Competitive advantages of Ukrainian border regions under the conditions of European integration processes

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Abstract

Trade liberalisation and intensification of European integration processes are important factors that influence economic development of Ukrainian border regions. This paper presents a methodological approach to assessing the competitive advantages of border regions under integration prospects into global value chains. The proposed approach takes into account the framework of world indices of competitiveness and investment attractiveness, peculiarities of border regions, modern trends in world economic processes. The integral index of competitiveness of these regions has been calculated. It is substantiated that the border regions' economy is in the process of transformation and its development is increasingly determined by innovations and efficiency. Integration of their economy into value chains by processing toll raw materials and its subsequent export determines its place in global production networks with the lowest share of value added. Consequently, low wages and border location today still remain the determining factors in shaping of border regions' competitive advantages.

Keywords: competitive advantages, regional development, European integration processes, border regions, Ukraine

Introduction

The globalisation of world economic processes and competition for product markets under resource scarcity strengthen the role of competitiveness as a core

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driver in the development of the economy of a country, region, and enterprise. In recent years, it is the regions that have become powerful players in world markets and in global production networks. Thus, the formation of competitive advantages is at the core of devising and implementing regional development strategies. In terms of globalisation, the level of competitiveness of regions in the domestic market will define the competitiveness of such regions in the external market. Assessment of competitive advantages of the regions will make it possible to identify the key factors and components of the competitiveness of such regions and to evaluate the integration prospects of the business entities of Ukraine into global value chains.

EU-Ukraine Association Agreement fully entered into force on 1 September 2017, after its ratification on 11 July 2017 by Europe Council. Trade liberalization, weakening of the borders barrier role, visa-free regime between Ukraine and the EU countries, etc. have a significant impact on the socio-economic development of Ukrainian border regions such as Volynska, Lvivska, Zakarpatska, Ivano-Frankivska and Chernivetska oblasts. These oblasts have a common border with the EU member-countries. In Ukraine, oblasts are administrative-territorial units of the regional level.

Border regions are generally less developed compared to the central regions where the concentration of investment and economic activity are higher (this is also typical for the EU border regions). Moreover, border regions lag behind other regions in key socio-economic indicators. Gross Regional Product per capita of the border regions ranged from 45 to 83% of Ukraine average in 2018. Among the main challenges that Ukrainian border regions faced with are ensuring competitiveness under the conditions of European integration processes; low level of economic security and outflow of human capital.

The novelty of this research is to examine the indicators of competitiveness and to determine competitive advantages at the regional level. While most recent research puts emphasis on enterprise competitiveness or a country as a whole.

The Resolution of the Cabinet of Ministers of Ukraine as of December 20, 2017 No. 1029 "Some Issues of Improving the System for Monitoring and Assessing the Effectiveness of the Implementation of State Regional Policy" approves the methodology for calculating the competitiveness index of Ukrainian regions. Under this Resolution, the calculation of a regional competitiveness index should be done annually from 2019 by the Ministry of Regional Development using data, such as official statistics and information from the Ministers, other central executive bodies, the National Bank of Ukraine (upon agreement), the Council of Ministers of the Autonomous Republic of Crimea, Regional State Administrations, and the City State Administrations of Kyiv and Sevastopol by the certain list of indicators as provided by the methodology for calculating regional competitiveness index. Conversely, this indicator has not yet been calculated because of the lack of the respective funding from the state budget[1].

This article presents a methodological approach to assessing the competitive advantages of the border regions of Ukraine including oblasts, such as Volynska, Lvivska, Zakarpatska, Ivano-Frankivska, and Chernivetska, in view of their integration prospects into global value chains. The focus of the approach is on the major trends in the generation of a range of world indices of competitiveness and investment attractiveness; the specifics of the Ukrainian border regions; the modern trends towards the development of world economic processes. This approach is used to calculate an integral index of competitiveness of border regions (hereinafter the integral index).

The aim of this paper is to identify the competitive advantages of border regions of Ukraine and to determine the directions and prospects of their implementation under the conditions of European integration processes.

The main research goals of this study are:
- to highlight the determinants of the competitive advantages of border regions;
- to calculate an integral index of competitiveness of Ukrainian border regions;
- to find out the peculiarities of Ukrainian border regions' foreign trade;
- to evaluate the integration of the economy of border regions into global value chains;
- to determine the directions of increasing the competitiveness of Ukrainian border regions under the conditions of European integration processes.

1. Literature review

The concept of competitiveness is widely used in economic literature at macro, meso and micro levels. However, there are many notions of competitiveness itself. Christian H.M. Ketels emphases about the two main competing views of how to define competitiveness: costs/ability to export vs productivity. The first one considers competitiveness as a location's unit cost level, driving companies' ability to compete successfully on global markets. And the second approach involves close relationship between competitiveness and a location's productivity level, driving the standard of living the individuals in that location can sustain (Ketels, 2017).

From this point of view, diamond-shaped framework is important. M. Porter has explained the conditions which force domestic companies to continuously innovate and upgrade and, as a result, to compete successfully in the international arena. These are Firm Strategy, Structure and Rivalry, Factor Conditions, Demand Conditions and Related and Supporting Industries (Porter, 1990).

Lately, some extensions of Porter's Diamond model have been appeared. Rugman and D'Cruz presented the 'double diamond' model or the North American Diamond. This model is linking the domestic diamond of each country thus incorporating the international context of national competitiveness. It pays attention to the role of inbound foreign direct investment, foreign-owned subsidary, the Free Trade Agreement, strategic clusters, etc. (Rugman and D'Cruz, 1993). The double

diamond model further has been extended into generalisation the double diamond model (GDD). The domestic diamond of the GDD model assesses the extent to which a country enhances competitiveness by utilizing its domestic resources, whereas the international diamond evaluates the extent to which the country enhances its competitiveness by aggregating all of the non-domestic diamonds. Therefore, the GDD model considers the four factors of Porter's single diamond model in both domestic and international contexts (Cho *et al*., 2009). The framework of Nine-Factor model includes four groups of human factors (workers, politicians and bureaucrats, entrepreneurs and professionals which including scientists and managers) in addition to the four physical factors of the original Diamond model in explaining a nation's competitiveness (Cho and Moon, 2005). The Dual Double Diamond Model or DDD model covering four dimensions of national competitiveness: physical and human factors in domestic and international contexts. The DDD model measures the physical factors of national competitiveness with four factors – Factor Conditions, Firm Strategy, Structure, and Rivalry, Related and Supporting Industries, and Demand Conditions – in domestic and international contexts. For the human factors, the model also analyzes national competitiveness with four factors – Workers, Politicians and Bureaucrats, Entrepreneurs, and Professionals – in domestic and international contexts (Cho *et al*., 2009).

Mentioned above concepts used as a basis for calculating most of the world's indices, which reflect various aspects of competitiveness at the country level and economies' level of integration into global value chains. Beside the Global Competitiveness Index it worth to note the Global Innovation Index, Doing Business rankings, etc.

The Global Competitiveness Index (GCI) is the best known. According to the GCI Ukraine ranks 85th in 2016 and has improved to 81st in 2017. The GCI 2019 results show that Ukraine ranks 85th, down two places from last year (83rd in 2018)[1].

Ukraine has improved its position in the Global Innovation Index (GII) since 2015 and according to the results of report 2016 has moved from 64th to the 56th position. However, Ukraine ranks 47th in 2019, down four places from 2018 (Global Innovation Index, 2019). Ukraine's relative strengths are sub-pillar Knowledge creation and indicators Patents by origin, Computer software spending, ICT services exports and Utility models by origin. Ukraine's weaknesses in the GII are found mostly on the innovation input side of the index. Ukraine exhibits weaknesses in sub-pillars Political environment, Ecological sustainability and Investment (Global Innovation Index. Ukraine, 2019).

Doing Business rankings measure various dimensions of business regulation. Generally, Ukraine improves rankings during the last few years (83rd in 2016, 71st in 2019). Especially, Ukraine strengthened minority investor protections, made trading

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[1] World Economic Forum (2019), *The Global Competitiveness Report* (retrieved from http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf).

across borders easier by eliminating the verification requirement on auto parts from the State Service of Export Control and made enforcing contracts easier (Doing Business, 2019).

Ukraine's economy is the 134th freest in the 2020 Index of Economic Freedom. Its overall score has increased by 2.6 points compared to 2019 (52.3 points, 147th) due to a higher scores for judicial effectiveness, government integrity, and trade freedom. In general, Ukraine has positive trends in rankings. The Ukrainian economy ascended from the ranks of the repressed in 2018 and has climbed in the mostly unfree category for three years in a row[2].

Global Services Location Index is a ranking of 50 countries based on their potential and fit to deliver business services to global companies. Ukraine ranks 20th in 2019 and moves up four positions in compere with 2017. This improvement was driven by an increase in its infrastructure costs and business environment scores, which offset a sub-average digital resonance score and the fourth-largest decline in the people skills and availability category (Global Services Location Index, 2019).

The development of effective competitiveness strategies at the regional level will also help increase the national economy's competitiveness. Ženka J., Novotný J., Csank P. argue that some concepts of regional competitiveness can be useful when analysing regional competitiveness of Central European (CE) regions. These are clusters, RIS (Regional Innovation Systems), GPNs concepts (Global Production Networks) and related variety and economic complexity (Ženka *et al*., 2014).

D. Litva explores the changes in competitiveness of Czech regions after accession to the European Union. Analysis of indicators of Czech regions according to RCI 2016 (The Regional Competitiveness Index) demonstrates the growing discrepancies with dominant position of Prague and Central Bohemia in comparison with other Czech Regions. So it is possible to observe disperse and agglomeration effects with dominant agglomeration forces. On the other hand, the lowest is rating for competitiveness of Northwest region (Litva, 2017).

Lengyel and Rechnitzer analyse the competitiveness of 93 NUTS2 level regions of 8 Central European countries. The results reveal a powerful spatial separation; the regions making up the individual clusters constitute 'bands' from west to east. The regions of the post-socialist countries, including the East-German provinces, detach themselves from the rest, with the only exceptions of Slovenia and Romania. The effect of the urbanisation agglomeration advantages can also be observed and the capital regions of the post-socialist countries constitute a separate group (Lengyel and Rechnitzer, 2013).

Zaman and Meunier analyse the main achievements of Romania in terms of competitiveness during the period of ten years since joining the European Union. The analysis was based on a proposed Competitiveness Index. The results confirmed

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[2] The Heritage Foundation (2020), *Index of Economic Freedom. Ukraine* (retrieved from https://www.heritage.org/index/country/ukraine).

that over the ten years of EU membership Romania recorded a net progress with respect to three indicators: Labour Freedom, which increased from 57.5 to 65.1; Corruption, where the CPI gained 16 units; and Paying Taxes, which recorded the most significant progress (an overall increase by 80%). The CI has increased and the gap between EU average and Romania has shrunk significantly since the accession (CI score in 2006 - 37.76, and in 2016 – 47.49) (Zaman and Meunier, 2017).
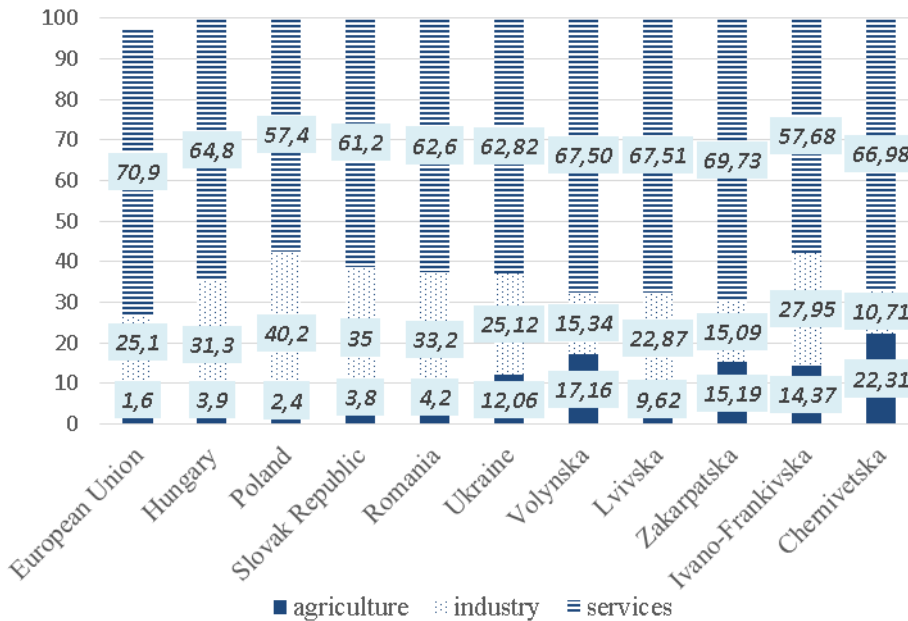
Despite the border location and the available opportunities for intensification of foreign economic activity, the economy of the border regions of Ukraine (except for Zakarpatska oblast) is less open compared to other regions (see Table 1). The entry into force of the temporary application of the Agreement on November 1, 2014, allowed the border regions to gradually increase the volume of exports and imports to EU member states, and their economies to become more open.

Table 1. Exports of goods and services (% of GDP/GRP)

	2011	2013	2015	2017	2019
World	30,51	30,35	29,26	29,37	30,52
Hungary	86,18	85,58	87,60	86,10	82,19
Poland	42,39	46,00	49,09	54,16	55,54
Slovak Republic	84,91	93,50	92,01	95,16	92,44
Romania	37,06	40,03	41,39	42,03	40,35
Ukraine	49,82	42,96	52,60	48,01	41,17
Volynska oblast	30,71	26,60	47,12	38,55	36,18
Lvivska oblast	21,50	21,29	36,36	37,10	37,85
Zakarpatska oblast	64,68	59,48	96,83	105,25	102,08
Ivano-Frankivska oblast	30,61	13,01	19,93	30,00	32,33
Chernivetska oblast	9,76	8,27	15,20	16,26	19,19

Source: Authors' representation based on World Bank and State Statistics Service of Ukraine data

According to the Porter concept of nation's competitiveness, international trade and foreign investment can both improve a nation's productivity as well as threaten it (Porter, 1990). If the growth of economic openness is accompanied by the loss of the opportunity to compete in the markets of high-productivity / high wage industries products, it leads to the maintenance of low standards of quality of life in this country. Hence the only meaningful concept of competitiveness at national and regional level is productivity. It is largely determined by the macrostructure and technological structure of production. The share of industry in GAV (Gross Added Value) of border areas is traditionally lower compared to the country as a whole and during 2015-2018 fluctuated between 11-31%. At the same time, the share of the services sector in most border oblasts is higher than its average in Ukraine. The border location of the territory and the receipt of funds from workers from abroad contribute to the active development of construction, transport, warehousing, postal and courier activities (see Figure 1).

Figure 1. GDP (GRP) – composition, by sector of origin, %, 2017

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Values shown in the chart:

- European Union: agriculture 1,6; industry 25,1; services 70,9
- Hungary: agriculture 3,9; industry 31,3; services 64,8
- Poland: agriculture 2,4; industry 40,2; services 57,4
- Slovak Republic: agriculture 3,8; industry 35; services 61,2
- Romania: agriculture 4,2; industry 33,2; services 62,6
- Ukraine: agriculture 12,06; industry 25,12; services 62,82
- Volynska: agriculture 17,16; industry 15,34; services 67,50
- Lvivska: agriculture 9,62; industry 22,87; services 67,51
- Zakarpatska: agriculture 15,19; industry 15,09; services 69,73
- Ivano-Frankivska: agriculture 14,37; industry 27,95; services 57,68
- Chernivetska: agriculture 22,31; industry 10,71; services 66,98

■ agriculture   ∷ industry   ≡ services

Source: Authors' representation based on The World Factbook and State Statistics Service of Ukraine data

Reorientation to new markets, shutdown of many industrial enterprises as a result of combat operations in Eastern Ukraine led to a decrease in the share of industrial products in the structure of GAV of the country and its regions. At the same time, the growth of world demand for food products, a significant devaluation of the national currency contributed to the growth of investment attractiveness of the agricultural sector of the economy. This determines the formation of Ukraine's competitiveness in foreign markets mainly due to the agricultural and raw material nature of exports (Prytula, 2019). Such structures of GDP and exports do not ensure adequate growth of the level and quality of the country's population. At the same time, in most EU member states that joined the community in 2004-2007, during 2007-2019 there is a growing trend of the share of high-tech production in total exports, and this largely determines the level of their GDP per capita (see Figure 2, Table 2). In 2020 due to Covid-19 pandemic the volume and structure of world trade have changed significantly depending on the country.

Figure 2. High-technology exports (% of manufactured exports) and GDP per capita (current US$), 2020
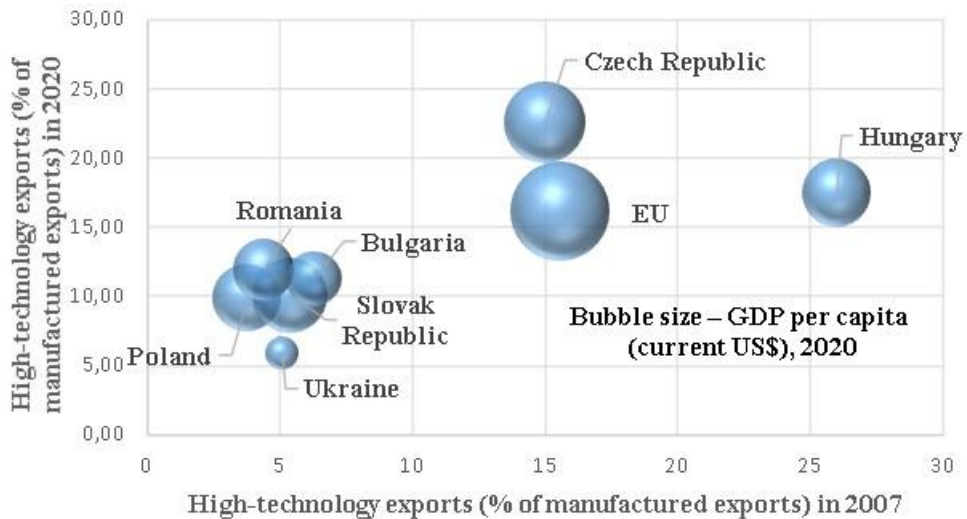
Source: Authors' representation based on World Bank and State Statistics Service of Ukraine data

Table 2. High-technology exports and GDP per capita (current US$) of the countries shown in Figure 2

	Indicators	2010	2015	2020
Poland	GDP per capita (current US$)	12613	12579	15721
	High-technology exports (% of manufactured exports)	7,72	10,77	9,86
	High-technology exports (current mln US$)	9587	16501	19967
Slovak Republic	GDP per capita (current US$)	16825	16336	19267
	High-technology exports (% of manufactured exports)	7,35	11,16	10,00
	High-technology exports (current mln US$)	4113	7461	7860
Hungary	GDP per capita (current US$)	13223	12721	15981
	High-technology exports (% of manufactured exports)	25,92	17,08	17,43
	High-technology exports (current mln US$)	20246	14668	18156
Romania	GDP per capita (current US$)	8214	8969	12896
	High-technology exports (% of manufactured exports)	12,53	9,41	11,94
	High-technology exports (current mln US$)	4857	4436	6985
Bulgaria	GDP per capita (current US$)	6853	7075	10079

	High-technology exports (% of manufactured exports)	8,40	8,43	11,30
	High-technology exports (current mln US$)	853	1186	2154
Czech Republic	GDP per capita (current US$)	19960	17830	22932
	High-technology exports (% of manufactured exports)	17,86	17,73	22,58
	High-technology exports (current mln US$)	20394	24758	39603
EU	GDP per capita (current US$)	32943	30475	34149
	High-technology exports (% of manufactured exports)	16,66	17,25	16,10
	High-technology exports (current mln US$)	569387	607990	644348
Ukraine	GDP per capita (current US$)	2965	2125	3727
	High-technology exports (% of manufactured exports)	4,51 (2011)	8,04	5,85
	High-technology exports (current mln US$)	1932,26 (2011)	1495	1176

Source: Authors' representation based on World Bank and State Statistics Service of Ukraine data

Kabaklarli, Duran and Üçler point out that a long-term relationship between high-technology exports and economic growth can be observed in some OECD countries in the period from 1989 to 2015 (Kabaklarli, Duran and Üçler, 2018). While Demir, using the dynamic panel data analysis techniques for 34 countries over the period 1995-2015 confirms that exports of high technological products will have a significant positive impact on economic growth first of all for upper middle-income countries as well as medium technological products' exports which have a limited effect (Demir, 2018).

Ukraine and its regions significantly lag behind the rest of European countries in their socio-economic development. Moreover, it is becoming increasingly difficult to compete in globalised world markets, especially when the economy's structure of the country is inefficient as well as the composition of exports and imports goods. Ukraine's border regions bordering the EU member states are particularly sensitive to external challenges.

2. Methodology of analysis

Given the complexity of the object of study (the economy of the region) the indicator-index calculation method is used to examine the role and relationship between the factors influencing the formation of competitive advantages of the region. Construction of composite indicators allow assessing the current state or prospects of regions' economic development based on their competitive advantages.

The data reduction method and expert-statistical method are the basis for constructing indices. The indexing technique in exploring the competitive advantages of regions allows:

- to produce summary data from a large amount of data;
- to take into account the main characteristics of the object of study and their significance weights in the overall index;
- to take into account both stimulating and destimulating indicators;
- to get more objective information about the object compared to purely expert methods.

Calculation algorithm of integral index of the competitiveness of Ukrainian border regions includes the following steps:
- identifying components of the integral index, such as the main/additional components and indicators;
- standardizing the values of the indicators of competitive advantages;
- calculating sub-indices of competitive advantages of border regions by an integral index and a set of indicators that characterize the corresponding main components of the index.

The definition of the main characteristics and the corresponding indicators are based on the following provisions: competitive advantages are formed primarily through the development and implementation of innovations; investments in skills and knowledge are the priorities; information is an important component of innovation prosesses; productivity is the determining factor of competitiveness at the regional level; increasing low-tech exports and high-tech imports will lower living standards over time; the availability of highly specialized personnel in accordance with market needs is an important condition for the formation of competitive advantages; competitiveness in foreign markets is determined by competitiveness in domestic markets; the main stimulus for investment is to encourage domestic competition; the geographical concentration and development of clusters is an important factor in the formation of competitive advantages.

Accordingly, the main components of the integral index (features of regional competitive advantages) are (see Table 3):
1. Basic features of the region represented by a set of indicators for the education and training (4 indicators), health (1 indicator), and transport and border infrastructure (8 indicators);
2. Development of the business environment whose assessment considers a set of indicators for the entrepreneurial support infrastructure (3 indicators) and entrepreneurial development (3 indicators);
3. Market efficiency which is studied on the basis of a set of indicators for market efficiency; these include the markets for goods and services (6 indicators), labour (6 indicators), and technology (4 indicators);
4. Innovation development (10 indicators).

Table 3. Components of Integral Index of the Competitiveness of Ukrainian border regions

Main components	Additional components	Indicators
Basic features	Education and training	1) Average score of External Independent Testing[3]; 2) Number of students in higher education institutions (per 10 000 population); 3) Number of pupils within vocational programmes (per 10 000 population); 4) The share of R&D personnel in total employment, %
	Health	Life expectancy, years
	Transport and border infrastructure	1) Road freight transport (million tonne-kilometres); 2) Internet users, thousand; 3) Road Density (length per 1000 sq. km); 4) Rail Density (length per 1000 sq. km); 5) Number of border crossing points; 6) The volume of freight across the border, thousand tons; 7) Number of vehicles that crossed the border, units; 8) Number of people crossed the land border and number of international air passenger traffic in Ukraine, persons
Development of the business environment	Entrepreneurial support infrastructure	1) Business support organizations, units; 2) Number of industrial parks, units; 3) Number of clusters, units
	Entrepreneurial development	1) Number of economic entities per 10 000 population, units; 2) The share of SMEs turnover in the total production value of business entities, %; 3) The share of persons employed by small and medium-sized enterprises (SMEs), %
Market efficiency	Markets for goods and services	1) The volume of domestic market (Retail trade turnover, mln UAH); 2) The share of low-technology goods in the total production value of business entities, %; 3) The share of the region in the total gross value added of Ukraine, %; 4) The share of exports and imports goods and services (% of GRP); 5) The share of medium- and high-tech goods in total exports, %;

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[3] examinations for admission to universities in Ukraine

		6) The share of medium- and high-tech goods in total imports, %
	Labour	1) Labour productivity (GDP per person employed), thousand UAH; 2) Average monthly nominal wage per one full-time employee, UAH; 3) Unemployment rate (according to the ILO definition), %; 4) The share of informal employment in total employment, %; 5) The share of employment in the low-technology industry, %; 6) Total coefficient of migration increase/decrease per 10 000 available population
	Technology	1) Employment in IT and Computer Manufacturing per 1000 population; 2) The share of ICT services in total service, %; 3) Number of acquired new technologies in Ukraine and abroad, units; 4) Number of implemented new technological processes at enterprises, units
Innovation development		1) Number of startups, units; 2) Number of inventions patents, units; 3) Number of applications for utility models, units; 4) The share of innovation-active enterprises in the total number of enterprises, %; 5) Number of realised innovative products, units; 6) The share of innovative products in the total turnover of business entities, %; 7) The share of innovative products sold abroad in the total volume of innovative products, %; 8) The share of capital investments in rights to commercial designations, industrial property objects, copyrights and related rights, patents, licenses, concessions, etc. in the total amount of capital investments, %; 9) Number of enterprises that implemented technological innovations over the past three years, units; 10) Number of enterprises that implemented only marketing and/or organizational innovations over the last three years, units

Source: Authors' representation

The calculation of the integral index was based on the data of State Statistic Service of Ukraine.

Standardisation of indicators of competitive advantages is used to bring the absolute and relative indicators in conformity with a unified measurement system. Standardization of indicators will be carried out according to the average value of the relevant indicators in the country and the share of the population of the region relative to the population of the country.

A total of 45 indicators were used to characterize the mentioned components. The integral index (I_{int}) was calculated based on the indices, considering the weight coefficients:

$$I_{int} = \sum I_{BF}^{int} \times w_{BF} + I_{BE}^{int} \times w_{BE} + I_{ME}^{int} \times w_{ME} + I_{IN}^{int} \times w_{IN} \ (1)$$

where

I_{BF}^{int} is the index of competitiveness of border regions by a set of indicators for basic features of a region; the weight coefficient (w_{BF}) is equal to 0.2;

I_{BE}^{int} is the index of competitiveness of border regions by a set of indicators for the business environment development; the weight coefficient (w_{BE}) is equal to 0.25;

I_{ME}^{int} is the index of competitiveness of border regions by a set of indicators for market efficiency; the weight coefficient (w_{ME}) is 0.25;

I_{IN}^{int} is the index of competitiveness of border regions by a set of indicators for innovation development; the weight coefficient (w_{IN}) is 0.3.

The indices are calculated based on the indicators grouped, accordingly, by the main components.

The index of competitiveness of border regions by the set of indicators for the region's basic features is calculated based on the sub-indices, considering the weight coefficients:

$$I_{BF}^{int} = \sum (I^{BF}{}_{edu} \times w_{edu} + I^{BF}{}_{med} \times w_{med} + I^{BF}{}_{inf} \times w_{inf}) \ (2)$$

where

$I^{BF}{}_{edu}$ is the sub-index for the education and training; the weight coefficient (w_{edu}) is 0.35;

$I^{BF}{}_{med}$ is the sub-index for public health; the weight coefficient (w_{med}) is 0.45;

$I^{BF}{}_{inf}$ is the sub-index for the infrastructure of the region; the weight coefficient (w_{inf}) is 0.2.

If the sub-index consists of more than one indicator, it is calculated as an arithmetic mean of the standardized values of the indicator.

The index of competitiveness of border regions by the set of indicators for the business environment is calculated based on the sub-indices, considering the weight coefficients:

$$I_{BE}^{int} = \sum (I^{BE}{}_{es} \times w_{es} + I^{BE}{}_{ed} \times w_{ed}) \quad (3)$$

where

$I^{BE}{}_{es}$ is the sub-index for the entrepreneurial support infrastructure; the weight coefficient (w_{es}) is 0.6;

$I^{BE}{}_{ed}$ is the sub-index for the entrepreneurial development; the weight coefficient (w_{ed}) is 0.4.

The index of competitiveness of border regions by the set of indicators for the market efficiency is calculated based on the sub-indices, considering the weight coefficients:

$$I_{ME}^{int} = \sum (I^{ME}{}_{gs} \times w_{gs} + I^{ME}{}_{l} \times w_{l} + I^{ME}{}_{tech} \times w_{tech}) \quad (4)$$

where

$I^{ME}{}_{gs}$ is the sub-index for the efficiency of markets for goods and services; the weight coefficient (w_{gs}) is 0.3;

$I^{ME}{}_{l}$ is the sub-index for the labour market efficiency; the weight coefficient (w_{l}) is 0.3;

$I^{ME}{}_{tech}$ is the sub-index for technology; the weight coefficient (w_{tech}) is 0.4.

The index of competitiveness of border regions by the set of indicators for innovation development is calculated as an arithmetic mean of the standardized values of the respective indicators.

3. Results and discussion

The calculation of the integral index makes it possible to assess:
- competitiveness of regions in a domestic market;
- competitiveness of regions in the external market;
- specific nature of the development of border regions.

If the value of the sub-index or index is >1, the region has a competitive advantage by a certain component (see Figure 3).

Figure 3. Integral indices of competitive advantages of border regions in 2017 and 2018
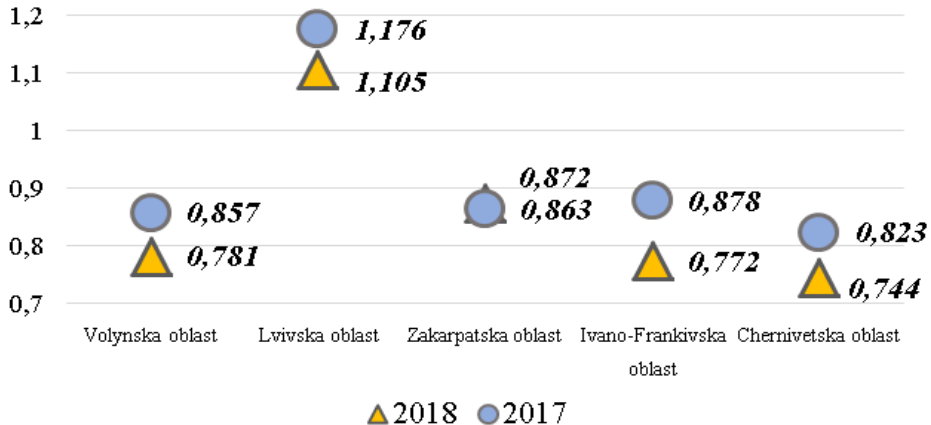
Source: Authors' representation

The integral indices, indices, and sub-indices in 2018 calculated for each border region of Ukraine are shown in Table 4.

Table 4. The components' values of integral index of competitiveness of Ukrainian border regions, 2018

Integral index components	Ukrainian border regions				
	Volynska	Lvivska	Zakarpatska	Ivano-Frankivska	Chernivetska
Basic features	1.108	1.174	1.101	0.865	1.1
Education and Training	0.818	1.204	0.634	0.801	0.868
Health	0.999	1.021	0.991	1.025	1.024
Transport and border infrastructure	1.862	1.465	2.165	0.616	1.676
Business Environment	1.136	1.468	0.943	0.969	1.03
Entrepreneurial support infrastructure	1.249	1.731	0.861	0.959	0.979
Entrepreneurial development	0.966	1.073	1.065	0.985	1.106
Market efficiency	0.681	1.069	0.862	0.743	0.593
Goods and services markets efficiency	1.185	1.007	1.698	1.112	0.805
Labour market efficiency	0.67	1.081	0.777	0.816	0.715

Technology	0.312	1.108	0.299	0.41	0.342
Innovation development	0.352	0.788	0.67	0.57	0.393
INTEGRAL INDEX	**0.781**	**1.105**	**0.872**	**0.772**	**0.744**

Source: Authors' calculations

Lvivska oblast is a leader in terms of all the values of indices of competitive advantages of border regions by the set of indicators for the region's basic characteristics, development of the business environment and innovation, as well as market efficiency. At the same time, Zakarpatska oblast has higher values of sub-indices for the transport and border infrastructure due to an enormous transit capacity of this region; and for the goods-services market efficiency due to a high level of economic openness of this region and far greater shares of high- and medium-tech products in the total volume of exports and imports of the region relative to other border regions and Ukraine in general.

Ivano-Frankivska oblast comes first in the index for public health. Of the other border regions, the average life expectancy in this region is the highest and accounts for 73.78 years. By certain indices and sub-indices, Chernivetska, Ivano-Frankivska, and Zakarpatska oblasts demonstrate the lowest values.

Similar trends by the values of indices and sub-indices took place in 2018. An undisputed leader in the consolidated integral index and sub-indices is Lvivska oblast. Some oblasts score highly by the values of particular sub-indices.

Typically, the development of certain industries in border regions of Ukraine highly depends on the manufacturing of products on the basis of tolling raw materials. At the same time, the share of finished goods made from tolling raw materials in the total volume of exports of goods of Ukraine is insignificant and was not greater than 10% for the last 5 years between 2015 and 2019 (see Figure 4).

For border regions of Ukraine, a specific feature of their exports is a large portion of finished goods produced from tolling raw materials. In exports of goods of Zakarpatska oblast, products made from tolling raw materials largerly prevail. The share of such products totals nearly 80%. Accordingly, in global value chains with the participation of enterprises of Zakarpatska oblast there is a modest value-added ratio of this region. For Lvivska oblast, this ratio did not exceed 50%. In Volynska oblast, the share of finished goods produced from tolling raw materials in the total volume of exports was not greater than 40%. In contrast, the share of finished goods produced from tolling raw materials in the total volume of exports of Ivano-Frankivska oblast totaled nearly 25%.

Figure 4. The share of products made from toll raw materials in the total exports of border regions and Ukraine in 2016-2018, %
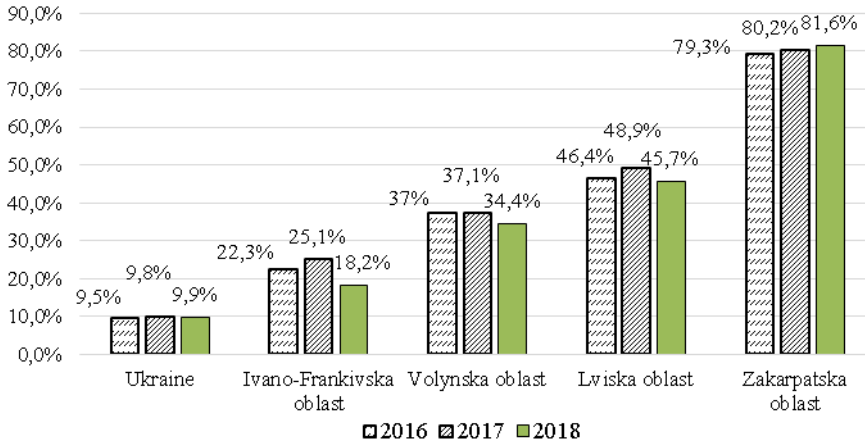
Source: Authors' representation based on State Statistics Service of Ukraine data

In the commodity composition of the foreign trade of Zakarpatska oblast, there are more than 90% of export products of the groups, such as XII. Footwear, headwear, and umbrellas, XI. Textile materials and products, XVI. Machines, equipment, and mechanisms; electrical equipment, VIII. Untreated hides and raw hides made from tolling raw materials. The products of the groups – XVIII. Optical instruments and photographic equipment, XVII. Land vehicles, aircraft, and watercraft, VI. Products of the chemical and chemistry-related industries, XX. Various industrial goods made from tolling raw materials – accounted for between 50% and 90% in exports of finished goods of the respective groups. In 2016, the share of products of the group – XVIII. Optical instruments and photographic equipment produced from tolling raw materials – totaled 16% in the export structure of products of the corresponding group. In 2018, the share of such products in the export structure of the respective group was as much as 62.6%.

In the commodity composition of the foreign trade of Ivano-Frankivska oblast, there are more than 90% of export products of the groups – XII. Footwear, headwear, and umbrellas; and XI. Textile materials and products made from tolling raw materials. 72% of imports of tolling raw materials of the group, such as XI. Textile materials and products, are synthetic or artificial staple fibers, textile materials, and wadding. For group XII. Footwear, headwear, and umbrellas, 100% of imports in 2016 – 2018 were raw materials for making shoes.

In general, within the border regions of Ukraine the exports of goods by the product groups – *XVI. Machines, equipment, mechanisms; and electrical equipment, XI. Textile materials and products, and XII. Footwear, headwear, and umbrellas – are*

characterized by the highest shares in exports of finished goods made from tolling raw materials. The share of such products in the total exports can be up to 95-99%.

Between 2016 and 2018, the volume of imports of tolling raw materials of the oblasts, such as Zakarpatska, Ivano-Frankivska, Lvivska, and Chernivetska, grew annually. However, the share of imports of tolling raw materials in the total imports of goods of the oblasts, such as Lvivska and Ivano-Frankivska, trended downward, and of Zakarpatska and Chernivetska trended upward. In Volynska oblast, the volume of imports of tolling raw materials and the share of such materials in imports of the oblast remained stable over the analyzed period (see Figure 5).

Figure 5. The share of tolling raw materials in the total volume of imports of goods of the border regions and Ukraine in 2016 – 2018, %
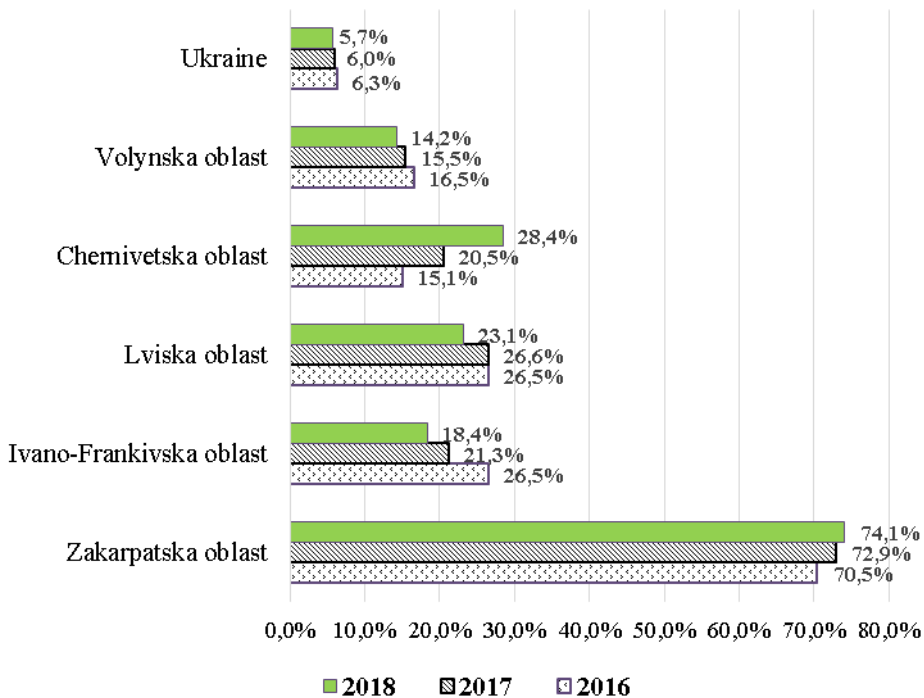
Source: Authors' representation based on State Statistics Service of Ukraine data

In 2018, in Zakarpatska oblast more than 90% of imports of goods of the product groups such as polymeric materials, plastics and plastics products, untreated hides and rawhides, textile materials and products, footwear, headwear, and umbrellas were tolling raw materials. The share of tolling raw materials by the group – XVI. Machines, equipment, mechanisms; and electrical equipment – for three years remained unchanged at 89% of all imports of goods in this group.

In Lvivska oblast, the goods of the XVI group scored the highest in terms of the volume of imports. Textile materials and products scored the second highest. Over 45% of the value of imports of such products in 2018 were tolling raw materials for clothing enterprises in Lvivska oblast. Such raw materials came from Europe (Germany, Poland, and Denmark). There were considerable volumes of imports of ready-made clothing and other second-hand products from Poland, Germany, and Switzerland[4].

In Ivano-Frankivska oblast more than 60% of imports of goods of the product groups such as untreated hides and rawhides, textile materials and products, footwear, headwear, and umbrellas were tolling raw materials. For most product groups, one can observe a decrease in the share of tolling raw materials in the structure of imports of the oblast between 2016 and 2018. The only exception is the goods of group VII. Polymer materials, plastics, and plastic products whose share of tolling raw materials in imports rose from 15.2% in 2016 to 24.8% in 2018.

Since 2015, the economy of Ukraine's border regions has become increasingly open, primarily due to the intensification of foreign trade operations with EU member states. At the same time, the peculiarity of this first stage of entry of Ukrainian regions into the European economic space is the increase in imports of toll raw materials and, accordingly, the growth of export goods made from toll raw materials. At this stage, it makes it easier for Ukrainian companies to enter European markets for goods and services, allows them better understand the market's rules and regulatory requirements, adapt to them, allows to modernize production, introduce a new culture of management and so on. Therefore, *to assess the level of the economic integration of the Ukrainian border regions in the global value chains*, it is suggested to calculate the corresponding index:

$$I_{GVA} = EI_{GDP} \times Trm_{EXP},$$

where EI_{GDP} is the share of exports and imports of goods and services in oblast' GRP (Gross Regional Product) (the openness of the region's economy), %;

Trm_{EXP} is the share of goods made from tolling raw materials in the total volume of exports of goods of the oblast, %.

The calculation data is illustrated in Figures 6-7. A higher index value indicates a higher level of integration.

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[4] Main Department of Statistics in Lvivska oblast (2018), Foreign Trade of Lvivska Oblast in 2018: analytical report (retrieved from https://www.lv.ukrstat.gov.ua/ukr/publ/ 2019/DP1120190301.pdf).

Figure 6. The level of the economic integration of the Ukrainian border regions in the global value chains in 2017
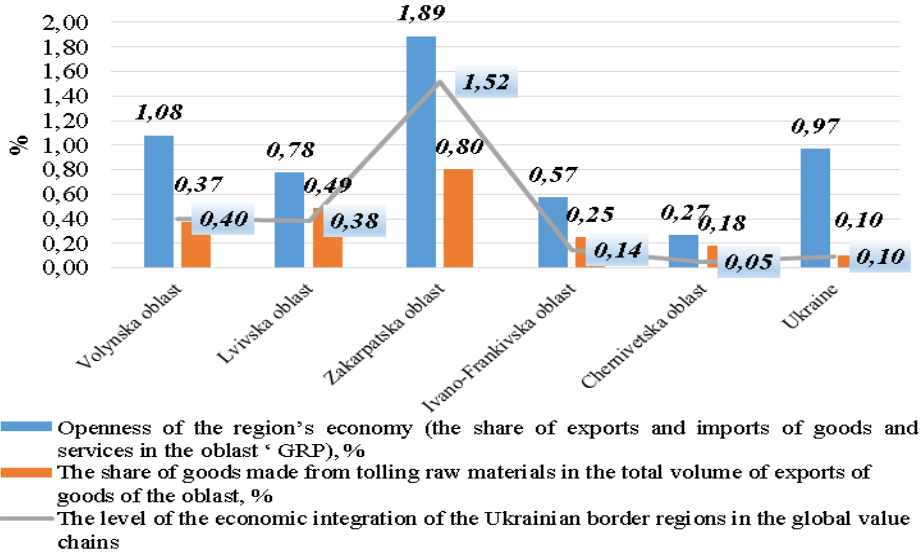
Source: Authors' representation based on State Statistics Service of Ukraine data

Figure 7. The level of the economic integration of the Ukrainian border regions in the global value chains in 2018
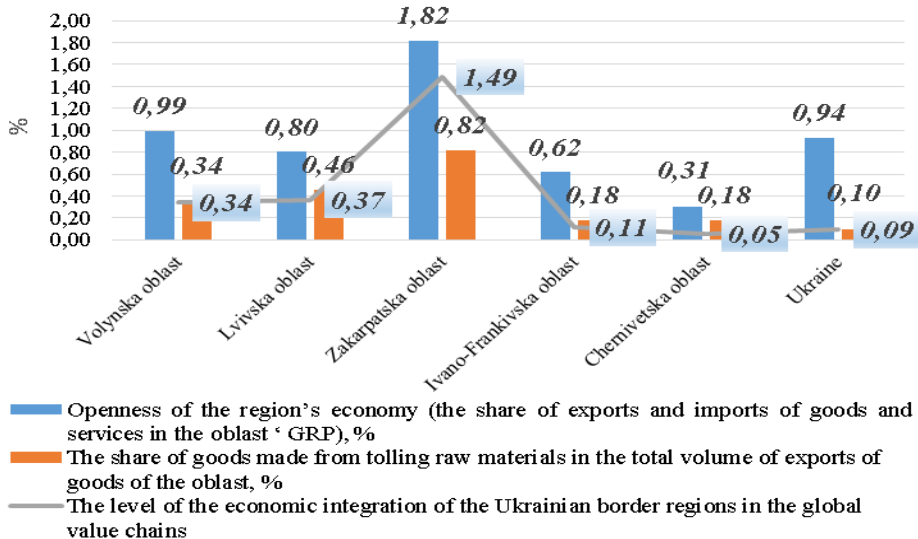
Source: Authors' representation based on State Statistics Service of Ukraine data

Despite the geographic proximity of the border and, accordingly, exposure of the territory to external sales markets, only the economies of the oblasts, such as Zakarpatska and Volynska, are more open with regard to an average indicator for the economic openness across the country. At the same time, the shares of finished goods produced from tolling raw materials in total exports of goods appear to be the highest in Zakarpatska and Lvivska oblasts. This indicator is 2-8 times higher than the average value across Ukraine.

Conclusions

Depending on the stage of production, the created value-added ratio varies. At both ends of the value chain, the value added far outweighs that one generated in the middle of the chain at the stage of direct production. Typically, low-income countries are integrated into global value chains right at the production stage, from the manufacturing of final or intermediate goods made from imported products to the product assembly and installation.

Economic integration of border regions in the global value chains through the manufacturing of products received under tolling agreement along with further exports of such products determines the place of economy in global production networks with the lowest value-added ratio. Hence, the determinants of competitive advantages of regions comprise the low rate of remuneration and cross-border location of such regions. Meanwhile, it is labour productivity that is a more important determinant of competitiveness. Ukrainian border regions greatly lag behind other regions within the country by labour productivity. During 2017 – 2018, the value of GRP per 1 employed person in border regions ranged within 0.4 – 0.77% of its average value in Ukraine.

In border regions of Ukraine, exports of goods by the product group, such as XVI. Machines, equipment, and mechanisms; electrical equipment, is largely characterized by the highest shares of exports of finished goods made from tolling raw materials. Such goods can be up to 99% (Zakarpatska oblast) of total exports. Performance of enterprises dealing with products of this group is limited to one or two stages of the production process related to the manufacturing of the products.

The study showed that today the economy of the border regions is in transition from the development based on resources to the development driven by investment and efficiency. Indeed, competitive advantages are formed through development and innovation adoption. Except for Lvivska oblast, all the border regions show a lower level of innovation development as to its average level across the country.

The high density of roads and railways because of proximity to the state border, a favorable geographical location at the intersection of the main European and global transport arteries determine the occurrence of powerful transit capacity of border regions. In case of effective implementation through the development of the logistics and transport infrastructure, transit capacity will accelerate regional

development and increase the competitiveness of regions in the domestic and international markets. There is a clear link between the high efficiency of logistics and the degree of involvement in the global value chains. Those countries that are focused on deep integration in global value chains are committed to giving much attention to trade facilitation and infrastructure development. With the high educational attainment of border regions, a number of IT workers, the high portion of information and communications technologies in the overall structure of services, and the location close to a border (in case of Lvivska oblast), the border regions hold the potential to develop the outsourcing industry.

The key to the promotion of entrepreneurial development is the delivery of business development services. A range of services can facilitate trade and investments connected with global value chains. Such services may include centers for the delivery of business development services and capacity-building measures to help domestic companies to comply with technical standards and promote awareness of international trade best practices.

Integration in international production networks can occur in case of an effective social policy and a well-functioning labour market; the implementation of programs for professional retraining and advanced training of employees; active promotion and popularisation of products of domestic enterprises in international markets; the formation of a favorable investment image of territories. Investment promotion agencies will contribute to attracting investments to the regions. Last year, Emerging Europe ranked UkraineInvest 5 in its rating of investment promotion agencies (Turp-Balazs, 2020).

The concentration of production in terms of location as a factor is also one of the key prerequisites for enhancing competitive advantages. Developing clusters, cluster initiatives, and industrial parks empowers and stimulates the attraction of information and investment resources, etc. This allows for the participation in creating the value added not only at the stage of production but also at other stages, including R&D, designing, modeling, etc., namely, all the stages with the high value-added ratio, and in forming full chains of value added.

Proximity to markets and coherence of spatial development of cross-border regions with the participation of border regions of Ukraine are the factors that should influence the attraction of foreign investors to invest in the economy of border regions. However, neighboring EU member states are not very active in investing in the border areas of Ukraine. The exception is the Republic of Poland, whose share of investment is significant in the economy of Lvivska, Volynska and Zakarpatska oblasts. Despite its territorial proximity, Romania does not consider Ukraine's border regions to be attractive in terms of investment. Accordingly, the share of Romanian investments in the economy of Ivano-Frankivska oblast in recent years fluctuates between 0.2-0.3%, Chernivetska oblast - 0.1%.

In conditions of high competition among countries for attracting foreign investment and a low level of investment attractiveness, Ukraine still remains

uncompetitive in the global investment market. Neighboring countries of Ukraine have been pursuing a purposeful policy of stimulating and increasing the efficiency of investment processes for the last 20-30 years, including by creating industrial parks. And they offer a wide range of incentives for potential investors. Therefore, the conditions for investment in the industrial parks of Ukraine should be competitive with other countries.

The formation and implementation of investment policy in Ukraine should be comprehensive and systematic. The development of industrial parks should be integrated into the general management system of investment processes, including science parks, technology parks, etc. Each of the structural elements of the investment and innovation infrastructure must be created and developed to achieve specific goals, with specific criteria for their participants, and accordingly with a system of incentives for their effective development. At the same time, in the conditions of structural transformation of the economy, the course of its industrialization and modernization, first of all it is necessary to encourage investments in high-tech production.

Prerequisites for the development of cross-border industrial parks with the participation of Ukrainian border regions are coordination of spatial development of adjacent border areas, development of planning schemes for cross-border regions, implementation of cross-border development strategies of adjacent border areas, etc. This will improve and strengthen the relations between the border regions of neighboring countries, make better use of the economic opportunities of both countries, make the markets of adjacent territories more open and competitive.

References

Cho, D.-S. and Moon, H.-Ch. (2005), National Competitiveness: Implications for Different Groups and Strategies, *International Journal of Global Business and Competitiveness*, 1(1), pp. 1-11.

Cho, D.-S., Moon, H.-Ch. and Kim, M.-Y. (2009), Does one size fit all? A dual double diamond approach to country-specific advantages, *Asian Business & Management*, 8(1), pp. 83-102. http://dx.doi.org/10.1057/abm.2008.27

Demir, O. (2018), Does High Tech Exports Really Matter for Economic Growth A Panel Approach for Upper Middle-Income Economies, *AJIT-e Online Academic Journal of*

Information Technology, 9(31), pp. 43-54. http://dx.doi.org/10.5824/1309-1581.2018.1.003.x

Dutta, S., Lanvin, B. and Wunsch-Vincent, S. (eds.) (2019), *Global Innovation Index: Creating Healthy Lives-the Future of Medical Innovation*, Cornell University (retrieved from https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2019.pdf).

International Bank for Reconstruction and Development / The World Bank (2019), *Doing Business. Training for Reform*, 16th edition (retrieved from https://www.doingbusiness.org/content/dam/doingBusiness/media/Annual-Reports/English/DB2019-report_web-version.pdf).

Kabaklarli, E., Duran, M. S. and Üçler, Y. T. (2018), High-technology exports and economic growth: panel data analysis for selected OECD countries, *Forum Scientiae Oeconomia*, 6(2), pp. 47-60.

Kearney (2019), *Global Services Location Index* (retrieved from https://www.kearney.com/digital-transformation/gsli/2019-full-report).

Ketels, C. (2016), *Review of Competitiveness Frameworks: An Analysis Conducted for the Irish National Competitiveness Council*, report, Dublin, Ireland (retrieved from https://www.hbs.edu/faculty/Pages/item.aspx?num=50988).

Lengyel, I. and Rechnitzer, J. (2013), The Competitiveness of Regions in the Central European Transition Countries, *The Macrotheme Review*, 2(4), pp. 106-121 (retrieved from macrotheme.com/yahoo_site_admin/assets/docs/9LengyelMR24.13191544.pdf).

Litva, D. (2017), Impact of European Integration on Competitiveness of Czech Regions, *Business, Management and Education,* 15(2), pp. 227-241. http://dx.doi.org/10.3846/bme.2017.371

Porter, M. (1990), *The Competitive Advantage of Nations* (retrieved from https://hbr.org/1990/03/the-competitive-advantage-of-nations).

Prytula, Kh. (2019), *Cross-Border Cooperation of Ukraine with the EU Countries: Current Challenges and Possibilities*, Lviv: NAS of Ukraine. SI «Institute of Regional Research named after M.I. Dolishniy of NASU» (retrieved from https://ird.gov.ua/irdp/p20190002.pdf).

Rugman, A.M. and D'cruz, J.R. (1993), The "double diamond" model of international competitiveness: The Canadian experience, *Management International Review*, 17-39.

Turp-Balazs, C. (2020), *Enterprise Estonia named emerging Europe's leading investment promotion agency*, Emerging Europe (retrieved from https://emerging-europe.com/news/enterprise-estonia-named-emerging-europes-leading-investment-promotion-agency/).

Zaman, C. and Meunier, B. (2017), A Decade of EU Membership: Evolution of Competitiveness in Romania, *European Research Studies Journal*, XX(2A), pp. 224-236. http://dx.doi.org/10.35808/ersj/638

Ženka, J., Novotný, J. and Csank, P. (2014), Regional Competitiveness in Central European Countries: In Search of a Useful Conceptual Framework, *European Planning Studies*, 22(1), pp. 164-183. http://dx.doi.org/10.1080/09654313.2012.731042