Purpose</b>                    | Provide an overview of types of funding and aim to illustrate evidence from evolution of funding types and discoursing CF as part of the VC market   | 2         | 4        |
| <b>H/RQ</b>                       | (1) Do Polish institutions support risk capital?<br>(2) Are Polish new ventures likely to internationalise?<br>(3) Are entrepreneurs created by entrepreneurship policy?   |           |          |
| <b>Data sources</b>               | Secondary data sources   |           |          |
| <b>Data processing</b>            | (1) Literature review<br>(2) Content analysis  |           |          |
| <b>Results</b>                    | (1) All instruments are in place to enable diversity of risk capital<br>(2) The government stimulates entrepreneurial activity to build up the capital demand side (create entrepreneurs), and not limit its activities on building up the capital supply side through entrepreneurship policy   |           |          |
| <b>Future research</b>            | More careful discussion about the 'newness' of crowdfunding among practitioners and scholars   |           |          |

**Table 3. Continued**

| <b>Skalická Dušátková (2015)</b> |   |           |          |
|----------------------------------|---|-----------|----------|
| <b>Title</b>                     | Macroeconomic Factors Influencing Business Angles Activity and Formation of Venture Capital in the Czech Republic   | <b>C*</b> | <b>G</b> |
| <b>Purpose</b>                   | Explores the possible relationship between venture capital investments and the development of key macroeconomic variables in the Czech Republic   | 0         | 2        |
| <b>H/RQ</b>                      | There is a dependence of venture capital activity in the Czech Republic on macroeconomic indicators of the Czech Republic   |           |          |
| <b>Data sources</b>              | (1) Secondary data sources<br>(2) European Private Equity & Venture Capital Association (EVCA)<br>(3) Czech Statistical Office  |           |          |
| <b>Data processing</b>           | (1) Descriptive data analysis<br>(2) Statistical data analysis<br>(3) Spearman's coefficient  |           |          |
| <b>Results</b>                   | There was found no significant statistical relationship between selected macroeconomic variables and the level of venture capital activity in the Czech Republic  |           |          |
| <b>Future research</b>           | For further research of the creation of venture capital and the business angel activity it seems appropriate to pay attention to the legal and institutional environment of the business angles and venture capital activities and compare them with the results of studies in this field abroad  |           |          |
| <b>Bortlová (2015)</b>           |   |           |          |
| <b>Title</b>                     | Business angels environment in the Czech republic and the USA – Case study  | <b>C*</b> | <b>G</b> |
| <b>Purpose</b>                   | Mapping and comparing the investors' environment in the USA and in the Czech Republic   | 0         | 1        |
| <b>H/RQ</b>                      | (1) What are the characteristics of Business Angels in the CR in comparison to Business Angels in the USA (in California, CA)?<br>(2) What are the main differences regarding investments and why is it so?   |           |          |
| <b>Data sources</b>              | (1) Primary and secondary data sources<br>(2) Questionnaire<br>(3) Interview<br>(4) EVCA<br>(5) Czech Venture Capital Association   |           |          |
| <b>Data processing</b>           | (1) Descriptive data analysis   |           |          |
| <b>Results</b>                   | (1) BA in the USA tends to be older, with more experience and higher education than BA in the CR<br>(2) Investing is considered as their full-time job and based on that fact their portfolio is wider<br>(3) In the USA, the investors have approximately 8 companies in their portfolio, while in the CR only 2<br>(4) Source of motivation for the US investors is knowledge transfer to young entrepreneurs (for almost 90% of investors) |           |          |
| <b>Future research</b>           | (1) More BA have to take part in the research in order to get valid data which might have descriptive value<br>(2) Further research regarding improving and strengthening the collaboration with BA and young entrepreneurs   |           |          |

**Table 3. Continued**

| <b>World Bank Group (2018)</b>             |  |           |          |
|--|--|-----------|----------|
| <b>Title</b>                               | Stimulating Business Angels in the Czech Republic  | <b>C*</b> | <b>G</b> |
| <b>Purpose</b>                             | A systematic assessment of business angel activities, and the ecosystem surrounding innovation finance, in the Czech Republic  | 2         | 1        |
| <b>H/RQ</b>                                | None   |           |          |
| <b>Data sources</b>                        | (1) Primary and secondary data sources<br>(2) Invest Europe<br>(3) European Commission<br>(4) OECD<br>(5) World Bank<br>(6) Interview  |           |          |
| <b>Data processing</b>                     | (1) Descriptive data analysis  |           |          |
| <b>Results</b>                             | (1) The angel market in the Czech Republic is developing with high growth potential<br>(2) The angel market is small in terms of the number of investors and the size of the amount invested<br>(3) Low focus on information and communication technologies<br>(4) The flow of trade on the demand side does not reach the volume for market development |           |          |
| <b>Future research</b>                     | Data collection and mapping to create a systematic understanding of demand and supply for angel investments  |           |          |
| <b>Poland</b>                              |  |           |          |
| <b>Gorączkowska (2017)</b>                 |  |           |          |
| <b>Title</b>                               | Technical advancement and the stimulation of companies innovation activity by business support organisations in developed regions  | <b>C*</b> | <b>G</b> |
| <b>Purpose</b>                             | Analysis of the influence of institutions (technology parks, technology incubators, academic business incubators, etc.) on business support in Poland  | 0         | 3        |
| <b>H/RQ</b>                                | Company innovations will grow after establishing cooperation with business support institutions  |           |          |
| <b>Data sources</b>                        | 1) Secondary data sources<br>(2) Statistical Offices   |           |          |
| <b>Data processing</b>                     | (1) Statistical analysis<br>(2) Regression analysis<br>(3) T-test<br>(4) Chi-square  |           |          |
| <b>Results</b>                             | After establishing cooperation with the support institutions, with the increase of the level of the applied technology also increases their effectiveness  |           |          |
| <b>Future research</b>                     | The importance of intellectual property for companies with a high level of innovation and technology   |           |          |
| <b>Gorączkowska and Tomaszewski (2019)</b> |  |           |          |
| <b>Title</b>                               | Support of innovation activity in small and medium-sized enterprises in the Greater Poland Voivodeship   | <b>C*</b> | <b>G</b> |
| <b>Purpose</b>                             | Identification of impact of business support organization on the innovation activity in industrial enterprises in the Greater Poland Voivodeship   | 0         | 3        |
| <b>H/RQ</b>                                | BSOs increase the odds of implementation of new products and process in enterprises, but their impact will be different  |           |          |
| <b>Data sources</b>                        | (1) Primary data sources<br>(2) Questionnaire survey   |           |          |

**Table 3.** Continued

|   |   |           |          |
|---|---|-----------|----------|
| <b>Data processing</b>                  | (1) Statistical analysis<br>(2) Multi-factor logit regression method  |           |          |
| <b>Results</b>                          | (1) BSOs increase the odds of implementation of new products and process in enterprises, but their impact will be different<br>(2) Most effective are training and consulting centres and financing organizations, because stimulate the implementation of new products   |           |          |
| <b>Future research</b>                  | The reason for using lower innovation techniques despite the available support for innovation centres in the Greater Poland Voivodeship   |           |          |
| <b>Szczukiewicz and Makowiec (2021)</b> |   |           |          |
| <b>Title</b>                            | Characteristics and Specificities of Local Innovation Accelerators: A Case of Poland  | <b>C*</b> | <b>G</b> |
| <b>Purpose</b>                          | Outline the characteristics of Polish accelerators and their specificities, with the focus on the differences between public and private accelerators   | 0         | 1        |
| <b>H/RQ</b>                             | (1) What definitions of accelerators are present in the literature and what are the features that can distinguish them from business angels and incubators?<br>(2) What are the dominant components of private and public Polish accelerators and how do they compare?<br>(3) What are the characteristics that can be distinguished in Polish accelerators compared to American accelerators |           |          |
| <b>Data sources</b>                     | (1) Secondary data sources<br>(2) Literature review<br>(3) Polish Agency for Enterprise Development   |           |          |
| <b>Data processing</b>                  | (1) Descriptive analysis<br>(2) Content analysis  |           |          |
| <b>Results</b>                          | (1) The majority of the accelerators in Poland are publicly funded and accelerators avoid taking equity in accelerated start-ups<br>(2) This is an effect of the competition from public accelerators, which offer a sizable equity-free grant of 200,000 PLN   |           |          |
| <b>Future research</b>                  | (1) Analyse operating models of accelerators in other countries of the block<br>(2) Analyse trajectories of accelerated start-ups   |           |          |
| <b>Lewandowska (2011)</b>               |   |           |          |
| <b>Title</b>                            | Venture capital and business angels and the creation of innovative firms in Poland  | <b>C*</b> | <b>G</b> |
| <b>Purpose</b>                          | Discussion and description of innovation as a strategic tool that helps companies be more competitive and also supports GDP growth with respect to investor business angels   | 0         | 1        |
| <b>H/RQ</b>                             | None  |           |          |
| <b>Data sources</b>                     | (1) Secondary data sources<br>(2) Polish Private Equity Association<br>(3) European Business Angel Network<br>(4) Polish Agency for Enterprise Development.   |           |          |
| <b>Data processing</b>                  | Descriptive analysis  |           |          |

**Table 3.** Continued

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|                        |  |
|------------------------|--|
| <b>Results</b>         | (1) Innovation can be the main driver of faster growth of competitiveness of Polish companies<br>(2) Business angels provide entrepreneurs with knowledge, know-how, business contacts and are actively involved in the operation of the company, which is also one of the "engines" of the company's innovation.<br>(3) Incubators help innovative companies to take an active part in economic processes on a global scale |
| <b>Future research</b> | Identification and analysis of funds used by the Polish government to support the sector of research and development, respectively innovation with emphasis on the use of European solutions, i. e. European Union funding   |

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Note: H/RQ: Hypotheses/Research questions; C: Number of citations; G: Generation; BSOs: Business Support Organizations; VC: Venture capital; CF: Crowdfunding; \*based on Google Scholar.

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## The co-operative enterprise business model on the Polish market

**JEL Classification:** *D21; M21*

**Keywords:** *business model; cooperatives; investor owned firms; tax payers; value added*

### Abstract

**Research background:** The history of cooperative enterprises in Poland dates back to the middle of XIX century. Despite the long history after the transformation of the central economy into a free market economy the cooperative branch in Poland is drastically diminishing.

**Purpose of the article:** The aim of the article is to analyse enterprises based on the cooperative and the commercial business models in terms of their economic results and their social functions.

**Methods:** The article is of theoretical and empirical nature. The theoretical part includes the overview of the two business models. The empirical part consists of a study containing two independent elements. Both were based on the method of analysing financial reports, available on the Polish Ministry of Finance and The National Court Register (Krajowy Rejestr Sądowy - KRS) websites. The MS Excel 2016 and applications for creating and reading financial reports by e-KRS were used.

**Findings & Value added:** The results of the first empirical study have confirmed the usefulness of the biggest payer rankings in comparing the economic results of the enterprises based on cooperative business model (CBM) and commercial business model. The results of the second empirical study have shown that applying the criterion of value added in CBM allowed for determining the degree of their social utility. Economic results of the chosen enterprises based on the CBM model turned

out to be similar to those of commercial business model but higher in terms of social utility. The presence of the cooperatives among the biggest tax payer group in Poland confirms their economic results. Social utility was confirmed by gross value added (GVA) distribution structure, which included i.e. participation of members, employees, local budgets and governmental budget. The research, conducted in Poland, covered cooperatives operating only in one country. Therefore, the results may be affected by a cultural factor.

## **Introduction**

The initial aim of an enterprise was to fulfill the basic human needs for goods and services necessary for survival and development.

The article defines the economical and social role of enterprises operating on the Polish market based on the business models. To highlight the specificity of CBM enterprises, the research results were juxtaposed with the results of the commercial enterprises. The premise of this paper reads that enterprises based on CBM achieve economic results comparable to those of commercial enterprises while also realizing the social functions in a broader sense. The nature of the article is theoretical and empirical. The theoretical part contains reflections on the business model notion as a whole and introduced the co-operative business model. Its specific features were highlighted in comparison to the commercial business model (specifically, with IOF- investor owned firm model). In the empirical part, authors explored the cooperative in a twofold manner. An analysis of the cooperatives' rankings (CMEs in the group of economic entities with a yearly income higher than 50 mln Euro) was performed. Secondly, the analysis of the internal revenue and expenses ratio as well as of the structure of the added value created in CMEs followed and was compared to the commercial firms. Finally, the last section includes conclusions.

It is generally assumed that a business model consists of four basic elements (Johnson, Christensen, Kagermann, 2008). The first one is a consumer value proposition (CVP), which refers to a certain value or profit which the business model offers through its products or services. The second element is the profit formula – the way in which the business generate profits and stay competitively priced. The third element contains “key resources”, which the business will need to realize its CVP. The fourth element indicates the key processes needed to deliver the CVP. Those include the rules, policies, key effectiveness measurements and the business culture. These four elements constitute “competitiveness blocks”, impacting

the configuration of the product, the profit formula and the resources (Osterwalder et al., 2005; Johnson et al., 2008).

In Polish literature, business model definition is formulated as a compilation of business' strategic concept with the technology of its realization, understood as a creation of a value chain, allowing for an effective exploitation of the resources and skills renewal.

Although the business model was widely described in literature, the business model of cooperative enterprises is a topic undertaken by a few authors ( Heflebower,1980; Pacelli, Pampurini, Sylos, Labini, 2019; Arnaud, 2008).

What differentiates the cooperative business model from the commercial one is a different understanding of the human being. The cooperative model is based on a human defined as a social creature (*zoon politikon*), whereas the commercial model is based on a concept of a human as an economically rational creature (*homo oeconomicus*). Therefore, in a business model of a cooperative none of the members is encouraged to maximise the capital value of an enterprise (Arnaud, 2008).

In the light of hitherto reflections on the cooperative business model, one can understand the cooperative as a "unique business model" (Mazzarol, Limnios, Reboud, 2011). Its uniqueness is easy to note while comparing its key elements with the ones of a commercial model of companies owned by an investor (Table 1).

A key starting point for understanding a co-op business model is its „purpose” for which a „member value proposition“ (MVP) needs to be developed (Mazzarol, Limnios, Reboud, 2011). It entails the strategy of a maximisation of members' well-being, whereas in IOF it is the profit maximisation strategy. Finally, it results in a different corporate governance and a different commitment of members and diversity. Further research led to the development of a business model in which, in addition to cooperatives, mutual enterprise business was included (Mazzarol, Clark, Reboud, Liminos, 2018). The concept of CME (Co-operative Mutual Enterprises) helps to unite the otherwise disparate co-operatives and mutual enterprise sectors (Yeo, 2002).

Despite the differences between mutual enterprises and cooperatives, the key features and principles that define both forms of enterprise have much in common, including free membership, democratic governance and limited profit sharing. The profit of a mutual enterprise can be shared among the owners / members, usually as discounts or special offers. Nonetheless, the main part of the company's profit is invested to improve services, finance the development of the business, or to increase its own funds (Archambault, 2009).

Contrary to the differences between mutual enterprises and cooperatives, which can be considered insignificant, the differences between CMEs and Investor Owned Firms are quite fundamental and result from their foundational principles and priorities.

The CME is not a solution to all economic or social problems, and it does not replace the IOF business model. It is also a complex enterprise to manage due to the hybrid nature of its strategic purpose, and the democratic nature of its governance. Certainly, it is an alternative for the capitalistic way of producing consumption. CMEs business model, however, in some cases, was a barrier in adjusting to market changes (Birchall, 2014).

### **Research methodology**

The aim of this study is to prove that the cooperative business model is functioning well on the market, both in terms of its social and economic functions. Achieving the aim of this study demands an analysis of the cooperative and commercial enterprises functioning on the market. It is assumed that this aim will be achieved if proven that the enterprises realising the cooperative businesses are amongst the biggest enterprises in Poland and the division of the profit generated by them is beneficial for the stakeholders - both members and employees. The realisation of this study is two-fold.

In the first research part an analysis of CMEs in the biggest tax payers in Poland was performed. Cooperatives, as legal entities, submit tax returns. The Public Information Bulletin publishes the data of the tax payers whose revenue value exceeds 50 mln euros.

The second part of the research is an analysis of the relation of revenues and costs as well as the structure of added value in CMEs compared to other entities from the list with a similar level of revenues. In this part of the study, the results presented in the financial statements of selected companies, were analyzed.

Both elements of the study were based on the method of analyzing financial documents available on the governmental platforms of the Ministry of Finance and the National Court Register (KRS). Excel 2016 programs and applications for compiling and reading e-KRS financial statements were used.

Therefore, both research parts concern this element of the business model, which specifically indicates estimated cost & profit potential. In case of CMEs it is "offering higher prices to suppliers & lower prices to

customers", and for IOFs it is "reducing supplier costs & targeting premium price customers".

Reflecting on the hybrid nature of the CME, the business model framework seeks to map both economic and social performance through the generation of both economic and social capital outcomes. The comparison from Table 1 indicates a "cost guillotine" in IOFs and a slice of benefits in CMEs. The measure and criterion for the evaluation of the results of cooperative enterprises are positive economic effects in the form of gross value added (GVA). This measure, as depicted in Figure 1, is broader than the profit by additional components of interest to members and employees in the form of salaries, social insurance contributions, dividends. Thus, the largest group of stakeholders.

## **Results**

The presence of CMEs among the largest taxpayers in Poland confirms the economic effectiveness of this business model under market conditions. Taxes are paid based on income, so if CMEs pay taxes, they make a profit, thus meet the economic criteria of the market as commercial entities.

In the first part of the study, CMEs entities were selected from the lists of the largest taxpayers in Poland. On each of the eight lists (from 2012 to 2019) of taxpayers with revenues exceeding 50 million euros, there were between 2 and 3 thousand companies representing various industries in Poland. CMEs accounted for less than 2%. In the last two years, among 2,717 and 2,801 entities in total there were 44 - 45 CMEs. These were mainly cooperative banks, mutual insurance companies, dairy cooperatives, food cooperatives, labor cooperatives, housing cooperatives, and agricultural cooperatives.

Over the years 2012-2019, the number of CMEs entities among the largest taxpayers in Poland increased systematically. Individual entities have stabilized their position. Especially since 2016, there has been a significant increase in the number of CMEs entities. In 2016, there were 28 of them, and in 2017 as many as 41. The reason for the increase in the number of enterprises based on a cooperative business model and earning revenues over 50 million euros was beneficial economic situation in Poland. CMEs were able to take advantage of the favorable macroeconomic conditions and stabilized their position on the market. Dairy cooperatives have a particularly stable position here, but also the strengthening of cooperative banks and mutual insurance companies, which compete with commercial entities in the banking and financial sectors, is visible. In the analyzed peri-

od, two food cooperatives PSS “Społem” and one housing co-operative found their place in the ranking. In 2018, one manufacturing cooperative and one from the fuel sector also appeared among the largest taxpayers. This proves the great potential of the cooperative business model and the possibility of effective implementation of this model in an increasing number of enterprises.

The second study compares the economic performance of CMEs and commercial enterprises in a given industry. Representing the trade industry is PSS Społem in Białystok and Jeronimo Martins S.A., and representing the banking sector – BS Ostrów Mazowiecka and Bank BGŻ BNP Paribas S.A., representing the dairy sector is the District Dairy Cooperative in Gostyń and Polmlek Raciąż sp. In this part of the study, the financial statements of the afore-mentioned companies were analyzed. Their internal content was examined in terms of participation in the GVA of members, employees, local and state budgets. The e-KRS platform, where companies submit their reports, was used for this purpose. In the case of cooperatives in the commercial sector, the share of employees by salaries and social insurance is 83.46%, the share of cooperatives by profit is 5.90%, by amortization 7.54%, and the budget is by taxes 3.1%. In comparison, in a commercial company in this industry, the share of employees by wages and social security is 46.97%, the share of cooperatives by profit is 28.07%, by amortization - 13.37%, and the budget is by taxes - 11.6%.

Also in the case of enterprises from the dairy industry, the distribution of the added value from the point of view of employees and members is more favorable in cooperative enterprises. Their share of GVA in value added is over 76% compared to commercial enterprises, where employees use 62% of GVA. A diametrical difference can also be seen in the proportion of profit to GVA, in commercial enterprises it is over 20%, and in CMEs - 2%).

With regard to the third group of compared enterprises, the analysis of the structure of the value added of banks does not show such significant differences in the share of individual groups in the use of the added value. It is worth emphasizing that in this case the difference concerns deposit holders treated differently in both forms of banks. In the case of cooperative banks, they are usually also members of the cooperative. Therefore, if we consider their merger as entitled to dividend members of the cooperative with working members of the bank, their share is almost 60%. In commercial banks, on the other hand, customers who place their money are only investors - owners of deposits. Their share in value added in the analyzed bank was 35%.

The results of the study confirmed the thesis that the economic results of CBM were not lower than those of commercial enterprises. This was proved by the first level of the study showing the presence of cooperatives among the largest taxpayers in Poland. On the other hand, the study of the GVA structure showed the superiority of the social efficiency of CMEs through a more even structure of the distribution of the value generated and a much wider circle of participants.

Further research ideas include further research on CMEs, as those, like SMEs, face similar barriers in development. Globalization deprives them of their place on the market. It is also worth exploring the GVA structure in the light of the stakeholder theory.

## **Conclusions**

The results of the study confirmed that CMEs entities coexist on the market with commercial entities, including those that achieve the highest turnover in the Polish economy, contributing to its development.

This proves that cooperative's business model is economically and socially useful in a market economy. Cooperatives are among the largest taxpayers in the Polish economy. Moreover, enterprises based on a cooperative business model meet social needs better than commercial enterprises. This is confirmed by the comparison of the use of the value created by individual groups of stakeholders. In CBM, the GVA usage structure ensures greater participation of members, employees and the local community (local and state budgets) than is the case of commercial enterprises.

In the light of the literature analysis on business models, the main elements of CBM appear to be opposed to the business model of commercial enterprises, for instance maximizing members' benefits versus maximizing profit. The results of empirical research confirmed the value of CBM for economic and social development.

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## Annex

**Table 1.** The Business Models of the Co-operative and Investor Owned Firm

| Key Business Model Elements              | Investor Owned Firm   | Co-operative  |
|--|---|---|
| Identifying purpose                      | Focusing mission on outcomes for investors  | Embedding mission and co-operative principles to meet member needs                      |
| Articulating the value proposition       | Satisfying customer needs & maximise shareholder returns                              | Maximising member benefits  |
| Identifying the market segments          | Targeting most lucrative opportunities  | Targeting areas of greatest member need   |
| Defining the value chain configuration   | Suppliers & customers are outsiders to the firm                                       | Suppliers & customers are owner-members of firm   |
| Estimating cost & profit potential       | Reducing supplier costs & premium price customers                                     | Offering higher prices to suppliers & lower prices to customers                         |
| Defining position within the value chain | Blocking substitution threats & form strategic partnerships with complementary actors | Blocking substitution threats & form strategic partnerships within the co-op membership |
| Formulating a competitive strategy       | Exploiting future opportunities with existing resources                               | Offering members best value   |

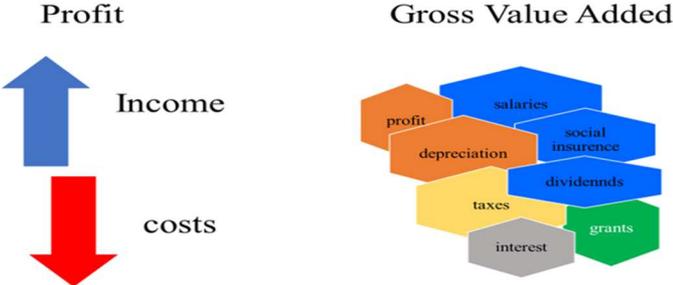
Source: Mazzarol, Clark, Reboud, Liminos, (2018), p.12.

**Table 2.** CBM entities among the largest taxpayers in Pland in 2012-2019

| clas | Total number of taxpayers | The number of CBM entities |       |       |           |      |         |       |              |       |
|------|---------------------------|----------------------------|-------|-------|-----------|------|---------|-------|--------------|-------|
|      |                           | total                      | dairy | banks | insurance | food | housing | labor | agricultural | other |
| 2019 | 2801                      | 44                         | 19    | 15    | 5         | 2    | 0       | 1     | 1            | 1     |
| 2018 | 2717                      | 45                         | 19    | 16    | 5         | 1    | 1       | 1     | 1            | 1     |
| 2017 | 2516                      | 41                         | 21    | 12    | 5         | 1    | 1       | 0     | 1            | 0     |
| 2016 | 2343                      | 28                         | 16    | 5     | 5         | 1    | 1       | 0     | 0            | 0     |
| 2015 | 2244                      | 23                         | 15    | 2     | 4         | 1    | 1       | 0     | 0            | 0     |
| 2014 | 2095                      | 24                         | 17    | 2     | 3         | 1    | 1       | 0     | 0            | 0     |
| 2013 | 1989                      | 24                         | 17    | 1     | 4         | 1    | 1       | 0     | 0            | 0     |
| 2012 | 1758                      | 26                         | 16    | 3     | 4         | 1    | 1       | 0     | 0            | 0     |

Source: own study based on The Ministry of Finance data, <https://www.gov.pl/web/finanse/indywidualne-dane-podatnikow-cit>

**Figure 1.** Estimating cost & profit potential for IOFs and CMEs



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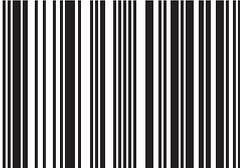
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