“Empirics of investment – social and economic development causal nexus in Ukraine (case study of the Lviv region of Ukraine)”

AUTHORS	Ruslan Boiko Rostyslav Baran Vitalii Boiko Taras Vasyltsiv Nataliia Mahas Yaroslav Berezivskyi

ARTICLE INFO	Ruslan Boiko, Rostyslav Baran, Vitalii Boiko, Taras Vasyltsiv, Nataliia Mahas and Yaroslav Berezivskyi (2025). Empirics of investment – social and economic development causal nexus in Ukraine (case study of the Lviv region of Ukraine). *Investment Management and Financial Innovations*, *22*(2), 365-384. doi:10.21511/imfi.22(2).2025.29
DOI	http://dx.doi.org/10.21511/imfi.22(2).2025.29
RELEASED ON	Thursday, 05 June 2025
RECEIVED ON	Thursday, 13 February 2025
ACCEPTED ON	Thursday, 29 May 2025

JOURNAL	"Investment Management and Financial Innovations"
ISSN PRINT	1810-4967
ISSN ONLINE	1812-9358
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
42	6	3

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine

www.businessperspectives.org

Ruslan Boiko (Ukraine), **Rostyslav Baran** (Ukraine), **Vitalii Boiko** (Ukraine), **Taras Vasyltsiv** (Ukraine), **Nataliia Mahas** (Ukraine), **Yaroslav Berezivskyi** (Ukraine)

EMPIRICS OF INVESTMENT – SOCIAL AND ECONOMIC DEVELOPMENT CAUSAL NEXUS IN UKRAINE (CASE STUDY OF THE LVIV REGION OF UKRAINE)

Received on: 13th of February, 2025
Accepted on: 29th of May, 2025
Published on: 5th of June, 2025

Ruslan Boiko, Ph.D. in Economics, Associate Professor, Department of Accounting, Control, Analysis and Taxation, Lviv University of Trade and Economics, Ukraine. (Corresponding author)

Rostyslav Baran, Doctor of Economics, Professor, Department of International Economy, Marketing and Management, Ivano-Frankivsk Educational and Scientific Institute of Management of the West Ukrainian National University, Ukraine.

Vitalii Boiko, Doctor of Economics, Professor, Department of Management of Organization, Lviv Polytechnic National University, Ukraine.

Taras Vasyltsiv, Doctor of Economics, Professor, Department of Social and Humanitarian Development of the Regions, M. Dolishniy Institute of Regional Research of the National Academy of Sciences of Ukraine, Ukraine.

Nataliia Mahas, Ph.D. in Economics, Associate Professor, Department of Management, Economy and Tourism, Lviv Institute IAPM, Ukraine.

Yaroslav Berezivskyi, Ph.D. in Economics, Docent, Department of Enterprise Economics, Innovations and Consulting at the Agricultural Industry named after I.V. Popovych, Stepan Gzhytskyi National University of Veterinary Medicine and Biotechnologies of Lviv, Ukraine.

Conflict of interest statement:
Author(s) reported no conflict of interest

Abstract

The development of regional socio-economic systems relies on investments as a key factor for expanded reproduction, creating a cyclical process in which investments drive development, generating resources for further investments. This paper aims to empirically investigate the nexus and causal link between investments and the socio-economic development of a region in Ukraine (Lviv region as a case study). The research methods include VAR modeling (to assess the elasticity of investment processes to environmental factors), Forward Stepwise (to examine the impact of investment on socio-economic development), and extrema (to determine optimal investment resource points). The data for the Lviv region of Ukraine from 2005 to 2023 serve as the information and analytical basis of the study. The article identifies key economic factors, such as employment growth (elasticity: 2.65%) and the number of large and medium-sized enterprises (1.39%), and financial factors influencing investment processes. Financial factors include the growth of personal income tax revenues (4.78%), economic activity expenditures (0.81%), and subsidies (0.49%) in the short term, while tax independence (1.35%), local taxes and fees (2.47%), and economic activity expenditures (0.94%) are significant in the long term. It is estimated that a 1% increase in capital or foreign direct investment boosts socio-economic development by 0.12% and 0.5%, respectively, with foreign direct and capital investments ensuring socio-economic development at 0.45%. The use of constructed models for forecasting and planning investments in the Ukrainian regions allows for optimizing resource allocation, avoiding excessive costs, and ensuring economic stability in the face of global shocks and crises.

Keywords investment, Ukraine, extrema, lag, finance, development, region, war

JEL Classification E20, O18, R13

INTRODUCTION

Investment activity serves as a fundamental indicator of a stable and efficiently functioning economic system, playing a pivotal role in both the quantitative and qualitative development of regional economies. On the one hand, investment ensures quantitative expansion through the creation of new enterprises, scaling of production capacities, modernization of infrastructure, and revitalization of economically depressed or deindustrialized territories. On the other hand, it facilitates qualitative transformations by promoting technological and innovative modernization, increasing labor productivity, and enhancing the technological competitiveness of core sectors, contributing ultimately to improved living standards and the effective functioning of social infrastructure.

Despite its critical importance, the activation of investment activity remains a complex and multifactorial process, influenced not only by

direct economic indicators (such as output volumes, business performance, foreign trade activity, and regional financial autonomy) but also by indirect conditions, notably the quality of the investment climate and institutional environment. However, empirical evidence suggests that increased investment volumes do not always translate into sustainable, qualitative shifts within the socio-economic structure of a regions of Ukraine, even in the rear regions (for example, the Lviv region is a rear territory located at a distance of 1,000 km from the front, but the impact of the Russian-Ukrainian war on all spheres of life, economic activity, and investment activity is significantly negative).

This discrepancy underscores the relevance of further scientific inquiry into the mechanisms and dynamics of investment-driven regional development. The key research problem lies in the insufficient understanding of the bidirectional relationship between investment activity and socio-economic development. Accordingly, there is a need to move beyond merely identifying investment drivers and toward a more integrated analysis of how investment processes shape, and are shaped by, the broader socio-economic trajectory of a region.

The results of the study also relate to the period of Russian-Ukrainian war, in particular 2022–2023, when the peculiarities of the Lviv region's investment environment were exacerbated by military risks, political and economic instability, narrowing of the domestic market, aggravation of energy and resource and other problems, complications in logistics, distribution and sales of products.

1. LITERATURE REVIEW

1.1. Causal aspects of investment and the identification of factors and conditions that shape investment activity and structural characteristics of investment processes

As evidenced by numerous academic studies, investment has consistently served as one of the leading drivers of economic growth, fulfilling functions such as supporting the regenerative processes of regional socio-economic systems, modernizing the material-technical and techno-technological base of production, creating new production capacities, and developing both general and social infrastructure (Sarkodie & Strezov, 2019). Furthermore, investment facilitates the expanded reproduction of regional economies through capital allocation in advanced technologies, innovations, commercialization of intellectual property, and the digital transformation of both the economy and society (Burke & Hung, 2016), ultimately contributing to an improved quality of life through the modernization of social service systems (Voznyak et al., 2024).

However, these are predominantly environmental or contextual factors. In contrast, managerial factors often act as impediments to the activation of investment processes. An effective regional investment policy fosters a favorable investment environment and cultivates a positive investment climate across the region and its territories, thereby enhancing both the volume and the productive nature of investments (e.g., in innovation, technological modernization, and public development initiatives). Conversely, poor-quality public investment management tends to suppress investment activity. Therefore, it is crucial to consider studies that explore the influence of managerial aspects, such as the organization and monitoring of public investment (Kafka et al., 2019), the competencies of public officials responsible for the investment sector in public administration (Cram & Lusardi, 2020), and the formation and allocation of investment resources at the level of local self-government (Voznyak et al., 2023).

Additionally, attention must be given to the ability of authorities to strengthen the effects of investment and growth convergence while mitigating investment climate divergence and systemic market distortions (e.g., corruption, shadow economy, administrative pressure) (Nayak & Sahoo, 2021), to simultaneously promote sectoral and spatial development through investment activity (Vdovenko et al., 2023), and to sustain investment activity under critically adverse conditions such as the Russian-

http://dx.doi.org/10.21511/imfi.22(2).2025.29

Ukrainian war and its existentially negative socio-economic consequences (Lyndyuk et al., 2023). Finally, it is important to emphasize the need for further studies that examine the impact and outcomes of investment activity in a region on various aspects of its socio-economic development.

1.2. The impact and consequences of investment activity in a region on various aspects of its socio-economic development

In addition to analytical research that explores the directions, interrelations, and influences between investment processes and development, special attention should be given to studies, particularly those with an empirical basis, that characterize the effects of investment on the sustainable progress of countries and regions across economic, social, and environmental dimensions. These effects include improvements in quality of life and migration stability (Lupak et al., 2022); environmental security and the development of the green economy and alternative energy sources (Brooks & Williams, 2024); reduction of social disparities and inequalities, including those related to living standards (Halland & Canuto, 2013); progress toward the achievement of the Sustainable Development Goals (Aust et al., 2020); enhancement of local governments' capacities to undertake social expenditures and investments (Lucianelli et al., 2018); preservation of the natural environment and ensuring consumer safety (Muhammad et al., 2021); improved opportunities for consumer and social investment (e.g., housing) via the banking sector (Rushchyshyn et al., 2021); reduction of greenhouse gas emissions; and mitigation of social vulnerability in areas with high levels of industrial activity and related environmental pressures (Kutsyk et al., 2020).

1.3. The causal nexus between the intensification of investment activity and regional economic and social development

Investment is largely a determinant of regional development. However, it is equally important to emphasize the bidirectional nature of this relationship. Regions that demonstrate stable progress tend to create favorable conditions for the intensification of investment activity, as well as for the effective allocation and distribution of investment resources. Key contributing factors include increased public budget revenues and enhanced public investment capacity; improved financial performance of enterprises and the corresponding growth of their investment potential; and regional economic expansion, which boosts overall investment attractiveness, particularly for external and foreign direct investments.

Foundational works in this area of research highlight various aspects of socio-economic development that function as enablers of investment activity across regional economic sectors (Rahman, 2015), territories (Liang et al., 2021), productivity-related dimensions (Amendolagine et al., 2019), financial and economic performance growth areas (de Mello, 1997), and sources for the expansion of regional resource potential (Nguyen & Nguyen, 2021; Osei & Kim, 2020).

1.4. Econometric toolkits for analyzing the relationships between investment and socio-economic development

As part of advancing research on the interrelation between investment processes and socio-economic development, a comprehensive foundation of both methods and validated econometric models has been established. Key findings include the application of stochastic analysis (Fuente-Mella et al., 2020), identification of causal links between investment and the functioning of the national and regional financial systems (Korneyev, 2019), and the construction of regression (Rakhmatullayeva et al., 2021) and correlation models (Rakhmatullayeva et al., 2020) that demonstrate the relationships between investment dynamics and structure and shifts in core indicators of socio-economic progress. These are further complemented by multilevel and multiplicative modeling efforts that link business environment factors with investment processes (first level), and investment volumes, dynamics, and structure with the principal parameters of countries' economic and social advancement (second level) (Mulska et al., 2023; Boiko,-2024).

1.5. The impact of the Russian-Ukrainian war and other contemporary trends

The existing models for enhancing investment activity and promoting socio-economic development across all levels of governance are understandably undergoing critical reassessment. Valid concerns are being raised regarding the need to adjust these models in response to several major influencing factors, chief among them being the consequences of the Russian-Ukrainian war. These include the weakening of Ukraine's investment security and the outflow of foreign direct investment (Kwilinski et al., 2020), the decline in the financial and economic security of strategic sectors (Dmytryk et al., 2024), increasing investment risks and threats (Ilyash et al., 2022), inflows of capital from so-called high-risk zones (Trusova et al., 2021), and the disruption of the socio-economic equilibrium of regions and communities (Voznyak et al., 2022).

On a more positive note, there are also promising efforts to deepen the study of investment processes and their socio-economic impacts through advanced methodological approaches. These include time lags (Sconosciuto, 2023), thresholds and boundaries (Butenko et al., 2023), factor weighting coefficients (Sinha & Sengupta, 2022), intensity and elasticity (Lysiak et al., 2020; Melnyk et al., 2014), collinearity filters (Park, 1995; Paul & Feliciano-Cestero, 2021), and differentiation of returns depending on the level of economic development, quality of institutional environment, and socio-demographic characteristics of territories (Sabir et al., 2019), among others.

However, unresolved issues remain regarding the development of econometric models that capture the bidirectional causal relationships on the one hand, between business environment factors and regional investment activity, and on the other, between increased investment activity, improved investment structure, and positive transformations in the social and economic parameters of the functioning and progress of regional socio-economic systems. Furthermore, it is essential to understand the boundaries and vectors of structural change and reform in investment activity, namely, the so-called lower and upper optima within which investment exerts the most rational and optimal influence on regional socio-economic development.

These gaps also reflect certain inconsistencies still present in current economic research, where the effects of external and internal factors on investment and the effects of investment on development are often modeled independently, without proper integration or accounting for multilevel and lagged relationships in the resulting analyses and conclusions.

Accordingly, there is an urgent and growing need to continue research in this area to develop and test methodologies for analyzing the influence of external environmental factors on investment, as well as the impact of investment processes on regional socio-economic development. This would facilitate the identification of key triggers and decisions for realizing investment potential within the framework of regional development strategies.

2. AIM

The purpose of the paper is to empirically investigate the nexus and causal link between investments and the socio-economic development of a region in Ukraine (Lviv region as a case study).

3. METHODOLOGY

The methodological approach to the complementary research of the impact of investment processes on the region's socio-economic development is based on the implementation of four stages:

1) formation of a three-component platform of the analytical base of the research – investment environment, investment processes, and markers of socio-economic development;

2) assessing the elasticity of investment processes to changes in the investment environment (VAR modeling);

3) identification of the systemic impact of investment processes on the region's socio-economic development (Forward Stepways, balanced modeling);

http://dx.doi.org/10.21511/imfi.22(2).2025.29

4) designing optimum points (local minimum and maximum) and critical limits of insufficient investment resources to maintain the region's stable development (method of extrema).

The information and empirical basis for the research on the complementary impact of investment processes on the region's socio-economic development is represented by formula (1).

$$CRID_t = \langle Inv_t | InvE_t | SED_t \rangle = \left\langle \begin{matrix} \mathrm{Cap_t} \\ \mathrm{ICap_t} \\ \mathrm{FDI_t} \\ \mathrm{IFD_t} \end{matrix} \middle| \left(\mathrm{Ec_t} | \mathrm{Fin_t}\right) \middle| \begin{matrix} \mathrm{GRP_t} \\ \mathrm{Inc_t} \\ \mathrm{InnP_t} \\ \mathrm{BdRes_t} \\ \mathrm{Exp_t} \end{matrix} \right\rangle, \quad (1)$$

where $CRID_t$ is the information and analytical base of the research in the t-period; Inv_t is investment processes in the t-period; SED_t is the region's socio-economic development in the t-period; $InvE_t$ is the conditions of the region's investment environment in the t-period; Cap_t is the volumes of the region's capital investments in the t-period (US dollars, per capita); $ICap_t$ is the index of capital investment in the t-period (previous year = 100%); FDI_t is the volume of foreign direct investment in the t-period (US dollars, per capita); IFD_t is the index of foreign direct investment (previous year = 100%); Ec_t is the economic conditions of the investment environment in the t-period; Fin_t is the financial conditions of the investment environment in the t-period; GRP_t is the Gross Regional Product in the t-period (US dollars, per capita); Inc_t is the present income of the population in the t-period (US dollars, per capita). $InnP_t$ is innovative productivity in the t-period (US dollars, per employee); $BdRes_t$ is the level of budgetary efficiency in the t-period (the amount of income with transfers per capita, US dollars); Exp_t is the volume of the exports of goods and services in the t-period (US dollars, per capita).

The research on investment processes, based on the decomposition of capital and direct investment through the indicators of volumes and rates of change, allows for drawing reasonable conclusions on the state and trends of the economic development of territories and building a foresight of the region's financial and economic self-sufficiency. This approach also helps identify weak points in the regional economy and stimulate investment development.

Understanding the investment environment as a set of financial, economic, political, legal, and other conditions for attracting investment resources, increasing and developing the investment potential of the territory, the configuration of determinants of the investment environment is proposed in the projection of two components – financial and economic conditions (Formula 2).

$$InvE_t = \left(\begin{matrix} Emp_t & InPr_t & Agr_t \\ Bld_t & Tr_t & Inn_t \\ Imp_t & Unt_t & Sms_t \\ & & Fop_t \end{matrix} \middle| \begin{matrix} Tax_t & Dot_t \\ Bud_t & InT_t \\ Pdfo_t & ExEc_t \\ & LocT_t \end{matrix} \right), \quad (2)$$

where Emp_t is the employment rate of the population aged 15-70 in the t-period (% to the total population of the corresponding age); $InPr_t$ is the volume of industrial production sold in the t-period (USD, per capita); Agr_t is the volume of agricultural production in the t-period (USD, per capita); Bld_t is the volume of construction work performed in the t-period (USD, per capita); Tr_t is the volume of retail trade turnover in the t-period (USD, per capita); Inn_t is the volume of sold innovative products in the total volume of sold industrial products in the t-period (USD, per capita); Imp_t is the volume of the imports of goods and services in the t-period (USD, per capita); Sms_t is the number of small businesses in the t-period (units, per 10 thousand people); Unt_t is the number of large and medium-sized enterprises in the t-period (units per 10 thousand people of the population); Fop_t is the number of private entrepreneurs in the t-period (units, per 10 thousand people of the population); Tax_t is the level of tax independence in the t-period (the ratio of tax revenues and income without transfers, coefficient); Dot_t is the level of subsidization in the t-period (the ratio of transfers and total revenues with transfers, coefficient); Bud_t is the level of budget independence in the t-period (the ratio of revenues without transfers to total revenues, coefficient); InT_t is the rate of changes in local budget revenues (without transfers) in the t-period (%

to the previous year); $Pdfo_t$ is the rate of change in Personal Income Tax revenues in the t-period (% to the previous year); $ExEc_t$ is the volume of expenditures on economic activity in the t-period (USD, per capita); $LocT_t$ is the level of local taxes and levies in local budget revenues (without transfers) in the t-period (coefficient).

The VAR approach was used to examine the dynamic relationships between capital investments, foreign direct investments, and economic indicators over two-run lags. This model accounts for potential feedback loops between variables, allowing for the analysis of both short- and long-term effects. Forward Stepways method identifies the dominant factors influencing investment processes, focusing on the coefficients of elasticity for capital and foreign direct investments. It also enables the calculation of the strength and direction of influence from economic and financial conditions.

The elasticity of capital and foreign direct investments was evaluated by determining how sensitive these investments are to changes in key economic indicators. The elasticity coefficients were computed for both the volume and rate of changes in investments over two lags. The following steps were undertaken:

- First lag (t-1): the impact of changes in employment, the number of businesses, industrial production, agricultural output, and other economic variables on capital and foreign direct investment.
- Second lag (t-2): The delayed effects of changes in economic conditions, focusing on factors such as construction works, fiscal independence, and local taxes and levies on investment volumes and rates.

Standard diagnostic tests, including R-squared, Durbin-Watson (DW) statistic, and F-tests, were conducted to ensure the models' robustness and to assess the goodness-of-fit and autocorrelation issues. The elasticity coefficients were computed for each variable to determine the percentage change in capital and foreign direct investment in response to a 1% change in independent variables. This analysis helped to pinpoint the most sensitive factors influencing investment in the region.

The construction of optimum points is carried out using the extremum toolkit. Formulas demonstrate the conditions for identifying local minimum and maximum points, respectively. Using the second derivative criterion, the nature of critical points is determined:

- if $f''(x_0) > 0$, the point x_0 is a local minimum;
- if $f''(x_0) < 0$, the point x_0 is a local maximum.

$$f(a_0) \le f(a), \quad a \in (a_0 - \delta, a_0 + \delta), \quad (3)$$

where $\delta > 0$,

$$f(a_0) \ge f(a), \quad a \in (a_0 - \delta,\ a_0 + \delta). \quad (4)$$

4. RESULTS AND DISCUSSION

The analysis has revealed that the volume of capital investment in the Lviv region during the researched period in the first-time lag was the most sensitive to changes in employment (elasticity coefficient of 2.65 %) and the number of large and medium-sized enterprises (1.39 %), the increase in which contributed to attracting investment to the region (Table A1, Appendix A). In the first lag, capital investment showed a moderate degree of sensitivity to changes in such economic indicators as the volumes of industrial output (0.51%), agricultural production (0.74%), and innovative products sold (0.72%). Capital investment was highly sensitive to changes in the number of small businesses (1.71%). The second lag shows a decrease in the sensitivity of the region's capital investments to the number of large and medium-sized enterprises (from 1.39% to 0.92%) and the volume of innovative products sold (from 0.72% to 0.59%). The impact of certain economic conditions of the investment environment on the volume of capital investment in the Lviv region from 2005 to 2023 increased in the second lag: the volume of construction works performed (by 0.41 pp), and the volume of imports of goods and services (by 0.35 pp).

It is noteworthy that the rates of increase/decrease in capital investment in the Lviv region in the two lags had the highest degree of sensitivity to changes in the level of employment (15.03% and 12.58%, respectively), the number of large and medium-sized enterprises (1.14% and 1.16%, respectively),

http://dx.doi.org/10.21511/imfi.22(2).2025.29

and small business entities (1.17% and 1.03%, respectively). In the first lag, capital investment in the region was the least sensitive to changes in the imports of goods and services (0.13%), and construction works performed (0.29%); in the second lag – to changes in retail turnover (0.34%), and the number of private entrepreneurs (0.13%).

Among the financial conditions of the investment environment in the Lviv region from 2005 to 2023, the growth rate of Personal Income Tax revenues (4.78%), the volume of expenditures on economic activity (0.81%), and the level of subsidization (0.49%) had the greatest impact on the volume of capital investments in the first lag. The sensitivity of the region's capital investments in the short term was the lowest to changes in the level of tax independence (0.01%), budget independence (0.16%), and the rate of local budget revenues (0.21%). In the second lag, there was an increase in the sensitivity of capital investments to the levels of fiscal independence (1.35%), local taxes and levies in regional budget revenues (2.47%), and the volume of expenditures on economic activity (0.94%).

The investment environment has a significant impact on the volumes and dynamics of foreign direct investment in the region. Regional characteristics, including geographic location, resource potential, the level of infrastructure development, economic policy, and social factors, can both stimulate and limit the inflow of foreign direct investment. For example, from 2005 to 2023, the Lviv region was characterized by greater investment attractiveness than other regions of western Ukraine. The economic conditions to the change of which the volume of foreign direct investment was more elastic in two lags are as follows: the level of employment (8.35% and 7.10%, respectively), the number of large and medium-sized businesses (2.75% and 2.76%, respectively), retail turnover (0.46% and 1.037%, respectively), and the number of private entrepreneurs (0.6% and 0.7%, respectively) (Table A1, Appendix A).

Unlike the results of scientific research, which identify factors influencing investment activity and socio-economic growth (Kafka et al., 2019), analyse the quality of regional investment policy (Cram & Lusardi, 2020), study the effectiveness of sources of investment resources (Voznyak et al., 2023), the results obtained do not allow to state about the quality and efficiency, but rather serve as a tool for modeling the conditions and consequences of regional investment policy, and are based on the principle of cyclicality, when the impact on the factors of the investment environment ensures an increase in investments and changes in their structure, and this activates the socio-economic development of the region while vice versa such development creates new prerequisites for further investment.

The rates of changes in foreign direct investment in the Lviv region from 2005 to 2023 in two periods had the greatest sensitivity to the level of employment of the population (11.37% and 11.91%, respectively), the number of small business entities (2.11% and 2.53%, respectively), and the volume of industrial products sold (1.11% and 1.21%, respectively). The volumes of agricultural products determine a high degree of elasticity relative to the indices of foreign direct investment only in the first lag (2.61%), and the volumes of retail trade turnover in the second period (0.74%). Research results on the elasticity of the business sector, namely the number of large enterprises in the region and private entrepreneurs, are interesting. The degree of sensitivity of the rates of foreign direct investment in the Lviv region to changes in these indicators is relatively small (from 0.01% to 0.17%).

It is worth noting that the region's financial self-sufficiency, according to the results of VAR modeling, is an existential factor in attracting investment resources and developing investment potential. The volume of foreign direct investment in the Lviv region from 2005 to 2023 in two lags was determined to the greatest extent by the level of subsidization (3.14% and 3.47%), the growth rate of Personal Income Tax revenues (5.53% and 4.61%), the level of tax independence (2.63% and 4.62%), and the volume of expenditures on economic activity (2.09% and 1.11%). Instead, in the second time lag, there is a decrease in the sensitivity of foreign direct investment volumes to changes in the level of budget independence (from 1.99% to 0.03%), the growth rate of local budget revenues (from 1.61% to 0.84%), and the level of local taxes and levies in local budget revenues (from 0.28% to 0.02%).

Unlike capital investments, where there was a clear differentiation of the sensitivity of their volumes and rates to changes in the financial conditions of the region's investment environment, the indices of foreign direct investments do not demonstrate an expressive difference from their volumes. Those determinants that had a high degree of influence on the volumes of foreign direct investments also determine their rates the most, and vice versa.

It is also necessary to additionally consider the specifics of the relationship between investment activity and the socio-economic development of the region in situations of a critically difficult external economic environment, such as in the rear region, but with the critically negative consequences of a full-scale war. In such a situation, regional authorities and local governments should intensify investment policies aimed at stimulating investment activity and minimizing its challenges and threats. At the same time, the task of guaranteeing investment security as a state of protection of the economic interests of business entities, regional and local levels (Aust et al., 2020; Lucianelli et al., 2018) from risks and threats in the investment sphere comes to the fore. Therefore, the focus of regional investment policy is on systemic challenges (administrative, environmental, political, financial, spatial-sectoral and ecological), and current threats (related to the consequences of a full-scale war, the difficulties of European integration, hybrid interventions, technology and digital transformation, economic globalization, etc.) to the investment security of the region.

Econometric modeling by the ForwardStepways method allows for identifying those factors that have a dominant influence on the investment process, in particular the volumes of investment resource attraction, as well as revealing the strength of their simultaneous influence on investment processes. Thus, an increase in the employment rate of the population and the volume of innovative products sold by 1% contributes to an increase in the volume of capital investments in the Lviv region by 7.46% and 3.56%, respectively (Formula 5). At the 95% statistical significance level, it can be stated that an increase in the volume of products sold and a decrease in the volume of imports of goods and services by 1% leads to increased capital investments.

$$Cap_t = \underset{\left(-4.064^{***}\right)}{-19.8} + \underset{(3.247^{**})}{7.463} Emp_t + \underset{(2.921^{**})}{0.966} InPr_t + \underset{(3.071^{***})}{3.556} Inn_t - \underset{(-2.656^{**})}{0.434} Imp_t, \quad (5)$$
$$R^2 = 0.915\ DW = 2.046\ F(5,13) = 13.361$$

Empirical estimates have shown that the rate of capital investment was most influenced by the employment rate of the population (8.2%), and the number of large and medium-sized businesses (2.96%) (Formula 6). An increase in the volume of innovative products sold, construction work performed, and the number of private entrepreneurs by 1% will allow for scaling the volume of capital investment by 0.26%, 0.79%, and 0.19%, respectively (statistical significance is 95%).

$$ICap_t = \underset{(1.361^{*})}{8.200} Emp_t + \underset{(2.304^{**})}{0.787} Bld_t + \underset{(1.222^{***})}{0.261} Inn_t + \underset{(2.314^{**})}{2.962} Unt_t + \underset{(0.405^{**})}{0.191} Fop_t, \quad (6)$$
$$R^2 = 0.849\ DW = 1.986\ F(6,12) = 1.409.$$

Among the financial conditions of the investment environment, the dominant factors influencing capital investment include the levels of tax independence (the coefficient of influence is 3.3%), and local taxes and levies in local budget revenues (2.72%). An increase in the rate of local budget revenues (excluding transfers) and a decrease in regional subsidization by 1% will contribute to attracting investment at 0.15% and 0.86%, respectively (Formula 7). It is noteworthy that the level of subsidization is a regressor of the activation of investment processes in the Lviv region.

$$Cap_t = \underset{\left(4.363^{***}\right)}{4.541} - \underset{(2.741^{**})}{0.858} Dot_t + \underset{(0.184^{*})}{0.147} InT_t + \underset{(1.476^{**})}{3.296} Tax_t + \underset{(1.262^{**})}{2.721} LocT_t, \quad (7)$$
$$R^2 = 0.8777\ DW = 2.112\ F(4,14) = 5.326.$$

With a statistical significance of 99%, it is identified that an increase in tax revenues from Personal Income Tax in the Lviv region by 1% will allow for an increase in the rate of capital investment by 5.01%. The regression model (8) proves that the rate of change in the region's capital investment

http://dx.doi.org/10.21511/imfi.22(2).2025.29

during the researched period depended on the level of tax independence (the coefficient of influence is 4.08%) and the volume of expenditures on economic activity (1.82%).

$$ICap_t = \underset{(1.338^{*})}{4.077} Tax_t + \underset{(2.133^{***})}{5.011} Pdfo_t + \underset{(1.204^{**})}{1.823} ExEc_t, \quad R^2 = 0.967\ DW = 2.05\ F(3,15) = 4.174. \tag{8}$$

The volume of foreign direct investment in the Lviv region is most influenced by the volume of agricultural products (the influence factor is 5.38%) and the number of small enterprises (2.23%) (Formula 9). An increase in the volume of construction works (statistical significance is 95%), industrial products sold, and retail turnover (statistical significance is 99%) by 1% will contribute to attracting capital investments by 1.54%, 1.83%, and 0.84%, respectively.

$$FDI_t = \underset{(5.493^{**})}{0.839} Tr_t + \underset{(6.570^{**})}{1.536} Bld_t + \underset{(3.635^{***})}{1.830} InPr_t + \underset{(3.792^{***})}{5.380} Agr_t + \underset{(3.652^{***})}{2.230} Sms_t, \quad R^2 = 0.937\ DW = 2.27\ F(5,13) = 16.939. \tag{9}$$

In turn, the dominant factors influencing the indices of foreign direct investment are the number of small business entities (the influence factor coefficient is 3.51%), and large and medium-sized enterprises (1.11%) (Formula 10). An increase in the volume of innovative products sold and the number of private entrepreneurs by 1% will contribute to an increase in the rate of foreign direct investment by 0.12% and 0.97%, respectively (statistical significance is 90% and 95%, respectively).

$$IFDI_t = \underset{(3.513^{***})}{3.506} Sms_t + \underset{(2.917^{**})}{0.973} Fop_t + \underset{(1.320^{**})}{1.107} Unt_t + \underset{(1.109^{*})}{0.119} Inn_t, \quad R^2 = 0.765\ DW = 2.18\ F(4,14) = 1.107. \tag{10}$$

The empirical models of the dependence of foreign direct investment on the financial conditions of the investment environment were allowed to state the following:

- The volumes of foreign direct investment depend most on budget performance (the influence level is 0.2%), and the growth rate of local budget revenues (0.76%) (statistical significance is 90%) (Formula 11);
- The rate of increase in foreign direct investment is determined by the level of tax independence and subsidization, and the volume of expenditures on economic activity (the influence coefficients are 0.80%, 0.48%, and 0.44%, respectively). The statistical significance of the empirical model is 95% (Formula 12).

$$FDI_t = \underset{(0.443^{***})}{0,857} + \underset{(0.664^{*})}{0,204} Bud_t + \underset{(0.843^{*})}{0.761} InT_t, \quad R^2 = 0.925\ DW = 2.09\ F(5,16) = 4.789. \tag{11}$$

$$IFDI_t = \underset{(1.321^{**})}{0.799} Tax_t + \underset{(0.511^{**})}{0.444} ExEc_t + \underset{(0.511^{**})}{0.484} Dot_t, \quad R^2 = 0.921\ DW = 1.98\ F(2,16) = 3.394. \tag{12}$$

The monitoring of the impact of investment processes on the socio-economic development of the Lviv region from 2005 to 2023 has a scientific and applied content, especially in conditions of instability and shocks, the implementation of which is an information and analytical foundation for identifying optimal and critical limits of the sufficiency of investment resources to maintain the region's stable growth. The following markers of the region's socio-economic development were selected: (1) Gross Regional Product (USD per capita); (2) present income of the population (USD per capita); (3) innovation productivity (USD per employee (the ratio of the volumes of innovative products sold and the number of people employed in innovative activities)); (4) the level of budget efficiency (the volumes of income with transfers per capita, USD); (5) the volumes of the exports of goods and services (USD per capita) (Appendix B).

Compared with the results obtained by other researchers (Lupak et al., 2022; Brooks & Williams, 2024; Halland & Canuto, 2013) when solving simi-

lar problems, the analysis results allowed to identify a wider range of initial factors (for example, despite the traditional indices of production and sales of products and the number of business entities, the level of employment of the population, budget revenues and expenditures) of investment activity and a wider range of their results – consequences (such as the impact not only on the GRP, but also on population income, innovative productivity, budget efficiency, and exports) for the region's socio-economic system.

The results of balanced modeling (Formula 13) have proved that investment processes in the Lviv region directly determine the state of an economic system and the dynamics of its progress (a condition of systemic influence on markers of the region's socio-economic development). An increase in the volume of capital and direct foreign investments by 1% will ensure the development of the socio-economic system by 0.12% and 0.5%, respectively. The statistical significance of the research is 95% and 99%, respectively.

$$SED_t = \begin{pmatrix} GRP_t \\ Inc_t \\ InnP_t \\ BdRes_t \\ Exp_t \end{pmatrix} = \begin{cases} \underset{(5.058^{***})}{3.039} + \underset{(0.551^{**})}{0.125} Cap_t \\ R^2 = 0.941 \, DW = 2.11 \\ \underset{(5.587^{***})}{2.092} + \underset{(3.421^{***})}{0.498} FDI_t \\ R^2 = 0.962 \, DW = 2.09 \end{cases} \cdot \quad (13)$$

Investment processes are the foundation for ensuring the region's socio-economic stability in times of crisis and macroeconomic shocks. Thus, under the condition of permanent "infusion" of investment resources into the economy of the Lviv region, the econometric model (Formula 14) proved that direct foreign and capital investments ensure the rate of socio-economic development at the level of 0.45% (statistical significance is 95%).

$$SED_t = \begin{pmatrix} GRP_t \\ Inc_t \\ InnP_t \\ BdRes_t \\ Exp_t \end{pmatrix} = \underset{(1.591^{*})}{1.017} + \underset{(1.990^{**})}{0.328} Cap_t + \underset{(4.165^{***})}{0.580} FDI_t, \quad (14)$$

$$R^2 = 0.957 \, DW = 2.42.$$

At the same time, it can be argued that the elasticity of the parameters of the region's socio-economic development and the volumes and rates of investment processes is not permanent. Thus, the volume of the exports of goods and services is more sensitive to changes in the volume of capital investments in the second lag (the elasticity coefficient is 4.7%) than foreign direct investment (0.24%), and the volume of Gross Regional Product is more sensitive to changes in the volume of foreign direct investments in the first lag (0.54%) (Table 1). The change in capital investment indices in the first lag has the greatest impact on the volume of the exports of goods and services (1.9%), GRP (1.44%), and budget efficiency.

The impact of foreign direct investment on the parameters of the socio-economic development of the Lviv region from 2005 to 2023 was observed to be the greatest in the first lag, with a weakening in the second. Thus, the coefficient of sensitivity of the GRP to changes in the volume of foreign direct investment decreased by 0.4 pp, innovation productivity, and budget efficiency by 0.02 pp. It is worth noting that the volume of the exports of goods and services is more sensitive to the indices of foreign direct investment in two lags (0.42% and 0.38%, respectively).

Table 1. Elasticity coefficients of the investment processes and socio-economic development of the Lviv region from 2005 to 2023

Markers	Lags	Capital investment		Direct foreign investment	
		Volume	Index	Volume	Index
Gross regional product	(1)	0.219776	1.440655	0.542111	0.477978
		(2.16991)	(0.47664)	(0.62162)	(0.30419)
		[0.10128]	[3.02255]	[0.87210]	[1.57134]
	(2)	0.829480	0.330340	0.141187	0.187282
		(2.81064)	(0.93994)	(0.82134)	(0.40372)
		[0.29512]	[0.35145]	[0.17190]	[0.46389]

http://dx.doi.org/10.21511/imfi.22(2).2025.29

Table 1 (cont.). Elasticity coefficients of the investment processes and socio-economic development of the Lviv region from 2005 to 2023

Markers	Lags	Capital investment		Direct foreign investment	
		Volume	Index	Volume	Index
Disposable income of the population	(1)	0.005502	0.497404	0.050831	0.062242
		(0.54223)	(0.14549)	(0.04736)	(0.12781)
		[0.01015]	[3.41876]	[1.07324]	[0.48699]
	(2)	0.210087	0.210724	0.029503	0.048700
		(0.28331)	(0.25742)	(0.04706)	(0.08058)
		[0.74154	[0.81861]	[0.62688]	[0.60437]
Innovative performance	(1)	0.173655	0.206372	0.237977	0.154994
		(0.36604)	(0.21261)	(0.08095)	(0.10853)
		[0.47442]	[0.97065]	[2.93977]	[1.42818]
	(2)	0.354776	0.434986	0.227957	0.177531
		(0.64282)	(0.15794)	(0.08967)	(0.15851)
		[0.55191]	[2.75405]	[2.54221]	[1.12001]
The level of budget performance	(1)	0.585519	1.099497	0.139086	0.075521
		(1.19671)	(0.44206)	(0.35944)	(0.27859)
		[0.48927]	[2.48719]	[0.38695]	[0.27108]
	(2)	0.102548	0.252354	0.114357	0.006491
		(0.72615)	(0.39607)	(0.35691)	(0.26605)
		[0.14122]	[0.63715]	[0.32041]	[0.02440]
Export volumes of goods and services	(1)	1.048088	1.931460	0.370436	0.428154
		(2.93540)	(0.80035)	(0.63624)	(0.50376)
		[0.35705]	[2.41327]	[0.58223]	[0.84992]
	(2)	4.690372	3.180616	0.241465	0.377665
		(5.64809)	(0.91526)	(0.97049)	(0.42919)
		[0.83043]	[3.47509]	[0.24881]	[0.87996]

Note: Calculated using EViews software (VAR modeling method); standard error is given in parentheses; Student's t-test is given in brackets.

Investment resources are usually limited, so the need to identify the minimum of their volumes, which will ensure the stability of the region's development (local minimum), and the maximum, which will allow them to be effectively used in the economic development system (local maximum), is emphasized. The construction of optimum points will also allow for carrying out short-term forecasting and building up the foresight of potential crises or excessive expenditures of investment resources in the region. The maintenance of stable development requires the sustainment of investment support at a level sufficient to avoid economic, financial, social, and other imbalances. The local minimum of investment processes determines the threshold below which the region may lose its development stability. The local maximum demonstrates the limit being above which indicates that further investment attraction will not be effective due to the imbalance in the system "investment processes – the potential of the region's economic development".

To identify optimum points, the dependences of investment processes in the Lviv region on the time factor were constructed using the fourth-order polynomial model (Formula 15-16).

$$Cap_t = -0.127x^4 + 5.392x^3 - 75.959x^2 + 370.43x + 117.78, \quad R^2 = 0.957. \tag{15}$$

$$FDI_t = -0.022x^4 + 0.9677x^3 - 18.149x^2 + 160.35x - 63.186, \quad R^2 = 0.966. \tag{16}$$

The analysis results demonstrate that the point of the local maximum of the volume of capital investments to ensure stable socio-economic development of the Lviv region is 598.1 USD per capita; the point of the local minimum is 361.7 USD per capita (Fig. 1). The critical point of capital investments to ensure the development of the region's economy is 308.7 USD per capita.

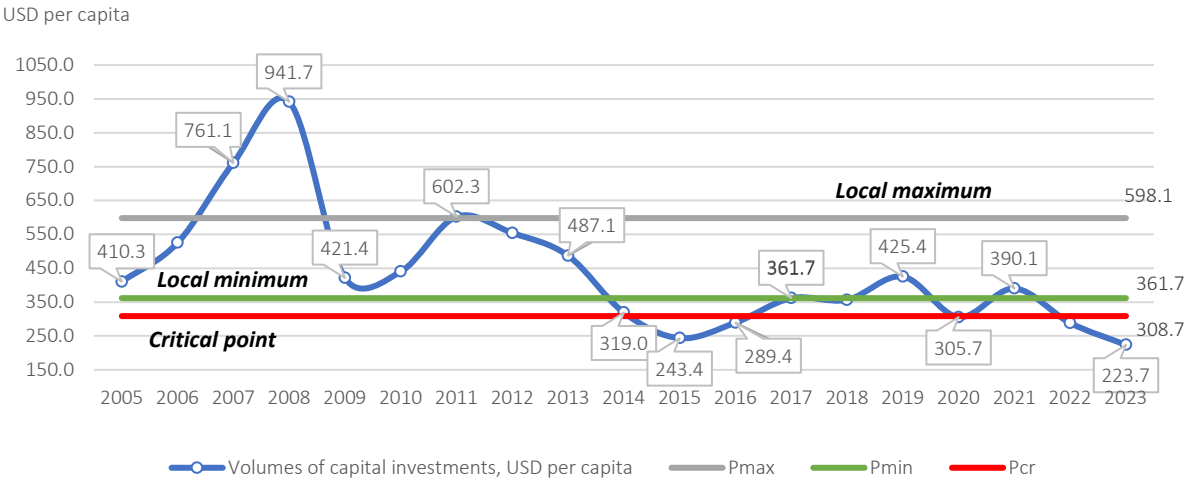

Figure 1. Optimum of capital investments to ensure the socio-economic development of the Lviv region from 2005 to 2023

From 2014 to 2016 and from 2022 to 2023, the volume of capital investments was less than the critical limit, which indicates a threat to ensuring the progress and stable functioning of the region's economy, and, therefore, the urgent need to attract external financial assets and capital investments.

The point of the local maximum of foreign direct investment for the Lviv region is 473.2 USD per capita, and the critical point is 163.2 USD per capita (Fig. 2). The calculation of the local minimum point of foreign direct investment in the region has methodological limitations due to the high sensitivity of foreign investment to the time factor. It is noteworthy that from 2012 to 2014 and in 2021, the volumes of investment processes in the economy of the Lviv region were greater than the local maximum (sufficient level of investment support for socio-economic development). The military aggression of the Russian Federation and the annexation of the Autonomous Republic of Crimea in 2014 triggered a decrease in the volume of foreign direct investment to the local minimum, and the Russian-Ukrainian war since 2022, to the critical threshold. The results of the investment process design have shown an urgent need to intensify investment activity and increase the volume of investment processes in the region, especially in the context of economic post-war recovery.

The globalization of the world economy leads to the diversification of forms and directions of com-

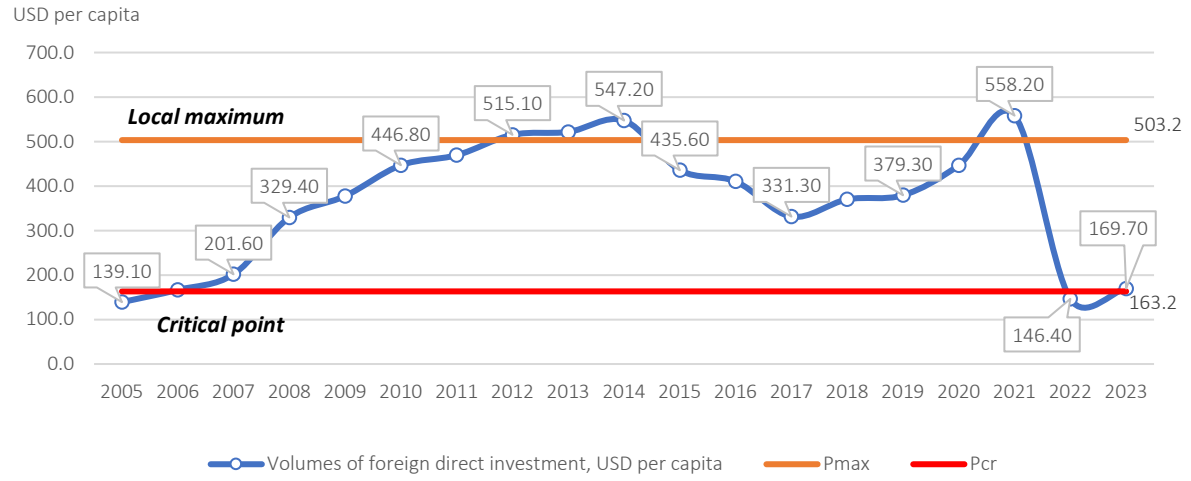

Figure 2. Optimum of foreign direct investment to ensure the socio-economic development of the Lviv region from 2005 to 2023

http://dx.doi.org/10.21511/imfi.22(2).2025.29

petition, as well as methods of struggle for access to and control over key resources of economic development, including investment, technological, labor, etc. Therefore, Ukraine's strategic priority is to intensify investment activities and build a rational, innovative, and adaptive regional investment policy to ensure the development of socio-economic systems.

Investment processes have a direct positive impact on the indicators of socio-economic development of territories, and are effective tools for overcoming crisis phenomena and minimizing negative post-shock consequences. On the one hand, their dynamics depend on the conditions of the socio-economic, financial, political, legal, etc. environment

Ensuring economic recovery and further stable economic growth rates in the region is possible only if investment security is maintained and the investment potential of the territories is developed. The Russian-Ukrainian war has weakened the stability of the socio-economic systems of the regions, deepened structural deformations, and led to a critical reduction in investment flows due to a lack of security guarantees for investors, a high level of risk, and the uncertainty of the situation in general. The recovery of the Ukrainian economy depends on the volume and pace of foreign investment, so the formation of a favorable investment climate and, consequently, increasing investment attractiveness and competitiveness, is becoming one of the existential tasks of regional development.

The current research results have practical significance, particularly in terms of adjusting regional economic policy in general and investment policy in particular. This includes the development of tools to stimulate investment activity in the region by influencing factors such as the number of business entities (promoting the creation and development of new SMEs), the level of employment (enhancing job creation policies), the expansion of industrial and agricultural production capacities (simplifying licensing and permitting procedures), and the activation of innovation and technological activities (fiscal incentives for innovation and R&D). Measures in these areas will ensure an inflow of investments, including foreign direct investments. In turn, directing these investments (through public procurement policies, production localization, accelerated depreciation, etc.) towards expanding the technological base of production, adopting advanced technologies, and developing production infrastructure will improve key economic growth parameters and enhance the quality of life in the region.

CONCLUSION

The purpose of the paper is to empirically investigate the nexus and causal link between investments and the socio-economic development of a region in Ukraine (Lviv region as a case study).

The analysis revealed that capital investment in the Lviv region was most responsive to changes in employment levels (elasticity coefficient of 2.65%) and the number of large and medium-sized enterprises (1.39%). Growth in these indicators contributed significantly to attracting investment to the region. In the second time lag, the sensitivity to these factors declined, while increases in the volume of construction works and imports of goods and services continued to have a positive effect on the volume of capital investment. FDI in the Lviv region showed high sensitivity to employment levels (8.35% and 7.10%) and the number of large and medium-sized enterprises (2.75% and 2.76%). Retail turnover and the number of private entrepreneurs also positively influenced FDI inflows. Changes in financial conditions, such as the level of subsidization and fiscal independence, were identified as key determinants of FDI volumes.

The volume of both capital investment and FDI in the Lviv region was found to be strongly influenced by the level of subsidization, growth in tax revenues, fiscal independence, and expenditures on economic activity. An increase in personal income tax revenues resulted in a 5.01% rise in capital investment, underscoring the importance of a robust financial base for fostering investment. Investment processes have a significant impact on the socio-economic development of the Lviv region (specifically, an in-

crease in capital and foreign direct investments leads to a 0.12% and 0.5% improvement in regional economic development, respectively), which highlights the critical role of sustained investment in ensuring stable economic growth and regional advancement.

Modeling using polynomial functions made it possible to determine optimal points for investment processes to maintain the region's stable development. The local minimum investment point indicates a threshold below which regional development stability may be compromised, while the local maximum point reflects the limit beyond which further investment becomes inefficient due to imbalances in the development system.

AUTHOR CONTRIBUTIONS

Conceptualization: Ruslan Boiko, Taras Vasyltsiv, Yaroslav Berezivskyi.
Data curation: Nataliia Mahas, Yaroslav Berezivskyi.
Formal analysis: Ruslan Boiko, Taras Vasyltsiv, Vitalii Boiko.
Funding acquisition: Rostyslav Baran, Vitalii Boiko.
Investigation: Ruslan Boiko, Taras Vasyltsiv.
Methodology: Ruslan Boiko, Yaroslav Berezivskyi, Nataliia Mahas.
Project administration: Taras Vasyltsiv.
Resources: Ruslan Boiko, Vitalii Boiko .
Supervision: Ruslan Boiko, Taras Vasyltsiv.
Visualization: Nataliia Mahas, Yaroslav Berezivskyi, Rostyslav Baran.
Validation: Ruslan Boiko, Taras Vasyltsiv, Rostyslav Baran.
Writing – original draft: Ruslan Boiko, Rostyslav Baran, Vitalii Boiko, Taras Vasyltsiv, Natalia Mahas, Yaroslav Berezivskyi.
Writing – review & editing: Ruslan Boiko, Rostyslav Baran, Vitalii Boiko, Taras Vasyltsiv, Natalia Mahas, Yaroslav Berezivskyi.

REFERENCES

1. Amendolagine, V., Presbitero, A. F., Rabellotti, R., & Sanfilippo, M. (2019). Local sourcing in developing countries: The role of foreign direct investments and global value chains. *World Development, 113,* 73-88. https://doi.org/10.1016/j.worlddev.2018.08.010
2. Aust, V., Morais, A. I., & Pinto, I. (2020). How does foreign direct investment contribute to Sustainable Development Goals? Evidence from African countries. *Journal of Cleaner Production, 245,* 1-5. https://doi.org/10.1016/j.jclepro.2019.118823
3. Boiko, R., Martsenyuk, R., & Protsykevych, A. (2024). Assessment of the investment environment of the region and policy instruments for the implementation of its investment potential in wartime. *Baltic Journal of Economic Studies, 10,* 5, 390. https://doi.org/10.30525/2256-0742/2024-10-5-120-130
4. Brooks, C., & Williams, L. (2024). *Investing Responsibly: What Drives Preferences for Sustainability and Do Investors Receive Appropriate Investments?* https://doi.org/10.2139/ssrn.4751838
5. Burke, W. P., & Hung, D. Y. (2016). The influence of trust and risk tolerance on investment decisions. *Journal of Economic Behavior & Organization, 130,* 171-184. http://dx.doi.org/10.14453/aabfj.v10i3.2
6. Butenko, D., Zaslavska, K., & Sheianova, Yu. (2023). Scientific and methodological principles of organizational capital management and its assessment. *Economics of Development, 22,* 52-61. https://doi.org/10.57111/econ/3.2023.52
7. Cram, L. R., & Lusardi, A. (2020). Financial literacy and investment decisions. *The Review of Financial Studies, 33*(6), 2999-3042. Retrieved from https://onlinelibrary.wiley.com/doi/10.1111/fima.12283
8. de Mello, L. (1997). Foreign direct investment in developing countries and growth: A selective survey. *The Journal of Development Studies, 34,* 1-34. https://doi.org/10.1080/00220389708422501
9. Dmytryk, O., Vasyltsiv, T., Mulska, O., Lupak, R., Kunytska-Iliash, M., & Dubyna, M. (2024). Financial and economic security and development of priority sectors of the national economy Ukraine: casual nexus empirical. *Financial and Credit Activity Problems of Theory and Practice, 4*(57), 301-316. https://doi.org/10.55643/fcaptp.4.57.2024.4443
10. Fuente-Mella, de la H., Vallina-Hernandez, A. M., & Fuentes-Solís,

http://dx.doi.org/10.21511/imfi.22(2).2025.29

R. (2020). Stochastic analysis of the economic growth of OECD countries. *Economic Research, 33*(1), 2189-2202. https://doi.org/10.1080/1331677X.2019.1685397

11. Halland, H., & Canuto, O. (2013). Resource-Backed Investment Finance in Least Developed Countries. *Poverty Reduction and Economic Management (Prem) Network, 123,* 1-7. Retrieved from https://documents.worldbank.org/pt/publication/documents-reports/documentdetail/619051468325193287

12. Ilyash, O., Lupak, R., Kravchenko, M., Trofymenko, O., Duliaba, N., & Dzhadan, I. (2022). A forecasting model for assessing the influence of the components of technological growth on economic security. *Business: Theory and Practice, 23*(1), 175-186. https://doi.org/10.3846/btp.2022.15298

13. Kafka, S., Kostin, O., Lutsenko, I., Liulchak, Z., Kuzmenko, H., & Moskaliuk, H. (2019). Management and control model of organizational change in the process of monitoring financial results. *International Journal of Recent Technology and Engineering*, 8(3), pp. 7261-7265. https://www.ijrte.org/wp-content/uploads/papers/v8i3/C6340098319.pdf

14. Korneyev, M. (2019). Identification of dependencies between the imbalances of financial resources and investment flows in the eastern European economies. *Public and Municipal Finance, 8*(1), 1-10. https://doi.org/10.21511/pmf.08(1).2019.01

15. Kutsyk, P., Lupak, R., Kutsyk, V., & Protsykevych, A. (2020). State Policy of the Investment Processes Development on the Market of IT Services: Analytical and Strategic Aspects of Implementation in Ukraine. *Economic Annals-XXI, 182*(3-4), 64-76. https://doi.org/10.21003/ea.V182-08

16. Kwilinski, A., Dielini, M., Mazuryk, O., Filippov, V., & Kitseliuk, V. (2020). System Constructs for the Investment Security of a Country. *Journal of Security and Sustainability Issues, 10*(1), 345-358. Retrieved from http://dspace.opu.ua/jspui/handle/123456789/11366

17. Liang, C., Shah, S. A., & Bifei, T. (2021). The role of FDI inflow in economic growth: Evidence from developing countries. *Journal of Advanced Research in Economics and Administrative Sciences, 2,* 68-80. https://doi.org/10.47631/jareas.v2i1.212

18. Lucianelli, G., Citro, F., Santis, S., Tranfaglia, A., & Mazzillo, A. (2018). How to improve the financial conditions of local governments in a period of crisis: a descriptive case study. *International Journal of Business and Management, 13*(1), 53-69. https://doi.org/10.5539/ijbm.v13n1p53

19. Lupak, R., Mizyuk, B., Zaychenko, V., Kunytska-Iliash, M., & Vasyltsiv, T. (2022). Migration processes and socio-economic development: interactions and regulatory policy. *Agricultural and Resource Economics, 8*(1), 70-88. https://doi.org/10.51599/are.2022.08.01.04

20. Lyndyuk, A., Boiko, V., Bruh, O., Olishchuk, P., & Rurak, I. (2023). Development of international cooperation of the borderline territorial communities of Ukraine with the EU countries under martial law. *Financial and credit activity: problems of theory and practice, 5*(52), 244-255. https://doi.org/10.55643/fcaptp.5.52.2023.4161

21. Lysiak, L., Kachula, S., Hrabchuk, O., Filipova, M., & Kushnir A. (2020). Assessment of financial sustainability of the local budgets: the case of Ukraine. *Public and Municipal Finance, 9*(1), 48-59. https://doi.org/10.21511/pmf.09(1).2020.05

22. Melnyk, L., Kubatko, O., & Pysarenko, S. (2014). The impact of foreign direct investment on economic growth: Case of post communism transition economies. *Problems and Perspectives in Management, 12*(1), 17-24. Retrieved from https://www.businessperspectives.org/index.php/journals/problems-and-perspectives-in-management/issue-44/the-impact-of-foreign-direct-investment-on-economic-growth-case-of-post-communism-transition-economies

23. Muhammad, B., Khan, M. K. K., Khan, M. I., & Khan, S. (2021). Impact of foreign direct investment, natural resources, renewable energy consumption, and economic growth on environmental degradation: evidence from BRICS, developing, developed and global countries. *Environmental Science and Pollution Research, 28,* 21789-21798. https://doi.org/10.1007/s11356-020-12084-1

24. Mulska, O., Storonyanska, I., Patytska, Kh., Ivaniuk, U., & Voznyak, H. (2023). Economic growth of Ukrainian regions and determinants of financial resilience: Modeling the causal nexus. *Problems and Perspectives in Management, 21*(4), 398-414. https://doi.org/10.21511/ppm.21(4).2023.31

25. Nayak, S., & Sahoo, D. (2021). Regional economic growth in India: convergence or divergence? *Competitiveness Review, 32*(1). https://www.emerald.com/insight/content/doi/10.1108/CR-10-2020-0131/full/htmlhttps://doi.org/10.1108/CR-10-2020-0131

26. Nguyen, K. T., & Nguyen, H. T. (2021). The Impact of Investments on Economic Growth: Evidence from Vietnam. *The Journal of Asian Finance, Economics and Business, 8*(8), 345-353. https://doi.org/10.13106/JAFEB.2021.VOL8.NO8.0345

27. Osei, M. J., & Kim, J. (2020). Foreign direct investment and economic growth: Is more financial development better? *Economic Modelling, 93,* 154-161. https://doi.org/10.1016/j.econmod.2020.07.009

28. Park, W. G. (1995). International Spillovers of R&D Investment and OECD Economic Growth. *Economic Inquiry. Western Economic Association International, 33*(4), 571-591. http://dx.doi.org/10.1111/j.1465-7295.1995.tb01882.x

29. Paul, J., & Feliciano-Cestero, M. M. (2021). Five decades of research on foreign direct investment by MNEs: An overview and research agenda. *Journal of Business Research, 124,* 800-812. https://doi.org/10.1016/j.jbusres.2020.04.017

30. Rahman, A. (2015). Impact of Foreign Direct Investment on Economic Growth: Empirical Evidence from Bangladesh. *International Journal of Economics and Finance, 7*(2), 18-25. https://doi.org/10.5539/ijef.v7n2p178

31. Rakhmatullayeva, D., Khajiyeva, A., & Abduraimov, O. (2021). Foreign direct investment in Kazakhstan: A success story over the years of independence of the republic. *Central Asian Journal of Social Sciences and Humanities, 7,* 4-15. https://doi.org/10.26577/CAJSH.2021.v7.i4.01

32. Rakhmatullayeva, D., Kuliyev, I., Beisenbaiyev, Z., & Tabeyev, T. (2020). Assessment of the influence of FDI on the economic growth of the host country: evidence from Kazakhstan. *E3S Web of Conferences, 159,* 1-6. https://doi.org/10.1051/e3sconf/202015906007

33. Rushchyshyn, N., Mulska, O., Nikolchuk, Yu., Rushchyshyn, M., & Vasyltsiv, T. (2021). The impact of banking sector development on economic growth: Comparative analysis of Ukraine and some EU countries. *Investment Management and Financial Innovations, 18*(2), 193-208. https://doi.org/10.21511/imfi.18(2).2021.16

34. Sabir, S., Rafique, A., & Abbas, K. (2019). Institutions and FDI: Evidence from developed and developing countries. *Financial Innovation, 5,* 1-8. https://doi.org/10.1186/s40854-019-0123-7

35. Sarkodie, S. A., & Strezov, V. (2019). Effect of foreign direct investments, economic development and energy consumption on greenhouse gas emissions in developing countries. *Science of the Total Environment, 646,* 862-871. https://doi.org/10.1016/j.scitotenv.2018.07.365

36. Sconosciuto, L. (2023). *Economic growth in eastern EBRD regions outpacing that of emerging Europe.* European Bank for Reconstruction and Development. Retrieved from https://www.ebrd.com/news/2023/economic-growth-in-eastern-ebrd-regions-outpacing-that-of-emerging-europe.html

37. Sinha, M., & Sengupta, P. P. (2022). FDI inflow, ICT expansion and economic growth: An empirical study on Asia-Pacific developing countries. *Global Business Review, 23,* 804-821. https://doi.org/10.1177/0972150919873839

38. Trusova, N. V., Cherniavska, T. A., Kyrylov, Y. Y., Hranovska, V. H., Skrypnyk, S. V., & Borovik, L. V. (2021). Ensuring security the movement of foreign direct investment: Ukraine and the EU economic relations. *Periodicals of Engineering and Natural Sciences, 9,* 901-920. Retrieved from http://elar.tsatu.edu.ua/bitstream/123456789/15243/1/Trusova%20N.V._Scopus_16.09.2021.pdf

39. Vdovenko, L., Ruda, O., Koval, O., Horlachuk, M., & Herasymchuk, V. (2023). Strategy of investment attraction for the development of rural areas for the economic restoration of the agricultural sector. *Scientific Horizons, 26,* 137-150. https://doi.org/10.48077/scihor5.2023.137

40. Voznyak, H., Kaplenko, H., Koval, V., Druhova, V., & Mulska, O. (2023). Financial self-sufficiency of Ukrainian territorial communities and local economic development: Modeling the causal relationship. *Public and Municipal Finance, 12*(2), 17-31. http://dx.doi.org/10.21511/pmf.12(2).2023.02

41. Voznyak, H., Mulska, O., Patytska, Kh., & Radelytskyy, Y. (2022). Financial imbalances and their impact on the development of Ukrainian regions in economic instability. *Financial and Credit Activities: Problems of Theory and Practice, 1*(42). https://doi.org/10.55643/fcaptp.1.42.2022.3706

42. Voznyak, H., Patytska, Kh., Mulska, O., Zherebylo, I., Sorokovyi, D. (2024). Resilience of territorial communities amid the war against Ukraine: The role of budgetary instruments. *Public and Municipal Finance, 13*(1), 41-54. https://doi.org/10.21511/pmf.13(1).2024.04

http://dx.doi.org/10.21511/imfi.22(2).2025.29

APPENDIX A

Table A1. Elasticity of capital investment to changes in the determinants of the investment environment in the Lviv region from 2005 to 2023

Determinants	Capital investment/lags			
	Cap_t		$ICap_t$	
	(1)	(2)	(1)	(2)
I. Economic				
The employment rate of the population aged 15–70	2,645076	4,291471	15,03292	12,58290
	(6,36007)	(6,61150)	(9,18732)	(11,0993)
	[0,41589]	[0,64909]	[1,63627]	[1,13366]
Volumes of sold industrial products	0,501840	0,512572	0,380616	1,184285
	(0,62388)	(0,77881)	(0,64039)	(0,66201)
	[0,80438]	[0,65815]	[0,59435]	[1,78893]
Volumes of agricultural production	0,738335	0,554947	3,695889	0,649694
	(2,17318)	(2,12207)	(3,51660)	(3,72980)
	[0,33975]	[0,26151]	[1,05098]	[0,17419]
Volumes of completed construction works	0,484089	0,892598	0,291991	0,511036
	(0,47554)	(0,56447)	(1,10068)	(1,62964)
	[1,01797]	[1,58129]	[0,26528]	[0,31359]
Volumes of retail turnover of retail trade enterprises	0,488356	0,408530	0,612437	0,337723
	(0,58826)	(0,44648)	(0,53765)	(0,41212)
	[0,83017]	[0,91501]	[1,13910]	[0,81947]
Volumes of sold innovative products in the total volume of sold products	0,722707	0,593431	0,699948	0,667623
	(0,27725)	(0,25343)	(0,30461)	(0,29593)
	[2,60666]	[2,34162]	[2,29786]	[2,25599]
Import volumes of goods and services	0,090572	0,435331	0,131367	0,628971
	(0,47918)	(0,46280)	(0,41387)	(0,45473)
	[0,18901]	[0,94065]	[0,31742]	[1,38318]
The number of subjects of large and medium enterprises	1,387942	0,922605	1,138091	1,156204
	(3,29238)	(1,77935)	(1,78406)	(1,53451)
	[0,42156]	[0,51851]	[0,63792]	[0,75347]
Number of small business entities	0,434417	1,711100	1,175320	1,038776
	(1,02599)	(1,73548)	(0,88981)	(1,57134)
	[0,42341]	[0,98595]	[1,32087]	[0,66108]
Number of individual entrepreneurs	0,265375	0,010294	0,623920	0,127037
	(0,51753)	(0,47855)	(0,45607)	(0,46453)
	[0,51277]	[0,02151]	[1,36803]	[0,27347]
II. Financial				
The level of tax independence	0,010334	1,350953	0,645925	1,156719
	(1,20473)	(0,79906)	(0,89203)	(0,68559)
	[0,00858]	[1,69067]	[0,72411]	[1,68720]
Subsidy level	0,487391	–0,191195	2,934568	1,119106
	(0,84378)	(0,80995)	(3,16701)	(1,87323)
	[0,57763]	[–0,23606]	[0,92661]	[0,59742]
The level of budgetary independence	0,156304	0,291005	1,060391	1,228308
	(0,43626)	(0,38217)	(1,73232)	(1,82662)
	[0,35828]	[0,76146]	[0,61212]	[0,67245]
The pace of changes in local budget revenues	0,206649	0,403379	0,306441	2,221872
	(0,85539)	(0,62662)	(1,28372)	(1,60147)
	[0,24158]	[0,64373]	[0,23871]	[1,38739]
The pace of changes in income from personal income tax	4,777513	0,600654	4,962047	0,683904
	(2,46986)	(1,75987)	(3,00081)	(2,11969)
	[1,93432]	[0,34131]	[1,65357]	[0,32264]
Volumes of expenditures on economic activity	0,812889	0,942109	1,606731	1,125577
	(0,65291)	(0,65619)	(2,02722)	(1,04347)
	[1,24503]	[1,43574]	[0,79258]	[1,07869]
The level of local taxes and fees in local budget revenues	0,112370	1,471665	0,658837	2,647019
	(1,07882)	(0,96913)	(1,10929)	(0,97469)
	[0,75302]	[2,55041]	[0,59393	[2,71574]

Note: Calculated using EViews software (VAR modeling method); standard error is in parentheses; Student's t-test is in brackets.

Table A2. Elasticity of foreign direct investment to changes in the determinants of the investment environment in the Lviv region from 2005 to 2023

Determinants	Direct foreign investment/lags			
	FDI_t		IFD_t	
	(1)	(2)	(1)	(2)
I. Economic				
The employment rate of the population aged 15–70	8,350744 (13,2662) [0,62947]	7,099925 (21,2411) [0,33425]	11,37202 (8,54943) [1,33015]	11,91326 (10,1778) [1,17052]
Volumes of sold industrial products	0,387932 (0,64240) [0,60388]	0,063232 (0,63726) [0,09922]	1,106522 (1,32236) [0,83677]	1,207436 (0,99217) [1,21696]
Volumes of agricultural production	0,013033 (2,95506) [0,00441]	1,484933 (4,06848) [0,36498]	2,614072 (3,15317) [0,82903]	0,054250 (4,11572) [0,01318]
Volumes of completed construction works	0,198426 (0,85381) [0,23240]	0,376528 (1,27385) [0,29558]	0,790400 (0,66619) [1,18646]	0,933245 (1,02470) [0,91075]
Volumes of retail turnover of retail trade enterprises	0,464873 (0,46107) [1,00824]	1,036866 (0,72586) [1,42847]	0,274150 (0,45446) [0,60324]	0,744697 (0,39201) [1,89971]
Volumes of sold innovative products in the total volume of sold products	0,411263 (0,70364) [0,58448]	0,119260 (0,83672) [0,14253]	0,229067 (0,34048) [0,67278]	0,253307 (0,48398) [0,52338]
Import volumes of goods and services	0,615468 (1,07178) [0,57425]	0,062491 (1,18684) [0,05265]	0,678562 (0,57857) [1,17282]	0,748773 (0,54902) [1,36385]
The number of subjects of large and medium enterprises	2,754104 (1,42384) [1,93428]	2,765801 (1,20436) [2,29649]	0,029331 (0,03672) [0,79881]	0,005281 (0,10085) [0,05237]
Number of small business entities	0,316674 (1,67452) [0,18911]	0,028164 (1,68870) [0,01668]	2,116065 (1,47348) [1,43610]	2,530268 (1,37979) [1,83381]
Number of individual entrepreneurs	0,600909 (1,69741) [0,35401]	0,702692 (1,46670) [0,47910]	0,173703 (0,94309) [0,18419]	0,048748 (0,86838) [0,05614]
II. Financial				
The level of tax independence	2,635813 (1,25247) [2,10448]	4,621337 (1,27153) [3,63448]	2,536807 (1,43381) [1,76928]	4,028126 (1,43431) [2,80841]
Subsidy level	–3,139155 (3,97987) [–0,78876]	3,473371 (2,52455) [1,37584]	1,374047 (3,18470) [0,43145]	2,075284 (1,93687) [1,07146]
The level of budgetary independence	1,989678 (2,37735) [0,83693]	0,028313 (1,77144) [0,01598]	1,060555 (2,04241) [0,51927]	0,591491 (1,02448) [0,57736]
The pace of changes in local budget revenues	1,611703 (1,65241) [0,97536]	0,844465 (1,62116) [0,52090]	1,616917 (1,13185) [1,42856]	1,295688 (1,27806) [1,01379]
The pace of changes in income from personal income tax	5,532735 (1,52243) [3,63414]	4,614564 (1,44095) [3,20244]	5,229669 (1,75450) [2,98071]	3,787170 (1,31716) [2,87526]
Volumes of expenditures on economic activity	2,086660 (2,43975) [0,85528]	1,110980 (1,14509) [0,97021]	0,003810 (0,91712) [0,00415]	0,649203 (1,21290) [0,53525]
The level of local taxes and fees in local budget revenues	0,287609 (2,80652) [0,10248]	0,023625 (2,63173) [0,00898]	1,362263 (1,98600) [0,68593]	0,046640 (1,36936) [0,03406]

Note: Calculated using EViews software (VAR modeling method); standard error is in parentheses; Student's t-test is in brackets.

http://dx.doi.org/10.21511/imfi.22(2).2025.29

APPENDIX B

Markers of the socio-economic development of the Lviv region from 2005 to 2023: temporal approach

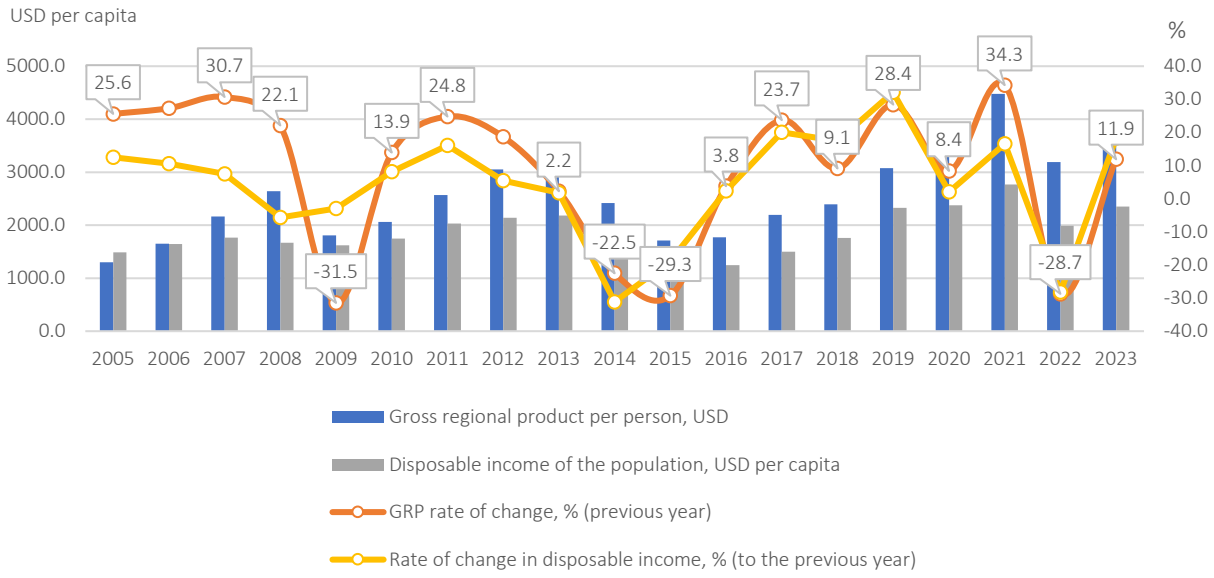

Figure B1. Gross regional product and income of the population

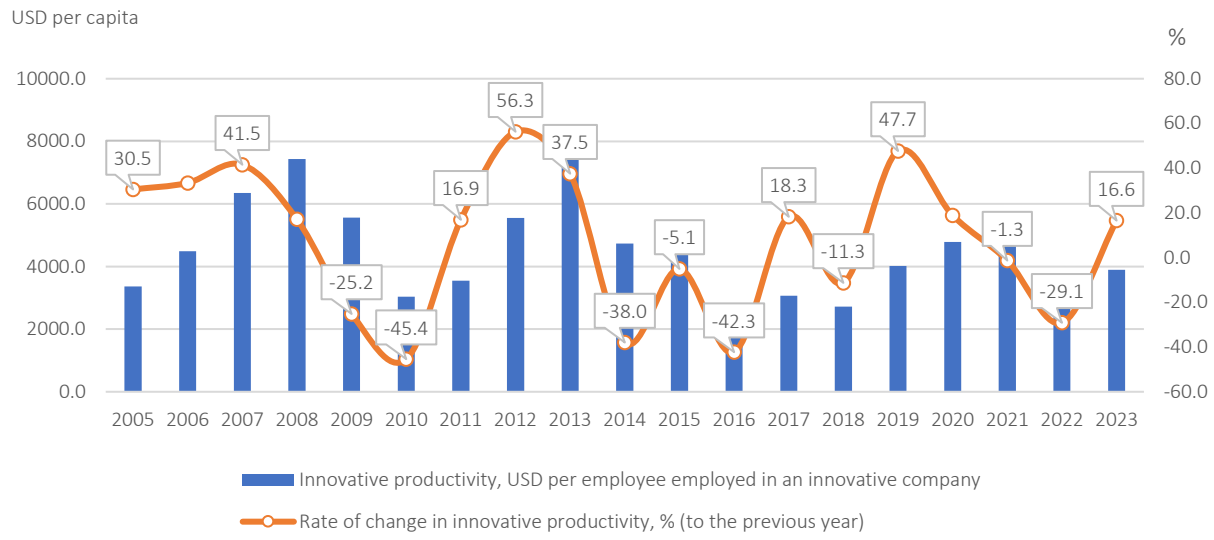

Figure B2. Innovative performance

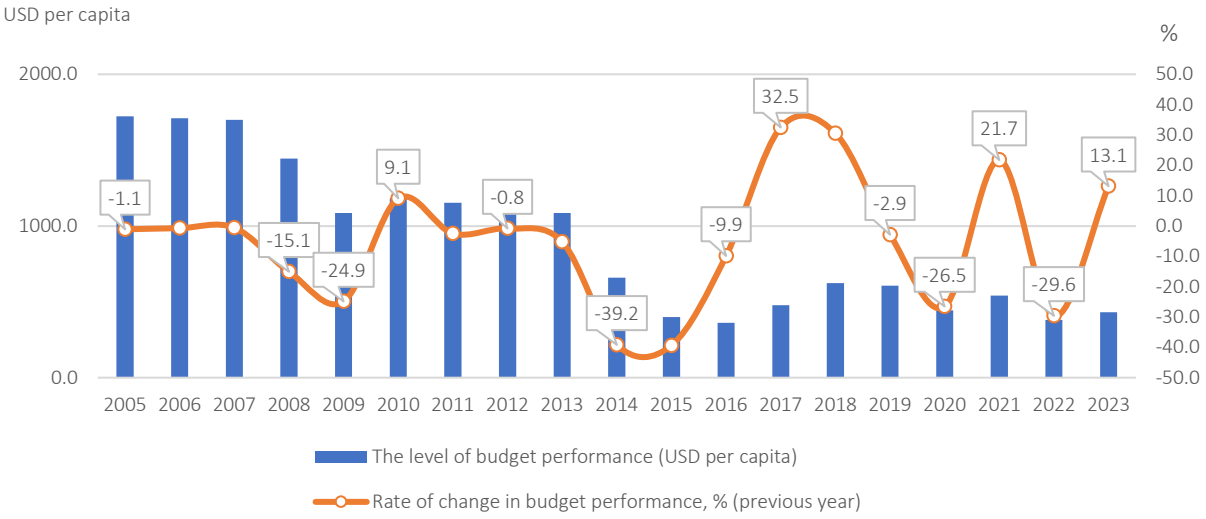

Figure B3. Export of goods and services

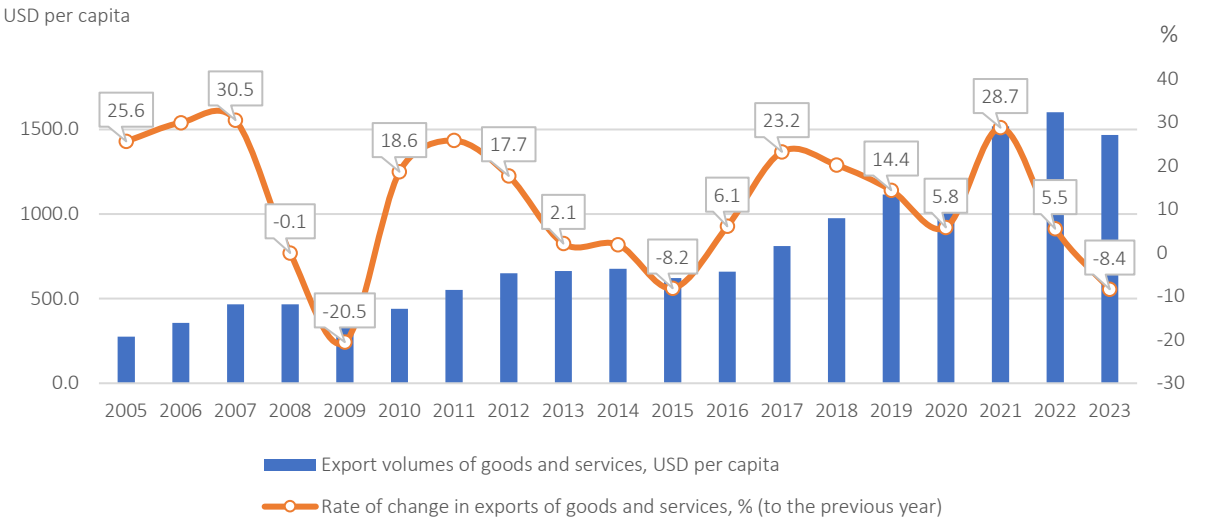

Figure B4. Budgetary performance

http://dx.doi.org/10.21511/imfi.22(2).2025.29