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What should be the optimal financial structure of the FDI inflows to Poland in stimulating growth processes?¹

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What should be the optimal financial structure of the FDI inflows to Poland in stimulating growth processes - experience in the years 2004-2021

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Abstract

The article is aimed at answering a question what should be the optimal financial structure of the FDI inflows to Poland for stimulating growth processes. The study on the dependence between financial components of FDI inflows and GDP for Poland covers the period 2004:Q1-2021:Q3. Define the structure of FDI would be the added value of this work. Among the important questions are the following: 1) How the components of the FDI inflows influence the degree of explaining GDP changes? 2) Which components of the FDI inflows explain to the greatest extent changes in GDP? 3) Which components of the FDI inflows explain to the lesser extent changes in GDP? 4) What should be the optimal FDI inflows structure to Poland that maximizes the positive impact on growth processes? The following thesis has been put forward: The optimal structure of FDI inflows to Poland is a structure that maximizes equities and reinvestment of earnings with less participation of debt instruments and dividend payments outside the host country. Results of the VAR/VECM model and forecast error variance decomposition (FEVD) indicate that in the optimal (growth-enhancing) structure of the FDI inflows, the share of equities and the reinvestment of earnings should be maximized, while the shares of debt securities and dividend payments could be rather minimized.

Keywords: FDI inflows (equity, reinvestment of earnings, debt instruments), GDP, EU, Poland, VECM, the impulse function, the variance decomposition

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1. Introduction

Most economic theories emphasize the beneficial influence of FDI on economic growth, while empirical research by both international financial institutions and economists shows inconclusive results. International standards International Monetary Fund (IMF, 2009), Organisation for Economic Co-operation and Development (OECD, 2008) relate to the methodology of estimating the value of FDI (inflows/ outflows, stocks) and its components, qualification to the financial account in terms of the balance of payments or the calculation of the international investment position. This methodology addresses the important quantitative dimension of FDI statistics.

However, the expansion of FDI in the global economy has continued uninterruptedly since the 1950s.-1960s. XX-th century, that is for over 70 years. According to the author, it is worth extending the current analytical dimension of FDI – mainly quantitative and aggregate (a monolithic rather than multidimensional variables) – about a new pro-growth dimension of FDI at the level of calculations by international financial institutions. The added value of the analysis of the impact of financial structure of FDI inflows (equity, reinvestment of earnings and debt instruments) on stimulating economic growth may be the identification of the importance of individual components in terms of their impact strength and impact period. Thus, these results may, at least in part, explain the ambiguous effects of empirical research for FDI aggregates.

Estimating the pro-growth dimension of FDI is important for investor and host countries (which the analysis focuses on). The expectations of the FDI's pro-growth (efficiency / quality) effects, for example in the Central and Eastern Europe (CEE) countries, including Poland, result from many challenges, such as: filling the shortages of capital accumulation (gross fixed capital formation), increasing productivity, stimulating innovation and technology transfer or real convergence processes. The presence of foreign investors in the host market is associated with influencing the labor market, the structure of the economy or the tax incomes.

For countries such as Poland or other CEE countries, which are still "catching up" (with varying intensity) Western European countries, it's important not only value the FDI inflows (quantity) but also the possibility of forecasting the impact of a specific type of investment (material or financial) on economic growth (share of growth/ productivity of capital or per employee). Moreover, the ability to estimate this multidimensional nature of the FDI inflows for GDP dynamics is awaited.

2. Financial instruments of FDI inflows - methodology

The direct investment enterprise denotes an enterprise in which direct investor owns at least 10% of the voting power in the decision making body of the company. The direct investment capital comprises equity capital in the form of shares and other equity, reinvestment of earnings and assets and liabilities vis-à-vis debt instruments. According to OECD (2008) direct investment transactions are all transactions between direct investors, direct investment enterprises, and/or other fellow enterprises. For transactions, the asset/liability principle is schematically shown as follows (Table 1).

Equity, other than reinvestment of earnings comprises equity in branches, all shares in subsidiaries and associates (except non – participating, preferred shares that are treated as debt securities and included under direct investment, debt instruments) and other contributions of an equity nature.

Reinvestment of earnings denote the part of profits, accruing to a direct investor, which remains in the direct investment enterprise, and which is allocated to its further development. According OECD (2008) *reinvestment of earnings* of direct investment enterprises (items A1.2 and L1.2) reflects earnings accruing to direct investors (that is, proportionate to the ownership of equity) during the reference period less earnings declared for distribution in that period.

According OECD (2008) **reinvestment of earnings** of direct investment enterprises (items A1.2 and L1.2) reflects earnings accruing to direct investors (that is, proportionate to the ownership of equity) during the reference period less earnings declared for distribution in that period. Earnings are included in direct investment income because they are deemed to accrue to the direct investor, whether they are reinvested in the direct investment enterprise or remitted to the direct investor. However, reinvested earnings are not actually transferred to the direct investor but rather increase the direct investor's investment in its direct investment enterprise. Therefore, an entry that is equal to that made in the direct investment income account but that flows in the opposite direction is made in the direct investment financial transactions account. In the direct investment income account, this form of income is referred to as "reinvested earnings" (ECB, 2019). However, in the direct investment transactions account, "reinvestment of earnings" is the term that is used, to more clearly differentiate between the income and financial transactions. Moreover, in cases where the equity asset holder has less than 10% voting power (*reverse investment* and investment in fellow enterprises), reinvested earnings and reinvestment of earnings are not recorded.

Debt instruments mean all forms of investing other than the acquisition of shares or equity, or reinvestment of earnings associated with such shares or equities. Debt instruments include, among others, credits and loans, debt securities and other unsettled payments between entities in direct investment relationship (OECD 2018) (Table 1).

It is worth adding that the structure of the FDI inflow in host countries depends on many conditions. On the side of a foreign investor, this structure depends on the investment strategy and dividend policy (including superdividends) (Borga 2018). On the side of the host country, location conditions are important, including: the existing structure of the economy, absorption possibilities or the so-called broadly understood investment climate.

Paying attention to the financial structure of the FDI can be found, e.g. in studies of central bank employees in the context of FDI life cycle phases (Brada and Tomšík, 2003, Novotný, Podpira 2008; Novotný, 2015, 2018) or forecasting direct investment equity income for the balance of payment (Dagmaard et al., 2010, Knetsch and Nagengast 2016).

FDI transactions according to the asset/liability principle

Table 1

Of direct investors in direct investment enterprises	Of direct investment enterprises to direct investors
A1. Equity	L1. Equity
A1.1. Equity transactions	L1.1. Equity transactions
A1.2. Reinvestment of earnings	L1.2. Reinvestment of earnings
A2. Debt instruments	L2. Debt instruments
Of direct investment enterprises in direct investors	Of direct investment enterprises in direct investors
-Reverse investment	- Reverse investment
A3. Equity	L3. Equity
A4. Debt instruments	L4. Debt instruments
In fellow enterprises	To fellow enterprises
A5. Equity	L5. Equity
A5.1. If ultimate controlling parent is resident	L5.1. If ultimate controlling parent is non-resident
A5.2. If ultimate controlling parent is non-resident	L5.2. If ultimate controlling parent is resident
A6. Debt instruments	L6. Debt instruments
A6.1. If ultimate controlling parent is resident	L6.1. If ultimate controlling parent is non-resident
A6.2. If ultimate controlling parent is non-resident	L6.2. If ultimate controlling parent is resident

Sources: OECD (2008, p. 70-71).

In the theory of the FDI profitability life cycle, according to Brada and Tomšík (2003) shows:

- stage 1 (entry) is connected with expenditures of foreign investors in a host country and means negative profitability (increased equity);
- at stage 2 (growth), profit peaks at around the 6th year of the cycle (this means increased reinvested earnings and debt instruments);
- stage 3 (investment repatriation) relates to distribution of profits and dividend payment (a part of reinvested earnings can be transferred abroad and increase debt instruments, or disinvestments).

According to studies by Novotný and Podpiera (Novotný and Podpiera 2008, Novotný 2015), among the countries of Central and Eastern Europe, the full-fledged FDI life cycle usually covers 15 years, followed by projections toward zero (null) annual profitability.

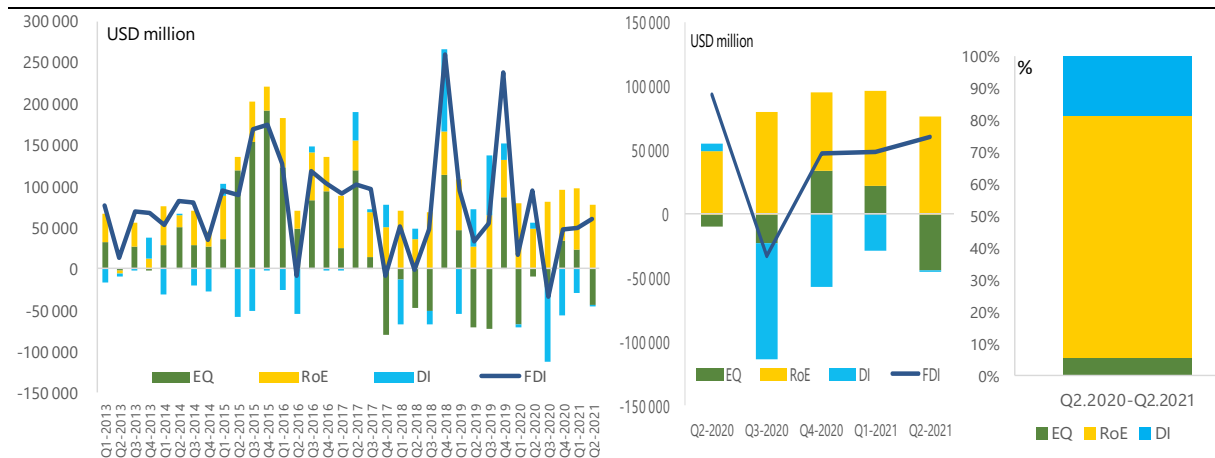
Moreover, many central bank analysts involved in forecasting the FDI components for the purposes of balance of payments estimates. Damgaard et al. (2010) from Danmarks Nationalbank for Denmark or Novotný (2015) from Czech National Bank for Czech Republic, are interested in FDI components. Knetsch and Nagengast (2016) from Deutsche Bundesbank forecasting FDI outflows in order to assess potential tax revenues of state budgets of countries in which transnational corporations have their headquarters.

3. Empirical data – structure of FDI inflows in EU countries

The financial structure of FDI inflows in the EU countries presented on a quarterly basis for the years 2013-2021, indicate their significant fluctuations. Nevertheless, the positive values were mainly due to equity and reinvestment of earnings (2013-2017), with negative value debt instruments. It can be added that debt instruments were used as highly liquid instruments (more mobile than others) to regulate liquidity between e.g. the parent company and subsidiaries. During the COVID-19 pandemic (Q2.2020-Q3.2022), the structure of FDI inflows was generally maintained.

The financial structure of FDI inflows in EU countries in the period Q1.2013-Q2.2021 (USD million, per cent of FDI inflows total)

Figure 1



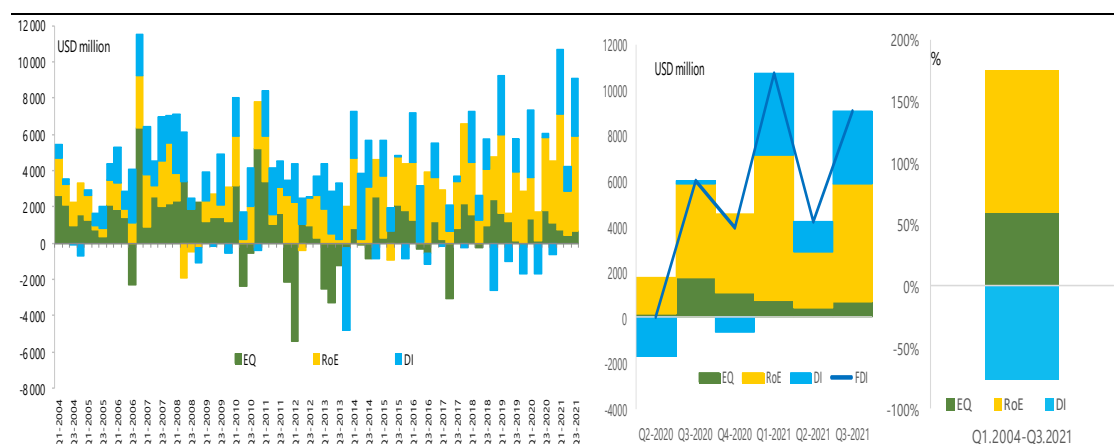
Sources: Author's compilation based on OECD (2022) and Eurostat (2022).

In the case of Poland, from the time of joining the structures of the European Union (EU) in 2004 to 2010, positive values, mainly equity and reinvestment of earnings, prevailed, while in the following years (2010-2021) reinvestment of earnings and negative debt instruments were dominant (2018-2021). During the pandemic, a similar structure was maintained in recent years. The average share of FDI inflows components in 2004-2021 was: equity (33.1%), reinvestment of earnings (139.0%) and debt instrument (-7.1%) (Figure 2).

It is worth noting that the financial structure of FDI (including FDI positions) differs significantly between countries, e.g. Central and Eastern Europe (V4). In 2020, Slovak Republic had the highest share in terms of equity including reinvestment earnings in inward FDI positions (91.5%) and the lowest in Poland (76.6%). The share of debt instrument was respectively for Hungary (3.3%) and for Poland (23.4%). This means that the presented differences in the financial structure of FDI could have determined the different impact of financial structure of FDI inflows on economic growth in individual V4 countries (Table 2).

The structure of FDI inflows in Poland in the period Q1.2004-Q3.2021
(USD million, per cent of FDI inflows total)

Figure 2



Sources: Author's compilation based on NBP (2022).

Inward FDI positions in Visegrad group (V4) in 2020 (per cent)

Table 2

Specification	Czech Republic (CZ)	Hungary (HU)	Poland (PL)	Slovak Republic (SK)
Equity including reinvestment earnings	89.8	96.7	76.6	91.5
Debt	10.2	3.3	23.4	8.5

Sources: Author's calculation based on OECD.Stat (2022).

Returning to FDI inflows, it is worth noting that there are significant differences between the V4 countries in the relation of these investments to gross fixed capital formation (GFCF) or GDP (Table 3).

FDI inflows as a percentage of GFCF, GDP and total world in Visegrad group (V4) in the year 2004-2020 (per cent)

Table 3

Specification	Czech Republic (CZ)	Hungary (HU)	Poland (PL)	Slovak Republic (SK)	Visegrad group (V4)
GFCF (2004-2019)	12.8	12.4	14.2	13.8	13.3
GDP (2004-2020)	3.4	2.8	2.7	3.0	2.4
Total world (2004-2020)	0.5	0.3	0.9	0.2	0.5

Sources: Author's calculation based on UNCTAD (2022).

4. Data and research procedure of cause-and-effect relationships between components of FDI inflows and GDP in Poland

The author decided to analyze the impact of FDI on economic growth, using the FDI inflows, not FDI stocks. This decision resulted from the fact that FDI inflows better characterize the impact on the economic growth rate (e.g. Osei and Kim, 2020; Carbonell and Werner, 2018; Moudatsou, 2003), while FDI stocks can be used to assess economic development (changes in GDP per capita).

The research is based on statistics from the NBP (FDI components) and OECD Internet databases (GDP) for the period 2004:Q1–2021:Q3 (71 quarters). NBP compiles data on direct investment in compliance with the OECD definition (OECD 2008, IMF 2009). FDI components come from the balance of payments (BP) data calculated according to assets and liabilities presentation. The analysis uses FDI as direct investment comes from the financial account of BP (liabilities, net transactions). This means that the analysis refers to the impact of FDI financial instruments on GDP changes.

Moreover, such data was selected as it is published on a quarterly basis. Quarterly data is important from the point of view of econometric modelling. In contrast, the data on the FDI inflows (according to directional principle) are published only on an annual basis. This means that a short series of annual data makes modelling difficult.

In order to analyse the relationship between changes in GDP values and financial instruments (components) of FDI in Poland in the years 2004:Q1–2021:Q3 (by used the simple moving average), a final formula for the GDP function was developed:

$$GDP_t = \alpha_0 + \alpha_1 EQ_t + \alpha_2 RoE_t + \alpha_3 DI_t + \xi_i \quad (1)$$

The model used consists of the dependent variable (GDP) and three independent variables, where:

GDP – gross domestic product (USD million),

EQ – equity other than reinvestment of earnings (USD million),

RoE – reinvestment of earnings (USD million),

DI – debt instruments (USD million),

ξ_i – random component,

t – period.

In this study, methods are used known from literature on international economics and international finance and econometric methods like the VECM model (*Vector Error Correction Method*) including the impulse response functions and forecast error variance decomposition analysis.

The data verification procedure and the selection of the analysis method included: ADF test, KPSS stationary test, VAR inverse root, the Engle-Granger and Johanson test and lag order (AIC, BIC, HQC criteria). In order to verify correctness of the VECM model results: two tests were carried out verifying the

5. Results – VECM model, the impulse response functions and the decomposition of variance

Co-integration was verified by means of the Engle-Granger and Johansen tests which confirmed the occurrence of co-integration and thus justified the use of the VECM model for the lag order 8 and co-integration of order 1.

In accordance with the Granger representation theorem, if variables y_t and x_t are integrated to the order of 1 (1) and are co-integrated, the relationship between them can be represented as a vector error correction model (VECM) (Piłatowska 2003).

The general form of the VECM can be written as:

$$\begin{aligned}\Delta Y_t &= \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \dots + \Gamma_{k-1} \Delta Y_{t-k+1} + \pi Y_{t-k} + \varepsilon_t = \\ &= \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + \pi Y_{t-k} + \varepsilon_t,\end{aligned}\quad (2)$$

where:

$$\Gamma_i = \sum_{j=1}^i A_j - I, \quad i = 1, 2, \dots, k-1, \quad \Gamma_k = \pi = -\pi(1) = -\left(I - \sum_{i=1}^k A_i\right)$$

and I is a unit matrix.

The analysis of the VECM model allows us to draw the following conclusions: the levels of vector α parameters indicating the rate of GDP adjustments in successive VECM model equations show that the highest rate of these adjustments was noted for own changes in GDP.

The evaluation of the EC1 indicates that the strongest correction of the deviation from long-term equilibrium occurs in the case of the own GDP equation. Here, around 0.7% of the imbalance from the long-term growth path is corrected by a short-term adjustment process. Weaker deviations adjustments occur for DI (0.61%), EQ (0.29%), and the worst for RoE (0.17%). The values of the coefficient of determination R^2 reveal adjustment of the VECM model equations to empirical data, i.e., for DI (83.0%), GDP (80.5%), RoE (71.4%) and EQ (52.6%) (Table 4).

The main research results for VECM model

VECM system, lag order 8. Maximum likelihood estimates, observations 2006:4-2021:3 (T = 60)

Cointegration rank = 1, Case 3: Unrestricted constant

Table 4

β (cointegrating vectors, standard errors in parentheses)			α adjustment vectors)	
ma_GDP	1.0000	(0.00000)	d_GDP	0.0071702
ma_EQ	-0.81884	(9.1276)	d_EQ	-0.0029978
ma_RoE	-167.94	(20.255)	d_RoE	-0.0017278
ma_DI	167.11	(18.882)	d_DI	-0.0061515
Specification	ma_GDP	ma_EQ	ma_RoE	ma_DI
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
EC1	0.00717025 (0.7496)	-0.00299777 (0.3291)	-0.00172779 (0.1930)	-0.00615147 (3.89e-05)
R2	0.805401	0.526401	0.714782	0.830466
DW	1.937766	1.776624	2.063881	1.903655

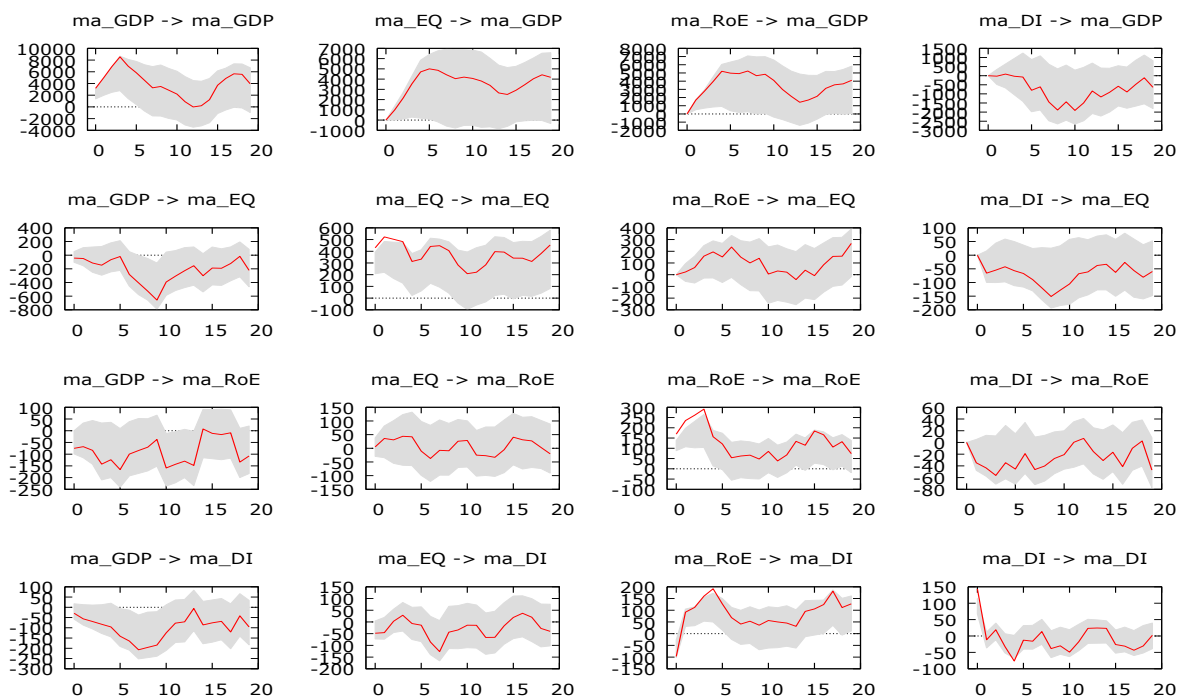
Sources: *Source*: author's own calculations.

5.1. The impulse response functions

Analysis of GDP responses to shocks derived from FDI components reveal that GDP responses are the strongest to impulses from reinvestment of earnings (RoE) and equity (EQ). The strongest GDP responses occur in the periods (quarters) 1–8 (RoE) and 1–6 (EQ). Next periods are characterized by falling fluctuations in GDP responses and growing in subsequent periods (15–20) (Figure 3).

The impulse response functions (summary statement), forecast horizon 20q, include bootstrap confidence interval 1- α =0.90 (shaded area)

Figure 3

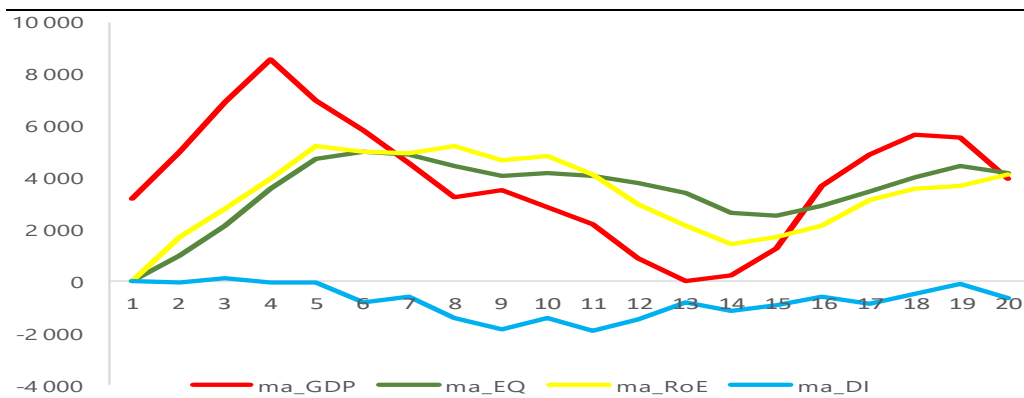


Sources: Source: author's own calculations.

Presentation of GDP responses to impulses shows distinctly that GDP responds most strongly to its own standard deviations in the period 1–5. However, in the periods 6–13, GDP responses to their own errors in forecasts indicate fading/weakening tendencies and next growing stronger over the few quarters (15–20) than the FDI components. Reassuring, in the case of impulses derived from FDI components, the GDP is the strongest to positive impulses from reinvestment of earnings and equity and negative stimuli from debt instruments (the weakest response) (Figure 4).

The response of GDP to a standard shock in own GDP and components of FDI inflows (quarters)

Figure 4



Sources: Source: author's own calculations.

5.2. The variance decomposition

GDP and all FDI components were analysed by means of decomposition of variance in the forecast horizon of 20 quarters (Table 5, Figure 5). The results of GDP decomposition indicate that in period 1 these changes are in 100% accounted for by their own forecast errors. In period 2, their own changes lose in significance (90.2%), and such FDI components as RoE (7.2%), equity (2.4%) and DI (0.2%) grow in significance. In the following periods, GDP's own changes fall in period 20th (42.5%), whereas RoE grow (27.5%, by maximum 29.3 in 12nd), similarly EQ (27.9%) and DI (about 2.0%). Thus, we can conclude that FDI significance in forecasting the degree of explanation of GDP amounts jointly to ca. 57.5% in the 20th quarter, that is 5 years (Table 5, Figure 5).

Decomposition of variance for ma_GDP (per cent)

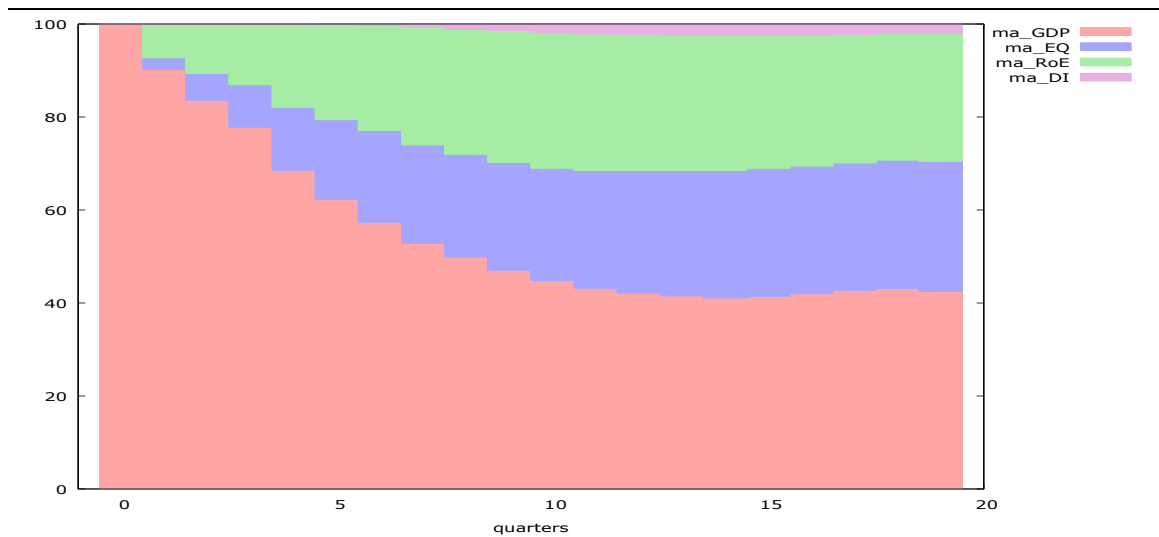
Table 5

period	ma_GDP	ma_EQ	ma_RoE	ma_DI
1	100	0	0	0
2	90,2598	2,4795	7,2587	0,0019
3	83,6233	5,7306	10,6377	0,0084
4	77,8407	9,1040	13,0507	0,0046
5	68,5739	13,5497	17,8715	0,0049
6	62,3186	17,1010	20,4084	0,1721
7	57,3975	19,7228	22,6504	0,2294
8	52,7771	21,2409	25,3707	0,6113
9	49,9027	22,1080	26,8059	1,1835
10	47,0728	23,1272	28,3794	1,4207
11	44,8134	24,1722	29,1301	1,8843
12	43,1929	25,3596	29,3069	2,1406
13	42,1546	26,3888	29,2665	2,1900
14	41,5409	26,9885	29,1208	2,3498
15	41,0897	27,4240	29,0585	2,4278
16	41,4267	27,5620	28,6266	2,3847
17	41,9984	27,4622	28,1923	2,3471
18	42,7385	27,4005	27,6539	2,2071
19	43,1311	27,6194	27,1942	2,0554
20	42,5052	27,9820	27,5218	1,9910

Sources: Source: author's own calculations.

Decomposition of variance for ma_GDP (per cent)

Figure 5



Sources: Source: author's own calculations.

6. Conclusion and way forward

Based on the research, the following conclusions were formulated.

- The experience of several decades of expansion of FDI flows and changes in their structure indicates the need for research on the impact of the financial structure of FDI inflows on GDP, i.e. as a multidimensional variable and not only as a monolithic variable.
- In the structure of FDI inflows in Europe and in Poland, the share of reinvestment of earnings has grown in the last 10 years. The period of the COVID-19 pandemic did not change that either.
- The research on the impact of FDI components on GDP in Poland using the VECM model, the impulse response functions and the decomposition of variance, confirmed the increasing over time, positive impact of mainly capital shares (equity) and reinvestment of earnings and the weakest impact of debt instruments. The impulse response function indicates that the impact of equity and reinvestment of earnings grows strongly on GDP in the first 2 years (about 8 quarters), slightly weakening the growth rate in the following years. According to decomposition variance financial structure of FDI inflows grow significance in forecasting the degree of explanation of GDP amounts jointly to ca. 57.5% in the 20th quarter, that is 5 years.
- The results of the research confirm the importance of pursuing an investment policy focused on attracting new investments (new equity), including the so-called greenfield and on maintaining the existing ones (reinvestment of earnings).
- Considering that the financial structure of FDI inflows also depends on the industry structure of the host economy, further research should focus on the diagnosis of these relationships and their impact on economic development.

Reassuring, the results of the research allowed for a positive verification of the formulated thesis that: The optimal structure of FDI inflows to Poland is a structure that maximizes equities and reinvestment of earnings with less participation of debt instruments and dividend payments outside the host country. These findings seem plausible and important because their implications can find practical applications and can become the basis of recommendations for economic policy in Poland. In the future, these results may have methodological application for international FDI statistics and measures of economic growth.

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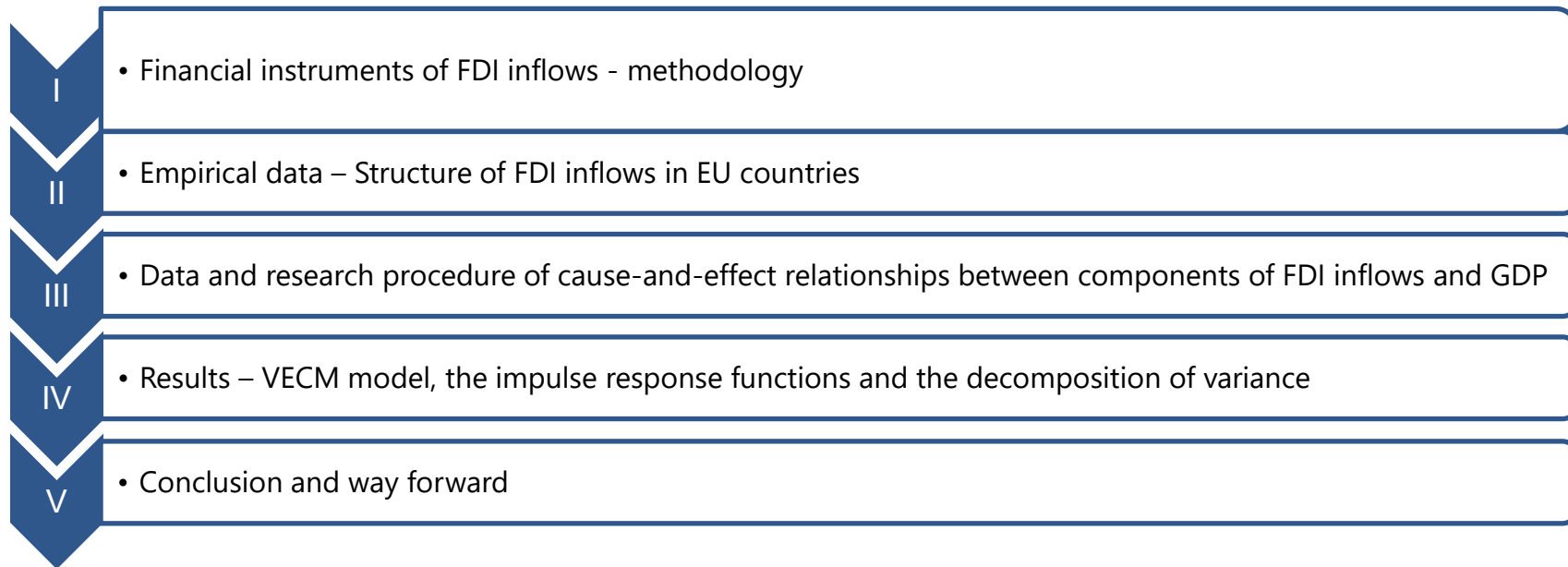
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- The views expressed are those of the authors and do not necessarily reflect those of the NBP.



Overview



Financial instruments of FDI inflows - methodology

Table 1. FDI transactions according to the asset/liability principle

Transactions in assets	Transactions in liabilities
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A5.1. If ultimate controlling parent is resident	L5.1. If ultimate controlling parent is non- resident
A5.2. If ultimate controlling parent is non- resident	L5.2. If ultimate controlling parent is resident
A6. Debt instruments	L6. Debt instruments
A6.1. If ultimate controlling parent is resident	L6.1. If ultimate controlling parent is non- resident
A6.2. If ultimate controlling parent is non- resident	L6.2. If ultimate controlling parent is resident

Source: OECD (2008).

According to OECD (2008) direct investment transactions are all transactions between direct investors, direct investment enterprises, and/or other fellow enterprises. For transactions, the asset/liability principle is schematically shown as follows (*Table 1*).

Equity, other than reinvestment of earnings comprises equity in branches, all shares in subsidiaries and associates (except non – participating, preferred shares that are treated as debt securities and included under direct investment, debt instruments) and other contributions of an equity nature.

Reinvestment of earnings denote the part of profits, accruing to a direct investor, which remains in the direct investment enterprise, and which is allocated to its further development. According OECD (2008) *reinvestment of earnings* of direct investment enterprises (items A1.2 and L1.2) reflects earnings accruing to direct investors (that is, proportionate to the ownership of equity) during the reference period less earnings declared for distribution in that period.

Debt instruments mean all forms of investing other than the acquisition of shares or equity, or reinvestment of earnings associated with such shares or equities. Debt instruments include, among others, credits and loans, debt securities and other unsettled payments between entities in direct investment relationship (OECD 2018; NBP 2017).

Empirical data – Structure of FDI inflows in EU countries and Poland

Figure 1. The structure of FDI inflows in EU countries (USD million, per cent of FDI inflows total)

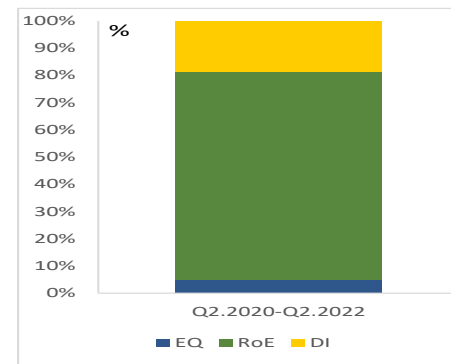
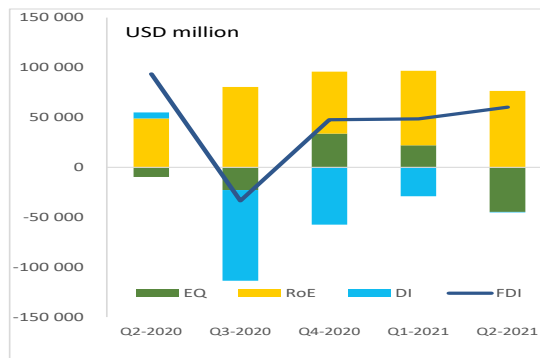
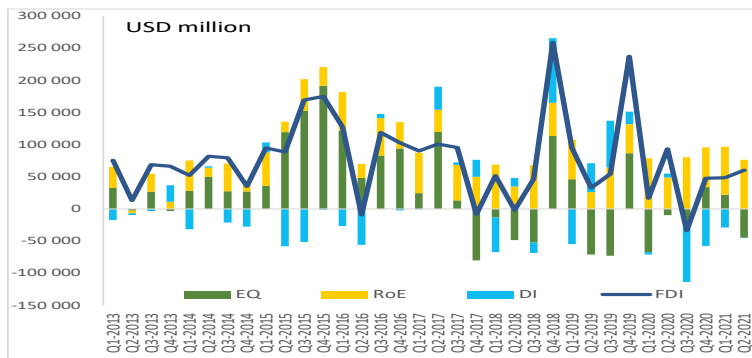
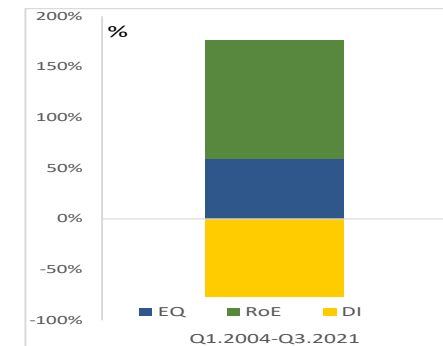
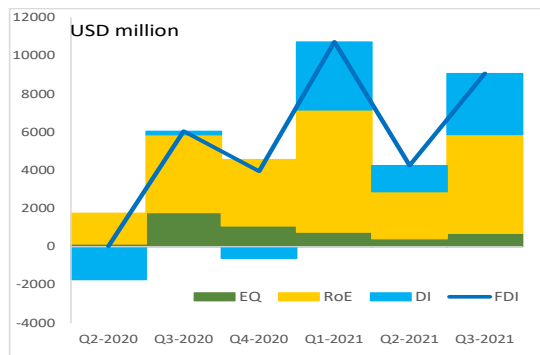
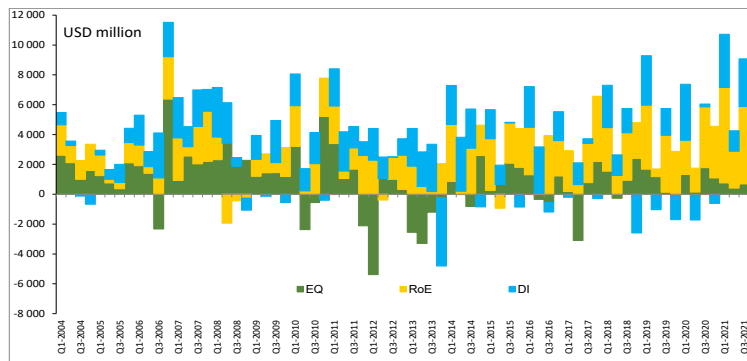


Figure 2. The structure of FDI inflows in Poland (USD million, per cent of FDI inflows total)



Source: Author's compilation based on OECD (2022) and Eurostat (2022).

Data and research procedure of cause-and-effect relationships between components of FDI inflows and GDP

Data: the quarters time-series data covering the period 2004:Q1-2021:Q3 (71 quarters; by used the simple moving average);

Sources: FDI inflows (NBP, BoP, 2022) and GDP (OECD Internet databases (2022)).

The data verification procedure and the selection of the analysis method included: ADF test, KPSS stationary test, VAR inverse root, the Engle-Granger and Johanson test and lag order (AIC, BIC, HQC criteria).

In order to verify correctness of the VECM model results: two tests were carried out verifying the occurrence of autocorrelation, i.e.: Autocorrelation Ljung-Box Q' test, and ARCH test.

The final formula for the GDP function:

$$GDP_t = \alpha_0 + \alpha_1 EQ_t + \alpha_2 RoFE_t + \alpha_3 DI_t + \xi_t$$

The general form of the VECM model:

$$\Delta Y_t = \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \dots + \Gamma_{k-1} \Delta Y_{t-k+1} + \pi Y_{t-k} + \varepsilon_t = \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + \pi Y_{t-k} + \varepsilon_t, \quad (2)$$

where:

$$\Gamma_i = \sum_{j=1}^i A_j - I, \quad i = 1, 2, \dots, k-1, \quad \Gamma_k = \pi = -\pi(1) = -\left(I - \sum_{i=1}^k A_i\right)$$

and I is a unit matrix.

Table 2. The main research results for VECM model

VECM system, lag order 8				
Maximum likelihood estimates, observations 2006:4-2021:3 (T = 60)				
Cointegration rank = 1, Case 3: Unrestricted constant				
	β (cointegrating vectors, standard errors in parenthes)		α (adjustment vectors)	
ma_GDP	1.0000	(0.00000)	d_GDP	0.0071702
ma_EQ	-0.81884	(9.1276)	d_EQ	-0.0029978
ma_RoE	-167.94	(20.255)	d_RoE	-0.0017278
ma_DI	167.11	(18.882)	d_DI	-0.0061515
	ma_GDP	ma_EQ	ma_RoE	ma_DI
Specification	Coefficient	Coefficient	Coefficient	Coefficient
	(p-value)	(p-value)	(p-value)	(p-value)
EC1	0.00717025	-0.00299777	-0.00172779	-0.00615147
	(0.7496)	(0.3291)	(0.1930)	(3.89e-05)
R2	0.805401	0.526401	0.714782	0.830466
DW	1.937766	1.776624	2.063881	1.903655

Source: author's own calculations.

The impulse response functions

Figure 3. Forecast horizon 20q, include bootstrap confidence interval $1-\alpha=0.90$ (shaded area)

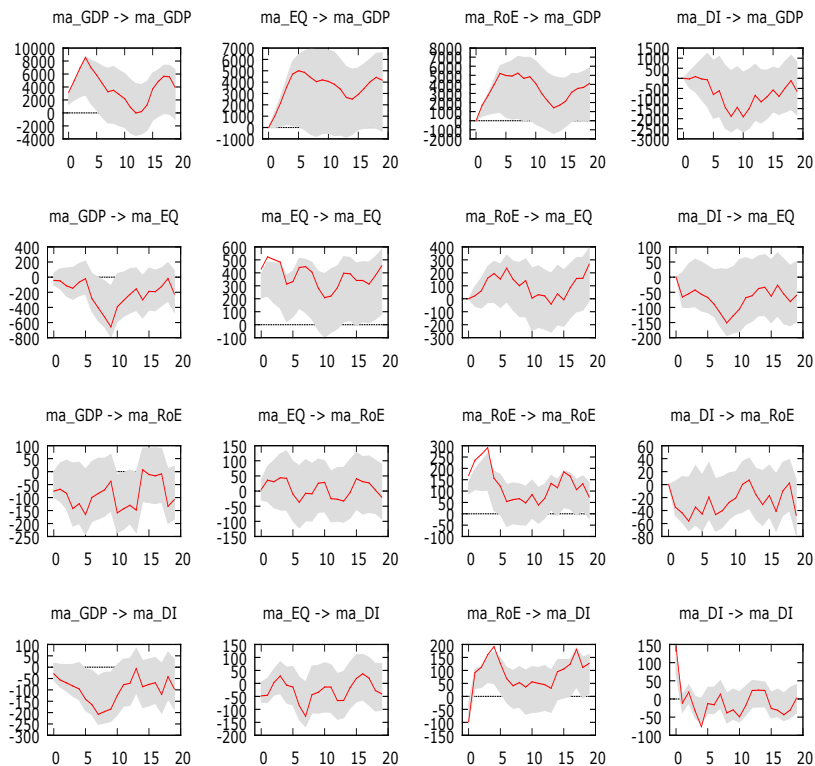
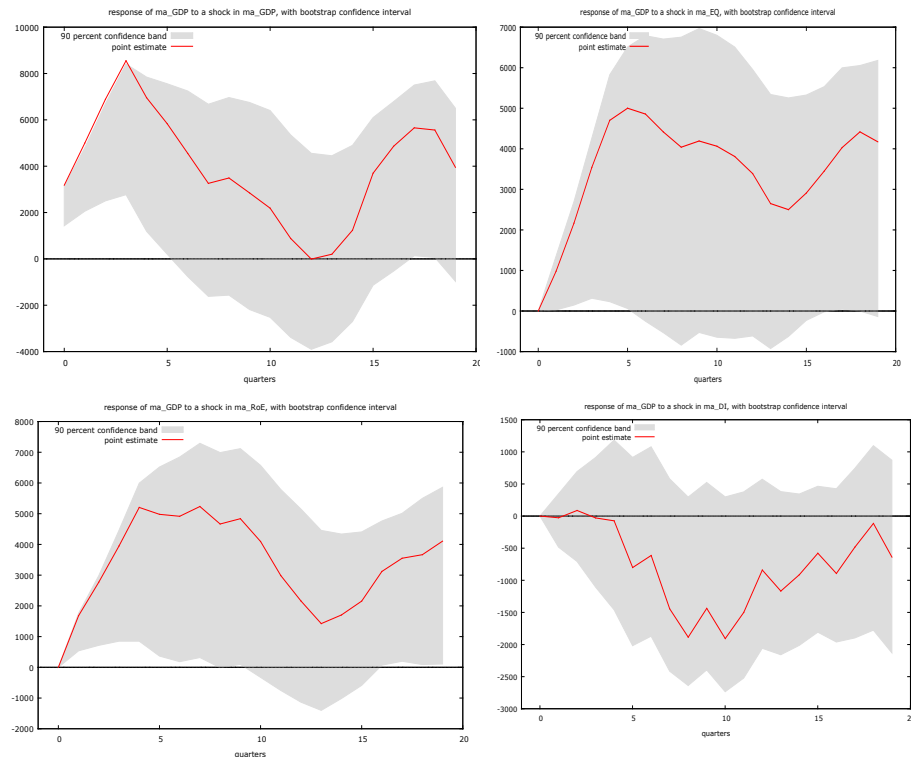


Figure 4. Response of GDP to a standard shock in own GDP and components of FDI inflows (quarters)



The variance decompositions

Figure 5. Forecast variance decomposition for GDP and EQ, RoE, DI (quarters)

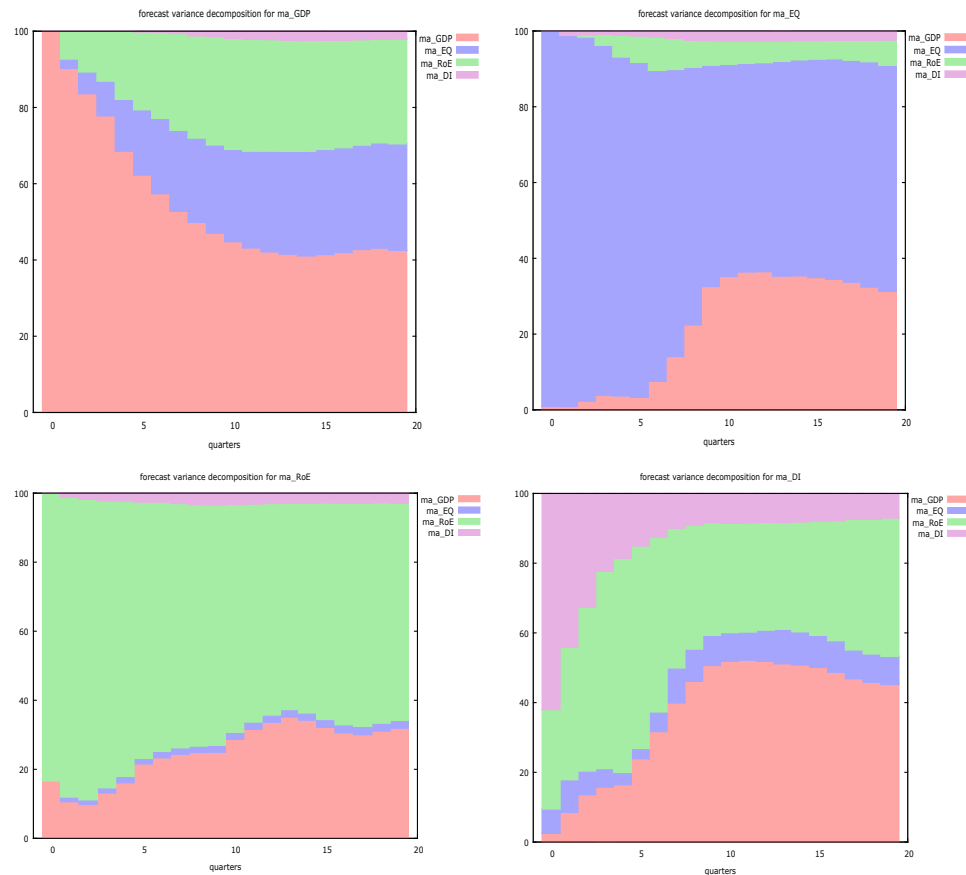


Table 3. Decomposition of variance for ma_GDP (per cent)

period	ma_GDP	ma_EQ	ma_RoE	ma_DI
1	100	0	0	0
2	90,2598	2,4795	7,2587	0,0019
3	83,6233	5,7306	10,6377	0,0084
4	77,8407	9,1040	13,0507	0,0046
5	68,5739	13,5497	17,8715	0,0049
6	62,3186	17,101	20,4084	0,1721
7	57,3975	19,7228	22,6504	0,2294
8	52,7771	21,2409	25,3707	0,6113
9	49,9027	22,108	26,8059	1,1835
10	47,0728	23,1272	28,3794	1,4207
11	44,8134	24,1722	29,1301	1,8843
12	43,1929	25,3596	29,3069	2,1406
13	42,1546	26,3888	29,2665	2,1900
14	41,5409	26,9885	29,1208	2,3498
15	41,0897	27,4240	29,0585	2,4278
16	41,4267	27,5620	28,6266	2,3847
17	41,9984	27,4622	28,1923	2,3471
18	42,7385	27,4005	27,6539	2,2071
19	43,1311	27,6194	27,1942	2,0554
20	42,5052	27,9820	27,5218	1,9910

Conclusion and way forward

I

- The experience of several decades of expansion of FDI flows and changes in their structure indicates that research on the impact of the financial structure of FDI inflows on GDP, i.e. as a multidimensional variable and not only as a monolithic variable.

II

- In the structure of FDI inflows in Europe and in Poland, the share of reinvestment of earnings is growing.
- The period of the COVID-19 pandemic did not change that either.

III

- The research on the impact of FDI components on GDP in Poland using the VECM model, the impulse response functions and the decomposition of variance, confirmed the increasing over time, positive impact of mainly capital shares (equity) and reinvestment of earnings.
- The impact of these variables grows strongly in the first 2 years, slightly weakening the growth rate in the following years.

IV

- The results of the research confirm the importance of pursuing an investment policy focused on attracting new investments (new equity), including the so-called greenfield and on maintaining the existing ones (reinvestment of earnings).

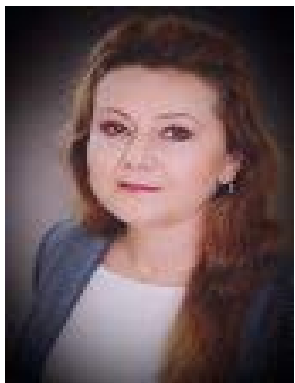
V

- Considering that the financial structure of FDI inflow also depends on the industry structure of the host economy, further research should focus on the diagnosis of these relationships and their impact on economic development.



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Thank for your attention



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