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The Influence of the Capital Market on Economic Growth in the USA

Abstract

This article analyzes the impact of the capital market on economic growth in the US with the use of annual data. The study covers the years 1975-2019. As part of the analysis, the construction and estimation of an econometric model was made using the GRETL program. The obtained results confirmed the statistically significant influence of the capital market on the economic growth in the USA.

***JEL classification**: G10.*

***Keywords**: capital market, economic growth, OLS, GARCH, GRETL*

***Paper type**: Theoretical research article*

Introduction

The capital market is an effective source of raising capital. In return for providing financial instruments, the issuer receives funds that can be allocated to the further development of the company, and the buyer of securities can invest the remaining capital in an investment that may bring profits in the future. From the issuer's perspective, the above solution is beneficial as its offer is addressed to a wide group of potential investors. On the other hand, investors usually have extensive knowledge of the issuer and the market in which it operates. Thus, they are able to make a rational

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assessment of the planned investment, the expected rate of return and investment trends in a given sector.

The capital market is a market for medium and long-term financial instruments, which means that the period of return on investment is distant in time in relation to the moment of capital transfer and is not less than 1 year. This specification is conducive to mobilizing large capital in the said market, which has a real impact on the processes taking place in the economy.

The concept of economic growth includes, on the one hand, economic effects, quantitative relations in the process of increasing inputs and productivity, and on the other hand, the mechanism of economic growth, and even social relations that keep the entire system in a normal state. Thus, the second part of the growth process consists of the functional structure and the system of social interest, as well as the institutional structure of the economy. In addition, changes in production over time must also be taken into account.

This article explores the relationship between the capital market and economic growth. The development of capital markets and their impact on the economy is a topic of public discourse. In its context, extreme views arise and conflicting arguments are presented. On the one hand, it emphasizes the negative impact of financial development, which increases economic instability, and on the other hand, emphasizes its positive impact on productivity in the most efficient way of allocating capital. Therefore, it is an extremely important question, especially since the financial crisis of 2007-2011 managed to shake the good perception of the positive effects of the functioning of the capital market.

The aim of the article was to examine the degree of impact of capital market development on economic growth in the USA in the long term. The time horizon of the work covers the years 1975-2019. The research was based primarily on the results of a critical analysis of the literature on the subject. For this purpose, rich literature was used, as well as factual materials. The second stage was collecting the necessary statistical data and their selection. The third stage will include an econometric analysis based on the created econometric model, which will be subject to estimation.

1. The influence of the capital market on economic growth in the light of scientific research.

From the perspective of theoretical analysis, there is a relationship between the capital market and economic growth, as shown by the results of research on the relationship between the financial market and economic growth (Didier T., Levine R., Montanes R. L., Schmikler S. L., 2020, p. 1-16). Several theoretical assumptions can be distinguished regarding the confirmation

of the potential correlation between capital markets and economic growth (Zhao R., 2019, p. 62-65). Based on the extended theory of Q-Tobin W. Brainard, the increase in the level of investment is influenced by favorable conditions on the stock market. The authors justify the chosen method with the causality caused by higher share prices (Brainard W., Tobin J., 1968). According to B. Malkiel, the overall impact of stock exchanges on economic growth is a product of the wealth effect (Malkiel B., 1999). This leads directly to an increase in the level of consumption. In the literature on the subject, there are also indications that there is a positive interaction between the functioning economy and stock exchanges by increasing the credibility of companies on capital markets, with a simultaneous increase in the price of individual shares of a given company (Beck T., Levine R., 2004, p. 423-442).

As part of the exploration of the problem, the authors constructed an econometric model, which was then estimated on the basis of selected research methods (Stulz R., 2004, p. 146-147). A common element of a large part of the published research article is the analysis of the relationships discussed by selected groups of countries, including, inter alia, factors such as:

1. Maturity of the capital market;
2. Level of economic development;
3. Participation in the international community;
4. The current financial system.

The version of the prognostic model proposed by R. Levin and R.G. Kinga is the basic econometric model for analyzing the relationship between the development of financial markets and the economic growth of a group of countries. This is the regression model for economic growth shown in Equation 1 (King R. G., Levine R., 1993, p. 717-737).

Equation 1. Formula of economic growth regression model.

$$Y_{it} = \alpha_0 + \alpha F_{it} + \beta X_{it} + u_{it}$$

Where:

1. Y_{it}- is the real GDP growth rate per capita of i-th country in period t;
2. F_{it}- is an indicator of the financial development of i-th country in period t (ratio of non-financial private sector loans to total domestic loans, ratio of current liabilities of the financial sector to GDP, ratio of domestic deposits to assets and total domestic assets of banks);
3. X_{it}- represents a vector containing specific explanatory variables that are factors determining the economic growth of the i-th country in period t (relation of foreign trade turnover to GDP, relation of budget deficit to GDP, natural correlation of GDP per capita, government consumption to GDP).

The above model was estimated using the double least squares method. By replacing GDP per capita in the equation with other indicators, such as the rate of investment in GDP, the rate of capital per capita growth or the rate of increase in effectiveness per capita, it is possible to examine the impact of individual financial indicators development on the values of other variables. After analyzing a group of 80 countries with data from 1960-1989, the authors of the model use panel data to show that there is a relatively strong relationship between financial development and economic growth in individual countries (Caporale G. M., Howells P. G. A., Soliman A. M., 2005, p. 166-176).

The impact of capital markets on economic growth is not always positively correlated (Ang J. B., 2008, p. 39-40). In selected literature items it is indicated that the liquidity of buying and selling shares on capital markets may have a real impact on the weakening of corporate governance (Kozioł L., 2007, p. 216-220). This, in turn, may lead to a slowdown in economic growth (Peter L., Wachtel P., 2005). Despite ambiguous assessments of the impact of capital markets on economic growth, the vast majority of literature on the subject suggests a positive relationship between these factors (Ritter J., 2012, p. 8-18).

Over the years, different models of the impact of financial/ capital markets on the economies of different countries have been used (Jin D., Boubakari A., 2010, p. 14-20). Among the obtained results, a set of observed phenomena can be distinguished, which constitute the basis for the collective drawing of the following conclusions about the tested model:

1. Stock market capitalization has quite a strong positive and statistically significant impact on the growth of real GDP and real physical capital, indicating that firms need to make long-term investments in the real sector,
2. In the analyzed period, there was a statistically significant correlation between the development of financial markets and economic growth,
3. The relationship between total banks' assets and the exchange rate has a significant positive and statistically significant impact on the growth of real GDP.

2. Empirical analysis of the relationship between the capital market and economic growth.

In studies on the impact of capital market development on economic growth in the US, data from the following databases was used:

1. World Bank;
2. Bureau of Economic Analysis.

For the needs of the empirical analysis, annual data from the period 1975-2019 were obtained. Data from previous years were not included due to the full availability of data obtained from 1975 for the purpose of econometric analysis. Data after 2019 were not analyzed due to the lack of published selected statistical data from recent years, which would have resulted in additional exclusion of other variables. It was decided to analyze the data presented in annual intervals due to the fact that the influence of the business cycle was not taken into account in this study.

The following statistical data was used:

1. GDP- Gross Domestic Product;
2. CAPINV- capital investments;
3. HOUCON- consumption of households;
4. EX- export of goods and services;
5. IM- import of goods and services;
6. FOREXRG- foreign exchange reserves, including gold;
7. GOV- government expenditure;
8. KAP- stock market capitalization;
9. NUMCOM- number of listed companies;
10. POP- number of population;
11. SAV- savings.

The obtained financial data was made uniform, adopting the US dollar as the unit of account. In addition, the deflator (2015) was applied to them in order to obtain real values, which is of key importance when analyzing data in a long time horizon. Moreover, the collected data for the purposes of calculations was transformed into a logarithmic form.

The basic econometric model for studying the relationship between financial development and economic growth is the version of R. Levin and R.G. King's regression model of economic growth by R. Barro (Filipowicz K., 2019, p. 18-35). The model will serve as a reference point for building your own model examining the relationship between the capital market and economic growth. The necessary calculations were made using the GRETL program. The natural log of real GDP was used as the dependent variable.

As a result of the activities carried out, a model was constructed to study the impact of the capital market on economic growth in the USA.

Equation 2. Author's econometric model examining the influence of the capital market on economic growth in the USA.

$$lnGDP_t = a_0 + a_1 lnFOREXRG_t + a_2 lnKAP_t + a_3 lnNUMCOM_t + u_t$$

Where:

lnGDPt- stands for the natural logarithm of the real Gross Domestic Product

lnFOREXRGt- is the natural logarithm of real foreign exchange reserves, including gold
lnKAPt- is the natural logarithm of real stock market capitalization
lnNUMCOMt- is the natural logarithm of the number of listed companies

A backward stepwise regression approach was used when building the model. The estimation of structural parameters by the method of least squares depends, among others, on from the favorable properties of the estimator obtained from CLRM (Gruszczyński M., Kuszewski T., Podgórska M., 2009, p. 17-19). Therefore, the OLS model was estimated, the results of which are presented in Table 1.

Table 1. The results of the OLS model estimation.

OLS, using observations 1975-2019 (T = 45) Dependent variable: l_GDP HAC standard errors, bandwidth 2 (Bartlett kernel)					
name	**coefficient**	**std. error**	**t-ratio**	**p-value**	**significance level**
const	2,08829	0,279711	7,466	3,65e-09	***
l_FOREXRG	0,298508	0,0421011	7,090	1,23e-08	***
l_KAP	0,515628	0,0292211	17,65	9,27e-021	***
l_NUMCOM	0,0818444	0,0357097	2,292	0,0271	**
Mean dependent var		8,540947	**S.D. dependent var**		1,083214
Sum squared resid		0,327532	**S.E. of regression**		0,089379
R-squared		0,993656	**Adjusted R-squared**		0,993192
F(3, 41)		4348,148	**P-value(F)**		2,42e-51
Log-likelihood		46,91146	**Akaike criterion**		−85,82293
Schwarz criterion		−78,59628	**Hannan-Quinn**		−83,12891
rho		0,228919	**Durbin-Watson**		1,535212

White's test for heteroskedasticity -
Null hypothesis: heteroskedasticity not present
Test statistic: LM = 9.25258
with p-value = P(Chi-square(9) > 9.25258) = 0.414293

Test for normality of residual -
Null hypothesis: error is normally distributed
Test statistic: Chi-square(2) = 13.8596
with p-value = 0.000978186

Test for ARCH of order 1 -
Null hypothesis: no ARCH effect is present
Test statistic: LM = 0.596625
with p-value = P(Chi-square(1) > 0.596625) = 0.439869

*** - the variable is significant at the significance level of 0.01,
** - the variable is significant at the significance level of 0.05,
* - the variable is significant at the significance level of 0.1.
Source: Own study based on the GRETL program.

As it results from the tests performed, in this estimation there is heteroscedasticity and the ARCH effect occurs. While the p-value for the test for the normality of the distribution of residuals is below 0.01, the distribution of the empirical distribution indicates the existence of an abnormal distribution of the model residuals (the so-called long tail). Thus, with this estimation method, the model does not meet the classic regression assumptions. Attempts to estimate the model using the Cochran-Orcutt, Prais and GLS methods did not give positive results in the tests.

The obtained results confirm that in the models estimated from financial series, the random components may not correspond to the assumption of the normal distribution. Hence, the least squares estimation is incorrect. In most cases, the variance estimates are incorrect, resulting in low power in commonly used tests. Therefore, it is necessary to look for a different estimation method in the problem under study (Maciejewska J., 2008, p. 534-536).

The GARCH model is a model used to predict the variability of financial time series due to the fat-tail phenomenon or aggregation of variance in the rate of change distribution. This can be explained by the presence of outliers in the financial time series. One-off phenomena are particularly important because they constitute a significant single deviation from the predicted value of the studied phenomenon only in one period and do not affect the series values in subsequent periods (Domańska S. A., 2020, p. 122-128). The GARCH estimation results are presented in Table 2.

Table 2. Model: GARCH estimation, observations used 1975-2019 (N = 45). Dependent variable (Y): lnRPKB. Standard errors of Quasi-Maximum Likelihood

GARCH, using observations 1975-2019 (T = 45) **Dependent variable: l_GDP** **QML standard errors**					
name	coefficient	std. error	z	p-value	significance level
const	2,08829	0,272457	7,665	1,79e-014	***
l_FOREXRG	0,298508	0,0336228	8,878	6,80e-019	***
l_KAP	0,515628	0,0240852	21,41	1,11e-101	***
l_NUMCOM	0,0818444	0,0342567	2,389	0,0169	**
alpha (0)	0,00727850	0,00224054	3,249	0,0012	***

Mean dependent var	8,540947	**S.D. dependent var**	1,083214
Log-likelihood	46,91146	**Akaike criterion**	−81,82293
Schwarz criterion	−70,98295	**Hannan-Quinn**	−77,78189

Unconditional error variance = 0.0072785

Test for normality of residual -
Null hypothesis: error is normally distributed
Test statistic: Chi-square(2) = 13.8596
with p-value = 0.000978186

*** - the variable is significant at the significance level of 0.01,
** - the variable is significant at the significance level of 0.05,
* - the variable is significant at the significance level of 0.1.
Source: Own study based on the GRETL program.

The model parameters can be estimated using the maximum likelihood method. This method allows for asymptotically effective parameter estimates to be obtained if the assumptions about the normality of the distribution are met. The quasi-maximum likelihood (QML) method is the standard method for estimating GARCH models. Moreover, this approach produces consistent parameter estimates even if the distribution is not normal (Fiszeder P., 2009, p. 21-24). Contrary to the results of the tests of the normality of distributions carried out with the use of OLS during model estimation, in the case of GARCH models, the phenomenological feature of financial data analysis in the form of time series is the so-called "Fat tails".

The analysis of the content of Table 2 shows that all explanatory variables are statistically significant and that there is quite a significant positive impact of changes in stock market capitalization on the volatility of the economic growth rate. Moreover, a slight positive effect of changes in the number of listed companies on the volatility of the economic growth rate is noticeable. Thus, it can be assumed that the conditions for confirming the positive impact of the capital market on the economic growth of the USA are met.

Conclusion

The empirical analysis confirms the dependence that the development of the capital market has a positive effect on economic growth in the USA. When interpreting the constructed model, it should be assumed that if the value of stock market capitalization increases by 1 percentage point, the value of GDP will increase by about 0.52 percentage point, assuming the stability of the other variables. If the number of listed companies increases by 1 percentage point, then the GDP value will increase by about 0.08 percentage point, assuming the stability of the other variables. In the event that the value of foreign exchange reserves (including gold) increases by 1 percentage point, then the value of GDP will increase by about 0.30 percentage point, assuming the stability of other variables.

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Development of small and medium-sized enterprises sector and the use of European Union structural funds in the Radom subregion

Abstract

The aim of the chapter was to analyze the use of European Union structural funds by the sector of small and medium enterprises in the Radom subregion. There was one hypothesis and one research question posed in the study. On the basis of literature studies, as well as the observation of economic reality, the SME sector for the Radom subregion was discussed, as well as the role of European Union structural funds in four programming periods.

The theoretical part includes a detailed author's questionnaire containing fifteen variables relating to the effects of implementing projects co-financed by EU funds on a group of 100 companies in the SME sector of the Radom subregion.

The paper contains results for a group of a national study conducted in September 2021 (100 enterprises) that used the method of Computer-Assisted Telephone Interview (CATI) are presented. The paper contains the author's original research into a representative group of SME's enterprises that can be generalised to the entire population.

JEL classification: D22, D24

Keywords: *Competitive potential of enterprise, structural funds, economic development, SME sector.*

Paper type*: Theoretical research article*

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Introduction

In the last 10 years, there have been far reaching changes in the global economy connected with the development of economies, liberalization of trade, fight against corruption and flows of production factors (especially capital), internationalization of economies and development of integration of European Union countries. As a result, a significant dynamics of small and medium enterprises sector importance growth may be observed.

The development of the SME sector is a resultant of the impact of various factors. On one hand external, on the other internal, among which an important role is played by financing business activity, especially access to external sources of financing. Therefore, it may be stated that it is undoubtedly related to the economic situation of start-ups and already operating SME sector enterprises. Often, however, small and medium-sized enterprises do not have significant equity capital, but they should because they are an important source and place in creating new jobs and stimulating economic growth of economies (Srhoj et al., 2021; Supun and Nadeeshika, 2021; Sava 2020; Bukowski, Siek, 2013).

On the basis of generally available Eurostat data, small and medium-sized enterprises constitute ca. 99% of over 18 million companies in the European Union. And in Poland this sector constitutes over 99.8% of the total number of enterprises operating on the market. The answer to gaining the investment capital are, among others, the activities of the European Union aiming at creating, stimulating and supporting an open and competitive economy by means of structural funds available for its members.

The available structural funds of the European Union are the largest in terms of amount of transferred funds for beneficiaries and the most important non-returnable financial support for Polish enterprises. The support from the European Union thanks to the availability of structural funds has enabled small and medium-sized organizational entities to open wide possibilities of development and competition in the global market, as a result of which the SME sector may be an attractive partner for the already existing as well as potential clients of the European Union.

Moreover, the aim of all the actions carried out in their scope is not only the necessity to adjust the level of the European Union member to the European standards, but also to ensure an even internal development of the country and to aim at levelling the disproportions between particular regions and sub-regions. It should be noted, however, that the analysis of already completed programmes or projects carried out within the framework of aid funds from the European Union structural funds indicates that the used strategies do not always guarantee an even increase in the level of regional development.

The literature presents many examples of the use of structural funds, their impact on investment, innovation, employment and sales and financial performance of the SME sector in different regions (Sandy and Fang, 2017; Lewandowska et al., 2015; Sońta, Markowska, 2015). Therefore, it is necessary to highlight how the mutual relationship of the use and impact of EU funds is shaped in creating, stimulating and supporting an open and competitive economy, ensuring an even internal development of the country and levelling disproportions between individual regions and sub-regions even on the example of a selected sub-region, which may be the Radom sub-region.

Therefore, based on the observation of economic reality, the following research question and one hypothesis were posed. The research question specified referred to the effects of projects co-financed from structural funds, i.e. which effects are most highly evaluated by the SME sector of the Radom subregion. The hypothesis assumed that the use of structural funds by the sector of small and medium enterprises in the Radom subregion is evaluated highly.

1. Small and medium-sized enterprises sector

In the modern economy, many organizational and legal forms of enterprises can be observed, the vast majority of which are SMEs (Wolak-Tuzimek et al., 2015). The enrichment of societies and the emergence of more and more individualised needs for products and services, global changes in the market through more efficient access to production factors, the increased importance of promoting culture and entrepreneurial attitudes among societies, as well as changes in the creation of missions, visions and strategies of enterprises, and the setting of goals have all contributed to the growth of the potential and economic strength of the SME sector as one of the categories of socio-economic growth (Chiapello, Lebas, 1996, p. 6).

Small and medium-sized enterprises were previously interpreted on the basis of a quantitative criterion, and it was only in 1996 that the European Commission issued Recommendation 96/280/EC concerning a uniform way of defining SMEs in order to standardize concepts (Maastricht Treaty), which was later replaced by a new recommendation numbered 2003/361/EC (Czarkowska, 2000, p. 215). Thanks to this Recommendation the members of the European Union could use the same definition of SMEs. The chosen way of defining SMEs was recommended as a necessary condition for applying concessions and preferences for entrepreneurs in the SME sector. Although this recommendation was not binding, all member states should feel obliged to strive to replace the existing

definitions with the definition recommended by the European Commission (Definition of SMEs).

The SME sector includes three categories of organizational and legal forms, i.e. (Biernacki, 2008, pp. 7-9):

- micro-enterprises whose average annual employment is less than 10 employees, whose annual net turnover from sales of goods, products and services and financial operations does not exceed the equivalent of EUR 2 million, and whose total assets as at the end of one of the last two years do not exceed the equivalent of EUR 2 million;
- small enterprises whose average annual employment is less than 50 employees, the annual net turnover from sales of goods, products and services and financial operations does not exceed the equivalent of EUR 10 million, and the total assets of the balance sheet drawn up at the end of one of the last two years does not exceed the equivalent of EUR 10 million;
- medium-sized enterprises which average annual employment is less than 250 employees, the annual net turnover from sales of goods, products and services and financial operations does not exceed the equivalent of EUR 50 million, and the total assets of the balance sheet drawn up at the end of one of the last two years does not exceed the equivalent of EUR 43 million.

However, it is important to underline the fact that the guidelines related to the interpretation of the SME sector are not unambiguous and uniform, as there is no generally recognised characteristic of enterprises in this sector. This category is usually subjective in nature and depends on the country of location and the country's affiliation to the EU communities (Biernacki, 2008, pp. 7-9). For example, in the United States of America the definition of SME sector entities is determined by the government department Small Business Administration Size Standards Office. In this case, the quantitative criteria are applied individually for each industry, which gives more tailored standards to the specifics of the selected company (U.S. Small Business Administration). In Canada, on the other hand, the SME sector is defined from an accounting and tax perspective (Biernacki, 2008, pp. 7-9).

Multifaceted characterization and classification is difficult due to the large number of various factors affecting their differentiation. One of the basic criteria for the classification of enterprises is their size. It is a quantitative category, but changes in size lead to qualitative transformations. Figure 1 shows the criteria used most often in practical definitions of classes of companies by size.

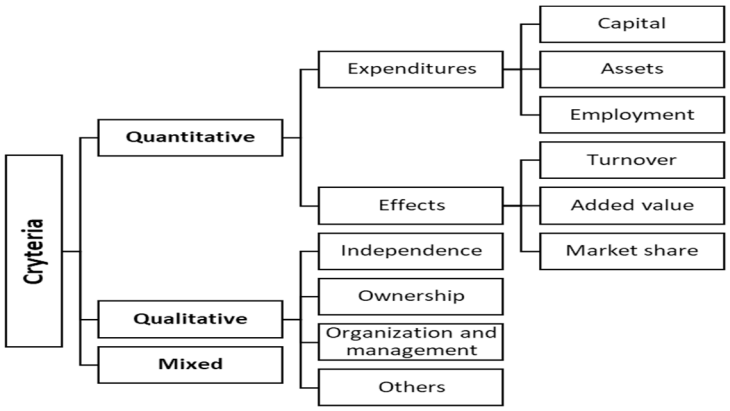

Figure 1. ***Most commonly used criteria in practical definitions of classes of firms by size***
Source: own elaboration based on: (Dominiak, 2005, p. 28.)

The definition of an SME is based on three criteria: quantitative, qualitative and mixed. The quantitative criteria for assessing the size of an enterprise can be either inputs or outputs. An enterprise can be small (large) because it involves low (high) inputs or it can have low (high) outputs. Of the input criteria, employment and capital or assets are the most commonly used. Qualitative criteria are extremely valuable in identifying the essence of an enterprise. These include: independence, ownership, organisation and management. Mixed criteria are a combination of selected qualitative and quantitative criteria. Therefore, when defining the SME sector, it is also recommended to use three sets of criteria: quantitative, qualitative and mixed.

2. The role of the European Union Structural Funds

The policy of the European Union implements a number of actions aimed at strengthening the importance of this SME sector on the market. Support for SMEs can take various forms such as loans, grants and in some cases collateral. Moreover, both direct support is available, or through programs managed at the national and regional level, such as programs funded by the EU structural funds (Szymańska, 2017, p. 318). Among the structural funds, the European Regional Development Fund (ERDF) and the European Social Fund (ESF) are the largest of the Community funding instruments supporting SMEs through various thematic programmes and Community initiatives implemented at the regional level. The beneficiaries of structural funds receive funding for the implementation of their projects (Vita, 2017, p. 997).

The funds provide a kind of guarantee for budget expenditure on approved objectives. The EU primarily co-finances regional policy programmes,

the so-called Operational Programmes, i.e. multi-annual activities aimed at achieving a given regional policy objective (Dynia, 2006, p. 196). The Structural Funds have become a resultant of achieving specific goals resulting from common policies. At the initial stage of development all funds functioned independently of each other and were intended to serve purposes other than solving structural problems, which accumulated during the later development of the European Communities. The Structural Funds by programming period are shown in Table 1.

Table 1. Structural Funds by programming period

2004-2006	2007-2013	2014-2020	2021-2027
European Social Fund (ESF)	European Regional Development Fund (ERDF)	European Regional Development Fund (ERDF)	European Funds for Infrastructure, Climate, Environment (FEnIKS)
European Agricultural Guidance and Guarantee Fund (EAGGF)	European Social Fund (ESF)	European Social Fund (ESF)	European Funds for Modern Economy (FENG)
European Regional Development Fund (ERDF)			European Funds for Social Development (FERS)
Financial Instrument for Fisheries Guidance (FIFG)			European Funds for Digital Development (FERC)
			European Funds for Eastern Poland (FEPW)

Source: own elaboration based on: (https://www.funduszeeuropejskie.gov.pl/)

While the structural funds of the first three programming periods are known, it is appropriate to discuss the structural funds of the fourth programming period. A brief analysis of the Structural Funds for the fourth programming period is given in Table 2.

Table 2. Structural Funds characteristics of the fourth programming period 2021-2027

Programme	Purpose	Beneficiary
FEnIKS	• building an efficient and resilient transport system, • the completion of sections of the TEN-T core network by 2030, • decarbonisation of the economy, • improving transport safety, • improving the resilience of the health system, • strengthening the role of culture in social and economic development, • ensuring equal access to health care.	• energy service providers, • cultural institutions, • health care institutions, • local government units, • churches and religious associations, • NGOs, • State Fire Department, • State budget units and public administration, • entities providing public services as part of their own responsibilities of local government units, • entities managing airports and seaports, • enterprises, • emergency services, • residential building owners, • managers of national roads and railways.
FENG	• develop skills for smart specialisation, industrial transformation and entrepreneurship, • transformation of economy towards Industry 4.0 and green technologies • increasing the competitiveness of SMEs, • Strengthen research and innovation capacity and the use of advanced technologies.	• financial institutions • business environment institutions, • consortia of entrepreneurs with research organisations, • consortia of entrepreneurs, • innovation centres, • enterprise centres, • enterprises, • science sector.

Table 2. cd

FERS	• training of personnel for the economy, • improving access to public services, • improving the professional and social situation of people with disabilities, • developing social and civil dialogue, • Support for implementation of social policy in the field of social integration, social services and social economy, • strengthen the health and education systems, • increasing access to childcare for the youngest children, • Improve the quality of services provided by public employment services, • increase the use of social innovation, including in the provision of public services.	• government administration, • scientific units, • local government units, • NGOs, • people with disabilities and their families, • social partners, • facilities and entities of the health care system, • entrepreneurs, • parents of children under 3 years old, • colleges.
FERC	• building a gigabit society in Poland, • developing a data-driven economy using the latest digital technologies, • development of cooperation for creating digital solutions to socio-economic problems, • provision of advanced e-services enabling full electronic handling of citizens' and entrepreneurs' matters (level 4 and 5 of e-services maturity), • support for the development of advanced digital competencies, including in the area of cybersecurity for local government units and entrepreneurs, • ensuring cyber-security through support under a new dedicated area of intervention.	• public administration, • cultural institutions, • NGOs, • medical entities, • entities of the higher education and science system, • entrepreneurs.

Table 2. cd

FEPW	• Strengthening the settlement attractiveness of cities and improving the quality of life of inhabitants in the era of climate change, • strengthening the competitiveness and innovation of enterprises, • increasing the use of the potential of tourism and spas for development, • Increase transport accessibility of the macro-region.	• local government units with the status of a health resort or health protection area • local government units, • cities of the macroregion - urban transport organisers • micro, small and medium enterprises operating or intending to operate in the macro-region, • non-governmental organisations and their partnerships • innovation centres, • PKP PLK S.A. • PKP S.A. • entities providing public services as part of the tasks of local government units, • enterprises - entities providing sanatorium or spa services and health treatment facilities • energy companies, • managers of public facilities.

Source: own elaboration based on: (https://www.funduszeeuropejskie.gov.pl/)

The presented EU funds together model the regional policy of the European Union. Each structural instrument contributes in an appropriate way to the objectives of cohesion policy: convergence, regional competitiveness and employment, and European territorial cooperation (Kuciel, 2016, p. 216).

3. The use of European Union structural funds in the Radom subregion

In order to verify the use of European Union structural funds in the Radom subregion, a survey on a group of 100 enterprises from the SME sector was used. For the survey were qualified only those companies that meet two conditions, ie:

- Running a business in the Radom subregion
- Benefiting from the aid offered by the European Union in the form of structural funds during the period of activity.

The surveyed companies had to evaluate fifteen achieved effects of projects co-financed from EU funds, which were selected on the basis of the literature analysis. The obtained assessments were registered on ten-point ordinal scales, where 1 meant a low achieved effect, while 10 meant a high achieved effect. Only the first three programming periods were analysed, i.e. 1st period

(2004-2006), 2nd period (2007-2013) and 3rd period (2014-2020), which is presented in Table 3 and Figure 2, where measures of central tendency were used.

Table 3. Descriptive statistics of observable variables concerning the evaluation of the effects achieved as a result of projects co-financed from the EU funds in the Radom subregion

Variable number	Observable variables	Descriptive statistics	
		Average assessment of the impact of the use of structural funds by SMEs in the Radom subregion	Standard deviation of the impact assessment of the use of structural funds by SMEs in the Radom subregion
V1	Increase in expenditures on fixed assets	5.52	1.65
V2	Increase in outlays on investments in human capital	5.47	1.67
V3	Increase in IT development expenditures	5.54	1.84
V4	Increase of the company's equity	6.88	1.92
V5	Increase in outlays on R&D activity	7.07	1.99
V6	Changes in marketing activities	7.27	1.96
V7	Purchase of patents, licenses	7.50	2.09
V8	Introduction of organisational innovations	6.03	1.66
V9	Improving the quality of products/services	6.21	1.37
V10	Introduction of new products/services	5.80	1.70
V11	Creation of new jobs	5.88	1.47
V12	Increase employment levels	5.70	1.71
V13	Total sales growth	6.21	1.11
V14	Increase in domestic sales	6.34	1.98
V15	Export growth	5.50	1.83

Source: own elaboration.

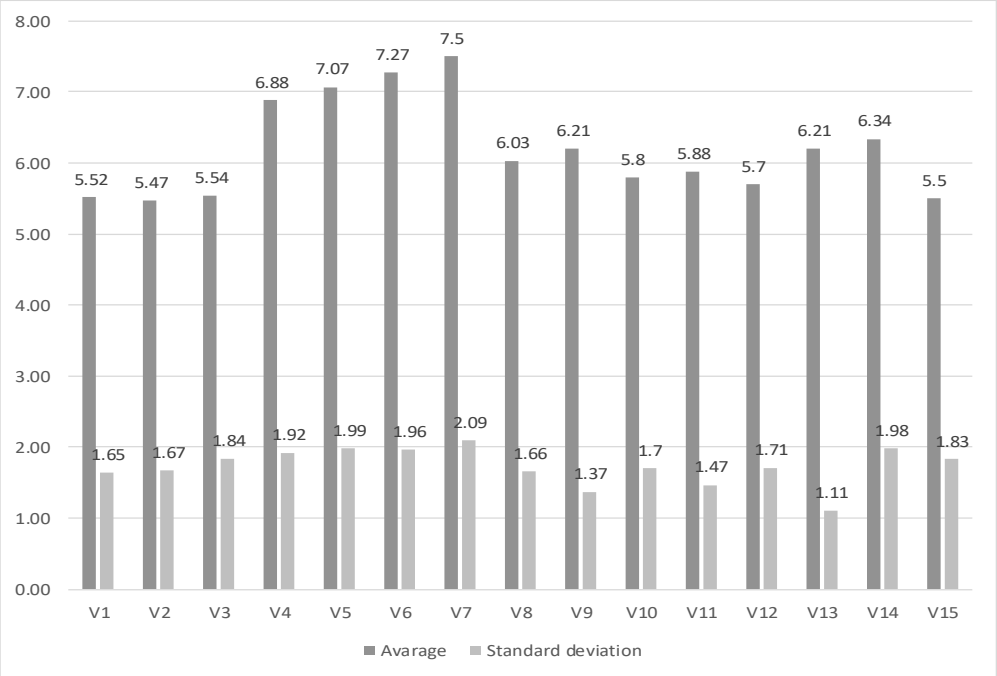

Figure 2: Descriptive statistics of observable variables concerning the evaluation of the effects achieved as a result of projects co-financed from EU funds in the Radom subregion
Source: own elaboration.

On the basis of the analysis of the information from the questionnaire survey it was possible to observe that for all variables concerning the evaluation of the effects achieved as a result of projects co-financed from EU funds in the Radom subregion, the average scores exceeded the value of 5.40 and were in the range <5.47; 7.50>. It only proves that all examined variables were rated "very high and coherently". The highest average values were obtained by variables No. V7 (Purchase of patents, licences), V6 (Changes in marketing activities) and V5 (Increase in R&D expenditure) and V4 (Increase in enterprise equity), for which the average values were 7.50; 7.27 and 7.07 and 6.88 respectively. On the other hand, definitely the lowest average values, although high anyway, were obtained for the following variables: Increase in investment expenditures on human capital, Increase in exports and Increase in fixed assets and Increase in IT development expenditures, for which the average values amounted to 5.47, 5.50 and 5.52 and 5.54 respectively.

On the other hand, when analysing the obtained scores in terms of standard deviations of the effects achieved as a result of projects co-financed from EU funds in the Radom subregion, they fell within the range <1.11; 2.09>. In view of the ten-degree scale, the results of standard deviations were stable. Among the examined variables the lowest diversification of answers was observed for variables V13 i.e. Total sales increase, V9 i.e. Improved quality of products/services and V11 i.e. Creation of new workplaces, for which the results of standard deviations were 1.11 and 1.37 and 1.47 respectively. It should be noted that the same variables obtained one of the highest average scores in the conducted research. On the other hand, variables V7 i.e. Purchase of patents, licenses and V5 i.e. Increase in R&D expenditures and V14 i.e. Increase in domestic sales, for which the standard deviation scores were 2.09 and 1.99 and 1.98 respectively. It is also worth mentioning that the same variables obtained some of the lowest average scores in the conducted research. Thus, we can see a tendency, that for variables evaluated better the variation of grades is small, and for variables evaluated worse the variation is large.

Conclusion and recommendatons

This chapter analyses the use of European Union structural funds in the Radom subregion by the SME sector. Regional development itself includes many aspects of human life, such as economy, technology or ecology. It also undoubtedly refers to the communities living in a given territory. Therefore, it is important to ensure sustainable regional development in the context of existing social needs. One of the main elements contributing to raising the level and pace of regional development is the use of assistance offered by the European Union in the form of structural funds. Poland's accession to the EU community in 2004 made it possible to take advantage of all kinds of "facilities" in this respect, mainly as beneficiaries of numerous European programmes and funds, from which impressive amounts in the form of subsidies made it possible to significantly accelerate development processes both in the whole country and its individual regions.

The analysis of the results in terms of the existing state gives a picture of a situation that shows great interest and far-reaching benefits that result from the use of aid offered to members of the European Union. On the basis of the survey carried out, the following conclusions can be drawn that the examined effects were dominated by factors related to the growth of innovativeness among enterprises, such as the purchase of patents, licenses, changes in marketing activities, the increase in expenditure on R&D activities) and the increase of financial capabilities, i.e. the increase in the enterprise's own capital, or the increase in general and domestic sales.

The above results of the research also indicate the validity of the research hypothesis, which stated that the use of structural funds by the sector of small and medium-sized enterprises in the Radom subregion is rated high, because for all variables concerning the evaluation of the effects achieved as a result of the implementation of projects co-financed from EU funds in the Radom subregion, the average ratings exceeded the value of 5.40 and were in the range < 5.47; 7.50>.

It seems that the conducted analysis has provided sufficiently significant conclusions to constitute a starting point for further analyses in this area. In the coming years, in spite of the ongoing unfavourable economic situation related to inflation, further use of aid offered by the European Union in the form of structural funds should be expected. The current evaluation of the situation is objective in nature; however, an assessment of future trends and effects will only be possible in the subsequent years of the fourth programming period.

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ARTICLES

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THE EFFECT OF INDIRECT TAXES ON THE STATE BUDGET REVENUE

Abstract

Taxes are among the key economic instruments by means of which the state fulfils its functions in the economy. Depending on the relation of an object of taxation to a source of tax, two tax types are distinguished: direct taxes, where the nominal (formal) and real taxpayers are clearly identical, and indirect taxes, where such identity is not present, i.e., a formal source of a tax is not the same as its real source.

This paper intends to discuss the fiscal significance of indirect taxes to the state budget.

The analysis implies the indirect taxes generate high budget receipts not only at times of economic growth but also during economic crises.

In 2016-2020, indirect taxation accounted for the largest proportion (an average of 70%) of all the state budget's tax revenue. A dominant status of the value added tax among the overall income of the state budget could be noted as well. It constituted 44% of the total income on average at the time. In addition, the results of a correlation matrix show a strong link between the state budget revenue and indirect taxes. A statistical analysis affirms the research hypothesis that indirect taxation has a considerable impact on the state budget's revenue.

JEL Classification: *E62, H24, K34*

Keywords*: state budget, indirect taxes, revenue*

Paper type*: Theoretical research article*

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Introduction

Any entity engaging in business is bound to pay tax, which includes not only economic but also legal content. Tax is a public levy, or a performance for the benefit of the state or another institution under public law (e.g., a local community), whose realisation is enforceable with the means of legal duress by the state. A taxpayer has no direct control over the level of such a charge and is only capable of influencing members of parliament indirectly, through lobbyists or pressure groups.

A tax is defined as a compulsory collection by a public authority, principally designed to defray public spending and distribute it in accordance with the tax capabilities of citizens (Paluch –Dybek, 2018, p. 56).

Tax is a basic and one of the oldest economic, fiscal, legal, political, and social instruments which is highly complex. Taxes collected for public entities fulfil functions that are very important to the economy and society as the convenient instruments of realising a variety of objectives set by the authorities (Ważna, 2018, p. 598). The fiscal function is one of those, consisting in the collection from various entities to the benefit of the state or other institutions under public law of monies required to discharge the latter's duties. Thus, taxes are a tool of collecting monies by authorised entities.

Income and spending taxation play key roles in the contemporary tax system (Litwińczuk, 2017, p. 21). As far as the relation of a taxable object to a source of taxation is concerned, two tax types can be distinguished: direct and indirect taxes.

Direct taxes are imposed on a taxpayer's income or assets. The description 'direct' refers to the identity of a subject paying a tax and incurring its financial burden and the impossibility of transferring the burden to other entities (Black, 2008, p. 317). Indirect taxes, on the other hand, are transferable, which means a legally bound subject does not incur the actual financial or fiscal burden. In this case, this is the consumer who is ultimately taxed (Partyka, 2011, p. 427). In addition, the burden of indirect taxes is not in any strict relation to a taxpayer's income or asset position. As such, they are latent taxes and the taxation burdens are more anonymous (Kosidłowska, 2014, p.159)

This paper intends to discuss the fiscal significance of indirect taxes to the state budget.

The effectiveness of indirect compared to direct taxes has been discussed by the theory of public finances for years. The fundamental argument for universal indirect taxation is that it has a less adverse effect on the supply of labour than direct taxes do and that it interferes with the choice between current and future consumption to a lesser extent (Watrin, Ullmann, 2008).

An easier redistribution of income among income groups is the chief argument for direct taxation, on the other hand (Saez, 2004).

Taxation can be employed as a tool of redistribution and reducing inequalities with the levels of its rates, the scale of progression, the tax-free amount, the system of reliefs and exemptions addressing taxpayers' financial and health standing, the rates of VAT and excise duties, among other ways. It should be also remembered the overall tax burden of a population and enterprises determines the income available to the state to dispose for broadly-defined public purposes, such as cash transfers, science and education, healthcare, national insurance, etc. The research hypothesis (H1) can be posited, therefore, indirect taxes have a significant effect on the state budget's revenue.

1. Indirect taxation in the Polish tax system

A tax system means all the existing taxes collected in a given state at any time. It denotes all the legal and organisational forms of taxation that consist of the particular taxes of varied designs (Sosnowski, 2014, p. 260). It has not only a legal, but also economic, social, and political dimensions (Etel, 2002, p. 38) In economic terms, a tax is paid by businesses to the state or institutions under public law. The economic aspect of a tax not only involves reducing a taxpayer's income or assets but also affects the economic process. The Polish state realising its public duties via its tax system considers taxpayers' family status and thereby their payment capabilities. The public nature of the system gives rise to a variety of reliefs and exemptions (Podstawka, Deresz, 2011, p.194). A tax in its political meaning concerns the relationship between the state and a citizen. The constitutional regulation is the foundation for the application of tax laws.

Tax is an economic category as well as a financial legal concept and institution. The financial legislation defines both the very notion of tax, its status among other public revenues, and its elements. The doctrine has developed a general definition of tax as a monetary performance to a public law institution, that is, the state or a local authority, set unilaterally by that institution, which is general, fundamental, non-returnable, and compulsory (Smoleń, Wójtowicz 2021, p. 7).

By force of Article 6 of the Tax Law of 29.8.1997 (OJ of 2020, item 1325 as amended), tax is defined as a public legal, free, compulsory, and non-returnable monetary performance to the State Treasury, regional, county or local authorities under the tax law.

Both the definitions are essentially similar. The one in the Law does ignore the theoretical characteristics of generality, fundamentality, and unilateral setting the doctrine accords to taxation. It doesn't mean, however,

the Tax Law deprives the tax of the characteristics contemplated by the theory of fiscal law.

In the legal perspective, tax is an abstract legal relationship having some characteristics that help to distinguish it from the remaining public law performances. The definitions of tax offered by diverse authors, though different, invariably indicate certain constant characteristics (Woliński, 2020, p.18).

Taxes are the basic revenue of a state budget. It is of utmost importance, therefore, that a tax system prevailing in a country be correct and effective, since it is the key instrument of development and economic growth.

As part of the Polish tax system, indirect taxes comprise the value added tax (VAT), the excise duty, and the tax on games. This classification is used by the Ministry of Finance to determine the sources of fiscal income to the national budget.

The Value Added Tax

The Value Added Tax is one of indirect taxes, the major sources of state revenue. It is grounded in the Value Added Tax Act of 11 March 2004 (OJ of 2021, item 685 as amended), which became effective on 1 May 2004 and adjusted its design to the requirements of the joint VAT system in the European Union. It is indirect because a taxpayer does not incur the actual financial burden, which is transferred to other entities. It's also a price-forming tax (charged on prices, not costs) for a manufacturer and cost-forming for a final customer (it's not deductible); it's levied on consumption spending, based on turnover (the value of goods and services supplied) and universal, which means it is charged on trade in all kinds of material and non-material goods. It's also deductible (each buyer has the right to deduct it from their purchases) and transferable (the fiscal burden of paying the tax transfers to every successive buyer and is finally charged to private individuals or consumers) (Wyrzykowski, 2008, p. 297). In addition, the VAT is a multi-phase tax charged on each phase of production or distribution. A taxpayer selling their product or services calculates the tax payable in their sales invoice, while the so-called charged tax is already deducted on a material or service purchase invoice. The difference between the output and input tax is paid to a tax authority.

In line with Article 15 of the Value Added Tax Act, taxpayers, payers, and VAT agents are the subjects of the value added tax. Taxpayers are legal entities, organisations without legal personality and self-employed individuals regardless of the purposes or results of their business activities.

Business activities are any activities of producers, traders or service providers, including those extracting natural resource and farmers, as well

as the professions. These activities also comprise a continuing use of resources or intangible assets for gainful purposes

Subjective VAT exemptions are allowed to entities engaged in small-scale activities and having special status. The value of a taxpayer's sales is the basic type of exemption. Entities whose revenue from taxable sales in the preceding fiscal year was below PLN 200,000 net are eligible for subjective VAT exemptions. The limit has been in force since 2017 in connection with a VAT Act amendment (Article 113 Section 1). The relief is also available to taxpayers who commence their business in a given year if they anticipate their sales to be below PLN 200,000 in the annual proportion. The obligation to pay the tax arises as the threshold is exceeded and the excess is taxable.

By force of Article 5 of the VAT Act, the value added tax is levied on:

a) Paid supply of goods and services in the area of Poland;
b) Export of goods;
c) Import of goods into Poland;
d) Intra community acquisition of goods paid in the area of Poland;
e) Intra community deliveries of goods.

The base of taxation is defined by Article 29a Section 1 of the VAT Act. Anything that constitutes payment received or to be received by a supplier of goods or services for sales from a purchaser, service recipient or a third party, including any subsidies and similar payments that have direct impact on the prices of goods or services supplied by a taxpayer is the base of taxation.

The rate of the tax is 23% or 8% for the goods and services listed in Appendix 3 to the Act, or 5% for the goods and services listed in Appendix 10 to the Act. 0% is charged on intracommunty delivery of goods (subject to Article 42) and exports by farmers paying the fixed amount of tax, provided such taxpayers keep the records of their transactions.

Excise duty

The structure of excise duty is laid down in the Excise Duty Act of 6 December 2008 (OJ of 2020, item 722 as amended). Excise duty is a one-off sales tax on the production or import of specified goods (thus, it's a selective tax levied on certain types of commodities), normally charged on alcoholic products, tobacco, cigarettes, refinery products, and other luxury consumer goods (Wolański, 2020, p. 257). Excise duty is integrated into the pricing of a product, which means its addition raises the prices of sold goods (Sygut, 2016, p. 55).

Pursuant to Article 13 of the Excise Duty Act, excise duty is paid by legal entities, organisations without legal personality that engage in activities

subject to excise duty or that are involved in situations taxable with excise duty, as well as non-importers bound to pay customs duties.

Entrepreneurs who pay excise duty must register for the purposes of this tax. As a rule, a business must submit their registration application to a competent customs authority before their first transactions subject to excise duty or first activities using products exempt from excise duty due to their purpose (Mastalski, 2021, p. 396)

Excise duty applies to seven major phenomena, most of which involve products subject to excise duty. A sale of excise duty products is the principal civil law transaction taxable with excise duty (Sowa,2013, p.73).

Excise duty products are listed in detail in a closed-ended catalogue attached to the Excise Duty Act. They can be divided into six groups (Sowa,2013, p.74):

- Luxury goods, e.g. cars,
- The so-called state monopoly products, e.g. tobacco and spirits,
- Fuel, e.g. petrol, gas fuel, bottled gas,
- Plastic packaging,
- Electricity,
- Other excise duty products.

The Act provides for some objective exemptions from excise duty, including in relation to (Article 30 of the Excise Duty Act):

a) Electricity generated from renewable sources according to a certificate of origin as defined by the Energy Law;
b) Wastage or destruction of excise duty products as a result of force majeure or acts of God, provided taxpayers prove the occurrence of circumstances entitling to the exemption;
c) Wastage of excise duty products up to limits set for a given entity by a competent customs authority;
d) Consumption of electricity in the process of its production or for the maintenance of these processes;
e) Consumption of electricity generated on board a vessel in shipping, including fishing trips.

Excise duty is levied on trade in excise duty products and, like the value added tax, is not integrated into pricing but added to net prices. The base of excise duty taxation is (Wyrzykowski, 2008, p. 319):

a) Sums due for the sales of excise duty products in Poland less the amount of the value added tax and excise duty payable on these products;
b) Sums a buyer is bound to pay for excise duty products in the case of an intra community acquisition;

c) Sums due on excise duty products in a member state in the case of intra community acquisition;
d) Customs value of excise duty products plus due customs duty in the case of imports.

Excise duty is a single-phase tax, which means a product subject to it should be taxed once only (Matarewicz, 2014, p. 35). The tax should be collected at the first stage of trade and each subsequent transaction involving excise duty products should be tax-free, while an entity carrying out the transaction should not be treated as an excise duty payer (Kałka, Ksieniewicz, 2013, p. 33).

The rates of excise duty are highly varied as the percentages of tax base, amounts per unit of product, percentages of maximum retail prices, amounts per unit of product, and percentages of maximum retail prices. The European Union laws oblige member states to apply certain minimum rates of excise duty, with states allowed to set higher rates as part of their fiscal policies.

Excise duty products, that is, engine fuels, oils, lubricants, alcoholic drinks, and tobacco products, must be marked as such. This duty serves the control of their sales, tightening of the excise duty system, and is proof of their legal trade in Poland. Excise stamps are evidence of prepayments towards excise duty (confirming the right to trade in a product). Excise stamps may be bands, logos or seal impressions.

The tax on games

The tax on games is, beside the VAT and excise duty, an indirect tax supplementary to the other, fiscally fundamental tax burdens. Its design is laid down in the Games of Hazard Act of 19 November 2009 (OJ of 2009, No. 201, item 1540 as amended).

The tax on games is charged on the organisation and administration of games of hazard, gaming arcades, and mutual betting, as well as participation in poker tournaments. The taxation is not applicable to poker tournaments and the organisation of promotional lotteries, though (Dolata, 2013, p.317).

In line with Article 2 Section 1 of the Games of Hazard Act, the games of hazard are games arranged for cash or material stakes, including those organised via the internet, whose results are particularly dependent on chance. These are: numerical lotteries, cash lotteries, telebingo, cylindrical games, dice, cash bingo, prize bingo, prize lotteries, promotional lotteries, audiotext lotteries.

The specific objective scope of the tax on games applies to activities that require a rigid state rationing. The dependence of licensing on clear requirements concerning: the organisation, ownership, capital levels, technical conditions, as well as statutory location limits on the gaming

centres, i.e., casinos, gaming arcades, and cash bingo parlours, is the basic instrument of this rationing (Wójtowicz, 2008, p. 56).

The base of taxation is related to the nature of a game, mutual betting or lottery. The varied bases of the performance and their thorough regulation for the particular games and bets are characteristic of the tax on games. The legislation provides for percentage and value rates of the tax depending on its object.

2. The share of indirect taxes in the revenue of state budget

A growth trend can be observed of the state budget's revenue levels in the entire period studied. The state budget's revenue totalled PLN 419.8 bn in 2020, PLN 105.1 bn (approx. 25%) more than in 2016. A maximum revenue rise (11.3%) was experienced in 2017 as a result of a range of steps taken by the fiscal administration to tighten the tax system and of an unexpectedly good macroeconomic situation (a GNP growth in real terms of 4.6% in 2017). The share of tax revenue (91.9%) in the total revenue reached its peak in 2019, with the revenue from indirect taxation accounting for 69.6% of tax revenue.

The state budget's revenue was the highest in 2020, reaching PLN 419.8 bn, PLN 19.3bn or 4.8% greater than in 2019.

Tax income was the key source of the state budget's revenue in 2020, totalling PLN 370.3bn and equalling 15.9% of the GNP. The rise over 2019 was derived from the value added tax of PLN 184.6bn and the CIT of PLN 41.3bn. The revenue from both these sources accounted for 53.8% of the overall state budget's revenue. Some declines of tax revenues in 2019 should be noted, too. The personal income tax income reached PLN 63.8bn (a fall by ca.1.6bn YOY) and the excise duty, PLN 71.8bn (a decline by PLN 0.6 YOY) (Sprawozdanie, 2021,p.63).

Table 1. The level and structure of the state budget's revenue in 2016-2020 (bn)

Specification	2016		2017		2018		2019		2020	
	bn	%	bn	%	bn	%	bn	%	bn	%
TOTAL REVENUE	**314.7**	**100**	**350.4**	**100**	**380.0**	**100**	**400.5**	**100**	**419.8**	**100**
Tax revenue, including:	**273.1**	**86.8**	**315.3**	**90.0**	**349.4**	**91.9**	**367.3**	**91.7**	**370.3**	**88.2**
Value added tax	126.6	46.4	156.8	49.7	174.9	50.0	180.9	49.3	184.6	49.9
Excise duty	65.7	24.1	68.3	21.7	72.1	20.6	72.4	19.7	71.8	19.4
Tax on games	1.4	0.5	1.6	0.5	1.9	0.5	2.3	0.6	2.3	0.6
Non-fiscal revenue	**40.1**	**12.8**	**33.7**	**9.6**	**28.9**	**7.6**	**31.4**	**7.8**	**47.4**	**11.3**
Funds from the European Union and other non-refundable sources	**1.4**	**0.4**	**1.5**	**0.4**	**1.8**	**0.5**	**1.9**	**0.5**	**2.1**	**0.5**

Source: The author's own compilation of the Ministry of Finance figures

The share of indirect taxation in fiscal revenue was about 70% in the whole period examined, while its share in the total budget revenue averaged 63%. The budget derived the most revenue from the value added tax, <40.2; 46.0> in 2016-2020, followed by the excise duty revenue, which averaged 19%. The income from the tax on games accounted for a minimum share of the state budget's revenue, that is, 0.5% on average.

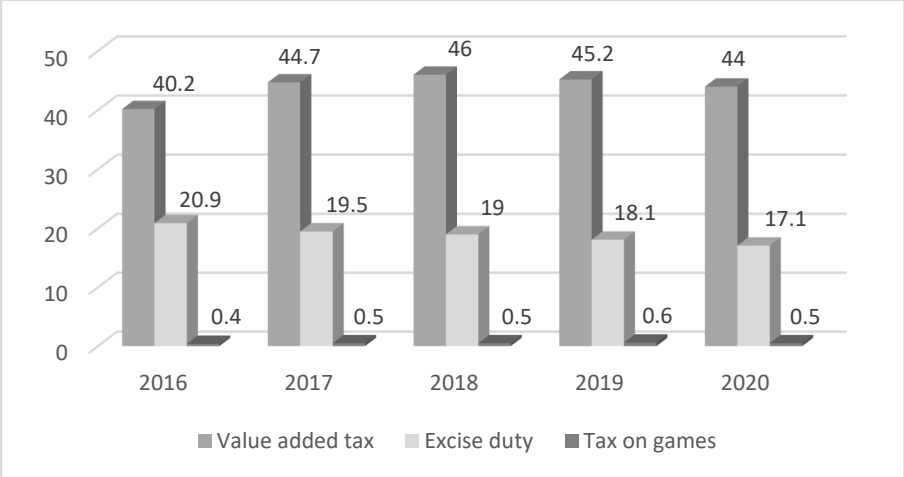

Figure 1. The shares of indirect taxes in the state budget's revenue
Source: The author's own calculations.

To verify the existence of a correlation between the following variables: the state budget's revenue, value added tax, excise duty, and the tax on games, the correlation matrix meeting the following criteria is computed:

- It is a square matrix that is symmetrical to the main diagonal (where elements become 1 as a variable is correlated to itself),
- The values of all the matrix elements are in the range <-1,1> and the matrix determinant is in the range <0,1>

The values of the matrix determinant are appropriate to the correlation levels of the variables making up the matrix. The higher the determinant's values, the more correlated the individual parameters are to one another.

All the variables tested are closely correlated, with the state budget's revenue and the tax on games (the correlation value 0.972) and the state budget's revenue and the excise duty (the correlation value 0.926) being the most correlated. The value added tax and the excise duty are the least correlated.

Table 2. Correlation matrix

	Total state budget's revenue	Value added tax	Excise duty	Tax on games
Total state budget's revenue	1,000	-0.657	0.926	0.972
Value added tax	-0.657	1.000	-0.361	-0.707
Excise duty	0.926	-0.361	1.000	0.906
Tax on games	0.972	-0.707	0.906	1.000

Source: The author's own calculations.

The sign of the correlation determinant denotes the direction of correlation and can be positive or negative. If it's positive, the following obtains: lower values of a first variable correspond to lower values of a second variable, while greater values of a first variable correspond to higher values of a second variable. Where the determinant is negative, lower values of a first variable correspond to greater values of a second variable and lower values of a first variable correspond to higher values of a second variable.

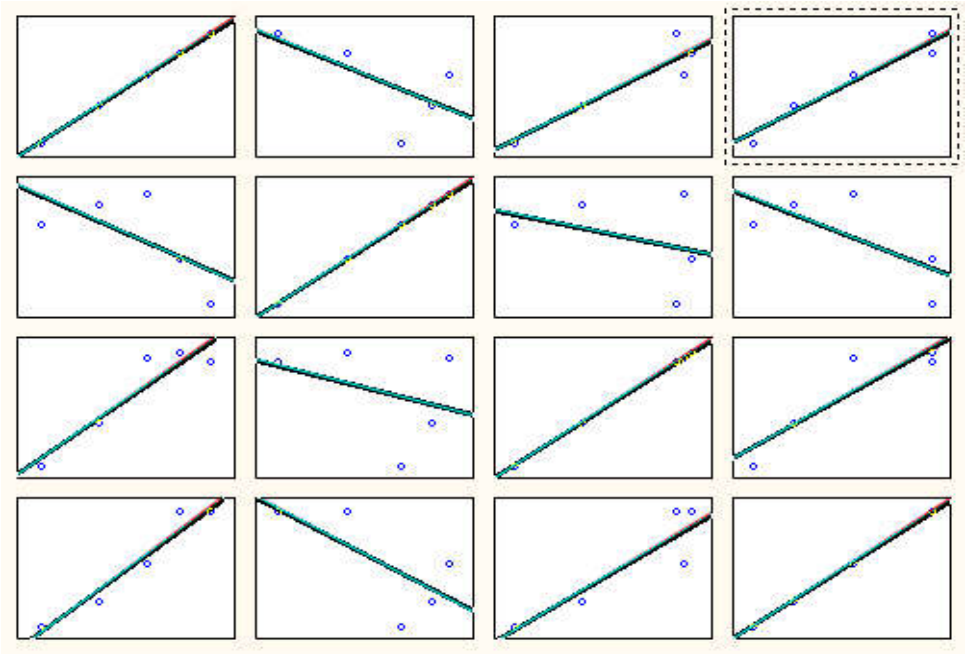

Figure 2. The scattergram matrix for the variables studied
Source: The author's own calculations.

Graph 2 shows only the dependence between the value added tax and the remaining variables, that is, the state budget's revenue and the excise duty, while the tax on games exhibits a negative determinant of correlation.

This analysis implies the share of indirect taxes in the state budget's revenue averaged more than 60%. The value added tax revenue prevailed, reaching 44% on average. In addition, the correlation matrix suggests a correlation between the state budget's revenue and all the types of indirect taxation, which validates the research hypothesis (H1) that indirect taxes have a significant effect on the state budget's revenue.

Conclusion

Indirect taxation burdens taxpayers in a way that has no close relation to their property and financial standing. It separates a business entity bound to calculate and pay a tax from an entity that incurs its actual economic burden. The simple design of indirect taxes and the 'latent' method of their inclusion in the values of goods and services make them an instrument of fiscal policy convenient to public authorities.

The level of the state budget's revenue depends on flows from taxable and non-taxable income as well as the funds from the European Union and other non-refundable sources.

This statistical analysis finds tax revenue to be the key source of revenue to the state budget. Indirect taxes prevailed in the structure of fiscal income. The value added tax revenue plays the central role, whereas the share of the tax on games in the state budget's revenue is negligible.

In 2016-2020, the share of fiscal revenue in total revenue ranged <86.8; 91.9>, including an average 70% of indirect taxes. In addition, the share of value added tax averaged 44% of the state budget's revenue. The analysis of the correlation matrix corroborated a strong link between the state budget's revenue and the value added tax, the excise duty, and the tax on games.

It can be concluded from the statistical analysis indirect taxation has a major impact on the levels of state budget's revenue, which upholds the research hypothesis advanced.

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