

Management of investment processes in the region

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ABSTRACT

The article presents a detailed analysis of direct capital investments in Khmelnytsky region, enterprises with foreign capital are considered. The dynamics and structure of foreign direct investment by types of economic activity are assessed. Methods of economic and mathematical modeling were used, which provided for the development of investment flows over time and modeled the impact of economic factors on the overall flow of foreign direct investment, which can be used in the management of foreign economic activity.

The article presents an analysis of foreign investment in one of the regions of Ukraine. The volumes and dynamics of foreign investments are determined, the branch structure of investments is determined, the main countries-recipients of foreign investments in Khmelnytsky region are determined. The largest industrial facilities operating at the expense of foreign investors are analyzed. The largest investor in the region is the Netherlands.

The results of economic and mathematical modeling showed that the increase in retail trade in the region has a positive effect on foreign investment in Khmelnytsky region; wholesale and retail trade – the second largest region of the region, where foreign investment is directed; the growth of imports of goods leads to an increase in foreign investment in the region; The impact of freight turnover and passenger traffic on the dynamics of foreign investment was ambiguous.

KEYWORDS: Foreign economic activity, Foreign direct investment, Foreign investment, Enterprises with foreign investment, Modeling, economic and mathematical models, Regression, trend, Extrapolation models.

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1.Introduction .Foreign economic activity is an important vector of economic development of the country. Its dynamics and future prospects have a significant impact on the country's macroeconomic performance and competitive position in the world market. Foreign direct investment is a direct factor in the region's foreign economic activity. Simulation of investment processes at the regional level is the key to attracting the region to the international economic space, improving economic development.

Theoretical bases for determining the essence of the FEA process were reflected in the works of domestic and foreign scientists, such as: Gorin N.V., Drozdova G.M., Didkivsky M.I., Kozak Y.G., Kirichenko O.A., Mayer J., Tyurina M.N., Shkurupiy O.V. and others.

The purpose of this study is to analyze the state of foreign direct investment in the region and to develop models of the impact of economic indicators on investment processes by methods of economic and mathematical modeling.

2.Proposed Techniques / Algorithms .To determine the impact of selected factors on foreign investment in the region used methods of economic and mathematical regulation and regression analysis. The constructed divisions were tested for adequacy and reliability with the help of correlation and determination coefficients, Fisher's criterion.

2.1 The First Technique

In today's context, the main form of international economic relations is foreign investment.

In Ukraine, the regions are unevenly involved in foreign economic relations. Foreign economic orientation of development is observed in industrial regions. These regions have significant export potential in modern conditions, occupy a favorable geographical position, have a developed infrastructure that ensures their functioning. In recent years, agricultural regions are also involved in the process of foreign economic activity. Such regions focus on the needs of the European food market [1].

According to the legislation of foreign economic activity in Ukraine it is subject to obligatory regulation. The methods of state regulation of foreign economic activity should be understood as ways of state influence as legislative and executive bodies on the sphere of foreign economic activity in order to create or ensure conditions for foreign economic activity in accordance with national economic policy [2].

In the economy of each state, investments together with investment infrastructure and investment activity and interaction of economic entities form an energy supply process, which forms the basis of expanded reproduction and socio-economic growth [3].

Today, investment at the regional level generally reflects negative macroeconomic trends in the country, but it is also affected by objectively complex socio-economic conditions in the regions [4].

In the Khmelnytsky region, in recent years, it has created almost 40 thousand jobs, launched more than 230 foreign-owned enterprises from 35 countries. The peculiarity and advantage is that more than 90% of the investment comes from EU countries.

According to information of the Department of Economic Development, Industry and Infrastructure of the Regional State Administration of Khmelnytsky region, **33%** of export of goods from the region is provided at the expense of enterprises with foreign investments (table 1).

Table 1. Companies of Khmelnytsky region with foreign investments *

No	Company name	The products of the company	Country of foreign capital, investor firm
1	Podilsky Cement enterprise (Kamyanets-Podilskyi District)	3 million tons of cement per year	CRH Poland Products & Distribution B.V.
2	LLC Inter Cars Ukraine (Khmelnitsky)	Sale of motor vehicle parts and accessories	Polish company Inter Cars SA
3	RosApatinvest LLC (Khmelnitsky)	Wholesale of chemical products, including sale of phosphorus fertilizers	G&G Couch Potato Limited, a Cyprus company
4	«WIX-FILTRON» (Krasyliv)	Production of air, fuel and oil filters for cars of foreign and domestic brands.	Affinia Netherlands Holdings and Poland Wix-Filtron Sp. With o.o.
5	Poultry Complex of PJSC «Agro Firm» AVIS (Kamyanets-Podilskyi District)	Expansion of the poultry farm area by 13.0 million chickens	AVANGARDCO IPL Holding is one of the largest agro-industrial groups in Ukraine
6	PRETTL-CABLE UKRAINE LLC (Kamianets-Podilskyi)	The annual production capacity of the complex at full capacity utilization is about 1.616 million eggs.	PEKM Kabeltechnic s.r.o Czech investment
7	Sirius Extruded LLC (Khmelnitsky)	Specializes in the production of cable products for motor vehicles	Companies BREYFIELD TRUST Reg. (Liechtenstein) and «AKARTON INVESTMENT LIMITED» (Cyprus)
8	Duveelsdorf Ukraine LLC (Khmelnitsky)	Specializes in the production of polymer packaging products (PET-preforms, stretch film, stretch-hood film and barrier film)	The German company Duvelsdorf Handelsgesellschaft mbH
9	Tin Impex LLC (Khmelnitsky)	Manufactures machinery and equipment for agriculture and forestry	German company of the same name - established a subsidiary - the only specialized metallurgical enterprise in Podillya
10	Slavutsk combine «Budfarfor»	Specializes in the processing of non-ferrous metal scrap with the subsequent production of European-grade aluminum alloys	With the participation of Sanitec Group (Finland), a European multibrand group, a leading European manufacturer of bathroom products
11	First solar power plant, Yasenivka village, Yarmolinets District	Powerful enterprise with full production cycle of porcelain sanitary ware	Group of Czech companies Ekotechnik Czech
12	Megatex Industrial LLC	Total power of 2 mW	With the involvement of British investors

* According to the materials of the Department of Economic Development, Industry and Infrastructure of Khmelnytsky Regional State Administration

Foreign companies such as CRH Poland Products & Distribution B.V. (Netherlands) and Affinia Netherlands Holdings (Netherlands), PEKM Kabeltechnic s.r.o. (Czech Republic), Wix-Filtron Sp. With o.o. (Poland) and Inter Cars SA (Poland).

Data on direct investments from the region are not disclosed in order to ensure compliance with the requirements of the Law of Ukraine «On State Statistics» on the confidentiality of statistical information. And information on the dynamics of investment in the area is presented in table 2.

Table 2. Dynamics of direct investments (share capital)

As of 01.01	Direct investment in the region, thsd. United States	Growth rate,%
2010	219569,0	59,9
2011	182975,1	-16,7
2012	186759,6	2,1
2013	205131,5	9,8
2014	224463,1	9,4
2015	189096,9	-15,8
2016	165530,0	-12,5
2017	158158,3	-4,5
2018	170764,1	8,0
2019	199465,3	16,8

**According to the materials of the Main Department of Statistics in Khmelnytsky region*

It is worth noting that FDI in the region has flowed unevenly, in particular from 2011 to 2014, the volume of investments from abroad increased, and after 2014 they declined until 2017 [5].

The Khmelnytsky region has received foreign investments from 19 countries. The largest investor is the Netherlands: 2017 - \$ 93.5 million. US (61% of total FDI), 2018 - US \$ 106.1 million US (64%), 2019 - \$ 136.9 million United States (70%). Major investments were made in processing enterprises (\$ 136.3 million as of 1 January 2019), less - in agriculture, forestry and fisheries (\$ 721.4 thousand as of 1 January 2019).

The second place is occupied by Cyprus, which is related to its belonging to the offshore zones. In 2017, \$ 14.8 million was received from this island. US FDI (10 % of total FDI), in 2018 - \$ 14.3 million (9 %), in 2019 - \$ 12.5 million USA (6 %). The bulk of the investment came from wholesale and retail trade; repair of motor vehicles and motorcycles (USD 9.4 million as of 01.01.2019), smaller volumes to processing industry enterprises (USD 3.5 million as of 01.01.2019), real estate activities (USD 0.913 million as of 01.01.2019), agriculture, forestry and fisheries (USD 0.95 million as of 01.01.2019). The Cyprus company G&G Couch Potato Limited is one of the founders of RosApatinvest LLC (Khmelnitsky), which is engaged in wholesale trade of chemical products - sale of phosphorus mineral fertilizers.

In January - September 2019 822 legal entities (3% of the total number) were registered in the EDRPOU region. The largest number of entities is traditionally established in Khmelnytskyi City (57% of all

established ones), by economic activity – 15 % in other services, 14 % in administrative and support services, agriculture, 13% in forestry and fisheries , 12% in wholesale and retail trade [6].

In the nine months of 2019, 923 foreign founders from 76 countries participated in the creation of Khmelnytskyi’s economic entities. The largest number of enterprises was created with the participation of Polish business entities – 11 %, Turkey – 8 % and Cyprus – 7 %.

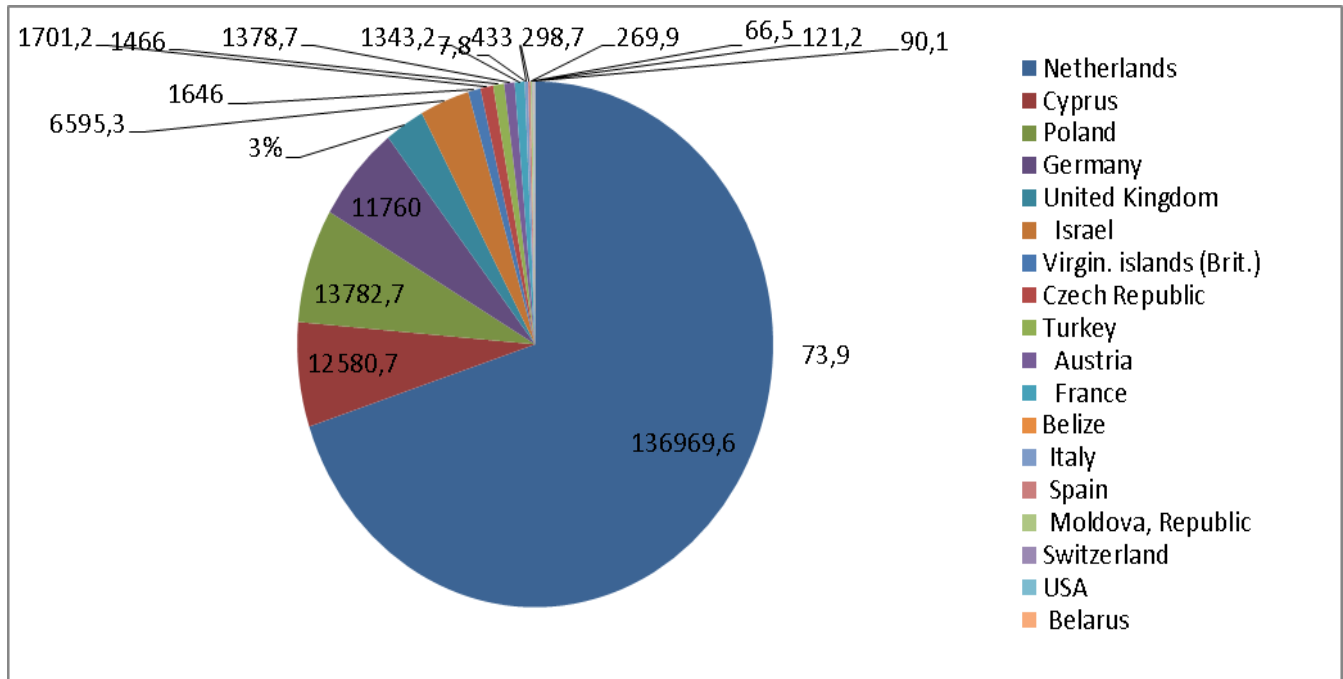


Fig 1. The structure of foreign direct investment in Khmelnytsky region by recipient countries in 2019

*According to the materials of the Main Department of Statistics in Khmelnytsky region

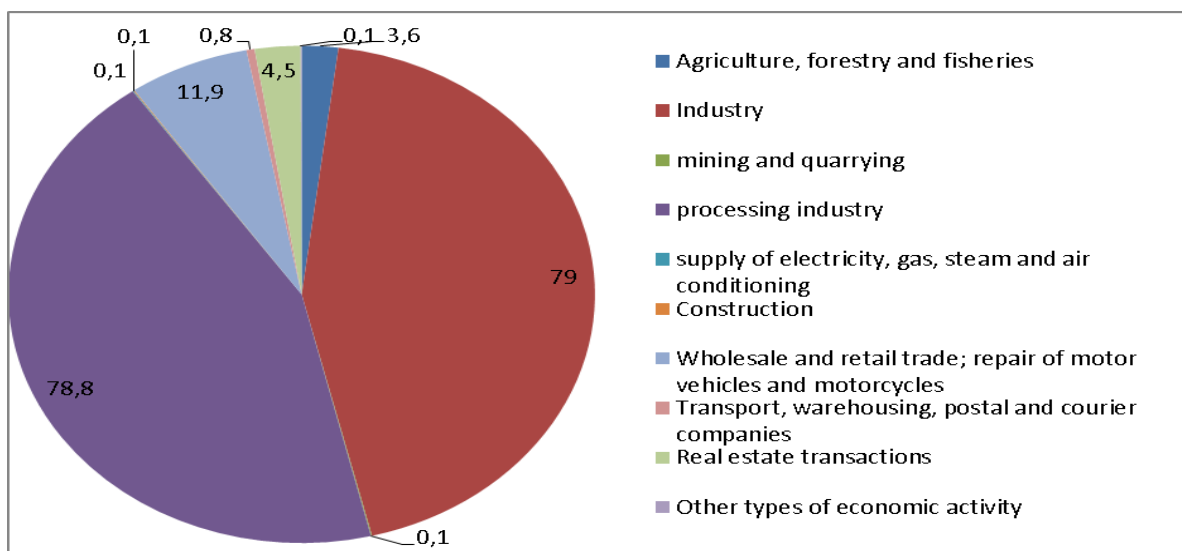


Fig 2. Sectoral structure of foreign direct investment in Khmelnytsky region in 2019, one thousand US dollars

*According to the materials of the Main Department of Statistics in Khmelnytsky region

Poland ranks third among foreign investors in the Khmelnytsky region, although the country's share from 2017 to 2019 decreased from 9% to 7%. Polish companies have invested investment in wholesale trade on 01.01.2019 - \$ 11.6 million. USA, industry \$ 1.8 million United States, Agriculture, Forestry and Fisheries - \$ 0.299 million USA.

Germany is the fourth largest investor in the economy of the Khmelnytsky region. Almost 90% of German investments are invested in the expansion of manufacturing enterprises.

At the beginning of 2016, \$ 165,500 was invested in the Khmelnytsky region. US \$ 158.2 million at the beginning of 2017 US \$ 170.7 million at the beginning of 2018 USA. Foreign direct and investment in the Khmelnytsky region is increasing, in particular in 2018 their value increased by 3% compared to 2016 and by 8% compared to 2017. In general, growth rates are not high (table 3).

Table 3. Dynamics of volumes and structures of direct investments in the Khmelnytsky region, by economic activities [5]

Types of economic activity	01.01.2019		01.01.2018		01.01.2017		Deviation, %	
	thsd	% of the total	thsd	% of the total	thsd	% of the total	2019-2018	2018-2017
Total	200538,4	100	170764,1	100	158158,3	100	-	-
Agriculture, forestry and fisheries	7136,7	3,6	10155,7	5,9	10059	6,4	-2,3	-0,5
Industry	158287,5	79	127314	74,7	114091,4	72,1	4,3	2,6
mining and quarrying	95,8	0,1	87,2	0,1	560,4	0,3	0	-0,2
manufacturing industry	158098,8	78,8	127134	74,5	113438,5	71,7	4,3	2,8
supply of electricity, gas, steam and air conditioning	92,9	0,1	92,8	0,1	92,5	0,1	0	0
Construction	269,2	0,1	308,7	0,2	-	-	-0,1	0,2
Wholesale and retail trade; repair of motor vehicles and motorcycles	23902,8	11,9	21569,7	12,6	1095,9	0,7	-0,7	11,9
Transport, warehousing, postal and courier activities	1520,5	0,8	1646,1	1	21751,1	13,8	-0,2	-12,8
Real estate transactions	9053,2	4,5	9017,3	5,3	7847,3	5	-0,8	0,3
Other economic activities	368,5	0,1	752,6	0,3	750	0,4	-0,2	-0,1

*Calculated by a team of authors

It should be noted that most of the investments – an average of 60% – are directed to Kamyanets-Podilskyi district, which is almost \$ 105 million. USA. The regional center – Khmelnytskyi – received only an average of 16% of FDI from their total volume and at the beginning of 2018 their share decreased, the amount of invested funds by foreigners in 2018 amounted to \$ 26.5 million. USA. Kamianets-Podilskyi received 4.8% of total FDI, with their share unchanged from 2016 to 2018, in absolute terms the amount of FDI in 2018 increased to \$ 8.1 million USA [7]. In recent years, quite large enterprises have been built in Podillya, in particular – a pharmaceutical factory of the Ecopharm company, two large factories of the group of companies Khmelnytsk Mill, a solar power plant Kamyanets-Podilsk, a plant of household chemicals 2K, biogas power plant “Theophipol Power Company”, Khmelnytsky branch of SE Bordnetze-Ukraine for the production of Volkswagen electrical components [8].

In May 2019, the Khmelnytskyi Innovation Terminal of Nova Poshta Company was opened, which is an important element of the logistics system in the region and has ensured the improvement of freight transportation infrastructure in Western Ukraine. The project was made possible with EBRD funding (€ 9.5 million). The company covers most of its energy needs through alternative and renewable sources.

In fact, the investment attractiveness of any country or region is based on two components: investment potential and investment risk [4]. And prof. P.M. Hryhoruk, on the importance of sustainable development of the regions of Ukraine, where the main tasks including: access to international cooperation, increasing investment attractiveness, enhancing the competitiveness of enterprises [9].

2.2 The Second Technique

To manage FDI flows, it is advisable to know if they will grow in the future, to track their behavior over time [2]. Why use economic and mathematical modeling. We use trend models to extrapolate FDI flows to Khmelnytsky region.

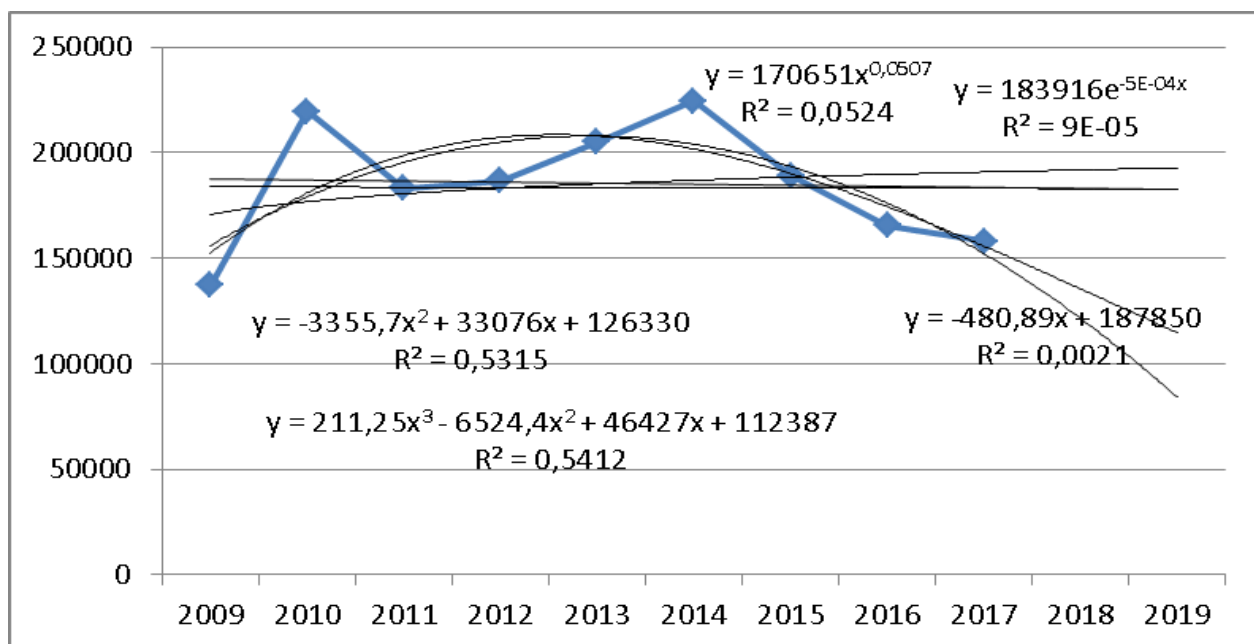


Fig 3. Trend models of foreign direct investment

*Calculated by a team of authors

As can be seen, the extrapolation did not show a good result, since none of the trending models has a coefficient of determination that approaches one. Even polynomial models, which usually qualitatively describe the dynamics of indicators, in the case of the foreign investment indicator, also proved to be unclear. Therefore, we can conclude that investments do not have a clear trend and that simple forecasting is impossible. Therefore, we construct models of influence of factors on investment processes, using regression analysis methods [1]. We have selected the factors that may have an impact on the foreign direct investment of the region and constructed one-factor regression models, which are presented in table 4.

Table 4. Results of modeling of influence of factors on investment processes

No	Factor	Regression coefficients	Correlation coefficient	Determination factor	Fisher's criterion
1	Number of registered unemployed at the end of the period (according to the State Employment Service), ths.	314719,5 -11879,2	0,84046	0,70637	2,405
2	Average monthly salary of one worker (nominal), UAH	66056,26 1,540251	0,96752	0,93608	14,64
3	Wage arrears – total, thousand UAH	158146 1,858553	0,28362	0,08043	0,087
4	The volume of industrial production, thousand UAH	154514,2 0,000591	0,07580	0,00574	0,005
5	The volume of construction products produced, thousand UAH	189751,7 -0,00144	0,74130	0,54951	1,219
6	Export of goods, millions USD USA	113171,6 123,0122	0,46885	0,21982	0,281
7	Imports of goods, millions USD USA	-44308,9 529,6023	0,98771	0,97558	39,95
8	Turnover, millions	534341,7 -232,455	0,97453	0,94971	18,88
9	Passenger turnover, millions km	366930,5 -189,582	0,98910	0,97832	45,12
10	Retail turnover, millions	-462822 30,64565	0,98587	0,97194	34,64

**Calculated by a team of authors*

Among the models built, three were found to be inadequate. That is, the influence of factors such as wage arrears in the region and the volume of sales of industrial products do not have any effect on the amount of foreign direct investment. This is understandable, because it is our internal problems and it does not attract investors. The value of exports of goods also showed a small correlation and determination coefficient (about 50% of change in the effective indicator (value of foreign investment) changes due to this factor (export of goods), and the other 50% are unaccounted for.

But the correctness of the selection of other factors affecting investment flows is confirmed by the adequacy and reliability of the models developed, as the relevant correlation and determination coefficients approach one, the Fisher criterion values are more critical.

3. Experimental Results

The regression model of the impact of imports of goods on foreign direct investment looks like this:

$$y = -44308,9 + 529,6023x_7 \quad (1)$$

The regression model of the impact of retail trade turnover on foreign direct investment looks like:

$$y = -462822 + 30,64565x_{10} \quad (2)$$

The regression model of the effect of foreign trade turnover on foreign direct investment looks like this:

$$Y = 534341,7 - 232,455x_8 \quad (3)$$

The regression model of the impact of passenger turnover on foreign direct investment is of the form:

$$Y = 366930,5 - 189,582x_9 \quad (4)$$

Modeling analysis showed that the growth of the productive indicator (foreign direct investment in the region) is influenced by the indicators characterizing the stability and growth of the economy. It should be noted that higher coefficients have indicators of imports of goods (1) and turnover of retail trade (2), the growth of which significantly increases the value of foreign investment.

But in models (3) and (4), the factor is negative with the factor. That is, an increase in these indicators may (under certain conditions) lead to a decrease in the FDI. It can be concluded that the transport sector of Khmel'nitsky region does not attract foreign investments in the region.

Therefore, within the region, investing can be aimed at achieving a number of important goals and objectives [10]. They can act as: obtaining the maximum possible income or profit of the investor,

increasing the economic and economic independence of the region, eliminating existing disparities in the development of regions, solving environmental and social problems, creating a reliable and stable financial base of the region.

4. Discussion and Conclusion Thus, we have constructed economic and mathematical models for determining the quantitative impact of factors on the volume of foreign direct investment in the Khmelnytsky region. A number of linear equations of dependence between the selected factors and the volume of direct foreign investments have been obtained, and the factors with the greatest influence have been selected. The results of economic and mathematical modeling make it possible to draw the following conclusions:

the increase in retail turnover of the region has a positive effect on the flow of FDI to the Khmelnytsky region;

wholesale and retail trade is the second largest foreign investment destination in the region;
an increase in imports of goods leads to an increase in FDI in the region;

The influence of freight turnover and passenger traffic on the dynamics of foreign investment was ambiguous. Generally, the models developed should be used by regional state authorities for forecasting and planning in the sphere of foreign economic activity, development of strategic plans, measures to improve the investment climate of Khmelnytsky region.

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