SciPap
scientific papers

Scientific Papers of the University of Pardubice, Series D: Faculty of Economics and Administration 2023, 31(1), 1680.

DOI: 10.46585/sp31011680
editorial.upce.cz/SciPap

Application of EU Programs and Financial Instruments for Ukraine

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Abstract

European structural funds and financial institutions are the primary funding sources for strategic development initiatives, achieving sustainable development goals and implementing the Green Deal strategy in Europe. As Ukraine moves towards EU membership, it has the potential to use these new financial instruments to support its development projects, drawing on the experience of neighbouring countries such as Poland and the Czech Republic. The article evaluates the effectiveness of EU funding in Poland, the Czech Republic, and Ukraine. We built a regression model that assessed the impact of EU financial instruments on economic growth in Ukraine, Poland and the Czech Republic over ten years. A regression analysis of the relationship between financing through EBRD, EIB loans and indicators of GDP per capita, and foreign direct investment, showed a high level of correlation between these indicators in each country. The most significant impact on GDP is indicated by EBRD project financing in Ukraine. In addition, the growth of financing through European banks is a good sign for foreign investors. It contributes to their involvement in the country's economy, which is crucial for the recovery of Ukraine after the war. The study is of practical importance for improving Ukraine's reconstruction programs using diversified sources of financing.

Keywords

EU programs, Cohesion policy, Grants, EIB loans, EBRD loans, Ukraine.

JEL Classification

G28, O19, R11

Introduction

Ukraine has suffered and continues to suffer significant destruction under Russian aggression. The international community is actively helping Ukraine fight the war's consequences and rebuild the country. Since Ukraine is on the way to EU membership, the state will attract new financial instruments from the EU to restore the country according to the Green Deal strategy. Ukraine cannot access structural funds but can use EU partner programs for sustainable development. Experts (Ferreira, 2023) agree that it is necessary to plan the restoration of the state now. The Green Deal can be the basis for Ukraine's recovery efforts, leading sustainable practices, technologies, and policies.

Ukraine should develop a modern and sustainable infrastructure that will reduce greenhouse gas emissions, increase energy efficiency, and encourage using renewable energy sources. For example, Ukraine can focus on modernising its power generation infrastructure in the energy sector to prioritise renewable energy sources; this transition will reduce dependence on fossil fuels and contribute to the country's energy independence and security. For this, Ukraine can use the financial resources of European banks and, in the future, EU structural funds. There is a lot of evidence that it could be a successful collaboration (Bostan et al., 2022; Scotti et al., 2022, Römisch et al., 2020).

In the article, we consider the results of Ukraine's cooperation with EU financial institutions and compare them with the results of financing strategic programs in EU countries, such as Poland and the Czech Republic. Differences can be detected by comparing the terms and cost of financing projects, the directions of program implementation and the impact on the economy from implementing EU-funded programs.

The purpose of the study is to evaluate EU financial instruments used for sustainable development programs in Poland, the Czech Republic, and Ukraine from the point of view of their impact on economic growth.

The study revealed in the three analysed countries the differences between the sources of sustainable development

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financing, the priorities of financing programs, as well as a positive correlation between the indicators of infrastructure project financing at the expense of EU instruments and the indicators of GDP per capita and FDI per capita.

The study shows that the EU financial instruments' involvement is a possible way to ensure sustainable development. At the same time, the authorities can choose between different financial instruments and improve development programs based on the green transition strategy since such directions will allow applying for grants and financial aid. High-quality cooperation with EU banks attracts foreign investors.

Theoretical Background and Literature Review

Financial policies and instruments of the EU for the sustainable development of regions or achieving the goals of the Green Deal are widely covered in modern research.

Scotti et al. (2022) examined the impact of EU structural funds on regional growth in European countries. They found that the funds positively affect economic growth and development in the regions that received them. An important discussion of EU funding instruments is conducted on the pages of the SciPap Journal. The authors Smekalova & Kucera (2022) focus on the period between 2014-2021, during which Poland and the Czech Republic received significant amounts of EU funds as new member states. They found that regions that received more EU funds had higher levels of economic growth, as measured by changes in GDP per capita. Areas with higher levels of human capital and more developed infrastructure could better absorb and efficiently use EU funds, leading to higher economic growth. Therefore, the impact of EU funds on regional development depends on the type of investment - investments in infrastructure and human capital have a more significant positive impact on regional growth than investments in other areas, such as environmental protection or innovation. Sobotková (2015) gives an example of the effectiveness of EU support for tourism development. At the same time, some research claim that EU funding programs and policies a less effective. Zdražil & Kozuń-Cieślak (2017) recommended improving cross-border cooperation programs. Applova (2016) reported that disparities in regional development still exist due to economic crises.

Researchers of SciPap Journal reached similar conclusions regarding the funding under the Cohesion Policy in the EU with other authors (Römisch et al., 2020), (Becker et al., 2018). Several authors (Cerqua & Pellegrini, 2020) indicate the emergence of convergence in regions' development thanks to EU funding. Researchers Brzáková & Kraft (2017) emphasise the importance of the subsidiary-grant form of regional development financing. Crescenzi & Giua (2020) found that the impact of cohesion policy funding is generally positive but could be offset by economic crises. According to Remeikienė et al. (2020), quantitative and qualitative growth indicators and their changes across EU regions and countries should be evaluated. At the same time, significant disparities between regions regarding achieving sustainable development goals remain, and funding within the cohesion policy does not solve them (Jedrzejczak-Gas, 2021). Focusing on the smart specialisation of lagging regions and diversifying financial instruments is better (Pilati et al., 2020).

Quite often, authors emphasise the use of European funds and instruments to implement the green transition. Lakatos & Arsenopoulos (2019) reviewed existing financial instruments and successful schemes aimed at implementing measures related to energy efficiency. The authors use SWOT analysis to obtain results regarding the prospects of attracting various financial instruments. The study of Bertoldi et al. (2021) focuses on financial tools for achieving the goals of the Green Deal in the EU and emphasises the need to introduce new financial instruments to finance relevant green measures. The article examines the current practice of financing energy renovation and explores innovative tools with a particular emphasis on their application to revitalising residential buildings. In addition to "traditional" financial schemes, such as subsidies, tax credits and loans, innovative financing schemes are recommended: property tax and mortgage financing and preferential tariffs for energy efficiency. However, the authors point out that financial instruments involve different stakeholders. Due to the complex nature of the sector, there is no single solution to accelerate investments in energy renovation of buildings. The author Kozera (2022) talks about the possibility of decarbonising the economy using European financing.

Several critical articles could be found in studies of previous EU policies and their instruments. Dąbrowski (2015) analyses the financial instruments of EU cohesion policy for developing cities used in Poland. He concludes that the JESSICA tool, which had the nature of a revolving fund and not grants funding, is too complex. Instead of "doing more with less", this tool only allows you to achieve "less results with less." However, the tool still positively impacts local authorities and promotes cross-sectoral interaction and learning.

A systematic review of publications on EU financial instruments supporting innovation by the researcher Wyrwa (2020) showed that more attention should have been paid to financing innovative enterprises.

In general, innovative financial instruments in European Union financing schemes differ from financing through direct subsidies (Branten et al., 2017); Wishlade et al., 2018). These financial instruments could be divided into two broad groups: instruments offering equity and debt instruments. The tools help attract private sector resources to projects that could be considered too risky and the implementation of which would be impossible or associated with

significantly higher costs for the project initiator.

Summarising the above, financing from structural funds for the EU's regional development positively affected the smoothing of regional inequalities in income and development rates. At the same time, studies of regional development indicators in Ukraine demonstrate the opposite trends - volatility and divergence in their values (Sytnyk et al. 20,22). The regional disparity in Ukraine should not be attributed to the lack of financing from European structural funds. After all, a more significant factor in the sustainable growth of the regions of European countries was the financing of projects related to energy efficiency, the development of human capital and innovation, and not just subsidising economically lagging areas.

Much less research is devoted to the impact of credit financing through European institutions on the economic growth of regions and states. Thus, the author Saccomanni (2008) recognises the EBRD as the largest single investor in the European area, which, in addition to its financing, can mobilise significant foreign direct investments. Among the positive aspects of the EBRD's activity, he attributes investments in private enterprises with commercial partners and financial services for banks and enterprises. Another advantage of the EBRD is that it works on improving municipal services, restructuring state-owned enterprises, and supporting their privatisation. Thus, through its investments, the EBRD promotes structural and sectoral reforms, competitiveness, privatisation and entrepreneurship, and the creation of more reliable financial institutions and legal systems.

The study by Gherghina et al. (2020) discusses the impact of investments and innovations based on European funding on territorial economic growth, measured by the turnover of active Romanian enterprises, especially SMEs, from 2009–2017. The article showed a positive impact of investments on the growth of the turnover of enterprises. López Herrera (2016) talks about the European Fund for Strategic Investments (EFSI) activities, known as the Juncker Plan, which creates attractive investment opportunities for Spain. This financial instrument has advantages for supporting business projects cooperating with government bodies and can contribute to job creation. Krasny (2019) describes the positive effect of EIB loans on urban development.

Both the EBRD (EBRD, 2018, 2020) and the EIB (European Investment Bank, 2023) are involved in assessing the investment climate of partner states, conducting large-scale business surveys, and developing an investment strategy for these states. The authors (Olmos et al., 2012), discussing the choice of financing tools to stimulate the development of new technologies, stop their choice of state grants and contracts. However, public loans, equity investments, tax incentives or rebates can support innovation processes at lower public costs. Therefore, credit financing from European banks is an additional positive tool for financing innovations and implementing the Green Deal strategy.

Research question: How do investment projects of EU financial institutions in Ukraine, Poland and the Czech Republic affect the development of territories?

EU Funding for Ukraine

The EU Structural and Investment Funds are the EU's most significant regional investment program, which supports the social and economic development of different regions of Europe, reducing the gaps between them. Although most of the funds are provided to EU member states, there are opportunities for other European countries to receive funding as well - primarily through territorial cooperation programs (Interreg) and programs of financial assistance for candidate countries and potential candidates for EU accession (the Pre-Accession Fund in the EU).

Most programs that are implemented under joint management are called "funds". The current program (strategic) document of the EU Party regarding the provision of technical assistance to Ukraine in the 2014-2020 program period was the European Neighbourhood Instrument (ENI), the purpose of which was to promote the deepening of political cooperation, fundamental democratic principles, activation of economic integration and strengthening of the partnership between the EU and countries - partners. For 2014-2020, the budget of the ENI amounted to 15.4 billion euros for all 16 neighbourhood countries (EU, 2022). During this period, strategic sectors related to the general directions of reforms in Ukraine were identified, for the implementation of which EU assistance was provided:

1) Strengthening institutions and good governance, ensuring the rule of law and security.
2) Economic development and development of market opportunities, including developing the private sector and improving the business climate.
3) Improving connectivity, energy efficiency, environmental protection, and climate change prevention.
4) Mobility and contacts between people, including implementing more effective social policy.

In implementing the tasks of all priority sectors, "transversal issues" played a unique role. Those are measures to strengthen trust and build peace; steps to ensure gender equality and observance of human rights; measures in environmental protection and prevention of climate change, digital economy, society, and youth.

From 2011 to 2021, Ukraine received loans from the EU for more than 13 billion euros (Gaidai, 2022). In addition, the EU also provided Ukraine with irreversible financial assistance through various programs and initiatives for

more than 3 billion euros (Fig.1). Further, in Table 1, the instruments used by Ukraine are grouped. As we can see, credit resources prevail. In particular, the EBRD is one of the largest institutional investors in Ukraine. As of the beginning of May 2022, the total financing allocated to Ukraine by the Bank is 16.5 billion euros within 510 projects. Nine joint projects with the EBRD are at the implementation stage with a total volume of loans of 1,764.0 million euros. EBRD loan funds used for these projects as of 30 April 2022 are EUR 600.67 million (34.1% of the total loan amount) (EBRD, 2022).

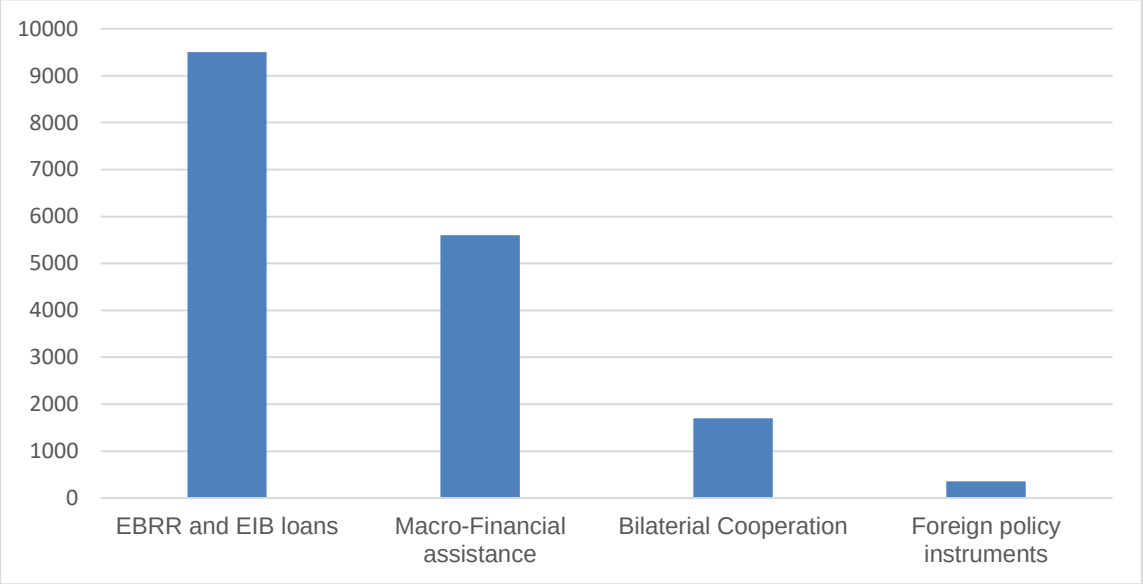

Fig 1. Financial Instruments Used for Funding Ukraine (2011-2021) in mil. EUR
Source: Ministry of Finance of Ukraine (2022)

Also, many Ukrainian regional centres joined the EBRD sustainable urban development program "Green Cities". It is a €1.5 billion framework program to support cities in identifying, benchmarking, prioritising, and investing in Green City measures to improve urban environmental performance.

The EBRD does not finance state budget expenditures but only development investment projects in the private and public sectors. The European Bank for Reconstruction and Development allocated 2 billion euros for Ukraine to help citizens and companies affected by the war. This financing is provided primarily for the support of Ukrainian companies - for example, in the form of deferred loans, liquidity support and trade financing. Where possible, businesses are helped to relocate so that they can continue to operate.

Table 1. Characteristics of financial instruments used for funding Ukraine.

Instrument	Description
EU Macro-Financial Assistance (MFA)	This is a financial assistance program that provides loans to countries in need of external financial support. Ukraine has already received four rounds of MFA from the EU. The loans are meant to help Ukraine with its balance of payments and to support its economic reform efforts.
European Investment Bank (EIB) loans	The EIB provides loans to support investment projects that contribute to the development of the EU and countries outside the EU. Ukraine is one of the eligible countries for EIB loans, and the Bank has already provided financing for various projects, such as energy efficiency and infrastructure.
European Neighbourhood Instrument (ENI)	The ENI is a financial instrument that funds countries in the EU's neighbourhood, including Ukraine. The instrument supports political and economic reform and social and economic development. The ENI supports various activities, including public administration, economic development, and civil society.
European Bank for Reconstruction and Development (EBRD) loans	The EBRD provides loans to support private sector development in countries transitioning to market economies. Ukraine is one of the EBRD's main countries of operation, and the Bank has already provided financing for various projects, such as energy efficiency, transport, and financial sector development.

Source: developed by authors based on Stulik (2021) and the Ministry of Finance of Ukraine (2022)

The European Investment Bank (EIB) is one of the world's largest public lenders and an institution that finances development projects. EIB is a structural unit of the European Union, and the largest share of financing falls on the implementation of projects within the borders of the European Union itself. The main goal of the EIB is to promote the balanced development of the member countries of the European Union by providing loans or bank guarantees. Ukraine began cooperation with the European Investment Bank in 2004 to create a regulatory and legal framework

to attract its resources for implementing infrastructure, energy, environmental protection, and other investment projects. As of 1 May, 2022, the total financial resources provided to the EIB in Ukraine, both in the public and private sectors, is more than 7.5 billion euros. Municipal programs have become one of the priorities of European institutions. The European Investment Bank (EIB) has allocated €1.5 billion to developing small and medium-sized businesses in Ukraine and plans to continue financing activities in this direction. Also, the EIB and the Ministry of Community and Territorial Development of Ukraine signed a grant agreement for 7 million euros, which the EU will finance. This grant will be aimed at preparing and implementing the Recovery Program in Ukraine. It is about restoring social infrastructure, improving communal services, and repairing damaged administrative buildings and critical social infrastructure (including hospitals, schools, kindergartens, and sports facilities).

In addition, the EIB has approved and disbursed two parts of the emergency financial support package for Ukraine for EUR 668 million. These funds will be used as additional financial and technical support for Ukraine, as well as neighbouring countries in the EU and beyond, to help them cope with the damage caused by the war and the influx of refugees.

Both characterised banks interact and complement each other. There are some areas of EBRD intervention in which the EIB is not actively involved and currently has no plans: direct support in the financial sector, trade finance, nuclear safety, and Business Advisory Services. At the same time, there are areas of the EIB in which the EBRD does not participate - these are state social services and health care and education services.

It can be argued that EU financial support has played an essential role in helping Ukraine stabilise its economy, reform its institutions, and establish closer ties with the EU. EU macro-financial assistance, loans and grants have provided much-needed funding to help Ukraine cope with the economic and political challenges it has faced, especially since the Euromaidan revolution in 2014, as well as in the context of the COVID-19 pandemic.

Second, EU support helped Ukraine implement reforms in public administration, governance, the fight against corruption, the rule of law, reform of the justice sector, and human rights. These reforms helped strengthen Ukraine's institutions and improve the business climate, which, in turn, helped attract foreign investment and promote economic growth.

Thirdly, EU support contributed to regional development in Ukraine. The EU supported infrastructure development, small and medium-sized enterprises, and civil society organisations in the regions, contributing to economic growth and social cohesion.

It should be noted that there are problems and limitations in assessing the effectiveness of EU financial support for Ukraine. This concerns the difficulty of evaluating the impact of numerous programs and financial instruments, the long-term nature of some reforms, and measuring the impact of intangible results (such as improved governance). In this research, we did not consider the financial and military aid that Ukraine received during the war period because those funds were used for solving the financial issues that our country faced last year.

Poland's Cooperation with EU Funds

Poland took full advantage of the possibility of financing strategic programs using EU structural funds. Before Poland acceded to the EU, the country received financing through three programs - financing instruments: PHARE (assistance in the restructuring of the economies of Poland and Hungary), SAPARD (a program for restructuring the agricultural sector and assistance to rural areas), ISPA (infrastructural projects in the fields of transport and ecology). Within the framework of these programs, Poland received the equivalent of about 2.5 billion euros in the first ten years (Piętak, 2021).

After Poland acceded to the EU in 2004, financing of measures within the framework of the Cohesion Policy was carried out through the European Structural and Investment Funds (ESIF) - the EU invested a total of 175 billion euros in Poland for the years 2004-2020. Additionally, since 2014, 18 billion euros of investments have been mobilised as part of the Juncker Plan (European Commission - Directorate-General for Regional and Urban Policy, 2022).

Poland continues to be the largest beneficiary of EU funds, reflecting the country's desire to develop and transform into a more modern, greener and digital economy. It is also commensurate with the challenges that Poland faces today. As part of the new EU budget for 2021-2027, Poland continues to move towards decarbonisation and digitalisation; the state plans to use European funds to invest in critical social services, help people improve their qualifications, and find work. The plans include the development of childcare and long-term care services, which will increase the participation of women in the labour market and positively impact the economy and society. Poland will also use the ESF+ to help build the capacity of civil society organisations and social partners, which the Commission believes is essential for a healthy social market economy.

Within the new Euro budget 2021-2027 framework, the funds allocated to Poland are equivalent to a third of Poland's GDP. Since 2004, the European Union has supplemented the Polish budget with 181 billion euros. Poland will receive almost 160 billion euros in 2021-2027. One hundred twenty-five billion euros are non-refundable grants, while 34 billion euros are loans. This is the most significant financing of infrastructure investments in the energy

sector. The EU budget primarily supports research and innovation, investments in trans-European networks and the development of small and medium-sized enterprises, which should support economic growth and create jobs in the EU. The EU's common agricultural policy, fishing policy and the environment will receive the most funds within the current long-term budget. Then there are the "cohesion" programs, which help to reduce the disparity between the level of development of the EU regions. The multi-year budget also financed development projects and international humanitarian aid.

Consequently, Poland has been one of the largest recipients of funding and support from the European Union (EU), with significant investments in infrastructure, research and development, and social and economic development. In 2014-2020, 82.5 billion euros were allocated to Poland as part of the EU Cohesion Policy, which aims to reduce regional differences and promote economic development in the EU. In addition, Poland received significant support through other EU programs, such as the European Regional Development Fund (ERDF) and the European Social Fund (ESF; Ministry of Economic Development and Technology of Poland, 2022).

One of the main areas of EU support for Poland is infrastructure development, including investments in roads, railways, airports, and other transport systems (European Commission, 2022). The EU also supports the development of renewable energy and energy efficiency projects and investments in water and waste management systems. The EU has supported Poland's research sector by funding universities, research institutes and innovative small and medium-sized enterprises (SMEs). This has helped facilitate technology transfer and knowledge sharing and support the development of high-tech industries. The effectiveness of EU support for Poland remains a subject of debate. Proponents argue that EU funding has helped modernise Poland's infrastructure, support economic growth, and promote social and economic development. Critics, however, raise concerns about the effectiveness of EU projects and how effectively they have addressed regional disparities and economic inequality within the country.

The Czech Republic Cooperation with EU Funds

During 2011-2021, the EU supported the Czech Republic and Poland, but the directions and amount of support differed between the two countries. The total amount of support that Poland received was higher than that of the Czech Republic. From 2014 to 2020, Poland received more than €104 billion from the EU, including support from the Cohesion Policy, the European Social Fund, and the European Regional Development Fund. The Czech Republic received €22.6 billion from the cohesion policy over the same period. The Czech Republic and Poland received support from the EU for infrastructure development. However, the direction of this support differed between the two countries. In the Czech Republic, the EU supported the development of transport systems, renewable energy sources, and water and waste management. In Poland, EU support has focused on developing transport infrastructure like roads and railways. The EU has supported innovation and research in the Czech Republic and Poland. However, in the Czech Republic, the EU supported the development of high-tech industries and funded universities, research institutes, and innovative SMEs. In Poland, the focus was on developing science and innovation centres and promoting technology transfer (European Commission, 2022).

Within the framework of the new package of the Cohesion Policy for 2021-2027, the financing of measures for the Czech regions - Karlovy Vary, Ustec and Moravian-Silesian regions, where there is a high concentration of carbon-intensive industries with 21,000 jobs related to such sectors, is provided. In the 2014-2020 program period, the EU has already supported investments in 11,000 Czech enterprises, helping to preserve or create 10,676 direct jobs. The mentioned industrial regions will have 1.64 billion euros at their disposal for a just transition of the local economy.

In Karlovy Vary, over 1,000 jobs are related to the production of electricity, which pollutes the environment. This is the least developed region of the Czech Republic, but it has the potential for the development of small and medium-sized businesses. 80% of Czech brown coal is mined in Ustec. There are 5,000 coal-related jobs, four coal mines, the most significant Czech coal-fired power plants, and a high concentration of chemical industry enterprises. The JTF will support investments for an economy based on renewable energy sources and a circular economy. Investments in research and development, including innovation platforms and clusters, are among the priorities of the JTF. Moravskoslezske is the largest coal mining region in the Czech Republic, with 5,000 direct jobs. The region faces several environmental problems, especially air and groundwater pollution, because of industrial activities. The JTF will invest in decommissioning and support the phasing out of coal in the region. The fund provides targeted support to help mobilise around €55 billion over the period 2021-2027 in the most affected regions to mitigate the socio-economic consequences of the transition. In addition, the European Investment Bank (EIB) provided EUR 50 million to SG Equipment Finance Czech Republic, bringing the total EIB support to Czech companies to EUR 610 million in 2022 (Touriño et al., 2022). EIB loan to SGEF is expected to improve access to finance and borrowing conditions for Czech and Slovak SMEs. This will encourage new investment, improve employment conditions, and ultimately lead to more innovation, higher economic growth, and increased competitiveness. It will also enhance economic and living conditions in less developed regions.

Methods

In the theoretical background, we underline two main actors – EIB and EBRD, that contributed to the funding of the Ukrainian economy.

We used the Tablo Public tool to visualise and analyse large data sets. This tool made it possible to visually present the countries' cooperation with the EIB and the EBRD. This step reveals the standard and distinctive features of financing programs and instruments in Poland, the Czech Republic, and Ukraine. We decided to focus on indicators of EIB loans per capita and EBRD loans per capita to evaluate the impact of EU Banks on chosen countries' economies.

A regression model was built to assess the impact of EU financial instruments on economic growth in Ukraine, Poland, and the Czech Republic over ten years. The main task of correlation analysis is to determine the type and closeness of the relationship between the variables of this econometric model (Rawlings et al., 1998). The practical use of regression analysis in economic research makes it possible to determine whether the obtained dependence between factor characteristics, expressed by the regression equation, is reliable or random. For this, we use the formula:

$$Y = b_0+b_1X_1+b_2X_2+\ldots+b_nX_n \quad (1)$$

where

Y	is an independent variable,
$X_1, X_2, \ldots, X_n$	are independent factors,
$b_0, b_1, b_2, \ldots, b_n$	are model parameters,
E	is an error.

This model was used to analyse the relationship between the inflow of financial resources from the EBRD and the EIB and the indicator of GDP per capita in Ukraine over a certain period.

The model includes variables such as foreign direct investment and GDP per capita, as well as EBRD and EIB lending volumes. The authors calculated the indicators based on the data from Eurostat (2023) and the World Bank (2023), as well as the official websites of the EIB (2023) and the EBRD (2023) regarding the volume of financing in selected countries. The data was for ten years, from 2011 to 2021.

The correlation of the selected indicators was also evaluated to reveal the closeness of the connection between the phenomena. The same models were created for Poland and the Czech Republic. The method of multivariate correlation-regression analysis and the application of the least squares method show the influence of X(factors) on Y(variable). Data on financing from European banks were divided by the respective country's population in the analysed period to compare these indicators per capita. Also, ready-made World Bank data on GDP per capita and Foreign Direct Investment per capita were applied. All calculations were made in the current US$ and listed in Table 3.

The results of the econometric modelling were calculated using the standard function "Regression" of Excel spreadsheets.

Results and Discussion

Since Ukraine, not being a member of the EU, mainly used loans from two financial institutions, the EBRD and the EIB, we will focus on the characteristics of Ukraine’s interaction with these banks and compare the effectiveness of such cooperation with the examples of the Czech Republic and Poland. We showed cumulative indicators of cooperation of the selected countries with the EIB and EBRD in Table 2.

The first difference is the duration of cooperation - Ukraine began such collaboration with the Bank 15-17 years later than the Czech Republic and Poland. Poland concluded ten times more loan agreements than Ukraine and accordingly received financing for more than 88 billion euros. Moreover, the number of local partners - domestic banking institutions cooperating with the EIB is commensurate in both countries. Using the Tablo Public software product, the sectoral structure of investment financing in three states was analysed and allowed to create an interactive data visualisation. Figure 2 shows a close-up of data for Ukraine, and Figure 3 shows the comparative structure of EIB lending programs across three countries.

Besides the significant preponderance of credit in Poland, an important difference is the sectoral distribution of investments. In particular, the Czech Republic has taken loans for the past three years to develop green energy and innovations. Poland - to ensure the sustainable development of cities and regions and Ukraine - to finance credit lines and transport infrastructure development. This fundamental difference indicates the strategic focus of the two EU member states on building a sustainable economy and the need for such a focus in Ukraine, where loans were used for the construction of highways and airports.

We can observe the different situations in the example of the cooperation of states with the EBRD (Fig. 4).

Table 2 shows the main characteristics of such an interaction, where Ukraine receives relatively the most funding in quantity and value and focuses on the agricultural sector and, again, transport infrastructure.

Table 2. Comparison of EIB and EBRD assistance in selected countries.

Characteristics	Czech Republic	Poland	Ukraine
EIB			
Year	1992	1990	2007
Sum of funding	€25,88 bl	€88,63 bl	€8,08 bl
Number of projects	206	581	54
Local partners	9	20	15
Sector	Energy, SME, Innovation	Sustainable cities and region	Transport, Credit lines
EBRD			
Sum of funding	€1,34 bl	€12,40 bl	€18,09 bl
Number of projects	118	493	529
Sector	Depository Credit, Manufacturing, Telecommunications	Depository Credit, Manufacturing, Energy	Depository Credit, Agribusiness, Transport

Source: developed by authors based on EIB (2023) and the EBRD (2023)

To what extent do the involved financial resources positively affect the state's economic growth, creating a favourable business climate and revitalising domestic investment and direct foreign investment in the state's economy? We tried to investigate the answer to this question using a regression model.

For this, we built a multifactor regression model

$$Y(X) = f(X_1, X_2, .. X_{n-1}, X_n) \quad (2)$$

where

X_1 and X_2 are factors, and

n is the number of factors.

Undoubtedly, it is essential to check the quality of the found parameters of the model and evaluate the model for its adequacy to the natural processes of social development and to ensure the population's well-being. Solving the two stated tasks of assessing the adequacy and quality of the model would allow using the built econometric model to explain the results of the influence of the studied factors. Moreover, it will provide an opportunity to model the impact of the volume of borrowings from EU financial instruments on the GDP per capita of Ukraine. We should note that European banks' set of indicators and the volume of investment financing included private foreign investments. The selected indicators relate to investment activity as a whole and thus will allow us to compare the impact of external borrowing on GDP per capita. Therefore, such indicators as EIB financing (X_1), EBRD financing (X_2) and direct foreign investments (X_3) were chosen for modelling (Tab. 3).

The model of Ukraine's GDP per capita dependence on these indicators was built as a linear multivariate regression using the standard "Regression" program and Excel spreadsheets. The classical econometric evaluation criteria of Beers B. (2023) were applied to characterise the macro model's reliability and parameters. According to the calculations, the linear equation of the dependence of GDP per capita of Ukraine on factors X_1-X_3 is as follows

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + E \quad (3)$$

where

b_i, for i=0,1,2,3, are linear regression coefficients,

Y is the estimated volume of GDP per capita in the country,

X_1 is EIB financing,

X_2 is EBRD financing,

X_3 is foreign direct investment,

E is a random component

Table 3. Input data and indicators for regression analysis (in current US$).

Year	EIB-loans per capita (X1)	EBRD-loans per capita (X2)	FDI per capita (X3)	GDP per capita (Y)
		Ukraine		
2012	18,09	15,32	179,30	4004,80
2013	12,22	18,01	99,12	4187,74
2014	27,52	13,91	19,70	3104,64
2015	22,18	13,09	-4,62	2124,66
2016	5,74	18,00	96,74	2187,73
2017	6,85	15,14	86,62	2638,33
2018	11,72	13,00	117,70	3096,56
2019	17,70	26,96	137,91	3661,46
2020	32,11	17,68	7,28	3751,74
2021	39,48	13,67	192,23	4835,57
		Czech Republic		
2012	130,25	0,00	897,48	19870,8
2013	137,04	3,38	699,77	20133,17
2014	157,46	0,00	768,49	19890,92
2015	56,70	0,00	161,19	17829,7
2016	63,35	0,00	1026,90	18575,23
2017	55,24	0,08	1060,44	20636,2
2018	47,17	0,00	783,13	23424,48
2019	159,73	0,00	1007,52	23664,85
2020	128,81	0,00	796,00	22992,88
2021	136,58	0,94	724,54	26821,25
		Poland		
2012	144,06	18,37	188,63	13010,92
2013	289,75	21,57	27,05	13558,41
2014	175,90	16,62	538,12	14182,14
2015	151,57	14,80	410,62	12560,05
2016	101,64	20,27	467,47	12378,76
2017	135,18	16,98	315,97	13815,62
2018	106,75	14,51	505,70	15504,58
2019	141,20	29,94	464,08	15699,91
2020	145,94	19,55	505,32	15816,99
2021	240,71	15,05	983,20	17999,91

Source: Prepared data based on Eurostat. (2023), World Bank (2023), Ministry of Finance of Ukraine (2022)

We used the method of multivariate correlation-regression analysis and then applied the method of least squares. We established that the volume of GDP per capita of Ukraine is significantly affected by the indicators X_1-X_3. The results of the econometric modelling, calculated using the standard function "Regression" of Excel spreadsheets, are shown in Table 4.

Based on the data in Table 4, we can state that the model is adequate because the significance of the F-criterion and P-value for the indicators is less than 0.05 (Beers, 2023). Therefore, indicators X_1, X_2 and X_3 are statistically significant. X_1 P-value was 0.006; X_2 P-value was 0.01; and X_3 was 0.02. The final equation of the dependence of the GDP per capita of Ukraine on the selected indicators is as follows:

$$Y = 60.74X_1+83.61X_2+8.17X_3 \quad (4)$$

Table 4. Regression Statistics for Ukraine.

Multiple R	0,989306					
R Square	0,978727					
Adjusted R Square	0,829791					
Standard Error	603,715					
Observations	10					
ANOVA	df	SS	MS	F		Significance F
Regression	4	1,19E+08	29724219	172,824		1,52E-05
Residual	6	1031948	171991,3			
Total	10	1,2E+08				
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
EIB-loans per capita (X_1)	60,7406	15,78593	3,847768	0,006311	23,41281	98,0684
EBRD-loans per capita (X_2)	83,61629	25,36654	3,296323	0,013187	23,63396	143,5986
FDI per capita (X_3)	8,171926	2,946845	2,77311	0,02757	1,203745	15,14011

The EBRD loan index has the highest ratio, followed by EIB loans. Establishing the adequacy of the model was performed by finding the multiple coefficients of determination, which estimates the share of the variation of the result due to the factors presented in the equation in the total variation of the result. In this case, according to the results of the Table 4, the coefficient of determination R2 is 0.979. The coefficient of determination approaches 1. This indicates a functional relationship between the estimated value of GDP per capita and indicators X_1-X_3. In addition, this value of R^2 indicates that 97.9% of the change in GDP per capita of Ukraine (Y) was due to changes in European bank borrowings and foreign direct investments. The statistical data in Table 3 show that foreign direct investment in Ukraine was quite sensitive to political factors. The fact that European banks continue to cooperate with Ukraine and increase their presence positively affects financing economic development. If Ukraine joins the EU as a partner, it will additionally be able to increase GDP through structural funds financing as it was in Romania (Zaman & Georgescu, 2009).

We made similar calculations for the data of the Czech Republic and Poland. Thus, Table 3 shows the initial data for the regression model of the Czech Republic, and Table 5 shows the results of econometric modelling.

Table 5. Regression Statistics for the Czech Republic.

Multiple R	0,971427					
R Square	0,943671					
Adjusted R Square	0,78472					
Standard Error	6111,432					
Observations	10					
ANOVA	df	SS	MS	F		Significance F
Regression	3	4,38E+09	1,46E+09	39,08982		0,000248
Residual	7	2,61E+08	37349600			
Total	10	4,64E+09				
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
EIB-loans per capita (X_1)	70,10003	42,13797	1,663584	0,140144	-29,5404	169,7405
EBRD-loans per capita (X_2)	271,697	2011,014	0,135104	0,896332	-4483,6	5026,99
FDI per capita (X_3)	15,90808	5,535175	2,873997	0,023855	2,819468	28,99668

Based on the data in Table 5, the model is adequate because the significance of the F-criterion and P-value for indicator X_3 is less than 0.05. Therefore, the X_3 indicator is statistically significant. For X_1, the P-value was 0.14, for X_2 - 0.89, and only for X_3 - 0.02. Based on the above, only the influence of the indicator of direct foreign investment on the GDP per capita of the Czech population is statistically justified. The final equation of dependence of the GDP per capita of the Czech Republic on the selected indicator is as follows:

$$Y = 15.91X_3 \quad (5)$$

The model's adequacy was established by finding the multiple coefficients of determination, which estimates the

share of the variation of the result due to the factors presented in the equation in the total variation. In this case, according to the results of the Table. 6, the coefficient of determination R^2 is 0.94. The coefficient of determination approaches 1. This indicates a functional relationship between the estimated value of GDP per capita and the X_3 indicator. We can conclude that EIB and EBRD borrowings do not significantly affect Czech GDP growth. Even though the Czech Republic emphasises using Cohesion Policy funds, new projects from the European Investment Bank for small businesses appear (Touriño et al., 2022), and EBRD will increase the number of its programs in the Check Republic.

Let us now consider the case of Poland (input data in Table 3 and the simulation result in Table 6).

Table 6. Regression Statistics for Poland.

Multiple R	0,993093					
R Square	0,986234					
Adjusted R Square	0,839444					
Standard Error	2040,477					
Observations	10					
ANOVA	df	SS	MS	F		Significance F
Regression	3	2,09E+09	6,96E+08	167,1666		3,6E-06
Residual	7	29144811	4163544			
Total	10	2,12E+09				
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
EIB-loans per capita (X_1)	21,33941	10,0871	2,115515	0,072198	-2,51279	45,19162
EBRD-loans per capita (X_2)	360,9912	91,09601	3,962755	0,005442	145,5833	576,399
FDI per capita (X_3)	9,007401	2,39207	3,765526	0,007024	3,351055	14,66375

Based on the data in Table 6, it can be seen that the model is adequate because the significance of the F-criterion and P-value of the indicators is less than 0.05. So, the situation in Ukraine was repeated - indicators X_1-X_3 are statistically significant. In addition, such a value of R^2 indicates that 98.6% of the change in the volume of GDP per capita of Ukraine (Y) was described as due to the change in borrowings of European banks and foreign direct investments. The final equation of dependence of GDP per capita in Poland looks like this:

$$Y = 21.34X_1+360.99X_2+9.01X_3 \quad (6)$$

Therefore, the most significant influence on GDP growth is the attraction of investments from the EBRD, followed by EIB loans and direct financial investments. Poland demonstrates itself as an active participant in all European funding programs, which allows it to attract resources from diversified sources (European Commission, 2022).

The regression models demonstrate three scenarios for using EU loan funds - for Ukraine containing the lion's share of economic development financing through EIB and EBRD loans. For Poland, despite active cooperation with the EIB, loans from the EBRD have a more significant impact on GDP growth. For the Czech Republic, European loans play an insignificant role. There is no one-size-fits-all solution, and adequate growth will rely on diversifying funding sources and strategic planning of investment directions, focusing on the Green Transition.

Conclusions

The study of financing the development of countries and regions using EU instruments made it possible to draw several conclusions. First, reviewing the literature and research on cohesion policy allowed us to identify positive qualitative and quantitative changes in the EU states thanks to such funding. EIB and EBRD funding has contributed to overall economic growth in the Czech Republic and Poland. The financing has helped stimulate investment, create job opportunities, and support the development of local businesses and industries. Those investments have played a crucial role in developing infrastructure projects in both countries, including transportation networks, energy systems, and municipal services.

Also, such collaboration has supported the growth of the private sector by providing funding, technical assistance, and advisory services to local businesses and entrepreneurs. The example of Poland and the Czech Republic once again confirmed that subsidising backward regions contributes to the convergence of indicators and the smoothing of inequalities in development. This testifies to the benefits of EU tools and the necessity of their application to Ukraine when it becomes a full member of the EU.

Second, the types and forms of EU financial support Ukraine received before 2022 are systematised. This made it possible to single out the credit instruments of the EIB and the EBRD as the largest sources of EU financing in

Ukraine in terms of volume. The analysis of the cooperation of Poland and the Czech Republic with the EBRD and the EIB showed that credit financial instruments and grant financing significantly positively impact economic growth. In the future, using debt financial instruments in the EU will allow the funding of large-scale green transition projects and energy efficiency projects, for which there may be a need for more funds in the EU budget. We could highlight the priority areas where the EBRD and the EIB work - energy efficiency and innovation.

The conducted regression analysis of the relationship between financing of these banks and indicators of GDP per capita, as well as direct foreign investments, showed a high level of correlation of these indicators, both in Poland and the Czech Republic, and in Ukraine, and made it possible to build regression equations for three countries and model the future value of GDP per capita depending on the volume of foreign investments and projects financed by the EIB and the EBRD. Thus, the highest values and the most significant impact on GDP are the indicators of EBRD project financing in Ukraine. In addition, the growth of financing through European banks is a good signal for foreign investments and promotes their involvement in the country's economy.

The study showed that despite the close connection between the indicators, there are other factors that affect the growth of the state's well-being. The example of the Czech Republic shows that it is possible to achieve economic growth without focusing on attracting EU debt financial instruments (the Czech Republic did not use loans from EBRD for several years). Structural funds (i.e. grant funds) were more attractive instruments for Poland.

This study's limitation is assessing the effectiveness of financial instruments in the pre-war period (until 2022). The significant amounts of financing that Ukraine received between 2022 and 2023 are not possible to assess from the point of view of the impact on macroeconomic indicators, which have undergone colossal negative changes in connection with the war.

After the end of the war, there should be a qualitative assessment of international financial aid and credit resources received by Ukraine from the point of view of their effectiveness and impact on economic growth.

The experience of Poland and the Czech Republic has shown that economic growth can be achieved only through joint efforts - the interaction of the interested public, the private sector, the high-quality development of development strategies at the state level, and only then - the attraction of financial resources from diversified sources.

Acknowledgement

Co-funded by the European Union

The research was held under Erasmus+ Programme Jean Monnet Module "Urban Revitalization – EU Experience for Ukraine" 620957-EPP-1-2020-1-UA-EPPJMO-MODULE

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

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Appendices

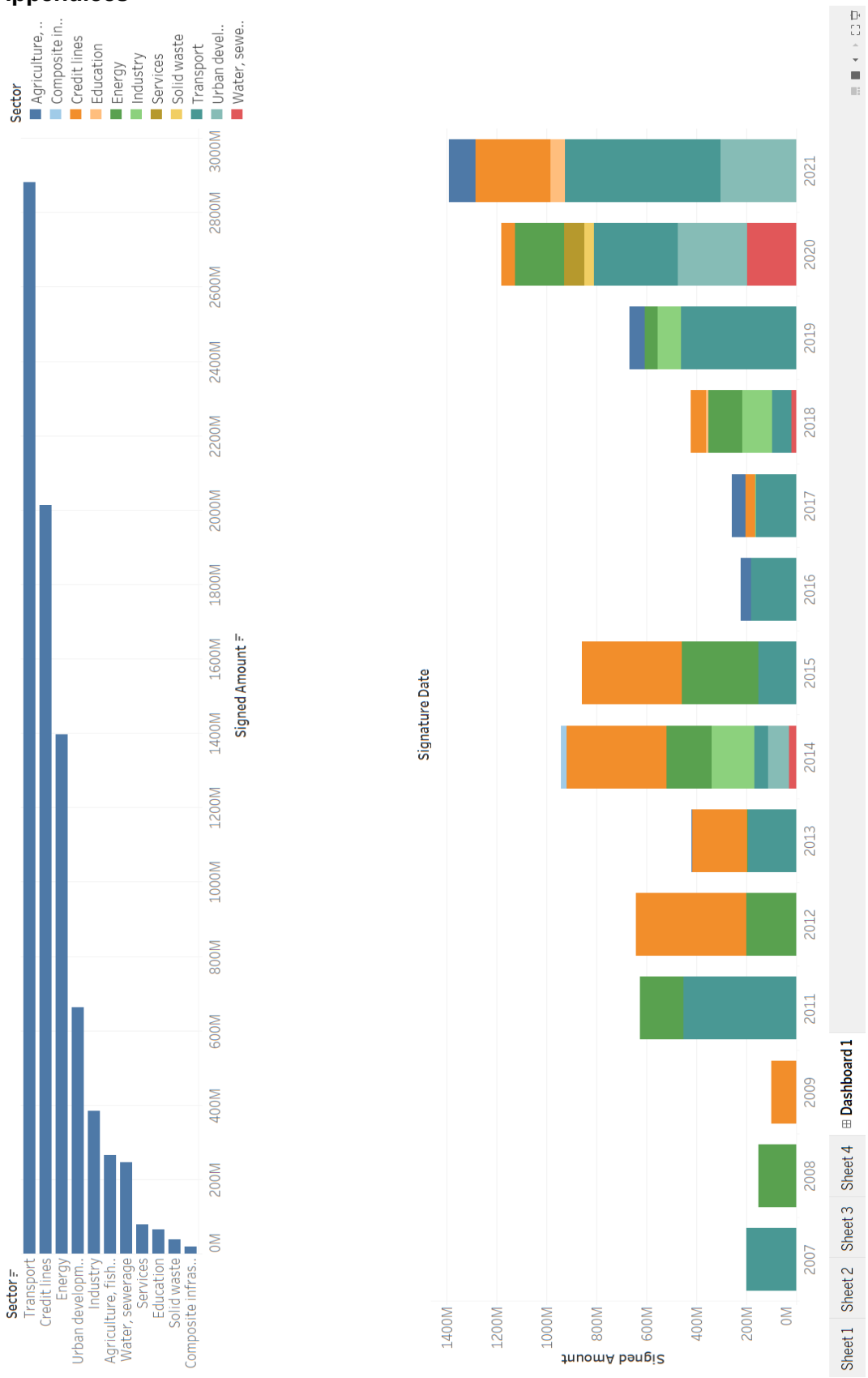

Fig 2. EIB Cooperation with Ukraine

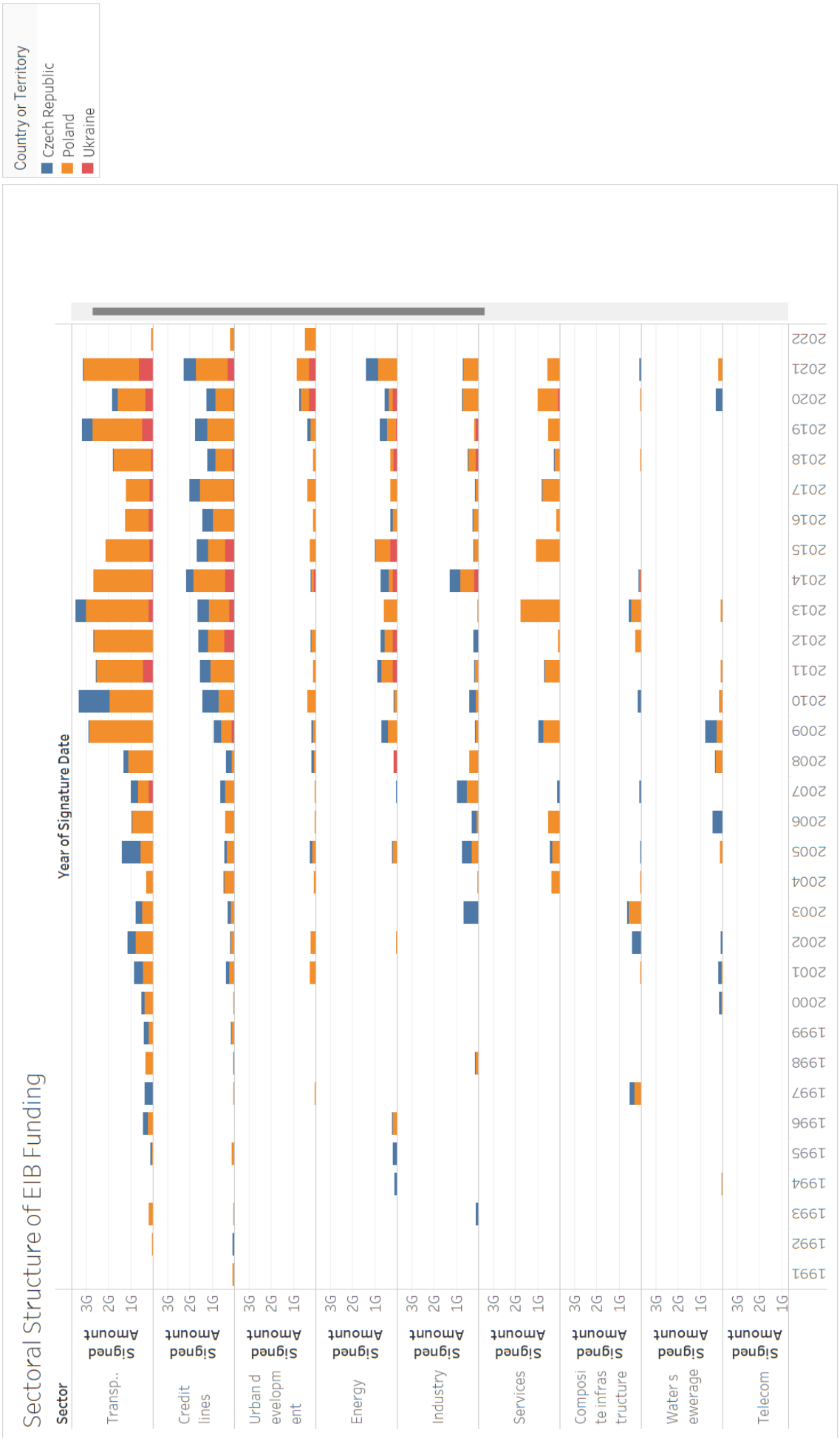

Fig 3. EIB cooperation with the Czech Republic, Poland and Ukraine

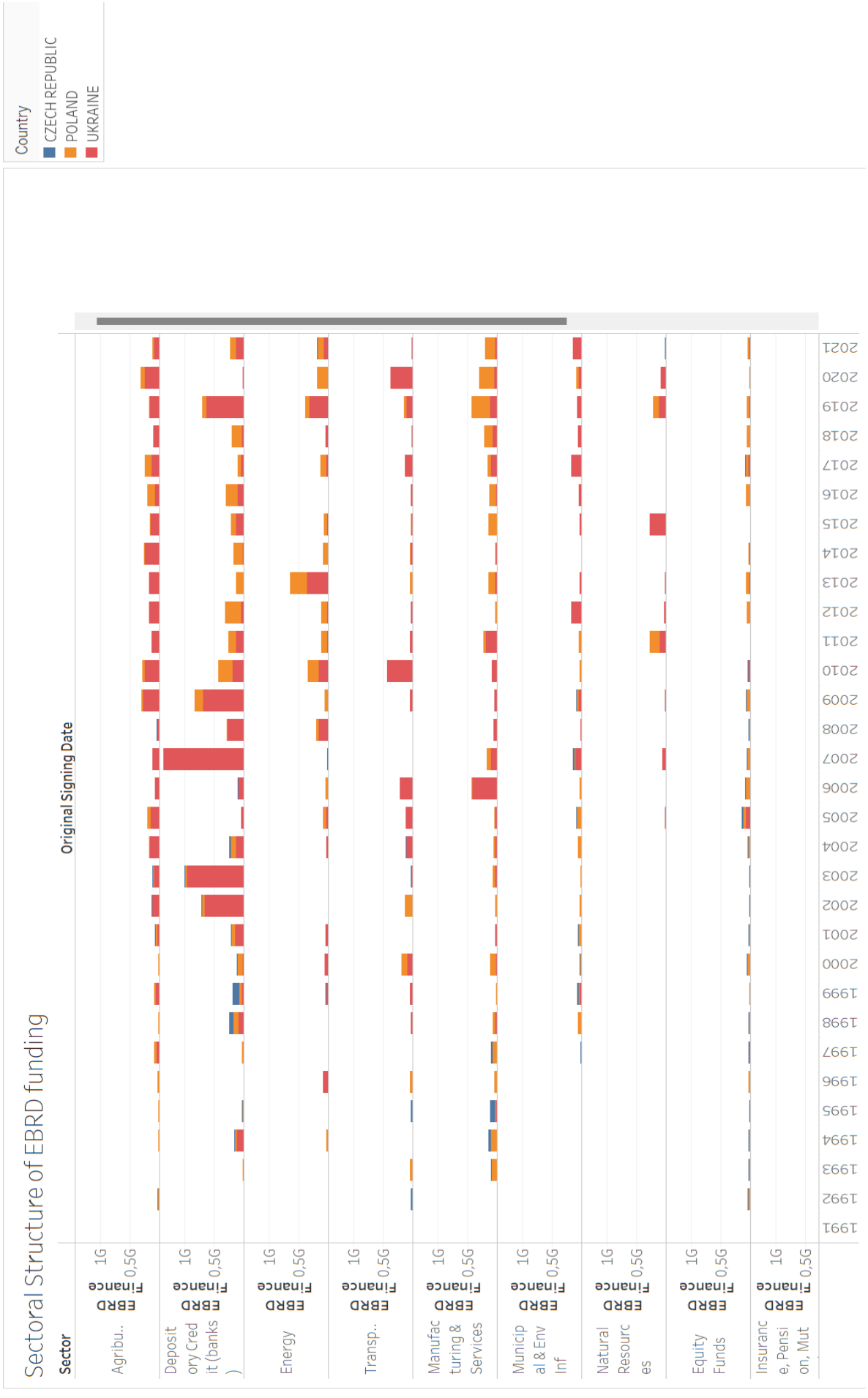

Fig 4. EBRD cooperation with the Czech Republic, Poland and Ukraine