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INFLUENCE EVALUATION OF THE EXTERNAL ENVIRONMENT FACTORS ON THE ECONOMIC SECURITY LEVEL OF INSTITUTIONS OF HIGHER EDUCATION IN UKRAINE

Annotation

The article deals with the multiple factor analysis of the macroeconomic environment factors influence on the level of economic security of the national IHE, namely on the number of entrants. The most significant are the following: the level of educational emigration and immigration; the level of real wages; GDP per person; birth rate and natural population growth with a lag of 17 years; the level of official unemployment and unemployment according to the methodology of the International Labor Organization, loading of unemployed population into one vacancy, vacant position; the absolute and relative levels of IHE state funding, etc. Based on the results of the analysis of the environment of functioning of the national IHE and factors affecting the level of economic security of institutions of higher education, an analytical model of the influence evaluation of the environmental factors on the economic security level of the IHE has been constructed

Keywords: IHE, environmental influence on economic security, model of environmental impact evaluation, IHE potential, IHE competitiveness.

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ОЦІНКА ВПЛИВУ ФАКТОРІВ ЗОВНІШНЬОГО СЕРЕДОВИЩА НА РІВЕНЬ ЕКОНОМІЧНОЇ БЕЗПЕКИ ЗАКЛАДІВ ВИЩОЇ ОСВІТИ УКРАЇНИ

Анотація

У статті проведено багатофакторний аналіз впливу макроекономічних чинників зовнішнього середовища на рівень економічної безпеки вітчизняних ЗВО, а саме на чисельність абітурієнтів. Найсуттєвішими визначені наступні: рівень освітньої еміграції та імміграції; рівень реальної заробітної плати; ВВП в розрахунку на одну особу; рівень народжуваності та природний приріст населення з лагом у 17 років; рівень офіційного безробіття та безробіття за методологією МОП, навантаження незайнятого населення на одне вільне робоче місце, вакантну посаду; абсолютного та відносного рівнів державного фінансування ЗВО та ін. За результатами аналізу середовища функціонування вітчизняних ЗВО та чинників, що впливають на рівень економічної безпеки закладів вищої освіти побудовано аналітичну модель оцінювання впливу чинників зовнішнього середовища на рівень економічної безпеки ЗВО

Ключові слова: ЗВО, вплив зовнішнього середовища на економічну безпеку, модель оцінки впливу зовнішнього середовища, потенціал ЗВО, конкурентоспроможність ЗВО.

1. Target setting

The primary task of managing the development of institutions of higher education (IHE) of Ukraine at the present stage is to analyze the factors influencing the development of IHE in order to identify and evaluate the risks and threats to its economic security. This task involves the first priority evaluation of environmental factors. An extremely urgent issue in these circumstances is the analysis of the relationship between environmental factors and the identification of threats that most significantly affect the economic security level of all domestic environmental protection in a changing external environment and global socio-economic changes, forecasting risks and threats to the economic security of the higher system. education in general and the individual IHE as part of this system.

It should be emphasized that the dynamics of the environmental development of modern IHE is very rapid and that allows to obtain information for analysis and management of its development.

2. The statement of basic research materials

Scientific studies on the systematization of threats and economic security criteria of the IHE are mainly devoted to the investigation of internal threats, the main ones of which are identified [1, 2, 3]: lack of a well-developed mechanism for financing the IHE; a high level of deterioration of fixed assets and, as a result, a low logistical security level of the IHE; insufficient level of investment in the development of IHE; low level of remuneration ofacademic staff; scientific, technical and technological level of development of Ukraine and, accordingly, educational programs of national IHEs, focused on meeting the needs of the national economy.

Studying the functioning environment of the national IHEs allowed to conclude that they carry out their educational and scientific activities in difficult conditions, characterized by: increased globalization processes, unsatisfactory dynamics of socio-economic development, demographic situation, as well as the pace and quality of reform of the higher education system of Ukraine itself, increasing the level of competition in the educational services market and the low (lower than average in the economy) level of remuneration in the educational sphere.

It should be noted that the factors of direct influence, among which are: changes in the targets and regulatory frameworks of regulation of the higher education system of Ukraine, increased competition between the IHEs, insufficient level of material incentives for academic staff, are factors that influence, above all, quality indicators of higher education system development. The impact of these factors should be assessed on the basis of an analysis of the quality of research and educational services provided by individual IHE.

At the same time, global, economic and socio-demographic factors indirectly influence the IHE activities, and the power and nature of their impact on all institutions of higher education is approximately the same. The resultant

indicator of the impact of macro-level factors is the number of entrants, which is directly dependent on the demographic situation in Ukraine. The level of socio-demographic development of the country, in its turn, is determined by the standard of living of the population, that is, depends on the state and tendencies of the economic system development.

In order to assess the strength and nature of the influence of macroeconomic factors of the environment on the level of economic security of national IHE, namely on the number of entrants (resulting trait), a multiple factor analysis has been conducted on indicators characterizing the dynamics of: (1) global factors (levels of educational emigration); (2) economic factors (real wage levels; GDP per capita); (3) socio-demographic factors (birth rate and natural population growth with a lag of 17 years); (4) labor market conditions (levels of official unemployment and unemployment according to the ILO methodology, loading of unemployed population into one vacancy, vacant position); (5) institutional (absolute and relative levels of state IHE financing, nominal indicators of changes in the legal regulation of the IHE activity). Thus, the results of the conducted analysis by significance level (p = 0,1) indicate that the number of entrants is influenced by factors: number of births (with a lag at 17 years) and the level of real salary (Table 1).

Table 1. Baseline data to build a model for the number of students admitted to IHE of III-IV accreditation level, from factors "number of births" and "level of real salary"

Years	Admitted students to IHE of III-IV accreditation level, ths. people	Number of births with a lag of 17 years, ths people	Real salary growth rate, chain, %	Real salary index compared to 2007,% *
2007	491,2	657,2	100	100
2008	425,2	630,8	106,3	106,6
2009	370,5	596,8	90,8	96,8
2010	392,0	557,5	110,2	106,7
2011	314,5	521,6	108,7	115,9
2012	341,3	492,9	114,4	132,6
2013	348,0	467,2	108,2	143,5
2014	291,6	442,6	93,5	134,2
2015	259,9	419,2	79,8	107,1
2016	253,2	389,2	109,0	116,7
2017	264,4	385,1	119,1	139,0
2018	256,8	376,5	112,5	156,4

* Calculated according to data [4].

According to the results of multiple factor analysis, the formula for the dependence of the number of students admitted to the IHE of III-IV accreditation level is determined from the factors (Table 1), namely:

$$Y = 0,86 \cdot N_{birth.} + 1,05 \cdot I_{sal} - 217,45 \qquad (1)$$

where   Y is the number of students admitted to the IHE of III-IV accreditation level, ths people;

N_{birth} is a number of births in Ukraine with a lag of 17 years, ths people;

I_{sal} is a real salary index compared to 2007,%.

The determined model explains 91.7% of the variation of the resultant trait, since the coefficient of determination is $R^2 = 0.917$ and the correlation coefficient (R) is 0.957, respectively.

It should be noted that increasing the accuracy of the model by setting the significance level (p = 0.05) led to the exclusion of the factor "real salary index" from the factor characteristics. That is, the model describing the dependence of the number of students admitted to the IHE of III-IV accreditation level from the number of births with a lag of 17 years is more accurate than the two-factor model (Fig. 1).
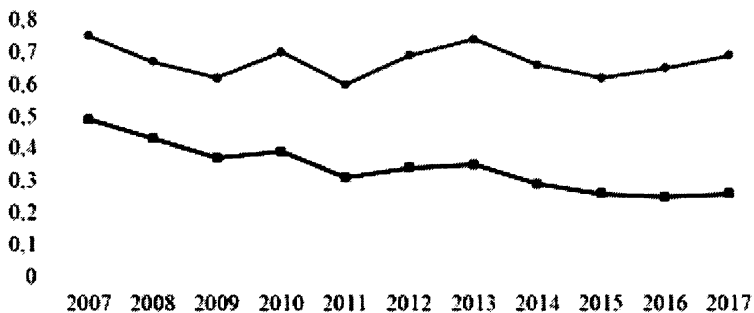

Fig. 1. Comparison of the number of students admitted to the IHE of III-IV accreditation level and their share in the total population of the relevant age group

According to the results of the regression analysis, the dependence between these signs can be described by any of the basic mathematical functions (linear, logarithmic, quadratic, cubic, power, etc.), since for each of them the presence of a dense direct connection between the number of births is revealed and the number of students admitted to the IHE of III-IV accreditation level. The high levels of correlation and determination coefficients for econometric models for all basic mathematical functions make it expedient to use the graphical method when selecting a particular function.

Therefore, in Fig. 1. the dynamics of absolute (number of students admitted to the IHE of III-IV accreditation level) and relative (share of students admitted to the IHE of III-IV accreditation level in the total population of this age group) have been given. The data shown in Fig. 1 illustrate the linear relationship between the dynamics of the absolute and relative levels of the productive trait. At the same time, since 2015, there has been a trend towards a more noticeable increase in the number of students admitted to the IHE of III-IV accreditation level in the total population of the relevant age group compared to the number of such students. This suggests that in the period 2015-2017, the number of students admitted to the IHE of III-IV accreditation level was influenced by factors, the effect of which led to a more marked increase in the relative level of the result attribute compared to its absolute level.

Thus, the most likely factors are: a change in public policy in the field of higher education and the beginning of reforming the higher education system in 2014, taking into account global factors and the process of European integration of Ukraine. Thus, at the end of 2018, the Ukrainian State Center for International Education reported a steady increase in the number of foreign students in Ukraine (63 310 people as of November 23, 2018) [5].

Therefore, in order to ensure the objectivity of the econometric model of the dependence of the number of students admitted to the IHE of III-IV accreditation level from the number of births with a lag at 17 years, it is necessary to choose a mathematical function that takes into account the tendency of a more noticeable increase in the proportion of such students, compared to the growth rate of the corresponding age group of the population of Ukraine. Such functions are, in particular, quadratic, cubic, logistic, exponential. A quadratic function has been chosen to construct the econometric model, taking into account the correlation and determination coefficients, as well as the level of the Fisher criterion. The constructed model of dependence of the number of students admitted to the IHE of III-IV accreditation level from the number of those born with a lag at 17 will be:

$$Y = 0,001 \cdot N_{birth.}^2 - 0,269 \cdot N_{birth} + 219,199 \qquad (2)$$

where Y is the number of students admitted to the IHE of III-IV accreditation level, thousand; $N_{birth.}$ is a number of births in Ukraine with a lag of 17 years, ths people.

According to the quadratic regression model, the correlation coefficient (r) is 0.895 and it indicates that there is a strong direct relationship between the factor and the effect traits. The statistical significance of the model (p <0.001) is very high. Thus, the use of a quadratic model to characterize the relationship between the studied variables is appropriate.

However, the analysis shows that a significant factor determining the number of students admitted to the IHE of III-IV accreditation level is the number of children born (with a lag of 17 years). The use of the proposed regression model makes it possible to predict with great accuracy the number of students admitted to the IHE of III-IV accreditation level. Fig. 2 shows the empirical data from 2007/2008 to 2018/2019 academic years and the predicted values of the admission rates of students to the IHE of III-IV accreditation level (for the 2019-2024 forecast period).

As the forecast data show in Fig. 2, starting in 2019/2020, there is a gradual increase in the number of students due to the increase in ишкер rates in Ukraine in 2002-2006, as well as due to the permanent increase in the number of foreign students. According to the study [5], the number of entrants to vocational education institutions of Ukraine will also tend to increase during 2020-2023.

At the same time, the aggravation of the financial, economic and socio-political situation in Ukraine has led to an increase in the outflow of entrants to European countries and, as a consequence, the lack of positive dynamics of the enrollment of students, or, even, its decline. The above points to the expediency of continuing the reform of the higher education system in order to increase the number of foreign students in Ukraine and reduce the academic migration of Ukrainian youth, which is the main source of formation and multiplication of human capital of the country. More complex, but strategically important, to ensure the development, maintenance of competitive positions and economic security of national IHEs and the higher education system and Ukraine as a whole is the task of socio-political stabilization and sustainable economic development of the country. This will help to overcome the demographic crisis and thus increase the number of students at the IHE of III-IV accreditation level, which is a direct influence on the level of economic security of all institutions of higher education.
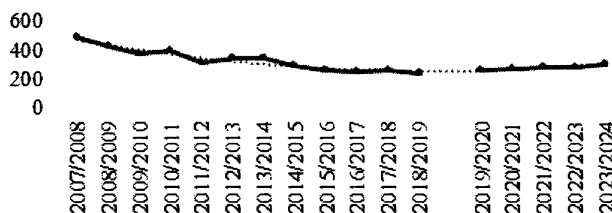

Fig. 2. Empirical and predictive number of students admitted to he IHE of III-IV accreditation leve, ths.
(calculated and constructed according to data [5])

The overarching goal of the "Higher Education Reform Strategy in Ukraine by 2020" is to "create an attractive and competitive national higher education system integrated into the European Higher Education Area and the European Research Area" [6]; however, the Ukrainian IHEs are not competitive enough in the European market for educational services. The main reason for the lack of competitiveness of Ukrainian universities compared to European universities is the desire of a large part of the population to get a job in the EU, which is caused by higher levels of socio-economic development, i.e. higher salaries and a higher standard of living. The issue of keeping Ukraine's youth from academic and labor migration to EU countries is increasing due to the fact that the demographic situation in Ukraine is not unique.

Trends in population aging, declining birth rates, negative population growth rates, and a corresponding decline in university student numbers are characteristic of the vast majority of EU countries, other developed countries, and the former USSR, as confirmed by studies presented in [7–8]. "... The population of European countries is, on average, older than residents of other parts of the world" [9]. This conclusion was the result of a sociological study conducted by the staff of Berlin Institute for Population and Development. According to the Correspondent.net electronic publication, this can lead to a lot of problems in the future, in particular: problems with payment of pensions and social assistance in the future due to insufficient tax base and social contributions, problems with finding highly qualified competent staff. The death rate in 28 EU Member States in 2015 exceeded the birth rate for the first time since World War II. At the same time, it is estimated that the population of EU countries will continue to increase from 510 to 529 million people by mid-century thanks to immigrants from other countries [70]. The confirmation of this prediction is that the current migration crisis and the associated influx of population have had a positive impact on the demographic situation in the European Union. At the same time, the European Union is demographically heterogeneous. In particular, the countries of Central, Western and Northern Europe will have relatively high birth and immigration rates in the coming years, and negative population growth will be observed in the countries of Southern and Eastern Europe.

At the same time, Ukrainian IHEs are attractive to foreign students from more than 150 countries, including: India (16.4%), Azerbaijan (11.3%), Morocco (8.8%), Turkmenistan (6, 7%), Nigeria (4.9%), Georgia (4.2%), Turkey (4.1%), Egypt (3.8%), Uzbekistan (3.5%), Jordan (3.2%)) and others (33,1), which is explained, first of all, by the low cost of studying and living in Ukraine [5]. Among the main advantages of higher education in Ukraine are: (1) accessibility to education — low cost of living in Ukraine and a significantly lower cost of study compared to the cost of study at universities in other European countries; (2) the international recognition of individual scientific achievements, the satisfactory quality of educational services and the effectiveness of teaching methods, a sufficient number of IHEs providing training to foreign students (239 IHE in 2017-2018); (3) equality in the territory of Ukraine of the rights and freedoms of foreign citizens and citizens of Ukraine.

In general, ensuring a sufficient contingent of students in national IHEs in the context of adverse demographic situations requires institutions of higher education to increase competitiveness in national and international markets for educational services in order to attract both Ukrainian and foreign entrants.

According to the results of the analysis of the environment of functioning of the national IHEs and factors affecting the level of economic security of of higher education, an analytical evaluation model of the environmental factors influence on the economic security level of the HIEs has been constructed (Fig. 3).
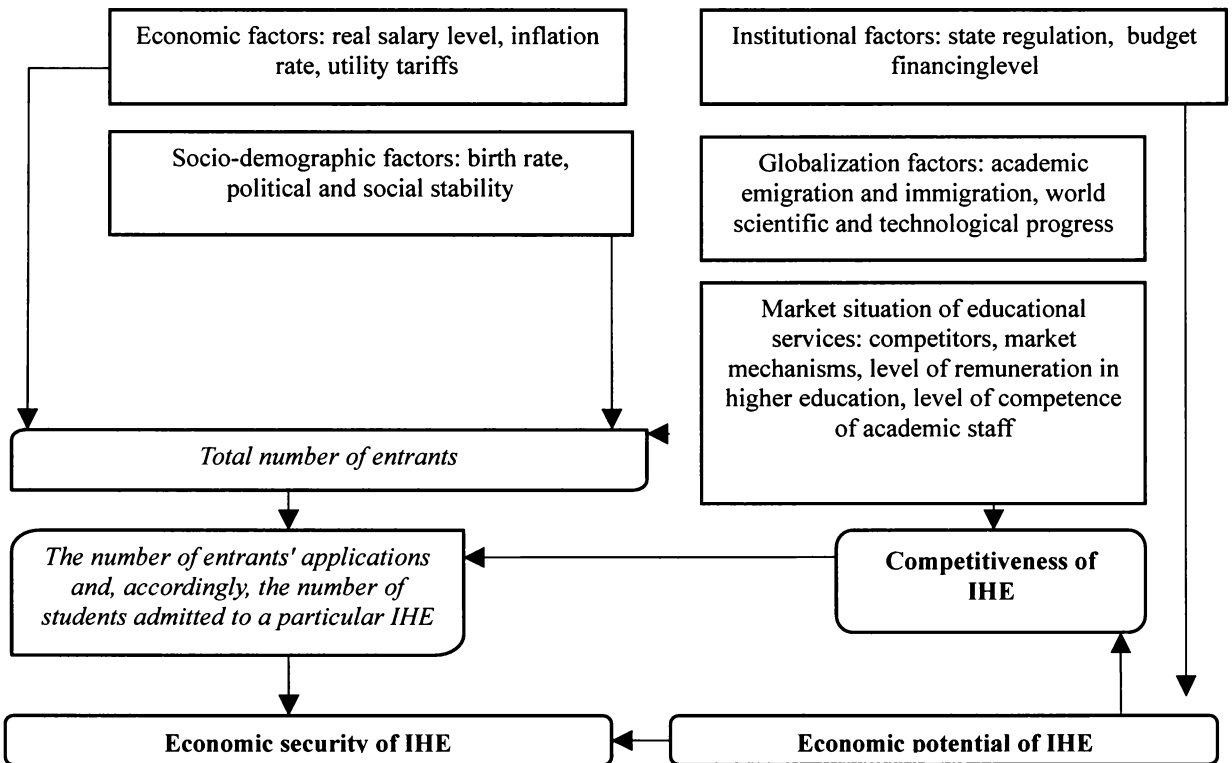

Fig. 3. Analytical evaluation model of the environmental factors influence on the economic security level

3. Conclusions

The proposed model illustrates that most environmental factors, with the exception of birth rates, have an indirect effect on the economic security of the IHE. It is the birth rate that is the most significant threat to the economic security of Ukrainian IHEs, since the decrease in the birth rate in Ukraine is a decrease in the number of entrants, which is presented in the form of a quadratic model, according to which 80.1% of the variation in the number of entrants is due to the variation in the birth rate with 17 years of lag.

It should be noted that the total number of university entrants in Ukraine is also influenced by the processes of academic migration, but the flows of immigrant and immigrant students have been balanced in recent years, that is, the number of Ukrainian students studying abroad is approximately equal to the number of foreign students and foreign students in Ukraine.

The regression analysis of macroeconomic indicators that characterize institutional and globalization factors, as well as indicators that characterize the market for education services in Ukraine, revealed no correlation between these indicators and indicators of economic security, competitiveness and economic potential of IHE. However, these factors have a direct impact on the IHE economic potential, with indicators of two main components (intellectual and human capital) being the number of publications and citations in publications indexed by the Scopus bibliographic database and the Hirsch index.

The application of the proposed analytical model of the factors influence on the economic security level will allow to identify priority directions of overcoming threats and using the opportunities of the environment. In addition, the results of the analysis, threats and opportunities, together with the results of evaluating the economic security level, will serve as a basis for selecting a strategy and developing a measures system to manage the IHE economic security .

References

[1] *Vakhovych I. M. Stan i problemy vyshchoi osvity v Ukraini* (The status and problems of higher education in Ukraine) / I. M. Vakhovych, L. I. Ishchuk, S. O. Pyrih // Aktualni problemy ekonomiky. – 2014. – № 1(151). – S. 63-69.

[2] *Snihyr L. P. Faktory zahroz ekonomichnii bezpetsi vyshchykh navchalnykh zakladiv* (Factors of threats to the economic security of institutions of higher education) / L. P. Snihyr // Ekonomika i suspilstvo. – 2917. – Vypusk № 9. – S. 647-653.

[3] *Yudina (Kalambet) S. V., Kyselova O. M., Halahanov V. O. Ekonomichni ta informatsiini aspekty rozvytku osvitnikh posluh v Ukraini* (Economic and informational aspects of the development of educational services in Ukraine)/ S. V. Yudina (Kalambet), O. M. Kyselova, V. O. Halahanov // Molodyi vcheny. – № 4 (44). – 2017. – S. 808-813.

[4] *Derzhavna sluzhba statystyky Ukrainy* (State Statistics Service of Ukraine.). Ofitsiinyi sait [Elektronnyi resurs] / Rezhym dostupu: http://ukrstat.gov.ua/

[5] *Ukrainskyi derzhavnyi tsentr mizhnarodnoi osvity* (Ukrainian State Center for International Education) [Elektronnyi resurs]. / Rezhym dostupu http://studyinukraine.gov.ua/uk/zavdyaki-zbilshennyu-chisla-inozemnix-studentiv-ukraina-posila-pershe-misce-v-napryamku-global-contributions-to-science-technology-svitovogo-rejtingu-the-good-country/. – Дата останнього доступу: 25.02.2019.

[6] *Stratehiia reformuvannia vyshchoi osvity Ukrainy 2020 (*Ukraine's Higher Education Reform Strategy 2020) [Elektronnyi resurs] / Ministerstvo osvity i nauky Ukrainy. – Ofitsiinyi sait. – Rezhym dostupu https://www.tempus.org.ua/uk/events/1217-strategija-reformuvanna-vishhoji-osviti-ukrajini-2020.html.

[7] *Zelikova Yu. A. Stareyushhaya Evropa: demografiya, politika, sotsiologiya* (Aging Europe: Demography, Politics, Sociology.). – SPb.: Norma, 2014. – 224 s.

[8] *Zonin N. A. Demograficheskie faktory` i ob`em ry`nka vy`sshego obrazovaniya* (na primere Kaliningradskoj oblasti) (Demographic factors and volume of the higher education market (on the example of the Kaliningrad region))/ N. A. Zonin, V. E. Lunin // Molodoj ucheny`j. — 2015. — #10.2. — S. 31-34. — Rezhim dostupa: https://moluch.ru/archive/90/19053/

[9] *Konieva T. A. Vplyv protsesu starinnia naselennia na ekonomiku Yaponii* (Influence of population aging process on the economy of Japan) / T. A. Konieva, A. V. Kuznietsov // Molodyi vcheny. – № 5 (45). – 2017. – S. 614-617.

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rozvytku v umovakh hlobalizatsii (Concept of sustainable development in the conditions of globalization) / A. M. Verhun, I. O. Tarasenko // Visnyk Kyivskoho natsionalnoho universytetu tekhnolohii ta dyzainu. - 2014. - # 2 (76). - C. 207-218., **3**. Tarasenko I. O. Vykorystannia systemnoho pidkhodu do upravlinnia finansovoiu bezpekoiu pidpryiemstva (System concept usage towards managing enterprise financial security) / I. O. Tarasenko, A. M. Verhun // Naukovyi visnyk: finansy, banky, investytsii. — 2014. — # 1 (26). — S. 6—10.

Tsymbalenko Natalia – Candidate of Economic Sciences, Associate Professor at the Department of Management, Kyiv National University of Technologies and Design. Nemirovich-Danchenko Street, Kyiv 01011, Ukraine, 01011, *e-mail:* natashats@ukr.net*. Where and when he(she) graduated:* Kyiv National University of Technologies and Design, 2007. **Professional orientation or specialization**: economic security and development of universities and higher education system. *The most relevant publication outputs:* **1.** Tsymbalenko N. V. Pidvyshchennia efektyvnosti diialnosti vyshchykh navchalnykh zakladiv yak peredumova zabezpechennia potreb rynku pratsi (Improving the efficiency of institutions of higher education as a prerequisite for meeting the needs of the labor market) / I. M. Gryshchenko, N. V. Tsymbalenko, T. M. Nefedova // Економіка праці та проблеми зайнятості. — 2015. — # 2 (43). — s. 32-35. **2.** Tsimbalenko N. V. Trends and problems in the development of higher education system in Ukraine / N. V. Tsimbalenko, O. S. Tarasenko // Scientific bulletin of Polissia. – 2016. – # 4 (8), P. 1. – p. 91-98. **3.** Tsymbalenko N. V. Strategic prioritities of higher education development in Ukraine / I. O. Tarasenko, N. V. Tsymbalenko, O. S. Tarasenko // Scientific bulletin of Polissia. – 2018. – # 1 (13), P. 1. – p. 42-46. **4.** Tsymbalenko N. V. Competitiveness management of Ukrainian higher educational institutions / N.V. Tsymbalenko // Scientific bulletin of Polissia. – 2018. – # 2 (14), P. 1. – p. 124-128. **5.** Tsymbalenko N. V. The impact of demographic processes on forming student body in Ukraine / N. V. Tsymbalenko, I. O. Tarasenko, T. E. Bielialov // Revista ESPACIOS. – 2019. – # 40 (12). – p. 8. Available at: http://www.revistaespacios.com/a19v40n12/19401208.html

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