Computer and Decision Making

An International Journal

www.comdem.org
eISSN: 3008-1416

Mechanisms for Ukraine's Economic Integration with EU Regions in the Context of Interregional Interactions

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ARTICLE INFO

Article history:
Received 16 June 2026
Received in revised form 8 July 2026
Accepted 9 July 2026
Available online 10 July 2026

Keywords:
trade strategies; interregional cooperation; economic sustainability; European Union; Ukraine; market.

ABSTRACT

Current trends in the development of the European community are characterized by the use of various forms of euro-regional cooperation (joint programs, regional economic development projects, Euroregions, inter-territorial cooperation, etc.) to promote sustainable growth, development of backward areas, and green transition. The processes of globalization and the problems of the EU countries' internal markets have led to the need to find regional and local partners for the exchange of goods, services, knowledge, technologies, innovations, and labor resources. This need has transformed the economic environment towards the creation of a single common market for goods, capital, and labor resources with regional peculiarities of development and growth due to the internal specifics of trade, investment, financial relations, and labor markets within the EU. These regional differences make it important to develop various strategies for the development of interregional economic cooperation, in which Ukraine is assigned the role of an important strategic trade, investment, and financial partner. In the context of intensifying European integration processes, the study of existing strategies for interregional cooperation between Ukraine, Poland, and other EU member states is of particular importance. The purpose of the study is to provide an extended analysis of strategies for the development of interregional economic cooperation between Ukraine and the European Union in the context of sustainable development. The article outlines the advantages, limitations of various strategies and forms of interregional economic cooperation, strengths and weaknesses of Ukraine's partnership with the EU member states. The specifics of the formation of modern strategies for the development of interregional trade between the EU and Ukraine are determined, their advantages and weaknesses are analyzed, and priority areas of development are identified. The necessity of improving the strategy for the development of interregional economic cooperation between Ukraine and the EU member states to ensure long-term competitive advantages is substantiated.

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1. Introduction

The development of interregional economic cooperation (further – IEC) requires effective regulation of sectoral relations. The strategy for the development of economic cooperation involves defining the main goals and objectives for strengthening the economic potential in the market and building competitive advantages of national economic systems. International standards of countries and markets should serve as the basis for the planned development of activities. An important role is assigned to the tools for the formation, analysis and implementation of interregional economic cooperation, including the specifics and conditions of export and import activities, marketing, promotion, risk insurance strategies, etc.

The armed aggression against Ukraine has increased the need to develop interregional economic cooperation, create an appropriate legal framework to ensure it, and strengthen the institutional capacity of local authorities at the regional level to achieve the goals of cooperation in the economic sphere. Therefore, the adoption of the Law of Ukraine No. 3668-IX "On International Territorial Cooperation of Ukraine" of April 24, 2024 [1] allowed for the formation of a legislative framework for the further implementation of various forms of interregional cooperation, including: implementation of joint programs and projects; implementation of interterritorial cooperation agreements in various fields; joining a Euroregional cooperation association or creating such an association; joining a territorial cooperation association. At the same time, the ongoing practical implementation of partnership with Poland and other members of the association demonstrates the existence of significant challenges and limitations in cooperation. In this regard, the issue of studying strategies for the development of interregional economic cooperation between Ukraine and the EU countries is becoming more relevant.

2. Literature Review

The issue of optimizing strategies for international economic cooperation, increasing its efficiency, and developing concepts for promoting foreign markets has been raised in numerous publications. For example, Tsekhanovych [2], Makedon *et al.* [3] analyze the potential of interregional cooperation strategies in light of the problem of achieving global goals. Burri and Polanco [4], De Noni and Ganzaroli [5] focus on the need to ensure economic stability in the European region. Dür *et al.* [6], in connection with the tendency to reorganization, emphasize the importance of creating regional value chains, in which interregional cooperation within the EU plays an important role. The disruption of trade operations and flows since the beginning of the pandemic and the changing patterns of globalization require the search for alternative ways of economic development [7].

Certain aspects of this issue are analyzed by Gavkalova *et al.* [8], Griffin and Pustay [9], who study the impact of international trade on global financial development and the level of market openness [10]. Sun *et al.* [11] focus on the sustainable ecological and economic growth of national socio-economic systems in line with the global sustainable development goals.

Biscop [12], Demirbilek and Civelek [13] analyze the potential for building a security landscape in the financial sector and developing anti-corruption management mechanisms against the backdrop of new geopolitical challenges. The authors are convinced that the high level of competition in the global market creates the need for dynamic adaptability of the strategy and tactics of commodity producers and the formation of a number of management structures responsible for coordinating the functioning of the infrastructure support for the development of external economic relations.

Beck *et al.* [14], Tsoukalis [15] and Kalashlinska [16] focus on sustainable development and greening of economic processes. The authors see the prospect of productive interregional cooperation in the areas of circular production, closed cycles of resource use, and environmental regeneration.

Despite a significant number of industry publications, there is a lack of practical developments on building an optimal strategy for interregional cooperation acceptable in the context of Ukraine and the European Union in the current crisis. At the same time, it is necessary to take into account the specifics of market functioning and consider existing trade strategies to develop the most appropriate solutions.

The aim of the study is a comparative analysis of strategies for the development of interregional economic cooperation between Ukraine and the European Union (EU) in the context of sustainable development.

The novelty of the study lies in combining a qualitative review of cooperation programs with a semi-logarithmic econometric model that quantifies the elasticity of the average annual integration effect across the amount of funds raised and the duration of the program. This approach provides an analytical tool for evaluating program design that goes beyond traditional descriptive analysis.

3. **Materials and Methods**

The study is based on a quantitative approach to analyzing Ukraine's interregional economic interaction with the regions of the European Union. The methodological basis is econometric modeling with an emphasis on assessing the effectiveness of financial integration mechanisms over time. The object of analysis covers cross-border and interregional cooperation program packages for 2003–2024. Observations are formed at the level of individual programs or aggregated measures with a completed financial cycle.

The primary data includes the total funding for the programs, funds directed to Ukraine, average annual expenditures, and the cumulative integration effect, expressed in millions of euros. To ensure the comparability of indicators, the data has been converted to a single monetary scale without adjustment for inflationary factors, as the analysis focuses on the internal structure of flows and relative changes. The duration of each program package is restored based on the ratio of the volume of funding to its annual intensity.

The performance indicator is interpreted as the average annual increase in the integration effect, which reflects the speed of transformation of financial resources into a measurable result. To assess the impact of key factors, a semi-logarithmic regression model focused on determining elasticities was used. This specification reduces the sensitivity of estimates to the scale of variables and increases the stability of results with a limited number of observations.

The semi-logarithmic specification with the ln(1+x) transformation was chosen for three reasons:

– it naturally takes into account the zero values present in the data set;

– the estimated coefficients are directly interpreted as elasticities;

– it reduces the sensitivity to large differences in the scale of the variables in small sample sizes.

The model takes into account the funding attracted by Ukraine, the total budget of the programs, and the duration of their implementation. For correct handling of zero values, a logarithmic transformation was used with the addition of one to each variable. The parameters were estimated using the least squares method. The quality of the approximation is checked through the coefficient of determination and residual analysis. The obtained parameters are interpreted from the

perspective of economic integration and interregional interaction, without going beyond the empirical capabilities of the sample.

4. Results

Implementing interregional cooperation strategies is not a new practice in the European economic area. The policy of developing cooperation between regions has been implemented since 2014. Thus, over the period 2014–2020, the relevant measures allowed different Member States to implement 258 projects with a total funding of EUR 402.1 billion from the EU structural funds [17]. The total financial impact of the projects is estimated at EUR 1.474 billion, significantly exceeding the EU budget of EUR 359 million for 2014–2020 [18].

Development strategies for interregional cooperation in the EU are based on the concept of smart regional specialization, which allows for the development of a cooperation network, trans-regional value chains in priority areas of cooperation, stimulates innovation, and ensures smart economic transformation. Supporting trans-regional value chains is a key goal of the European "smart specialization" paradigm. All regions in the EU were required by the policy "A smarter Europe by promoting innovative and smart economic transformation" to implement international cooperation measures in three priority areas of S3: research and innovation; Small and Medium-Sized Enterprises (further – SME) competitiveness; and low-carbon economy, environment and resource efficiency. In 2023, the S3 Interregional Cooperation Support Working Group was launched, with the following objectives: collecting and documenting knowledge and practices in the EU regions; identifying common needs, objectives and challenges of interregional cooperation; joint development, support, implementation, and monitoring of these tasks.

In order to visualize the long-term transformations in the financial intensity of cross-border cooperation, we will analyze the temporal dynamics of the aggregate budgets of cooperation programs between Ukraine and the European Union, as well as the amounts of funds that were actually attracted by the Ukrainian side.

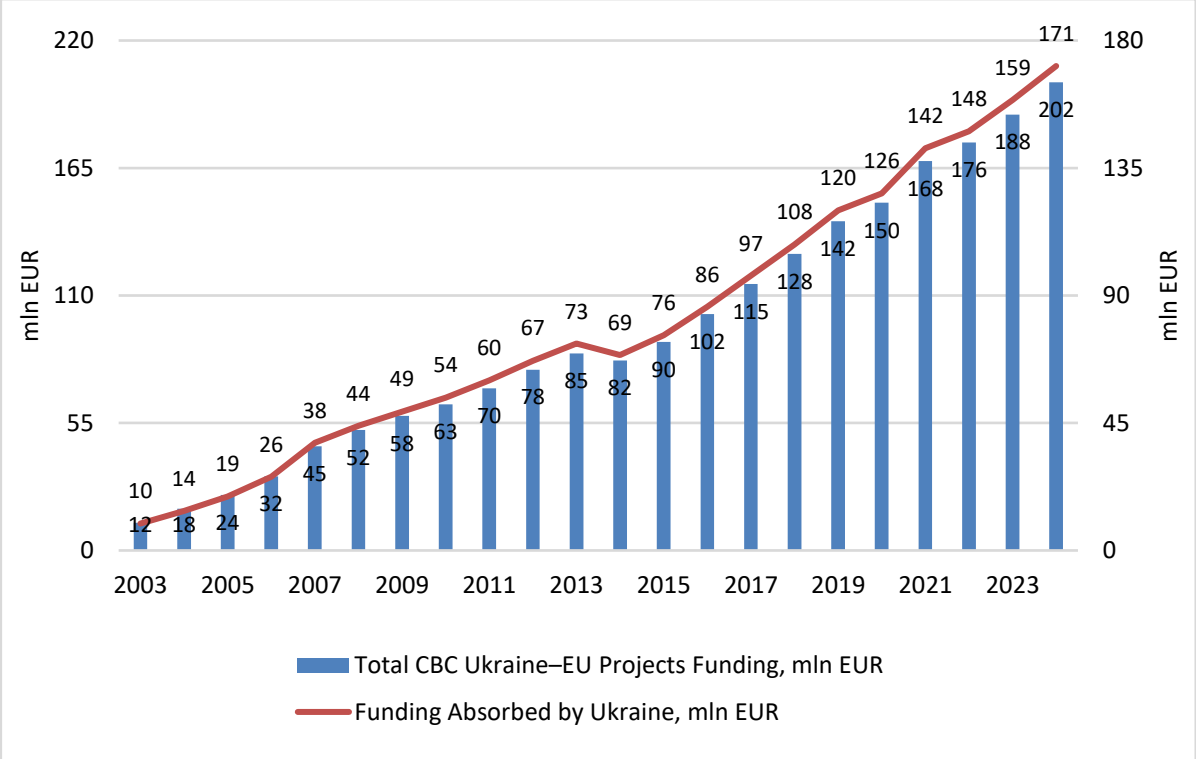


Fig. 1. Dynamics of cross-border cooperation projects between Ukraine and the EU and the amount of funding attracted by Ukraine in 2003–2024 (million euros)
Source: European Commission [19]; Interreg Europe [20,21]

Ukraine participates in interregional cooperation programs with the EU, including Interreg programs focused on cross-border cooperation and regional development. In May 2024, the Ukrainian parliament ratified international agreements that allow for funding for interregional cooperation under the EU's Interreg and Interreg NEXT programs. Interreg NEXT includes the Ukraine-Poland, Ukraine-Romania, Ukraine-Hungary-Slovakia-Romania, and the Danube and Black Sea region development programs. Interreg NEXT funds cooperation initiatives in six Ukrainian regions, and the implementation of cooperation programs between Ukraine and Romania helps to strengthen the environmental sustainability and social development of the regions of these countries. In January 2025, Ukraine officially joined Interreg Europe, a program of interregional cooperation to improve regional development policy [22, 23]. For the period of 2021–2027, 520 projects are planned to be implemented in Ukraine within the framework of Interreg Europe [24,25].

In general, Ukraine is an active participant in interregional cooperation programs, is sufficiently involved in the development of border regions, and the sectors of education, environment, health, social services, and infrastructure are priority areas for funding. The main challenges and risks to the development of interregional cooperation include limited cooperation in certain areas, difficulties in coordinating programs, lack of systematic measures to develop partnerships, and instability of funding (Table 1).

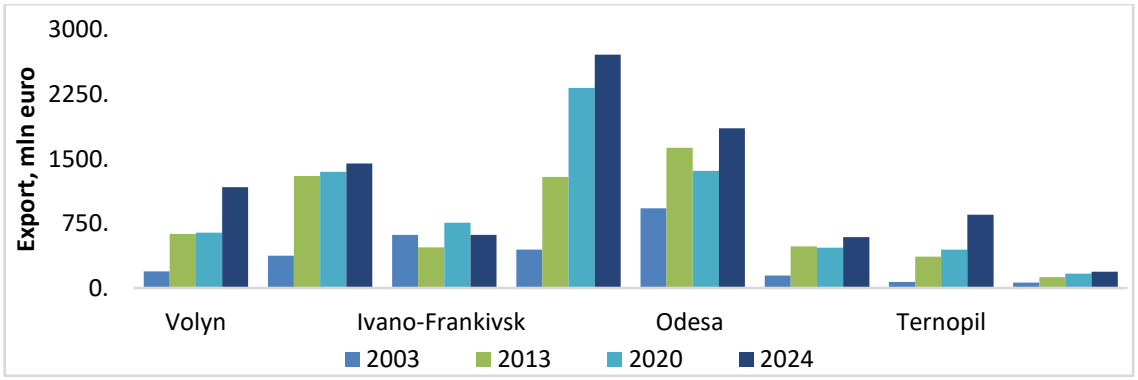
Table 1
Peculiarities of interregional cooperation between Ukraine and the EU countries

Cooperation program	Features, characteristics	Advantages.	Challenges and risks

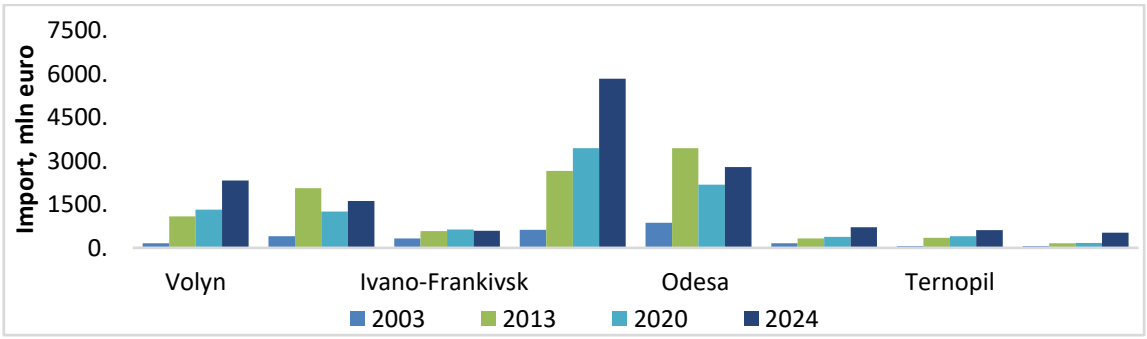
Poland – Ukraine (Interreg NEXT Poland – Ukraine 2021–2027)	The program has been in place since 2003, with 167 projects implemented in 2004–2006 with funding of EUR 58.4 million, 117 projects implemented in 2007-2013 with funding of EUR 203.6 million, and 158 projects implemented in 2014–2020 with funding of EUR 201.4 million. The program focuses on the development of border regions, support for sustainable development, infrastructure modernization, environmental protection, tourism, healthcare, and accessibility. The funding budget is EUR 235.9 million for 2021–2027. Program priorities: green transition, infrastructure development, strengthening relations and economic ties between communities	Poland is one of Ukraine's strategic partners, within the framework of which institutional cooperation has been developed, which allowed us to quickly adapt the program to the military challenges and needs of Ukraine Funded by the European Regional Development Fund using the Neighborhood, Development and International Cooperation Instrument	Limited areas of cooperation, insufficient coverage of such areas as innovation, technology transfer, and digitalization
Ukraine – Slovakia – Hungary – Romania	Comprehensive multilateral cooperation program with the EU with a budget of EUR 73 million in the following areas launched in 2007: sustainability, green transition, environmental protection, social services, infrastructure, cultural heritage	Funding and support for many projects as a result of the formation of cooperation clusters	Difficulties in coordinating the program between the four partner countries complicate project implementation Focus on infrastructure development, almost no coverage of innovation and digitalization
Ukraine – Romania	The program covers the border regions of Romania and Ukraine, with a budget of EUR 63 million to finance the sectors of health, education, security, biodiversity, and infrastructure development	High level of activity of local authorities in implementing the program (municipalities, educational and medical institutions)	Broader systemic measures are needed to develop long-term institutional regional partnerships

Source: compiled by the author Poland – Ukraine Cross-border Cooperation Programme [26]; Interreg VI-A NEXT Hungary-Slovakia-Romania-Ukraine Programme [27]; Romania – Ukraine Cross-border Cooperation Programme Interreg NEXT Romania – Ukraine [28]

As a result of the implementation of cooperation programs with Poland, Ukrainian partners implemented 442 projects with a total funding of EUR 463 million over the period 2003–2024. As a result, it was possible to improve not only the local regional infrastructure, but also the quality of social services and accessibility of services to the population. In addition, the implementation of interregional cooperation between Ukraine, Poland, and other member states has increased the volume of export and import operations, improving regional trade in goods during the periods of program implementation in 2003–2024 (Figure 2).



a) exports of goods, EUR million



b) imports of goods, EUR million

Fig. 2. Exports and imports from the regions of Ukraine participating in the Interregional Cooperation Program in 2003, 2013, 2020, 2024
Source: State Statistics Service of Ukraine [29]

Ukraine has gained experience in managing EU funds in accordance with European procedures and standards. The European Commission's report on enhanced support measures for Ukraine for 2024 points out the importance of Ukraine's accession to interregional cooperation programs as a step towards EU membership [30].

The empirical basis for the study will be a summary statistical table of projects and measures for Ukraine's integration with EU regions for the period 2004–2027, compiled on the basis of EU-Ukraine cooperation programs and related cross-border initiatives (Table 2) [31]. The column «Cumulative integration effect» shows the overall financial scale of the programme package. For Interreg Europe, EU, 2014–2020, the value of €359 million is the EU level amount and does not represent the cumulative contribution of Ukraine. In the econometric model, only funds attracted by Ukraine are used as the growth of the integration effect.

Table 2
Projects and measures for Ukraine's integration with EU regions (in millions of euros) for the period 2004–2027

Program/period	Total funding, million euros	Funding attracted by Ukraine, million euros	Average annual funding, million euros	Cumulative integration effect, million euros
Interreg Europe, EU, 2014–2020	359	0	51	359.
Poland–Ukraine CBC, 2004–2006	58.4	58.4	19.5	58
Poland–Ukraine CBC, 2007–2013	203.6	203.6	29.1	262

Poland–Ukraine CBC, 2014–2020	201.4	201.4	28.8	463.4
Interreg NEXT Poland–Ukraine, 2021–2027	235.9	235.9	33.7	699.3
Ukraine–Slovakia–Hungary–Romania, baseline package	73.0	73.0	5.2	772.3
Ukraine–Romania, basic package	63.	63.0	9.0	835.3
Interreg NEXT Danube Region, Ukraine's participation	52.0	52.0	7.4	887.3
Interreg NEXT Black Sea Basin, Ukraine's participation	45.0	45	6.4	932.3
Interreg NEXT Hungary–Slovakia–Romania–Ukraine, additional measures	38.0	38.0	5	970.3
Interreg NEXT Romania–Ukraine, additional projects	29.0	29.0	4.1	999.3
Ukraine's participation in Interreg Europe, 2021–2027	0	0	0	999.3

Source: constructed by the authors

For the Interreg Europe, EU, 2014–2020 programme, the cumulative integration effect value of €359 million reflects the total financial volume of the programme at the EU level, not the accumulated contribution of Ukraine. In the model, the incremental effect for this line is taken as zero, as Ukraine did not receive any funds.

For each package i in the table, we define:

– F_i total funding, million euros.

– U_i funding attracted by Ukraine, million euros.

– A_i average annual funding, million euros per year.

– C_i cumulative integration effect, million euros.

An intermediate step is to restore the duration of the program period T_i and the outcome variable Y_i . For rows where the average annual amount is related specifically to Ukrainian involvement, we determine the duration as:

$$T_i = \frac{U_i}{A_i}, A_i > 0.$$

For the Interreg Europe 2014–2020 row, where $U_i = 0$, but $A_i > 0$, we restore the duration through the total budget:

$$T_i = \frac{F_i}{A_i}, A_i > 0,\ U_i = 0.$$

For rows with zero financial values (participation without financial flow in statistics), we set $T_i =$ 7 years, since the period 2021–2027 is seven years.

Increase in cumulative effect. The tabular accumulation is constructed as the accumulation of funding attracted by Ukraine (Table 3). Therefore, we take the increase as:

$$\Delta C_i = U_i,$$

and for rows with $U_i = 0$, we take $\Delta C_i = 0$. In the study, the increase in the cumulative integration effect ΔC_i is equated to the amount of funds attracted by Ukraine U_i. Thus, financial flows are used as a proxy indicator of integration results. This simplification allows for quantitative modeling of the effect, but does not take into account qualitative dimensions – institutional learning, policy coordination, capacity building. The limitations of such a proxy should be taken into account when interpreting the results.

We set efficiency as the average annual increase in the integration effect. The unit of measurement Yi is million euros per year.

Table 3
Calculation matrix of intermediate indicators of the econometric model

Program / period	F_i	U_i	A_i	T_i (years)	ΔC_i	$Y_i = \frac{\Delta C_i}{T_i}$
Interreg Europe, EU, 2014–2020	359.0	0	51.3	7.0	0	0.00
Poland–Ukraine CBC, 2004–2006	58.4	58.4	19	2.9	58.4	19.5
Poland–Ukraine CBC, 2007–2013	203.6	203.6	29.1	7	203.6	29.1
Poland–Ukraine CBC, 2014–2020	201.4	201.4	28.8	6.99	201.4	28.8
Interreg NEXT Poland–Ukraine, 2021–2027	235.9	235.9	33.7	7	235.9	33.7
Ukraine–Slovakia–Hungary–Romania, basic package	73.0	73.0	5.	14.0	73	5.20
Ukraine–Romania, basic package	63.	63.	9	7	63	9.0
Interreg NEXT Danube Region, Ukraine's participation	52	52	7.4	7.0	52	7.40
Interreg NEXT Black Sea Basin, Ukraine's participation	45.0	45	6.4	7.0	45	6.40
Interreg NEXT Hungary–Slovakia–Romania–Ukraine, additional measures	38.0	38	5.4	7.0	38	5.40
Interreg NEXT Romania–Ukraine, additional projects	29.0	29	4.1	7.0	29	4.1
Ukraine's participation in Interreg Europe, 2021–2027	0.0	0	0	7	0	0

Source: constructed by the authors

Note: Since Ukraine's actual accession to Interreg Europe took place in January 2025, the full 7-year period (2021–2027) was taken for consistency with the other packages 2021–2027. Under the alternative assumption of T = 3 years (2025–2027), the Y indicator would remain zero (ΔC = 0), so the choice of duration does not affect the regression results.

The estimated duration of 14 years for the Ukraine-Slovakia-Hungary-Romania baseline package is obtained by dividing the total funding (EUR 73 million) by the average annual funding (EUR 5.2 million). This reflects the merging of several consecutive programming phases into one consolidated record; the actual implementation spanned several budget periods, which explains the longer than typical cycle. The resulting value is consistent with the data structure and is correctly taken into account when estimating the time penalty coefficient.

The table above restores the variables needed to estimate elasticities. It also shows that for most programs, Yicoincides with tabular Ai, since Aiis presented as the average annual volume of financing attracted by Ukraine. We apply a semi-logarithmic elasticity model that is robust to small samples. Given the presence of zero values, we apply the ln(1+x) transformation to all variables:

$$ln(1 + Y_i) = \beta_0 + \beta_1 ln(1 + U_i) + \beta_2 ln(1 + F_i) + \beta_3 ln(1 + T_i) + \varepsilon_i,$$

– β_1 is the elasticity of performance for funding attracted by Ukraine.

– β_2 is the scale effect of the total program budget for a fixed U_i.

– β_3 time penalty. Expectedly, β_3<0, because a longer cycle reduces the rate of effect accumulation. The weak and statistically insignificant coefficient on the total program budget reflects almost complete collinearity between F_i and U_i in the sample: for most programs, F_i = U_i. Therefore, the separate effect of program scale cannot be isolated from the available data; the variable rather performs a control function. To distinguish these effects, observations are needed where the total program budget significantly exceeds the funds directly directed to Ukraine, for example, data on subprograms or regional components. Table 4 shows the values that directly enter the regression: $ln(1 + Yi)$ as the dependent variable and three regressors.

Table 4
Regression design after transformations $ln(1+x)$

Program / period	$\boldsymbol{ln(1+Y_i)}$	$\boldsymbol{ln(1+U_i)}$	$\boldsymbol{ln(1+F_i)}$	$\boldsymbol{ln(1+T_i)}$
Interreg Europe, EU, 2014–2020	0.000	0.	5.886	2.079
Poland–Ukraine CBC, 2004–2006	3.020	4.084	4.084	1.385
Poland–Ukraine CBC, 2007–2013	3.405	5.321	5.321	2.079
Poland–Ukraine CBC, 2014–2020	3.395	5.310	5.310	2.079
Interreg NEXT Poland–Ukraine, 2021–2027	3.547	5.468	5.468	2.079
Ukraine–Slovakia–Hungary–Romania, basic package	1.825	4.304	4.304	2.711
Ukraine–Romania, basic package	2.303	4.159	4.159	2.079
Interreg NEXT Danube Region, Ukraine's participation	2.128	3.970	3.970	2.083
Interreg NEXT Black Sea Basin, Ukraine's participation	2.001	3.829	3.829	2.083
Interreg NEXT Hungary–Slovakia–Romania–Ukraine, additional measures	1.856	3.664	3.664	2.084
Interreg NEXT Romania–Ukraine, additional projects	1.629	3.401	3.401	2.088
Ukraine's participation in Interreg Europe, 2021–2027	0	0	0	2.079

Source: constructed by the authors

The final equation is as follows:

$$ln(1+Y_i) = 1.794 + 0.602ln(1+U_i) + 0.053ln(1+F_i) - 1.013ln(1+T_i).$$

Approximation quality indicators.
$R_2 = 0.969$.
The F-criterion of the model is significant at standard levels.

The coefficient at $ln(1+U_i)$ is 0.602. The sign is positive. The economic meaning is as follows. A 1% increase in Ukraine's attracted financing increases the effectiveness of Y_i by approximately 0.60% under other equal conditions within the logarithmic scale. This means a decreasing return from scaling up the funds raised. The result is consistent with the fact that high budgets do not automatically translate into a proportionally higher annual intensity of the effect. Part of the increase is absorbed by administration, co-financing, procurement procedures, and time lags in implementation. This coefficient is statistically significant. It captures the main mechanism. Direct financing of Ukrainian participants is the main determinant of measured effectiveness.

The coefficient at $ln(1 + F_i)$ is 0.053. The sign is positive, but the effect is weak and statistically insignificant. There is a simple explanation for this, which follows from the data structure. For most rows in the table, $F_i = U_i$. This is almost complete collinearity between the two regressors. In such a situation, the model is unable to consistently separate the effect of program scale from the effect of direct Ukrainian involvement.

We formulate a cautious economic conclusion. The scale of the program budget does not in itself ensure increased efficiency unless it translates into an increase in U_i. To isolate the scale effect, we need rows where F_i significantly exceeds U_i in Ukrainian programs, as well as a breakdown into subprograms or regional components.

The coefficient at $ln(1 + T_i)$ is –1.013. The sign is negative. The effect is significant. This is empirical confirmation of the time loss of efficiency. A longer program cycle reduces the annual rate of integration effect formation. The economic meaning is simple. In long programs, funds are distributed more evenly. Part of the costs goes into planning, coordination, audits, and regulatory changes. This step reduces the annual intensity, even if the total budget remains significant.

The total budget of the program package does not show an independent stable effect in this sample. The reason lies in the data. For most programs, $F_i = U_i$. This limits the identification of β_2. To strengthen the evidence, additional observations with a gap between Fiand Uior a breakdown of budgets by component are needed.

The time factor has a strong negative effect. The estimate $\beta_3 = -1.013$ confirms that longer cycles reduce the annual intensity of the integration result. This creates a direct impetus to review the design of the programs. Mechanisms are needed to concentrate funding within shorter stages, with clear deadlines and fewer sequential approvals.

The model results support the practical thesis. Bilateral cross-border programs demonstrate higher measurable effectiveness because they combine large U_i with standard T_i. An analysis of individual program packages based on calculated Y values shows that bilateral cross-border programs with Poland demonstrate the highest effectiveness, particularly in the periods 2007–2013 and 2021–2027. They are characterized by high values of funding attracted by Ukraine, relatively short duration, and a significant increase in the cumulative integration effect. On the other hand, multilateral programs, such as Ukraine–Slovakia–Hungary–Romania, have lower performance values, which is explained by both lower average annual funding and greater time costs for coordinating decisions.

The sample covers the period of full-scale war after February 2022. Because only a few observations fall entirely within this interval, a war dummy variable was not introduced. Testing for structural shift would require a larger number of completed programs after 2022 and is a subject of future research. Therefore, the elasticity estimates should be taken as averages over the entire period under study, which may not account for wartime specificities.

The model is built on 12 observations, making it sensitive to individual points. The high R^2 (0.969) and theoretically consistent signs of the coefficients indicate a good fit, but the point estimates of elasticities should be interpreted with caution. Verification and refinement of the model will become possible with the accumulation of new data after the completion of subsequent program cycles.

Given the collinearity, a simpler specification without the overall budget could be used. However, the variable is left to control for the overall program environment. Methods such as ridge regression will only make sense with a larger and more diverse sample, where there is a significant discrepancy between the overall budget and the funds for Ukraine.

The results obtained allow us to conclude that the effectiveness of Ukraine's cooperation with EU regions is determined not only by the volume of financial resources, but also by the structure of

programs, their duration, and implementation format. The semi-logarithmic econometric model shows that an integration policy focused on increasing direct funding for Ukrainian regions and reducing excessively long program cycles can ensure higher returns in terms of the average annual integration effect.

5. Discussion

The development strategies for Ukraine's interregional cooperation with EU member states, which have been implemented since 2003, are based on European standards and regulation of partnership program implementation procedures, European methodology for developing projects of various scales, and are financed by EU structural funds. This allows Ukraine to borrow European experience in managing and monitoring their implementation, gain access to EU funding, and improve its interregional cooperation policy. Additional advantages include the involvement of local and national governments in cooperation programs and the public sector, which promotes balanced governance and participation of various stakeholders. The main weaknesses in the implementation of programs and projects are difficulties in coordination, bureaucratic obstacles, and limited funding from Ukrainian sources of program funding. In addition, projects focus on key areas such as the environment, health and education, infrastructure development, and accessibility. In contrast, in EU countries, regional economic cooperation focuses on innovation, research, SME competitiveness, low-carbon economy measures, environment, and resource efficiency. This demonstrates Ukraine's significant lagging behind as a partner in various areas of cooperation. Given the need to achieve the Sustainable Development Goals, Ukraine should review the existing priority areas of partnership with the EU in terms of existing programs and projects for the period 2021–2027. These priorities should be aligned with the areas of interregional cooperation in the EU and address the challenges of regional growth in Ukraine. Promoting the development of the business sector should become part of the policy of building interregional economic partnership between Ukraine and the EU. In particular, Kruse [32], Pavlikha *et al.* [33] note this need as a factor in stimulating the innovative activity of small and medium-sized businesses. Policy formation Interregional cooperation of Ukraine, development and implementation of joint strategies for cooperation with the EU helps to reduce the imbalance of socio-economic development [34, 35]. Although no significant positive direct correlation was found between the economic indicators of the regions cooperating within the partnership Șlusarciuc and Tokar [36], various forms of interregional cooperation generally affect the competitiveness of the territories. The creation of Euroregions allows for the prompt resolution of the problems of their participants, the formation of flexible, joint economic structures, and the attraction of investments in new technologies. In addition, in the context of the war in Ukraine, interregional partnerships can facilitate the relocation of businesses to the territory of partner countries, especially in the field of energy and resource efficiency.

The estimated time penalty empirically confirms the consequences of lengthy administrative procedures. Longer cycles disperse resources across multiple planning, approval and audit stages, reducing the annual intensity of the integration effect. Practical measures could include creating shorter operational windows within seven-year programmes (e.g. two-year phases with a separate budget), simplified reporting and faster transfer of funds to implementers.

To illustrate: if the Interreg NEXT Poland-Ukraine 2021-2027 programme were to be restructured into two consecutive three-year phases with separate budgets and clear milestones, the model would suggest a higher average annual intensity of integration than under a single seven-year cycle. Such a

redesign would require corresponding changes to the EU financial regulations, but could serve as a pilot approach for future programming.

Some researchers, in particular, Hayakawa and Mukunoki [37], note the need to promote the introduction of energy-saving technologies and energy-efficient production methods as a prerequisite for the effectiveness of international economic interaction.

In the context of geopolitical instability, developing the competitiveness of Ukraine's SMEs by focusing interregional cooperation with the EU on business stimulation is a particularly urgent task [38, 39]. In continuation, Balland and Boschma [40] see the key to the success of EU member states' economic cooperation strategies with third countries in the combination of innovation and digital opportunities.

Summarizing the results of previous studies and the conclusions of the current research, it is worth highlighting the key factors in the formation of the modern concept of economic cooperation between the EU and Ukraine:

- focusing cooperation programs on priority areas of implementation, including research, innovation, SME competitiveness, resource efficiency, and low-carbon economy to ensure consistency with the development policies of interregional cooperation in the EU;
- strengthening the institutional capacity of regional authorities to further promote the effective implementation of projects within the framework of cooperation programs with Europe (exchange of experience with regional authorities of partner countries, further use of EU advisory support);
- involvement of Ukrainian SMEs and their information and advisory support, methodological support for their involvement in interregional cooperation programs with the EU, in particular as part of the SME development policy of Ukraine.

6. Conclusions

The overall goal of the strategic policy of international economic cooperation in the European community is to maximize the promotion of sustainable development of regions, developing cooperation networks in three main areas: research, innovation, competitiveness, low-carbon economy and resource efficiency. Instead, Ukraine's partnership with Poland and other EU member states focuses on improving infrastructure, its accessibility, the quality of social services, and environmental protection. This is not in line with EU trends in implementing interregional economic cooperation policies.

Given the ongoing war in Ukraine, it is necessary to take into account the new realities of economic development and the prospects for interregional cooperation with the EU. The main problems are the lack of certainty in the Ukrainian market, limited information support for SMEs on legal norms, language and cross-cultural specifics, the need to improve methodological, regulatory and legal support for interregional cooperation, and the need for significant financial investments.

The estimated elasticity of the outcome by the amount of funds attracted by Ukraine (0.602) indicates that the increase in financial revenues gives a measurable, albeit decreasing, annual integration effect. If these funds are gradually directed to areas that correspond to the EU's smart specialization (research, innovation, SME competitiveness, low-carbon economy), the same coefficient could provide an even stronger structural impact. Testing this hypothesis by distributing projects by thematic priorities is a promising direction for further research.

Based on the results of empirical evaluation of the semi-logarithmic econometric model, it was established that the effectiveness of interregional cooperation between Ukraine and the regions of the European Union is quantitatively determined by the elastic dependence of the average annual

integration effect on the volume of financial resources attracted and the duration of program implementation. The calculated values revealed a positive elasticity of performance in terms of Ukraine's financial contribution, which is 0.602, indicating the ability of financial flows to transform into an integration effect with diminishing returns. On the other hand, the time coefficient of −1.013 empirically confirms the existence of a time penalty, whereby extending the duration of program cycles leads to a decrease in the intensity of the positive effect. The constructed model adequately reflects the differences between bilateral and multilateral formats of cooperation and can be used as a tool for quantitative assessment of the effectiveness of regional integration mechanisms.

Prospects for further research are seen in the development of practical measures for integration into the European market, using the practical support of the European community in the period of post-war recovery.

Author Contributions

Conceptualization, M.B. and A.K.; methodology, M.B., A.K. and N.V.; software, N.V.; validation, M.B., A.K., N.V., L.H. and E.M.; formal analysis, M.B. and A.K.; investigation, N.V. and L.H.; resources, L.H. and E.M.; data curation, N.V. and E.M.; writing—original draft preparation, M.B., N.V. and L.H.; writing—review and editing, A.K. and E.M.; visualization, N.V.; supervision, M.B. and A.K.; project administration, M.B.; funding acquisition, A.K. All authors have read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Data Availability Statement

No new data were created or analyzed in this study. The research is based on publicly available documents, reports, and published sources cited in the reference list.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement

This research was not funded by any grant.

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