INTERNATIONAL ECONOMIC RELATIONS AND GOVERNANCE BY NATIONAL ECONOMY

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FACTORS OF INFLUENCE ON INNOVATIVE ACTIVITY IN UKRAINE AND ITS WESTERN REGIONS

The problem of the interdependence of the level of human development and the state of the innovation sphere acquires particular importance in the context of the transition to a knowledge economy, when intellectual capital, education, and the ability to apply knowledge effectively are the main competitive advantages.

The aim of the article is to determine the role of the factors of formation of the industry on the level of innovation activity in Ukraine and the regions of the Carpathian economic region.

In the course of the research, methods of abstraction, generalization, factorial research, deterministic modeling, and others were used.

The multiplication model is built. The result of which shows the influence of the factors: Innovative employee productivity, Employment prospects of students, The share of students in the country's population.

Results show that the innovative activity reduces.

The reasons which led to the worse situation of innovative activities in Ukraine and regions of Carpathian airs are the following. First is the VUCA, which are attached to the global middle:

1. Volatility – instability of the economic, political, and social situation in the country and regions.
2. Uncertainty – the lack of significance of the strategy for the development of the country,
3. Complexity – the complexity of mutual relations, and competition.
4. Ambiguity – the ambiguity of the prospects and possibilities.

Another group includes internal reasons: Lack of strategic vision of the country's development in spite of the presence of its declarations in regional and national strategies. The shortage of the support (financial, infrastructural) of innovative entrepreneurship. A high level of immigration leads to an outflow of youth and a decrease in the intellectual potential of the development of the country and its regions. The hard economic and social situation in Ukraine and its regions and this reduce the national and regional labor markets, worsens the demographic situation. The lack of trust can be used as an economic instrument. The scarcity of intensions on the development in the sphere of entrepreneurship.

Keywords: innovative activity, knowledge economy, education, employment, factor analysis.

Introduction. The competitive struggle between economic actors is significantly intensifying in the transition to the knowledge economy, which can be considered as a system of relations between participants, the main subject of which is intellectual capital, new knowledge, ideas and innovations. It is this new knowledge that gives a radical competitive advantage to an economic player who was able to acquire and use it.

The knowledge economy is characterized by a high level of innovation activity, which is both the goal and motivator of the knowledge economy. New knowledge provides the innovation process with ideas, the theoretical development and practical implementation of which leads to the emergence of new knowledge.

Both the knowledge economy and innovative development put forward special requirements for the human element of the economy and the level of its development.

The important component of human strategic factor of the economic development in new conditions is higher education.

Firstly, educational sphere is the main zone of knowledge education.

Secondly, knowledge is a background of innovation development.

And thirdly, as P.Drachuk declares that the need for knowledge transfer, personality socialization, its integration into society is ensured by the education system; as a social institution, it uses knowledge as a means of broadcasting social experience[1].

Under these circumstances, the human factor and its quality are of particular importance.

Review of publications. The problem of human development as a part of economic progress has found a place in the research of such scientists as N. Kubiniy, who considers the strategic potential is in interdependence with the human factor[2]. The issues of human development and higher education were raised by S. Sharova, who proves that "higher education provides certain professional knowledge, skills and abilities, and when students undergo industrial practice, the possibility of their application in practical fields of activity. Higher education contributes to the development of a common cultural capital, which lays the fundamental basis for further professional development. One of the areas of postgraduate education often becomes business education, which is focused on obtaining practical skills»[3]. I. Honcharenko, M. Dubinina, N. Kubiniy, O. Honcharenko touch on the role of the human factor and its level in the process of «the formation of a perfect evaluation system for the public authorities[4].

At the same time, the influence of educational factors on innovation activity, which is derived from science and education, is not presented in the research.

The aim of the article is to determine the role of the factors of formation of the industry on the level of innovation activity in Ukraine and the regions of the Carpathian economic region.

To achieve the goal, the following tasks were solved:

1. A group of factors is proposed that reflects the education, labor and economic influence on the innovative activity in modern conditions.

2. On the basis of a three-factor multiplicative model by the method of integrals, the influence of factors on the level of innovative activity in the indicated economic subjects of Trans Carpathian is determined.

3. On the basis of the study, to identify the reasons for a global nature, as well as the internal Ukrainian reasons for the deviation of indicators characterizing innovative activity, education and employment prospects of graduates of higher education.

In the course of the research, methods of abstraction, generalization, factorial research, deterministic modeling and others were used.

Results. In the process of transition to the knowledge economy, education becomes a driving force, an impetus for economic development, especially in the field of innovation. Modern studies show "that if earlier the degree of socio-economic development of regions was assessed in terms of the availability of material and natural resources (minerals, climate, etc.), then in an innovative economy, advanced technologies, intellectual capital, social and labor relations adapted to innovative development»[5]. An innovative economy requires an appropriate human potential, which reflects the ability and ability of people to solve problems of a certain level.

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[4] Honcharenko, I., Dubinina , M., Kubiniy, N., Honcharenko, O. (2021). Evaluation of the regional public authorities' activities. *Management Theory and Studies for Rural Business and Infrastructure Development*, *43 (1)*, 90-99.

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As Paul Hobcraft argues, "knowledge production and reproduction are key actions that stimulate activity and drive innovation. As we create, accumulate and disseminate knowledge, we become more involved outside our own walls. We need to constantly look for comparative advantages and achieve this goal, covering more and more open exchanges, because such types of exchange allow us to cover the flow of knowledge»[1].

The most important indicator of human development, efficiency of education and adaptability of a country or region to the knowledge economy is intellectual capital, the manifestation of which is innovation activity.

Data on the level of innovative activity and the state of the human factor in Ukraine and some of its regions are presented in Table 1.

Table 1

Main indicators of innovative activity, population, occupation and education in Ukraine and regions of the Carpathian economic region in 2015 and 2020

Region	Population, persons at the end of the year, thousand persons	The number of employees, thousand people	Number of university students (at the beginning of the academic year), thousand people	Volume of sold innovative products, thousand UAH	Volume of sold innovative products per 10,000 people, thousand UAH
2015					
Ukraine	42760,5	16443,2	1603,5	23050092,9	5390,5
Trans Carpathian region	1259,2	519,3	21,9	583169,7	4631,20
Ivano-Frankivsk region	1382,3	558,3	38,3	241973,4	1750,5
L'viv region	2534,2	1042,0	125,4	1193855,9	4711,0
Chernivtsi region	909,9	367,2	31,2	99981,9	1098,8
2020					
Ukraine	41588,4	15915,3	1141,9	47526197	8177,4
Trans Carpathian region	1250,1	492,7	20,2	89199	1107,0
Ivano-Frankivsk region	1250,1	548,8	32,2	238652	1037,2
L'viv region	2497,8	1038,9	95,4	1253064	3471,0
Chernivtsi region	896,6	411,3	22<3	66187	298,3

Resource [2]: p.403, 405[3]; p.27, 40, 200[4], p.78, p.27, p.63.[5] ; p. 616

The data in Table 1 allow us to conclude that the level of innovation activity in the regions of the Carpathian economic region is insufficient. The indicator of the volume of sold innovative products per 10 thousand populations in all oblasts is below the average level in Ukraine.

If we analyze higher education using the number of students per 10,000 populations, only L'viv region exceeds the average level in Ukraine, and this did not lead to improved innovation in the region.

It is expedient to analyze the factors related to higher education, economic factors and demographic situation that have influenced the level of innovation activity in Ukraine and its regions.

The following factors and results have been identified for this purpose.

The level of innovative development in this article is determined through the indicator of innovative productivity of the population (IPP), which is calculated by dividing the volume of sold innovative products (IP) by the number of population in a country or region (P):

$$IPP=IP/P$$

[1] Hobcraft, P. (2013). The Real Value of Knowledge Exchange. *Innovation management* <http://innovationmanagement.se/2013/01/17/the-real-value-of-knowledge-exchange/> (2021, May, 05).
[2] Статистичний збірник (2016). *Регіони України, 2*, 692.
[3] Статистичний збірник (2016). *Регіони України, 1*, 299.
[4] Ibid, 276.
[5] Статистичний збірник (2016). *Регіони України, 2*, 625.

The level of innovative development, which is determined using the indicator of innovative productivity of the population, is influenced by the following factors:

– Innovative Employee Productivity (IPL). The indicator is calculated as the fraction between the volume of sold innovative products (IP) and the number of employed (L):

$$IPL=IP/L$$

– Employment Prospects (or future labor market possibilities) of the people graduated the higher education (FL) as a ratio between the number of employed (L) and the number of students (S):

$$FL=L/S$$

The dynamics of the growth of this ratio shows that the labor market is growing faster than the number of students receiving higher education, and this indicates good prospects for employment. This indicator is also important for motivating students to obtain high-quality knowledge that will be useful in the knowledge economy and innovation activity;

– The share of students in the country's population (NR), calculated as a quotient of the number of students (S) divided by the population (P):

$$NR=S/P$$

This indicator reflects the educational load and its growth testifies to the successful transformation of the economy of a country or region into a knowledge economy.

Table 2

Factors of influence on the innovative activity in Trans Carpathian

Factors	2015	2020	+/-
IPL	1122,9919	181,0412	-941.9507
FL	23,7123	24,3911	0,6788
NR	0,0174	0,01616	-0.00124
IPP (result)	463,1271	71,3535	-391,7736

Resource: table 1.

Calculations show that an indicator characterizing the number of innovative products per employee, in other words, the innovative productivity of employed people significantly decreased in 2020 compared to 2015. The level fell from 1123 to 181, which is a marker of the low level of innovative orientation of the economy of the Trans Carpathian region.

Employment Prospects (or future labor market possibilities) of the people graduated the higher education shows little growth, which means increased employment opportunities for future university graduates. Unfortunately, national and regional statistics do not allow determining this indicator for the innovation sphere, which veils the analysis of employment opportunities in an innovational active business.

The third factor is the share of students in the country's population. This factor also has a downward trend, which is observed in the context of a decrease in the population of Ukraine and its regions. Consequently, the future, strategic potential of the innovative development of the economy is decreasing. A growing economy requires a wide range of specialists, especially in the field of innovation.

On the Figure 1 we can see the changing of the level of result indicator.

As can be seen from Figure 1, the level of innovative products per person decreased in 2020 compared to 2015 in the Trans Carpathian region by more than six times. This is a signal to start active actions to strengthen the innovative development of the region. The current situation has an extremely negative effect on the motivation of schoolchildren to receive an adequate education and direct their education towards mastering the professions necessary for the knowledge economy.

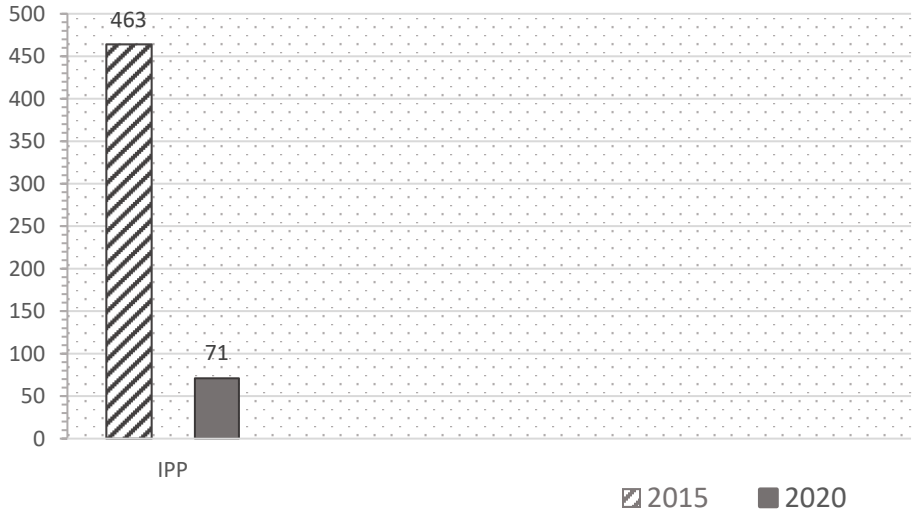

Figure 1. The innovative productivity of the population in Trans Carpathian area in 2015 and 2020 (resource: table 1)

We will use multiplicative model:

$$Y=F(xyz)$$

Integral method offers the following actions:

$$\Delta f(x) = ½\Delta x\ (y0*z1 + y1*z0) + ⅓\Delta x*\Delta y*\Delta z;$$

$$\Delta f(y) = ½\Delta y\ (x0*z1 + x1*z0) + ⅓\Delta x*\Delta y*\Delta z;$$

$$\Delta f(z) = ½\Delta z\ (x0*y1 + x1*y0) + ⅓\Delta x*\Delta y*\Delta z;$$

In our case the model: IPP=IPL*FL*NR

$$IPP_{IPL} = 1/2\ \Delta IPL(FL_0NR_1+FL_1NR_0) + 1/3\ \Delta IPL\Delta FL\Delta NR$$

$$IPP_{IPL} = (-941.9507079)\ (23.7123*0.01616+24.3911*0.0174)/2 + +(-941.9507079)\ *0.6788*(-0.00124)/3 = -380.093$$

$$IPP_{FL} = 1/2\ \Delta FL(IPL_0NR_1+IPL_1NR_0) + 1/3\ \Delta IPL\Delta FL\Delta NR$$

$$IPP_{FL} = 0.6788(1122.99191*0.01616+181.0412021*0.0174)/2 + + (-941.9507079)\ *0.6788*(-0.00124)/3 = 7.493$$

$$IPP_{NR} = 1/2\ \Delta NR(IPL_0FL_1+IPL_1FL_0) + 1/3\ \Delta IPL\Delta FL\Delta NR$$

$$IPP_{NR} = (-0.00124)\ (1122.99191*24.3911+181.0412021*23.7123)/2 + +(-941.9507079)\ *0.6788*(-0.00124)/3 = -19.38$$

So, the final total influence of factors $\Delta IPP = -392,0$.

We support the results by absolute difference method.

1. The influence of IPL:

$$\Delta IPP_{IPL} = \Delta IPL*FL_0*NR_0 = (-941.9507) *23,7123*0.0174 = -3886432.2921431.2$$

2. The influence of FL:

$$\Delta IPP_{FL} = IPL_1*\Delta FL*NR_0 = 181.0412021*243673768*0.0174 = 767600858.69384$$

3. The influence of NR:

$$\Delta IPP_{NR} = IPL_1*FL_1*\Delta NR = 181.0412021*243910891*(-0.0012413) = -54813227.227969$$

So, the final total influence of factors

$$\Delta IPP = -3886432.29 + 767600858.69 -54813227.23 = -391,7736.$$

The reasons for the lack of a high level of innovation in the development of the country and the western regions are divided into two groups.

First is the VUCA, which are attached to the global middle:

1. Volatility – instability of the economic, political and social situation in the country and regions.
2. Uncertainty – the lack of significance of the strategy for the development of the country,
3. Complexity – the complexity of the situation, mutual relations, and competition.
4. Ambiguity – the ambiguity of the prospects and possibilities.

As Paul Kan writes, the term VUCA was first used in 1987, and it was coined by the U.S Army War College in the immediate post-Cold War time. It was an attempt to understand what was happening in the world, and how to navigate the times post-war. VUCA has, according to a podcast by the Army War College, been used and overused to describe anything not simple on strategic level[1]. Now, these features take place in economic and social life.

The second group of reasons is the factors that arise within Ukraine and its regions. The main factors related to this group include the following:

1. Lack of strategic vision of the country's development in spite of the presence of its declarations in regional and national strategies. That is, the country adopts strategies that have no real justification and political will to implement them.
2. The shortage of support (financial and others) of innovative entrepreneurship.
3. High level of immigration which leads to an outflow of youth and a decrease in the intellectual potential of the development of the country and its regions.
4. Hard economic and social situation in Ukraine and its regions and this reduces the national and regional labor markets, worsens the demographic situation.
5. The lack of trust, which can be used as economic instrument[2].
6. The scarcity of intensions on the development in sphere of entrepreneurship[3].

Conclusion. Human development and the level of innovative activity are extremely important in terms of economy of knowledge, where intellectual capital concentrated in people and new ideas becomes the main competitive advantages.

A group of factors is proposed that reflects the education, labor and economic influence on the innovative activity in modern conditions.

[1] Kan, P. (2020). Is VUKA a useful term or it is all vuked up? *Warroom* <http://warroom.armywarcollege.edu/podcasts/is-vuca-useful/> (2021, May, 05).

[2] Алтман, Й., Кубиний, Н. (2016). Виды доверия и их оценка. *Науковий вісник Ужгородського університету. Серія Економіка*, *2*, 148-152.

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The study showed that in the regions of the Carpathian region, innovative activity does not find the proper development, as required by modern conditions of competition. The indicator of the volume of sold innovative products per thousand populations in the regions of western Ukraine is lower than the national average.

Three factors have been identified that have a large impact on the level of innovative activity in the context of the transition to the knowledge economy: Innovative employee productivity, Employment prospects (or future labor market possibilities), The share of students in the country's population. The conducted factor analysis on the example of the Trans Carpathian region showed that the innovative productivity of the employed has a significant negative impact on the level of innovative activity in the region.

The external and internal reasons for the deviant behavior of these factors in modern conditions have been determined.

In further studies, it is planned to outline the contours of strategic management of human development as the basis for the transition to the innovative rails of the knowledge economy.

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