

THE REVIEW OF TRENDS AND FOREIGN DIRECT INVESTMENT ESTIMATES IN UKRAINE AND POLAND

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Abstract

The article addresses foreign direct investment as an economic growth factor. The dynamics of the main economic development parameters of Poland and Ukraine is analyzed. The estimates are based on such parameters as economic development level, GDP, ease of doing business indicators, economic development index, economic freedom index, corruption perception index, etc. Poland's advantages compared to other countries when establishing the mechanism of foreign direct investment attraction are determined. Special attention is focused on the factors that impact the development of the investment environment in Ukraine. The investment dynamics in both countries is specified. The impact of hostilities on investment opportunities not only in Ukraine but also in Poland is described. The article examines the experience of the post-war recovery in the leading countries worldwide, namely the experience of European countries in manufacturing restoration, the experience of Japan in the efficiency of fiscal and education reforms, and the post-war experiences of Israel and West Germany in the context of the future reconstruction of Ukraine and chances to attract the attention of a foreign investor. The priority industries for investment in Ukraine and Poland in the nearest future are characterized. Based on the conducted analysis, a model of foreign direct investment dependence on various economic parameters is formed. The component analysis is applied to perform the gradation of the parameters' impact. The research enables constructing the foreign direct investment trend models in both countries and making the interval and point estimates for the next four years. The recommendations on investment climate improvement in Ukraine are offered.

Keywords: *foreign direct investment, investment environment, investment climate, investment activity, investment attractiveness, state regulation, foreign investment directions.*

JEL Codes: *R11, R42, R50.*

Introduction

In current conditions, when foreign capital plays an essential role in the process of economic transformation, and the countries' economic development is determined by the level of their participation in the investment

process, it is necessary to examine the development of foreign direct investment in our countries. Indeed, foreign direct investment is the resource that not only fills in the shortage of capital but also contributes to the improvement of economic efficiency and

its transition to a new level. The amount of funds coming from abroad significantly defines the development of both Poland and Ukraine. Being an essential foreign capital attraction tool, foreign direct investment fosters structural reforms and the development of scientific and technological capacity in the countries.

The development of the foreign direct investment attraction mechanism in Poland and Ukraine should stem from the features of economic globalization. The foreign direct investment attraction mechanism created in Poland has advantages compared to the countries the investment comes from and other prospective recipient states. Poland's consistent development testifies thereto. Meanwhile, the process of foreign direct investment attraction in Ukraine has always been the priority economic development direction. However, it hasn't managed to dispose of deep structural deformations even in the last years, which is among the causes of significant lag behind the developed countries worldwide in the efficiency of all factors of production and thus the wellbeing of Ukrainians. The situation has aggravated considerably with the large-scale invasion of Ukrainian territory, the investment climate of which hadn't been quite favorable even before that. However, there is an opinion that after the war, Ukraine will be very attractive to investors, and if \$70-80 billion are attracted in the next five years, a new economic wonder is to be expected.

Literature review

The issue of investment policy is extremely relevant today and requires in-depth analysis. The studies (U. Andrusiv et al., 2022; L. Simkiv et al., 2022) offer a concept of "economic resilience", which is aimed at improving the investment climate in Ukraine and should ensure the development, security, and investment attractiveness of the Ukrainian economy. I. Popadinets et al. (2021) argue that the intensification of innovation and investment activities in the country is the driving force of economic growth. H. Zelinska et al. (2021) consider social capital as a

potential resource for successful interaction between business and economic entities. A. Cherchata et al. (2022) suggest the methodology for determining the efficiency and effectiveness of business processes. This, in turn, will contribute to the prioritization of investment attraction. B. Danylyshyn (2022, 2023) addresses the issue of martial law in Ukraine, i.e., the policy of macroeconomic stability, where during the war, the market principles of the economy and its price formation are disrupted, monetary transmission mechanisms do not work properly, and the role of the state in ensuring the normal functioning of commodity-money relations and the formation of investment policy is increased.

The group of researchers identifies strategic directions for improving the implementation of environmental innovations in international cooperation between Europe and Ukraine, which is impossible without attracting sufficient investment. The authors study the process of innovative industrial activity in the European Union, Ukraine and, in particular, at the regional level. They offer a set of new measures to promote environmental innovations and develop a taxonomic economic and mathematical model for the assessment of the integral indicator of the introduction of environmental innovations in the regional context (A. Valyukh et al. 2021).

In another study, the authors present key factors that impact the investment attractiveness of renewable energy sources in the world. They characterize the problems of renewable energy sources in Ukraine, in particular, the existence of investment risk in terms of its components, including general economic, legal, and financial ones (V. Yakubiv et al. 2019).

The investment and technological activities of enterprise development are considered in the studies of R. Sodoma et al. (2021), M. Dzyamulych et al. (2021), and A. Hutorov et al. (2022). A. Was et al. (2020), A. Kucher et al. (2019), T. Kalashnikov et al. (2019), Popov A. et al. (2019), O. Suhina et al. (2019) and O. Stashchuk et al. (2020) examine the development of investment impact on

agricultural enterprises, in particular, agriculture and crop production.

To determine the strategic priorities of Ukraine's socio-economic development, the authors conduct a comparative study with the Republic of Poland, focusing on the problem of investment resources and their impact on economic development (O. Pavlova et al., 2021). The substantiation of the impact and use of investment resources on environmental protection in Ukraine and Poland is quite essential (A. Valyukh et al., 2020). Therefore, we can see that a number of scholars are dealing with these issues, but the changes that are taking place in the country today require more and more research and updating.

The objective of the research is to analyze the foreign direct investment inflow in the economies of the counties under research, detect its trends, determine the main directions, and estimate foreign direct investment in the economies of Ukraine and Poland.

Methodical approach

Three groups of parameters were formed to detect the relationship between foreign direct investment and economic parameters: 1. Market condition factors ($x_1 - x_4$); 2. Socio-economic and demographic parameters ($x_5 - x_{10}$); 3. Economic activity of companies ($x_{11} - x_{14}$). Since many factors rather than one impact foreign direct investment, the multifactor correlation-regression analysis was used to build a model for such type of relationship, where a resultant variable (y) is linked by the multiple regression equation to two or more factor variables ($x_1, x_2, x_3, \dots, x_m$). The linear dependence was used to build the model:

$$y = a_0 + a_1x_1 + a_2x_2 + \dots + a_mx_m$$

The calculations in STATISTICA show a close correlation between the parameters. Therefore, the most essential indicators that would adequately describe the foreign direct investment trends in both countries should be selected for further analysis. For that purpose, we used the components analysis (Principal Component Analysis) – one of the factor analysis methods that enables the generalization of the elementary feature

values. The method is simple and logical. Its nature stipulates the replacement of correlated components with uncorrelated factors. An opportunity to reveal the most informative principal components and exclude others from the analysis is another significant characteristic of the method that simplifies the results interpretation. As the result of the research, 3 out of 14 components were selected, and based on them, using multiple regression again, the model of foreign direct investment dependence was built.

The trend method was used to calculate estimated values since estimates can be built based on time series considering the patterns of the previous periods. The trend equation is:

$$y_t = f(t) + \varepsilon_t$$

where $f(t)$ is the deterministic (non-random) component of a process (phenomenon);

ε_t is the stochastic (random) component of a process; t is period number $t = \overline{1, n}$, where n is the number of researched periods.

There are various types of dependencies that describe the trend equation. We used four of them (since they smooth out the ranging of source data):

- Linear: $y = a_0 + a_1t$
- Logarithmic: $y = a_0 + a_1 \ln t$
- Exponential: $y = a_0 e^{a_1 t}$
- Linear polynomial: $y = a_0 + a_1 t + a_2 t^2$

Next, the point and interval estimates were made. In point estimates, the value of the dependent variable (foreign direct investment) is determined by putting the forecasted values of independent variables in the multiple regression equation:

$$y_{np} = a_0 + a_1x_1^{np} + a_2x_2^{np} + \dots + a_px_p^{np}$$

The following model was used to make the interval estimates of foreign direct investment:

$$\tilde{y}_t - \Delta_{yt} \leq y_t \leq \tilde{y}_t + \Delta_{yt}$$

$$\text{where } \Delta_{yt} = t_p \cdot \sigma_\varepsilon$$

$$\sqrt{1 + \frac{1}{n} + \frac{(t - \bar{t})^2}{\sum_{t=1}^n (t - \bar{t})^2}} - \text{maximum error;}$$

t_p is the probability ratio calculated from the Student's t tables (for small samples) or standard normal tables (for large samples) at the given significance level α and the number of degrees of freedom $\nu = n - k - 1$; t is the number of the time period ($t = n + \tau$); τ is lead time; n is the number of observations in time series; σ_ε is the standard error of the model; \bar{t} is the time that corresponds to the middle observation period for input series.

Results

Assessment of Ukraine's and Poland's investment climates

Foreign direct investment is a feature of Central Europe. Poland has the highest foreign direct investment profitability among the EU countries. Even though neither the area, the population, nor the economic capacity is the largest in Poland, the resource capacity and economic and political roles of Poland are significant. Indeed, Poland is among the most dynamically developing European countries nowadays. By its economic development, Poland is in the top thirty worldwide. In 2018, Poland was 21st (according to the World Bank) and 22nd (according to IMF) by GDP, while Ukraine was 57th in global rankings. The experts consider both Poland and Ukraine as developing countries. Yet if Poland was 4th (among the countries with emerging economies) and its economic development index was 4.57 out of 7 in 2017 (that makes it the country with slow economic growth), Ukraine was 47th in the rankings with the 3.67 index (that makes it the country with slow economic decline) (Slovo and Dilo, (2017).

Poland is a famous supplier of coal (1st in Europe by coal extraction), black and some non-ferrous metals, fabric, agriculture (1st in the world by the production of potatoes), and food on global markets (Findbiz-PL, 2022).

According to World Bank, Poland was 33rd in 2019 by ease of doing business (the lowest rate in 2006-2019 was in 2009 and amounted to 76). Meanwhile, Ukraine was 71st in 2019 in global ease of doing business rankings (the rate was the lowest in 2012 – 152nd position) (Word Bank, 2019).

It is worth mentioning that, in our opinion, the changes in the fiscal domain were the major precondition of Polish business climate improvement, while foreign direct investment was the key assessment criterion. Poland was characterized by a favorable investment climate fostering foreign investment in the country's development. According to the central bank of Poland, foreign investment has already reached \$ 600 billion.

Polish authorities consistently encourage investment increase. For that purpose, investors are secured additional benefits and grants, and special economic zones are being created. The monetary assistance comes not only from the state budget but also from the EU. Poland is interested in providing grants to investors since it helps addressing unemployment and updates various technological innovations at local companies.

Nowadays, there are fourteen economic zones in Poland. Their total area is about 6,000 ha. The largest companies of the world have opened their offices there, including AIG, Citygroup, ING, Dell, Crédit Agricole, Motorola, Toshiba, Thomson, Danone, etc. IT companies worldwide value Polish specialists engaged in software development (Findbiz-PL, 2022).

The history of the special economic zones in Ukraine is complicated. Although Ukraine adopted the Law "On General Foundations of Establishment and Functioning of Special (Free) Economic Zones" in 1992 (before Poland did), the first SEZ was actually launched only in 1998. Nowadays, theoretically, there are 11 SEZs and nine priority development areas in Ukraine. Unfortunately, their functioning had been theoretical even before the war started.

The significant benefits of Poland include sustainable economic growth, a convenient geographical position, a large sales market, numerous tax benefits, qualified personnel, and capacity for labor productivity growth. Ukraine lags behind Poland by such international parameters as the Index of Economic Freedom, Ease of Doing Business

Index, Corruption Perception Index, etc.
(Table 1).

Table 1 The positions of Poland and Ukraine in the world by international parameters

| Year | Index | | Position in the rankings | | Total number of countries |
|-----------------------------|--------|---------|--------------------------|---------|---------------------------|
| | Poland | Ukraine | Poland | Ukraine | |
| Index of Economic Freedom | | | | | |
| 2022 | 68.7 | 54.1 | 39 | 130 | 177 |
| Ease of Doing Business | | | | | |
| 2020 | 76.4 | 70.2 | 40 | 64 | 190 |
| Corruption Perception Index | | | | | |
| 2021 | 56 | 32 | 42 | 122 | 180 |

*Source: calculated by authors based on data (*The First News*, 2022; *Poltav wave*, 2022; *New time*, 2021).

Some believe Poland can improve its positions in the EU due to consolidation into an economic cluster with Ukraine. This idea was announced in May 2002 at the roundtable in Davos held to discuss Ukraine's Reconstruction and Recovery Plan with large international institutional and venture investors and representatives of the Digital Transformation Ministry.

According to Polish Economic Institute (PIE), foreign direct investment inflow to Poland increased by 82% in 2021 and amounted to \$ 24.8 billion (Table 2).

In 2019-2021, Poland created the largest number of jobs in Europe (339,000), and 19%

of them due to foreign direct investment. In 2020, Poland was the leader in foreign investment income among other EU countries. Return on investment as of late 2020 reached 9.2% (calculated as net investment income to FDI cost). In 2021, Poland was 14th in the world and third in the EU behind Germany and Sweden by FDI inflow. Before it, the largest FDI inflow to Poland was recorded in 2007 and amounted to \$ 19.9 billion. At the end of 2021, the cumulative volume of FDI inflow to Poland was \$ 269 billion, making it the 16th in the world. According to NBU, foreign direct investment in Ukraine amounted to \$ 62 billion or about \$ 1,500 per capita in late 2021.

Table 2. Foreign direct investment inflow to Polish and Ukrainian economies and the country's GDP in 2014-2021

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|--------------------------|--------|--------|-------|--------|-------|-------|-------|-------|
| FDI, Poland, billion \$ | 14.27 | 15.27 | 15.69 | 9.18 | 13.49 | 13.5 | 13.8 | 24.8 |
| FDI, Ukraine, billion \$ | 0.41 | 3.088 | 3.529 | 2.237 | 2.135 | 2.767 | 0.452 | 2.371 |
| GDP, Poland, billion \$ | 245.15 | 477.34 | 469 | 524.51 | 586 | 592 | 594 | 674 |
| GDP, Ukraine, billion \$ | 133.5 | 91.03 | 93.36 | 112.1 | 130.9 | 153.9 | 156.6 | 200.1 |

*Source: calculated by authors based on data (*International production beyond*, 2020; *Official Site of the State Statistics Service of Ukraine*, 2022).

The largest amounts of funds in Poland are invested in manufacturing – 42%, financial services – 22.7%, as well as motor vehicles and communication – 12.1% (Investments, 2021).

Meanwhile, in Ukraine, foreign investors are more eager to invest in the

processing industry, wholesale and retail trade, and industries that do not require long-term investment and new technologies, including financial and real estate sectors.

Certainly, with regard to Ukraine nowadays, the issues related to investment

security guarantees in wartime and post-war periods come to the fore. This fact holds investors back the most. To minimize it, risks insurance by international organizations is suggested to be applied. The Multilateral Investment Guarantee Agency (MIGA) included in the World Bank Group is among the organizations that have such a practice with the countries where hostilities and terroristic acts have occurred. By arrangement with the Ministry of Economy of Ukraine, MIGA will launch the wartime investment insurance mechanism. The cost of the pilot project is \$ 30 million. It will be launched shortly. Next year, the Ukrainian Government plans to attract about a billion dollars from MIGA for this program. Moreover, risk minimization requires guarantees from partner states to their businesses that will invest in Ukraine. Indeed, the guarantees of G7 will be a powerful sign for the entire global business. To cover these guarantees, it is best to involve the arrested russian assets (Economic truth, 2022).

It is worth mentioning that hostilities in Ukraine hold back investors from Poland. Some companies consider the geopolitical risk too high currently, even though Poland is a NATO member, and hostilities are not conducted here.

Investment attractiveness of Ukraine in the post-war period

Today Ukraine lives in conditions when people are forced to start over. So, there is an opportunity to take into account all mistakes and achievements and choose quite different ways of thinking and social and economic models for the country to become the center where investors from different countries worldwide can implement the best ideas. That will be exceedingly advantageous for them and interesting and prospective for the development of the country's economy.

Nowadays, the investment attractiveness of Ukraine is naturally much lower. The research of the European Business Association (conducted since 2008; the 2022 survey covered 102 CEOs of the largest international and Ukrainian companies) shows that the integral rate of the Investment Attractiveness

Index for Ukraine fell half a point in the first half of 2022 due to large-scale invasion and accounted for 2.17 points out of 5 possible. This rate is the lowest since 2013. Although it must be specified that the index hasn't exceeded 4 in the entire calculation period.

The investment environment estimates in Ukraine also have deteriorated, as expected. 53% of CEOs estimate the current investment climate as extremely unfavorable (it was 5% in the previous research), 34% of them see it as rather unfavorable, 9% - neutral, and only 4% consider it to be favorable. However, according to estimates for the next 6 months, 38% expect the further worsening of the situation, while 36% believe that the investment climate won't face significant changes and 26% predict it will have improved by the end of the year. Meanwhile, despite the war, 91% of the companies plan to continue to operate in the Ukrainian market and 55% are going to invest in Ukraine even in wartime.

But the war will come to an end, therefore, it is worth examining once again and considering the experience of the post-war recovery of the countries that have become the leading ones globally. Even now, prospective investors pay attention to Ukraine. In the context of the future recovery of Ukraine, the term "Marshall Plan" has been increasingly used. It is logical to analyze the experience of other countries' recoveries: West Germany, Italy, Japan, South Korea, and Israel.

It is worth reminding that the genuine Marshall Plan or the European Recovery Program was launched in 1948 to recover manufacturing. Financial inflows from the USA were among the tools of assistance. In four years, they amounted to over \$ 17 billion (nowadays, it's about \$ 210 billion). 20% of the total accounted for cheap loans, and 80% was transferred in the form of gratuitous financial assistance. Additionally, Europe received 14 billion for infrastructure recovery from 1945 to 1947.

The plan was designed for sixteen countries in Europe, but 2/3 of all funds accounted for Great Britain, France, Italy, West Germany, and the Netherlands. The funds were allocated for the purchase of

industrial and agricultural products rather than directly for government budgets. Accumulated funds were used for investment in reconstruction (France, Germany) or to repay military debts of the government (Great Britain) (J. Zheleznyak, 2022).

In World War II, due to massive air attacks and nuclear bombs dropping on Hiroshima and Nagasaki, Japan lost 25% of its total capital, 100% of warships and warplanes, 81% of merchant ships, 34% of industrial machines, 33% of municipal housing, 25% of buildings, 16% of telephone, telegraph, and water supply, 11% of electricity and gas supply, and 10% of land transport. 25% of national wealth and 40% of industrial enterprises and infrastructure were destroyed, and manufacturing returned to the level of 25 years ago. Examining the experience of Japan, it is worth mentioning that Japan has succeeded in a range of structural reforms urging significant economic transformations.

For instance, to overcome the problems of inflation and economic stabilization, in addition to the well-known Jordon Plan, a new fiscal reform was conducted (1950). The reform abolished indirect taxes like VAT in Japan till 1989. By the way, Poland has recently decided to reduce the food VAT rate to 0% to battle inflation. Meanwhile, the VAT reduction in Ukraine is a subject of debate. Yet, we argue that a special tax regimen should be introduced to return businesses to the areas that have faced destruction.

In 1952, Japan joined the IMF and the World Bank. It helped accelerate the development of energy, industrial, and transport systems due to long-term loans. Technological modernization also contributed much to the development and recovery of the post-war economy. Education reform was also conducted to secure the highest literacy rate in the world, and high standards have become the reason for success in the technological development of the economy (Poltav wave, 2022).

Naturally, for various reasons the experience of Japan is not relevant to Ukraine. Something cannot be applied because of the

presence of the aggressor state nearby. Something has already been implemented. However, it would do well if, after the war, much attention was paid to the reform of education and high-tech processes. After all, Ukraine expects the inflow of significant financial resources after the war that can be directed at technological modernization and improvement of their functioning efficiency.

The experience of Israel is also quite interesting. Initially, it has poor natural resources and unstable foreign policy situation, it was detached from its land for long, and it lives on high alert to conflicts. However, these factors haven't prevented it from becoming one of the leading states globally. Interestingly, the Israeli model wagers on security, development, and innovations. The authorities and citizens have made every effort to build the country with developed technology. Their success is based on a combination of military industry, science, education, business, technological cooperation with large partners, and support of innovations.

Notably, foreign direct investment inflow to Israel amounts to \$ 85 billion in the last 25 years, which is only \$ 7 billion more than to Ukraine. Having more than three times less population (9.2 million and 36 million, respectively) and a small area covered with black earth and fresh water, the Israeli GDP was more than twice larger than the Ukrainian GDP in 2021 (\$ 407 billion and \$ 200 billion, respectively) due to innovative economic development (A. Novgorodska, 2022)

In our opinion, Ukraine needs to use the experience of Israel in taxation, production stimulation, human capital accumulation, and the introduction of innovations in industrial output.

There are some interesting facts about the experience of West Germany's recovery. For instance, taxes were reduced and benefits were provided to attract investment and stimulate producers. Back in 1948, Ludwig Erhard approved the decision to abolish government control over prices for commodities and 90% of regulation restrictions for businesses. Special attention

was paid to reindustrialization: the replacement of outdated equipment, the update of manufacturing technologies, and the acceleration of the development of some regions. Meanwhile, 25% of housing, 20% of industrial facilities, and 40% of transport infrastructure were destroyed in World War II, and industrial output declined eight times against the pre-war level (O. Moshenets, 2022).

However, government policy was directed at the creation of the most favorable climate, guaranteed legal protection, reduced the monopoly impact on the market, and protected domestic producers from external competition. In such a way, it managed to achieve the growth of industrial output three times against the pre-war level. It was the start of Germany's economic prosperity, which currently is the European Union's driver and the country that has one of the largest economies globally (PSM7, 2022).

It is worth mentioning that even now, in midst of war, Ukraine remains interesting for foreign investors in the future, including in terms of the presence of mineral resources, the status of "the nurse for the developing countries", well-developed branching of production capacities, well-balanced and established logistics, quite stable banking system, continuous simplification of bureaucratic procedures due to the introduction of "state in a smartphone", regular generous cash inflows from the West, guarantees of support from the strongest countries worldwide, and, finally, the desire and aspiration of people to implement qualitative changes and do good for themselves. Everything abovementioned gives the impression that it will be simpler for Ukraine to develop post-war than, for example, Afghanistan, Syria, or Iraq (PSM7, 2022).

In response to the request of the Ukrainian Government, the strategy providing recommendations to attract investment and find ways to increase foreign direct investment in Ukraine has already been elaborated. The Strategy is built around the intersectoral (privatization, export promotion, education, digital transformation, etc.) and sectoral

stimuli to increase foreign investment. The Strategy offers particular recommendations on how to make the country more attractive for prospective foreign investors – both from the viewpoint of production capacity relocation and the launching of the activity in Ukraine. The Strategy is divided into three sections: a macro approach to the situation with FDI, sectoral analytical documents, and the suggested 2030 Action Plan and Vision (Ukraineinvest, 2022).

Ukraine pursues an ambitious but realistic objective: to have accomplished a jump from the transition (transformational) economy to a developing economy by 2032.

To attract foreign investors to the Ukrainian economy, a unique e-platform Advantage Ukraine that comprises over 500 investment projects and opportunities in 10 industries has been created (Official Website of the Ministry of Economy of Ukraine, 2023).

The most prospective investment areas in Ukraine and Poland

Economic sectors most interesting for investors in Poland:

- Aviation and space. Poland has long-standing traditions in the space industry and participates in many scientific and technical projects. In November 2012, Poland became the 20th full member of the European Space Agency (ESA) with an annual budget of € 5.75 billion. Moreover, Polish Space Agency (POLSA) was created in 2014 to perform public tasks in new space technology research and development. Nowadays, Poland uses EU funds to develop the technology of metal 3D printing, introduce new solutions in aircraft engines and gearboxes, and develop software for engine control (Investments, 2021).

- Manufacture of household appliances. Lately, Poland has become the leader in the industry. Every second washing machine, dishwasher, and clothes dryer from the EU is made in Poland. The sector generates an income of € 7.2 billion or 2.53% of GDP. Today, due to numerous sector investors, existing infrastructure, and staff knowledge and qualification, it is a modern and competitive industry on the international level.

- Electronics. It is the fast-developing segment of the Polish economy. The cost of sales in the industry in 2020 was PLN 44.23 billion, the number of companies in the industry was 150, the cost of exports was PLN 98.41 million, and FDI liabilities were € 1.471 billion.

- Electromobility. In 2015-2019, this Polish industry was the fastest developing in the world. 50,000 new jobs will be created here in the next decade. 300,000 students annually graduate from engineering faculties. There is no excise tax and parking are free. Moreover, electromobility is among the most essential aspects of the Polish Strategy for Responsible Development. Public transport electrification is also planned.

- Business services. Poland is a reliable site to locate BSS centers since the work is done qualitatively, the staff is educated and qualified and speaks many languages, the country has a wide range of locations offered to investors in services, is stable, and can compete not only with the countries in the region but also the countries of Asia and South America.

- Food industry. Government subsidies are granted to new manufacturing centers, and special economic zones provide tax exemption. FDI increases in the industry as it becomes increasingly competitive. Poland is the leading producer of fruits, meat, dairy, and mushrooms. By market size, Poland is 6 in Europe with a capacity of 38.5 million residents. In 2021, the cost of exports was a record and amounted to € 37.4 billion. Over 70% of output goes to the EU markets.

- Pharmaceutical industry. The total cost of investment is € 640 million. In 2019, the FDI inflow was € 78.2 million. The degree of trust in large companies is high. Poland has a powerful academic basis for pharmaceuticals and biopharmaceuticals and well-educated staff (first place in Central and Eastern Europe and fifth in Europe by the number of graduates in biopharmaceuticals-related sciences. 1% of GDP accounts for the industry.

- MedTech. The estimated market growth is 10.1% (2019-2024) and healthcare expenses account for 6.2% of GDP (by 2027, GDP is estimated to have increased to 7%). The market cost is \$ 11 billion (estimated \$ 13.8 billion in 2024), and there are 38.3 million of aging population. The labor force is large and well-educated. The access to a large client base is also notable (logistics bridge between East and West).

- ICT industry. According to PARP reports, IT industry accounts for about 8% of the Polish GDP, and over 430,000 employed (Investments, 2021).

The industries interesting for investors in Ukraine are (Economic truth, 2022):

- **Military industry.** *Military and military-tech* industry development will boost the export capacity of the country. The investment capacity is \$ 43 billion.

- **Metallurgy and metalwork.** Ukraine has an experience in high-tech metallurgy processes and full-cycle manufacturing of titanium-rich products. It can keep its positions on direct reduced iron and green metallurgy markets. The investment capacity is \$ 26 billion.

- **Energy.** It may be possible to generate dozens of gigawatts of green electricity capacity and millions of tonnes of green hydrogen. The investment capacity is \$ 177 billion.

- **Natural resources.** Ukraine has rich mineral resources, including substantial reserves of coal, iron ore, natural gas, manganese, salt, oil, graphite, etc. The investment capacity is \$ 5.6 billion.

- **Industrial agriculture.** There is a large reserve for the improvement of processing capacity and the development of high-value-added industries (production of meat, milk, and dairy, gardening, etc.). The investment capacity is \$ 34 billion.

- **Logistics and infrastructure.** The geographical position of Ukraine makes it a significant transit corridor for trade. Logistics is among the most important economic industries, with an extensive network of rail

and road routes, sea and river ports, and airports. The investment capacity is \$ 123 billion.

- **Manufacturing.** Ukraine has a large network of engineering enterprises that manufacture turbines and electricity generators, rail cars, mining and agricultural equipment, machines, aircraft engines, and manufacturing equipment for the light and food industries. The investment capacity is \$ 16 billion.

- **Wood processing and furniture industry.** Ukraine can become a furniture factory of the continent. We have the resource base and convenient logistics to supply finished goods. The investment capacity is \$ 5 billion.

- **Pharmaceuticals.** Ukrainian pharmaceutical companies comply with international standards. Most production capacities are partially restored according to GMP. The investment capacity is \$ 19 billion.

- **Innovation technology.** Ukraine is ranked 4th globally in financial operations performed with mobile devices and the number of crypto users. The investment capacity is \$ 11 billion.

Currently, the Advantage Ukraine team is processing about 50 requests from international strategic and portfolio investors on prospective investment directions and deepening cooperation with domestic enterprises of the public and private sectors.

The representatives of the USA, Germany, Great Britain, Poland, and Turkey are the most interested in investment opportunities in Ukraine, namely in innovative technology, agriculture, the financial sector, logistics, energy, mineral resources, and the defense industry.

Foreign direct investment estimation models for the future period for Poland and Ukraine

When analyzing the main parameters of Ukraine and Poland, we have tried to create a model of dependence between foreign direct investment in both countries and various economic parameters directly or indirectly impacting the investment. In the process of the

research, we have formed 14 parameters for the 2009 - 2022 period and conditionally grouped them into:

1. Market condition factors that characterize the country's economic development: x_1 – Gross Domestic Product; x_2 – Gross Domestic Product per capita; x_3 – the change in Gross Domestic Product; x_4 – foreign trade balance.

2. Socio-economic and demographic parameters (x_5 – average nominal wages; x_6 – the income of the population; x_7 – working age employment rate; x_8 – working age unemployment rate; x_9 – population; x_{10} – demand for workforce).

3. Economic activity factors: x_{11} – number of economic entities by economic activity types; x_{12} – the volume of sales by economic activity types; x_{13} – value added by economic entities' production costs by economic activity types; x_{14} – consumer price index.

The results of the conducted research help identify the main components with the dominant total contribution to the explanation of dispersion based on the principal component analysis.

Therefore, to estimate the level of foreign direct investment for the future period, one parameter is selected from each main investment market component, namely:

- the first main component G_1 is represented by GDP;
- the second main component G_2 is expressed by average wages;
- the third main component G_3 is described by the consumer price index.

Applying the method of exclusion to build the multiple correlation-regression model (J. Zheleznyak, 2022), we receive the following final model of foreign direct investment (y) dependence on economic system parameters – Gross Domestic Product and average wages:

- For Poland:

$$\tilde{y} = 99081.654 + 16.411809 x_1 + 37.8596 x_2.$$

- For Ukraine:

$$\tilde{y} = 258.8327 + 96.42757 x_1 + 33.9887 x_2.$$

Two other economic parameters – foreign trade balance and unemployment – do not impact foreign direct investment significantly in both countries (the regression coefficients are statistically insignificant).

The built correlation-regression models rather adequately describe the dependencies between the researched parameters since the determination coefficients are 0.887 for Poland and 0.8945 for Ukraine, i.e., 88.7% and 89.45% of foreign direct investment dispersion are explained by the parameters included in the model.

The positive values of the regression coefficients $a_1 = 16.411$ (Poland) and $a_1 = 96.43$ (Ukraine) indicate direct correlation dependence between GDP and FDI, namely the GDP growth by \$ 1 billion leads to foreign direct investment increase by PLN 16.41 million in Poland and by \$ 96.42 million in Ukraine.

The model of foreign direct investment dependence on GDP and average wages for Ukraine is built based on the data that could have been in 2022 (estimated) before the beginning of the large-scale russian invasion of Ukraine. The figures taken for calculations were \$ 205 billion GDP (estimated rate according to the basic scenario of economic development in Ukraine till 2024) (New time, 2021), UAH 14,577 average wage (the level of January 2022 – the last released statistical data in Ukraine), and \$ -210 million foreign direct investment (the data for I, II quarters of 2022 released by the National Bank of Ukraine)

Foreign direct investment for the future period was estimated in two stages:

1. The estimation of economic systems' parameters (GDP and average wages in Poland and Ukraine) based on trend models (Fig.1, Fig. 2).

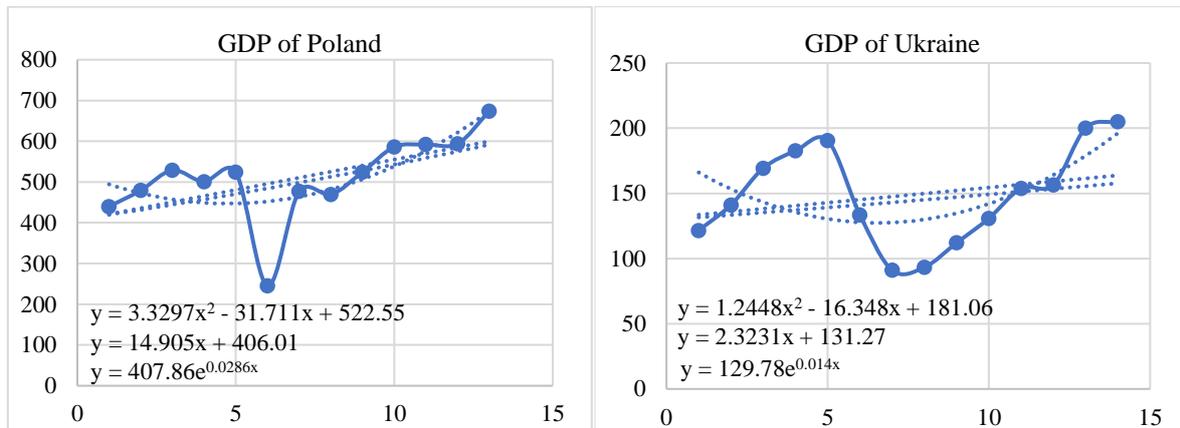


Figure 1. GDP dynamics in Poland and Ukraine (2009-2022)

*Source: calculated by the authors.

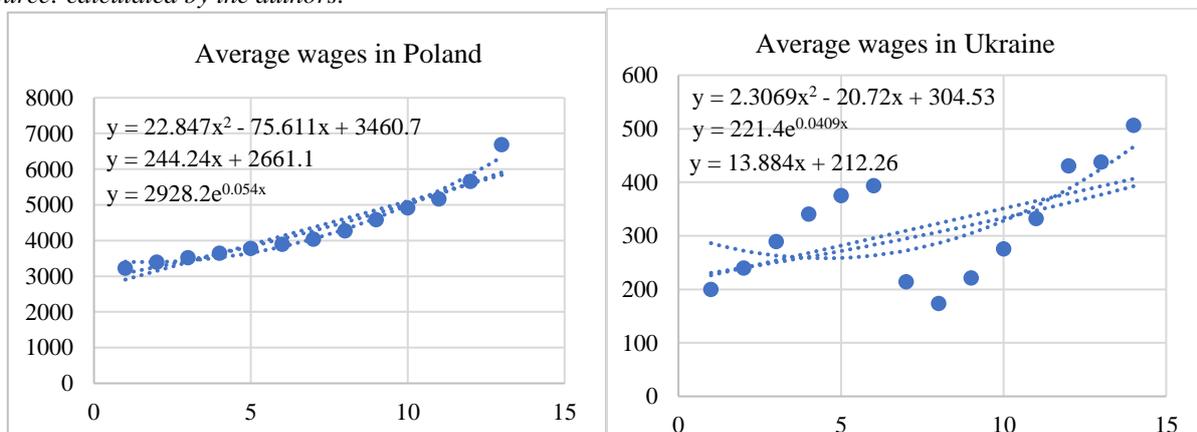


Figure 2. Average wage dynamics in Poland and Ukraine (2009-2022)

*Source: calculated by the authors.

2. The estimation of foreign direct investment based on the elaborated correlation-regression models and investment market parameters estimates.

A scenario approach was used to estimate foreign direct investment, i.e. several possible development options were identified, namely, neutral, optimistic, and pessimistic scenarios. The pessimistic scenario is characterized by a decline or delayed growth of labor market parameters, while the optimistic one – by the growth of relevant parameters. The analytical form of trend models for each development scenario is obtained due to correlation-regression analysis methods, namely, the least square method or maximum likelihood estimation (J. Zheleznyak, 2022).

The GDP growth by 29.45% from 2023 to 2026 (described by the second order polynomial trend model) and almost the same average wages growth paces – by 27.25% in four years (polynomial trend model) are peculiar to the optimistic scenario of foreign direct investment development in Poland. The trend models of these parameters for the optimistic scenario are the following:

$$\tilde{x}_1 = 522.55 - 31.711 t + 3.3297 t^2;$$

$$\tilde{x}_2 = 3460.7 - 75.611 t + 22.847 t^2;$$

where t – time index ($t = \overline{1.14}$);

Considering the development trends before 24 February 2022, according to the optimistic scenario, the increase in foreign direct investment in Ukraine stipulated the GDP growth from \$ 215 billion in 2023 to \$ 290 billion in 2026. Average wages might increase from \$ 512.78 to \$ 679.01 or by 32.6%. The trend models of these parameters for the optimistic scenario are the following:

$$\tilde{x}_1 = 181.06 - 16.348 t + 1.2448 t^2;$$

$$\tilde{x}_2 = 304.53 - 20.72 t + 2.3069 t^2;$$

In turn, the neutral scenario of foreign direct investment development stipulates an annual moderate increase in both GDP and average wages in Poland. Their estimated values are obtained by the following trend models:

$$\tilde{x}_1 = 407.86 \cdot e^{0.0286t};$$

$$\tilde{x}_2 = 2928.2 \cdot e^{0.054t}$$

In Ukraine, it stipulates a slight but consistent increase in GDP and average wages. Their estimated values are obtained by the following trend models:

$$\tilde{x}_1 = 131.27 + 2.321 t;$$

$$\tilde{x}_2 = 66.525 \ln(t) + 196.68$$

The pessimistic scenarios for both countries are characterized by slight growth of parameters. Polish GDP increases to 7% in the forecast period and Ukrainian – to 4%. On average, wages will increase by 3-4% annually in both countries, which is described by the following models:

- for Poland:

$$\tilde{x}_1 = 406.01 + 14.905 t;$$

$$\tilde{x}_2 = 2661.1 + 244.24 t.$$

- For Ukraine:

$$\tilde{x}_1 = 129.78 \cdot e^{0.014t};$$

$$\tilde{x}_2 = 221.4 \cdot e^{0.0409t}$$

Interestingly, the models are built based on the data of the last 14 years, when Ukraine has been facing a period of both growth and drastic decline in the parameters. In 2014, the Ukrainian GDP in dollar terms declined by a third and reached the 2013 level only in 8 years. In turn, although average wages grew in hryvnya terms, they declined by 56% (against 2014) in foreign currency and reached the 2013 level only in 2019. With regard to foreign direct investment, consistent dynamics wasn't observed. In 2014, foreign direct investment inflow to Ukraine accounted for only 9% of the 2013 level. The situation happened again in 2020, and foreign direct investment inflow to the country amounted to only 16% of the previous 2019-year level. In 2022, the foreign direct investment rate is negative altogether.

Meanwhile, a one-time GDP decline by half was recorded in Poland in 2014 but the figures exceeded the previous level already in three years. A consistent upward trend (in national currency) and a stable situation with

foreign direct investment inflow to the country were observed in wages.

To carry out the point estimates of foreign direct investment in both countries, the following values of the time index must be put

in the built trend models: $t = 16, 16, 17, 18$. Table 3 and Table 4 show the point estimates of the minimum wages for each development scenario.

Table 3. Estimated foreign direct investment parameters in Poland for 2023-2026

| Year | Period | Time index | FDI (million PLN) | GDP, billion \$ | Average wages, PLN |
|-----------------------|--------|------------|-------------------|-----------------|--------------------|
| Optimistic estimates | | | | | |
| 2023 | 1 | 15 | 394848.78 | 796.07 | 7467.11 |
| 2024 | 2 | 16 | 419974.14 | 867.58 | 8099.76 |
| 2025 | 3 | 17 | 446938.76 | 945.75 | 8778.10 |
| 2026 | 4 | 18 | 475742.63 | 1030.57 | 9502.13 |
| Neutral estimates | | | | | |
| 2023 | 1 | 15 | 358565.87 | 626.36 | 6582.32 |
| 2024 | 2 | 16 | 372691.13 | 644.53 | 6947.54 |
| 2025 | 3 | 17 | 387592.23 | 663.23 | 7333.02 |
| 2026 | 4 | 18 | 403311.98 | 682.47 | 7739.89 |
| Pessimistic estimates | | | | | |
| 2023 | 1 | 15 | 348865.25 | 629.59 | 6324.70 |
| 2024 | 2 | 16 | 358356.71 | 644.49 | 6568.94 |
| 2025 | 3 | 17 | 367848.17 | 659.40 | 6813.18 |
| 2026 | 4 | 18 | 377339.63 | 674.30 | 7057.42 |

*Source: calculated by the authors.

Table 4. Estimated foreign direct investment parameters in Ukraine for 2023-2026 as expected before the war

| Year | Period | Time index | FDI (million \$) | GDP, billion \$ | Average wages, \$ |
|-----------------------|--------|------------|------------------|-----------------|-------------------|
| Optimistic estimates | | | | | |
| 2023 | 1 | 15 | 3650.66 | 215.92 | 512.78 |
| 2024 | 2 | 16 | 4068.87 | 238.16 | 563.58 |
| 2025 | 3 | 17 | 4570.32 | 262.89 | 618.98 |
| 2026 | 4 | 18 | 5155.03 | 290.11 | 679.01 |
| Neutral estimates | | | | | |
| 2023 | 1 | 15 | 3468.98 | 166.12 | 376.83 |
| 2024 | 2 | 16 | 3547.06 | 168.44 | 381.13 |
| 2025 | 3 | 17 | 3633.99 | 170.76 | 385.16 |
| 2026 | 4 | 18 | 3728.76 | 173.09 | 388.96 |
| Pessimistic estimates | | | | | |
| 2023 | 1 | 15 | 2889.47 | 160.11 | 408.90 |
| 2024 | 2 | 16 | 2961.20 | 162.36 | 425.97 |
| 2025 | 3 | 17 | 3044.85 | 164.65 | 443.75 |
| 2026 | 4 | 18 | 3139.46 | 166.97 | 462.28 |

*Source: calculated by the authors.

Table 5 and Table 6 show the interval estimates of foreign direct investment inflow to Poland and Ukraine (that might have been possible before the beginning of the war) by each development scenario.

Table 5. Interval estimates of foreign direct investment inflow in Poland, million PLN

| Year | Period | Time index | Point estimates of foreign direct investment | Interval estimates of foreign direct investment | |
|-----------------------|--------|------------|----------------------------------------------|-------------------------------------------------|-------------|
| | | | | lower limit | upper limit |
| Optimistic estimates | | | | | |
| 2023 | 1 | 15 | 394848.781 | 385055.129 | 404642.433 |
| 2024 | 2 | 16 | 419974.145 | 409658.165 | 430290.124 |
| 2025 | 3 | 17 | 446938.76 | 436035.162 | 457842.359 |
| 2026 | 4 | 18 | 475742.628 | 464186.119 | 487299.137 |
| Neutral estimates | | | | | |
| 2023 | 1 | 15 | 358565.873 | 348772.222 | 368359.525 |
| 2024 | 2 | 16 | 372691.132 | 362375.152 | 383007.111 |
| 2025 | 3 | 17 | 387592.229 | 376688.63 | 398495.828 |
| 2026 | 4 | 18 | 403311.984 | 391755.475 | 414868.493 |
| Pessimistic estimates | | | | | |
| 2023 | 1 | 15 | 348865.252 | 339071.601 | 358658.904 |
| 2024 | 2 | 16 | 358356.713 | 348040.733 | 368672.693 |
| 2025 | 3 | 17 | 367848.173 | 356944.575 | 378751.772 |
| 2026 | 4 | 18 | 377339.634 | 365783.125 | 388896.143 |

*Source: calculated by the authors.

Table 6. Interval estimates of foreign direct investment inflow in Ukraine (before the war), million \$

| Year | Period | Time index | Point estimates of foreign direct investment | Interval estimates of foreign direct investment | |
|-----------------------|--------|------------|----------------------------------------------|-------------------------------------------------|-------------|
| | | | | lower limit | upper limit |
| Optimistic estimates | | | | | |
| 2023 | 1 | 15 | 3650.659 | 2670.902 | 4630.417 |
| 2024 | 2 | 16 | 4068.867 | 3036.855 | 5100.878 |
| 2025 | 3 | 17 | 4570.323 | 3479.526 | 5661.12 |
| 2026 | 4 | 18 | 5155.028 | 3998.914 | 6311.142 |
| Neutral estimates | | | | | |
| 2023 | 1 | 15 | 3468.975 | 2489.218 | 4448.733 |
| 2024 | 2 | 16 | 3547.058 | 2515.047 | 4579.07 |
| 2025 | 3 | 17 | 3633.991 | 2543.194 | 4724.788 |
| 2026 | 4 | 18 | 3728.761 | 2572.647 | 4884.875 |
| Pessimistic estimates | | | | | |
| 2023 | 1 | 15 | 2889.469 | 1909.711 | 3869.226 |
| 2024 | 2 | 16 | 2961.202 | 1929.191 | 3993.214 |
| 2025 | 3 | 17 | 3044.855 | 1954.058 | 4135.652 |
| 2026 | 4 | 18 | 3139.457 | 1983.343 | 4295.571 |

*Source: calculated by the authors.

Therefore, we can conclude that, for instance, in 2025, foreign direct investment inflow in Poland can amount to PLN 376.7 to 398.5 billion according to neutral estimates and PLN 436 to 457.8 billion according to optimistic estimates. Foreign direct investment inflow in the Polish economy can be

interpreted in the same manner according to other scenarios and for other estimated periods.

With regard to the scenario of foreign direct investment inflow in the Ukrainian economy that would have been true if the large-scale invasion of Ukraine hadn't started,

Ukraine could have relied on investment growth in 2023 at least in the amount of \$ 1,909.7 according to pessimistic estimates (lower limit) to \$ 4,630.41 billion according to optimistic estimates (upper limit). Therefore, under the most favorable conditions, Ukraine could have received \$ 6,311 billion in form of foreign direct investment in 2026.

Conclusions

Poland is the country that has managed to achieve the highest return on foreign direct investment among the EU countries. It is ranked first in Europe by coal mining and is a well-known supplier of black and some non-ferrous metals and fabrics. The country is in the top rankings in agricultural and food production. Polish authorities continuously encourage investment growth using benefits and grants, creating special economic zones, and consistently improving the country's business climate.

Ukraine lags behind Poland by many development parameters, including the Economic Freedom Index, Ease of Doing Business Index, Corruption Perception Index, etc. Moreover, the issues related to investment security in the war and post-war periods come to the fore and scare off the investors the most. To address these issues, risk insurance by international organizations is offered since hostilities in Ukraine dissuade investors to invest in Poland as geopolitical risks remain to be high.

Today, Ukraine lives in conditions where it has to start over. So, there is an opportunity to take into account all its own and others' mistakes and achievements and implement the best ideas of the post-recovery in Europe, Japan, Israel, South Korea, etc. For even in the midst of war, Ukraine remains interesting for investors since it has minerals, developed branching of production capacities, well-established logistics, regular assistance from the West, support from the strongest countries worldwide, and, finally, the desire and aspiration of people to implement qualitative changes. Ukraine sets an ambitious

goal – to have leaped from a transformational economy to a developing economy by 2032.

It is worth specifying the most perspective sectors for investment in Ukraine and Poland. For Ukraine, these sectors include the military industry, metallurgy and metalwork, energy, natural resources, industrial agriculture, logistics, infrastructure, manufacturing, wood processing and furniture industry, pharmaceuticals, and production technology. The most prospective sectors for investment in Poland are aviation and space, manufacture of household appliances, electronics, electromobility, business services, food industry, pharmaceuticals, MedTech, and ICT.

The built model of foreign direct investment dependence on economic parameters in Ukraine and Poland shows that for instance, in 2026, Poland can receive up to PLN 487 billion in investment and Ukraine could have received up to \$ 6.3 billion in foreign direct investment if the large-scale invasion hadn't started.

Finally, it is worth mentioning that according to the integral and coherent strategy of the Polish Government, the interests of most economic entities are considered and the conditions for the implementation of their economic strategies and orientation towards a direction beneficial for the country are created. Unfortunately, there is no such integrity in Ukraine. Investors will be interested in Ukraine only in case of high dynamics of economic and managerial reforms since a significant list of barriers and obstacles is currently especially relevant. On the positive side, Poland can strengthen its position in the EU if it consolidates with Ukraine in an economic cluster in the future.

In addition to its main problem – the end of hostilities, Ukraine also needs to address the issue of political and legal instability, lack of reliable guarantees of protection against the changes in Ukrainian legislation, significant fiscal and administrative pressure, high corruption and bureaucracy levels, significant inflation in the country, and complexity of registration, licensing, and customs

procedures. It requires the improvement of general (fiscal, land, corporate, and customs) and specific legislation that regulates relations when investing following European standards, the establishment of foreign investment risk insurance mechanism, and the creation and

provision of government guarantees fixed in national legislation to investors.

It is worth continuing the examination of foreign direct investment to map the optimal government policies that would boost their inflow in the Polish and Ukrainian economies.

References

- Andrusiv, U., Zelinska, H., Galtsova, O., Seleznova, O., Bahorka, M., Yurchenko, N. (2022). Socio-economic development in the context of using reasonable specialization in the economy of Ukraine. *Financial and Credit Activity Problems of Theory and Practice*, 2(43), 248–258. <https://doi.org/10.55643/fcaptop.2.43.2022.3729>
- Cherchata, A., Popovychenko, I., Andrusiv, U., Gryn, V., Shevchenko, N., Shkuropatskyi, O. (2022). Innovations in logistics management as a direction for improving the logistics activities of enterprises. *Management Systems in Production Engineering*, 30(1), 9-17. doi:10.2478/mspe-2022-0002
- Danylyshyn, B., Cymbal, O., Ostafiichuk, Y., Pylypiv, V. (2022). The tax changes impact on the municipal budgets revenues in Ukraine. *Financial and credit activity-problems of theory and practice*, 5(46), 126-136. DOI10.55643/fcaptop.5.46.2022.3843
- Danylyshyn, B.M. (2023). Of the modern research and innovation policy. *Science and innovation*, 19, 1, 3-19. DOI10.15407/scine19.01.003
- Dziamulych M., Shmatkovska T., Petrukha, S., Zatssepina, N. Rogach, S., Petrukha, N. (2021). Rural agritourism in the system of rural development: a case study of Ukraine. *Scientific Papers Series «Management, Economic Engineering in Agriculture and Rural Development»*, 21(3), 333-343.
- Economic truth. (2022). Land of opportunities: why investors will come to Ukraine. <https://insurancebiz.org/discuss/interview/detail.php?ID=8685>
- Findbiz-PL. (2022). POLAND. <http://www.findbiz-pl.com/plinfo/>
- Hutorov, A., Lupenko, Y., Ksenofontov, M., Bakun, Y., Vlasenko, T., Sirenko, O. (2022). Strategic development of agri-food corporations in the competitive economic space of Ukraine. *Independent journal of management & production*, 13(1), 37-55. 10.14807/ijmp.v13i1.1620
- International production beyond. (2020). The pandemic world investment report. Unitednations conference on trade and development. https://unctad.org/system/files/official-document/wir2020_en.pdf
- Investments. (2021). Polish Investment and Trade Agency S.A. https://www-paih-gov-pl.translate.google.sektory/aeronauczny?_x_tr_sl=pl&_x_tr_tl=uk&_x_tr_hl=uk&_x_tr_pto=sc
- Kalashnikova, T., Koshkalda, I., Trehub, O. (2019). Mathematical methods of data processing in formation and evaluation of sectoral structure in agricultural enterprises. *Global Journal of Environmental Science and Management*, 5, Special Issue, 87-95.
- Kucher, A. V., Lialina, N. S., Kucher L. Yu. (2019). Investment attractive of land use of agricultural enterprises. *International Journal of Ecological Economics & Statistics*, 40(1), 118–130.
- Moshenets, O. (2022). Which model of post-war recovery will work in Ukraine? LB.UA. https://lb.ua/blog/olena_moshenets/533342_yaka_model_povoiennoho_vidnovlennya.html
- New time. (2021). How Will Ukraine's Economy Develop Until 2024 and What Risk Factors. Hinder Growth. <https://biz.nv.ua/ukr/economics/ekonomika-ukrajini-v-2021-2024-yaki-ye-scenariji-rozvitku-i-golovni-riziki-novini-ukrajini-50185677.html>
- Novgorodska, A. (2022). The experience of Israel: how to build a strong state during war. Mind. <https://mind.ua/openmind/20249638-dosvid-izrayilyu-yak-pobuduvati-silnu-derzhavu-pid-chas-vijni>
- Official Site of the State Statistics Service of Ukraine. (2022). <http://www.ukrstat.gov.ua>
- Official Website of the Ministry of Economy of Ukraine. (2023). Investments in Ukraine and Recovery of the Economy. <https://www.me.gov.ua/Documents/Detail?lang=uk-UA&id=62bfd716-8665-4a4c-9e2d-6325ba53b3c8&title=InvestitsiiVUkrainuTaVidnovlenniaEkonomiki>
- Pavlova, O., Pavlov, K., Novosad, O., Irtyshcheva, I., Popadynets, N., Hryhoruk, I., Gelich, N., Suriak, A., Makara, O., Zhuk, O., Boiko, Y., Kramarenko, I. (2021) Strategic Priorities for Socio-economic Development of Ukraine in Comparison with the Republic of Poland. In: Karwowski W., Ahram T., Etinger D., Tanković N., Taiar R. (eds) *Human Systems Engineering and Design III. IHSED 2020. Advances in Intelligent Systems and Computing*, 1269. https://doi.org/10.1007/978-3-030-58282-1_49
- Poltav wave. (2022). How to Restore Ukraine After the War - The Experience of Japan. <https://poltavawave.com.ua/p/iak-vidnoviti-ukrayinu-pislia-viini----dosvid-iaponiyi-695849>
- Popadinets, I., Andrusiv, U., Galtsova, O., Bahorka, M., Yurchenko N. (2021). Management of motivation of managers' work at the enterprises of Ukraine: innovative aspects. *Management Systems in Production Engineering*, 29(2), 120-131.

- Popov, A., Koshkalda, I., Kniaz, O., Trehub O. (2019). Land fragmentation of agricultural enterprises in the context of administration of land. *Economic Annals-XXI*, 176(3-4), 80-90.
- PSM7. (2022). The Economy Of Victory: The Post-War Experience of Four Countries That Will Help Ukraine Revive After The War. <https://psm7.com/uk/vojna-s-rossiej/ekonomika-pislya-peremogi-povoyennij-dosvid-chotirox-kra%D1%97n-shho-dopomozhe-ukra%D1%97ni-vidroditisya-pislya-vijni.html>
- Simkiv, L., Andrusiv, U., Kupalova, G., Goncharenko, N., Dzoba, O., Yushkevych, O. (2022). Concentration of entrepreneurial activity in the regions of Ukraine in the context of sustainable development. *Financial and Credit Activity Problems of Theory and Practice*, 3(44), 347–356. <https://doi.org/10.55643/fcaptop.3.44.2022.3776>
- Slovo and Dilo. (2017). Ukraine's Plase in the World Runking of Economic Development. <https://www.slovoidilo.ua/2017/02/01/infografika/ekonomika/misce-ukrayiny-v-svitovomu-rejtnihu-rozvytku-ekonomik>
- Sodoma, R., Shmatkovska, T., Dziamulych, M., Vavdiuk, N., Kutsai, N., Polishchuk, V. (2021). Economic efficiency of the land resource management by agricultural producers in the system of their non–current assets analysis: a case study of the agricultural sector. *Scientific Papers Series «Management, Economic Engineering in Agriculture and Rural Development»*, 21(2), 577-588.
- Suhina, O., Shults, S., Tkach, V., Popadynets, N., Kamushkov, O. (2019). Methodology of evaluating economic losses resulting from partial loss of the air ecosystem's assimilative capacity. *Journal of Geology, Geography and Geoecology*, 28(1), 188-198. <https://doi.org/10.15421/111920>
- The First News (2022). Fdi Inflows Into Poland Hit Record High in 2021. <https://www.thefirstnews.com/article/fdi-inflows-into-poland-hit-record-high-in-2021-30145>
- Ukraineinvest. (2022). National Strategy for Increase of Direct Foreign Investment in Ukraine. <https://ukraineinvest.gov.ua/uk/fdi-strategy/>
- Valyukh, A., Yakymchuk, A., Diugowanets, O., Bilyk, R., Pavlov, K., Pavlova, O., Batkovets, N., Popadynets, N., Hryhoruk, I. (2020) Public Administration and Economic Aspects of Ukraine's Nature Conservation in Comparison with Poland. In: Kantola J., Nazir S., Salminen V. (eds) *Advances in Human Factors, Business Management and Leadership. AHFE 2020. Advances in Intelligent Systems and Computing*, 1209, 258-265. https://doi.org/10.1007/978-3-030-50791-6_33
- Valyukh, A., Yakymchuk, A., Irtysheva, I., Yakubiv, V., Popadynets, N., Hryhoruk, I., Pavlov, K., Pavlova, O., Maksymiv, Yu., Boiko, Ye., Hryshyna, N., Ishchenko, O. (2021) Economic Diagnostics and Management of Eco-Innovations: Conceptual Model of Taxonomic Analysis. In: Russo D., Ahram T., Karwowski W., Di Bucchianico G., Taiar R. (eds) *Intelligent Human Systems Integration 2021. IHSI 2021. Advances in Intelligent Systems and Computing*, 1322, 573-579. https://doi.org/10.1007/978-3-030-68017-6_84
- Was, A., Sulewski, P., Krupin, V., Popadynets, N., Malak-Rawlikowska, A., Szymanska, M., Skorokhod, I., Wysokiński, M. (2020) The Potential of Agricultural Biogas Production in Ukraine—Impact on GHG Emissions and Energy Production. *Energies*. 2020, 13, 5755, 1-20. doi:10.3390/en13215755
- Word Bank (2019). Doing business 2019. Training for reform 2019. International bank for reconstruction and development. http://www.doingbusiness.org/content/dam/doingBusiness/media/Annual-Reports/English/DB2019-report_web-version.pdf
- Yakubiv, V., Maksymiv, Y., Hryhoruk, I., Popadynets, N., Piatnychuk, I. (2019). Development of renewable energy sources in the context of energy management. *Journal of Vasyl Stefanyk Precarpathian National University.*, 6, 3-4, 77-87. <https://doi.org/10.15330/jpnu.6.3-4.77-87>.
- Zelinska, H., Andrusiv, U., Galtsova, O., Dmytrenko, M. (2021). Management of Social Risks and their Impact on the Spheres of Human Life in the Conditions of Sustainable Development of Ukraine. *Problemy ekorozwoju*, 16(2), 116-124 doi:10.35784/pe.2021.2.12
- Zheleznyak, J. (2022). 5 Stories of Economic Success After the War: Global Experience for Ukraine, LB.UA. https://lb.ua/economics/2022/04/13/513199_5_istoriy_ekonomichnogo_uspihu_pislya.html