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## Development of the higher education market in the EU countries as a factor of human capital accumulation: experience for Ukraine

**Abstract.** The scientific and methodological approach to the analysis of the peculiarities of the higher education market functioning in the EU countries in the system of human capital formation is represented. The purpose is to identify the chief factors influencing the development of the higher education market in the EU countries from the standpoint of human capital accumulation, to form scientific and practical approaches to improve its functioning in the economy of Ukraine. The author has proposed: to carry out a comparative analysis of the dynamics of higher education market in the EU countries (2013-2019) and in Ukraine, to evaluate the indicators of variation of this market in general and by educational and vocational levels; to determine the system of correlations between the capacity of the higher education market in the EU countries and the set of economic and socio-demographic indicators of development by means of multiple regression analysis.

Taking into account the human capital accumulation, it is established that the market of higher education in the EU countries is characterized by a number of structural features: focus on education in public higher education institutions with a slight trend to reduce the share of students enrolled in them in 2013-2019; differentiation by educational and vocational levels of higher education, public and private higher education institutions; sensitivity to the economic situation and the state of budget financing, demographic processes, the amount of household income, prospects for employment and career growth. In view of the EU countries experience, it is important for Ukraine to pay attention to improving the functioning of the market segment of higher education services, which includes public higher education institutions and create a favourable environment for private education institutions activities, public policy measures aimed at macroeconomic stability, development of the labour market and improvement of the financial situation of households.

**Keywords:** Higher Education Market; Socio-Economic Development; Vocational Skills; Human Capital; Econometric Modelling

**JEL Classification:** C50; I20; J24; L10; O15

**Contribution:** The author contributed personally to this work.

**Data Availability Statement:** The dataset applied is publicly available and provided by Eurostat.

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**Розвиток ринку послуг вищої освіти в країнах ЄС****як чинника нагромадження людського капіталу: досвід для України**

**Анотація.** У статті представлено науково-методологічний підхід до аналізу особливостей функціонування ринку послуг вищої освіти в країнах ЄС у системі формування людського капіталу. Автором запропоновано: здійснити порівняльний аналіз динаміки розвитку ринку послуг вищої

освіти в країнах ЄС (2013–2019 рр.) і в Україні, оцінити показники варіації цього ринку загалом та за освітньо-кваліфікаційними рівнями; визначити систему взаємозв'язків між місткістю ринку послуг вищої освіти в країнах ЄС та сукупністю економічних і соціально-демографічних індикаторів розвитку на підставі багатофакторного регресивно-кореляційного аналізу. З позиції нагромадження людського капіталу встановлено, що ринок послуг вищої освіти у країнах ЄС відзначається низкою структурних особливостей: орієнтованістю на навчання у державних вищих навчальних закладах із незначним трендом до скорочення частки студентів, які в них навчалися, у 2013-2019 рр.; диференціацією за освітньо-кваліфікаційними рівнями здобуття вищої освіти, державними й приватними вищими освітніми закладами; чутливістю до економічної ситуації та стану бюджетного фінансування, демографічних процесів, величини доходів домогосподарств, перспектив працевлаштування та кар'єрного зростання. З огляду на досвід країн ЄС визначено, що в Україні важливо звернути увагу на вдосконалення функціонування того сегменту ринку послуг вищої освіти, на якому представлено державні вищі навчальні заклади, і створити сприятливе середовище для активізації діяльності приватних ВНЗ, формування заходів державної політики, націлених на забезпечення макроекономічної стабільності, розвиток ринку праці та поліпшення матеріального становища домогосподарств.

**Ключові слова:** ринок послуг вищої освіти; соціально-економічний розвиток; освітні компетенції; людський капітал; економетричне моделювання.

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#### **Развитие рынка услуг высшего образования в странах ЕС**

#### **как фактора накопления человеческого капитала: опыт для Украины**

**Аннотация.** В статье представлен научно-методологический подход к анализу особенностей функционирования рынка услуг высшего образования в странах ЕС в системе формирования человеческого капитала. Автором предложено: осуществить сравнительный анализ динамики развития рынка услуг высшего образования в странах ЕС (2013–2019 гг.) и в Украине, оценить показатели вариации этого рынка в целом и по образовательно-квалификационным уровням; определить систему взаимосвязей между ёмкостью рынка услуг высшего образования в странах ЕС и совокупностью экономических и социально-демографических показателей с использованием регрессивно-корреляционного анализа. С позиции накопления человеческого капитала установлено, что рынок услуг высшего образования в странах ЕС характеризуется следующими структурными особенностями: ориентированностью на обучение в государственных высших учебных заведениях с незначительным трендом к сокращению доли студентов, которые в них учатся, в 2013-2019 гг.; дифференциацией по образовательно-квалификационным уровням получения высшего образования, государственными и частными высшими образовательными учреждениями; чувствительностью к экономической ситуации и состоянию бюджетного финансирования, демографических процессов, величины доходов домохозяйств, перспектив трудоустройства и карьерного роста. Учитывая опыт стран, ЕС определено, что в Украине важно обратить внимание на совершенствование функционирования того сегмента рынка услуг высшего образования, на котором представлены государственные высшие учебные заведения, и создать благоприятную среду для активизации деятельности частных ВУЗов; формирование мер государственной политики, направленных на обеспечение макроэкономической стабильности, развитие рынка труда и улучшения материального положения домохозяйств.

**Ключевые слова:** рынок услуг высшего образования; социально-экономическое развитие; образовательные компетенции; человеческий капитал; эконометрическое моделирование.

## **1. Introduction**

Educational activity is one of the important components of ensuring the country's competitiveness, implementing an innovative model of national economic development and improving human capital (HC). Ukraine has launched reforms in the field of higher education, focused on the formation of vocational skills of students that meet the needs of the labour market, and integration into the European educational space. It is necessary to evaluate the main trends in the development of the higher education market (HEM) in the EU countries in the context of the accumulation of HC to determine the prospects for its functioning in the economy of Ukraine.

## **2. Brief Literature Review**

Outlining scientific approaches to the study of peculiarities and main regularities of development of the HEM in the national economy and the economy of EU countries is debatable. At the theoretical and methodological level, F. Kindermann (2012) has structured the risks of

investment in HC due to the transition from the state to private financing of higher education institutions (HEIs). A comparative analysis of trends and problems of HC development in Central and Eastern Europe, taking into account the duration of training and acquisition of vocational skills was conducted by O. Tkachenko and A. Ardichvili (2013). Analyzing the expenditures on higher education in the United States and other OSCE countries, E. N. Wolff, W. J. Baumol and A. N. Saini (2014) have found out that their growth affects the social and economic development of countries and leads to increased financial pressure on the purchasing power of households. From the standpoint of competition for highly qualified human resources between HEIs in the EU countries B. Lepori, M. Seeber and A. Bonaccorsi (2015) have estimated the strategies of hiring workers, the level of mobility of scientists and the impact of public policy measures on this process. N. Azmuk (2015) has determined the chief factors of development and interaction for the labour market and higher education market under the influence of information and computer technologies. The main peculiarities of the HEM in the context of the theory of merit goods and tendencies of its functioning in the Ukrainian economy has been identified by N. Savvytska, N. Ushakova and I. Pominova (2016).

Based on the analysis of European standards implementation process in the system of higher education in Central and Eastern Europe, D. Dakowska (2017) has clarified their impact on the formation of competitive HEIs. In the context of creating a fictitious HC, O. Grishnova and O. Brintseva (2018) have specified the factors that ensure the competitiveness of higher education in Ukraine and the main reasons that worsen it. Through the evaluation of quality and the formation of individual learning trajectory Ba K. Do and H. Q. Duong (2018) have identified the features of achieving market equilibrium in the market of private higher education services in terms of information asymmetry. O. Voropai, K. Pichyk and N. Chala (2019) have substantiated the expediency of using the value co-creation strategy to increase the competitiveness of higher education in the economy of Ukraine. Based on the regression analysis, E. Pelinescu, C. Pauna, C. Saman and T. Diaconescu (2019) have found out the importance of supporting the development of education as one of the factors of HC accumulation for economic growth and promotion of innovation in the EU countries. Through the comparison of higher education system functioning models of Eastern and Western samples O. Marchenko and N. Sydorenko (2019) have specified the main directions of social and economic transformation of the HEM in the world. N. V. Long (2019) has determined the main approaches to improving the model of financing higher education in the system of HC formation in a market economy.

Based on the analysis of the functioning of 15,000 HEIs in 78 countries, A. Valero and J. Reenen (2019) have revealed the presence of positive externalities from the growth of their number, which lead to improvement of HC offer, intensification of innovation and democracy development. The main preconditions of the transition to the knowledge economy and the problems of functioning of higher education institutions in Ukraine are determined by H. Zelinska, U. Andrusiv and L. Simkiv (2020). From the standpoint of improving the effectiveness of educational policy measures R. Hippe (2020) has analysed the factors of HC formation in European regions over the last 200 years and has identified the existence of a negative effect in this sphere due to increasing competition in higher education. S. Stephens (2020) has proved the existence of positive externalities between the formation of academic knowledge and professional skills of students enrolled in HEIs and their use in business. C. L. Mamuli (2020) has defined the main factors influencing the services of HEIs and government measures on the development of HC in the national economy. A comparative analysis of the effectiveness of the use of Internet marketing tools by HEIs in member states and non-EU countries was carried out by A. Kisiółek, O. Karyy and L. Halkiv (2021). The reasons for the inefficiency of the current model of financing higher education in 2005-2020 are determined and the main directions for its reforming are specified by M. Bilinets, A. Buriachenko, T. Paientko (2021). Quantitative evaluation of the effectiveness of HC formation in the digital transformation of Ukraine's economy was carried out by V. Rodchenko, G. Rekun, L. Fedoryshyna, I. Roshchin and S. Gazarian (2021).

### 3. Purpose

The purpose of the research is to identify the chief factors influencing the development of the HEM in the EU countries from the standpoint of HC accumulation, to form scientific and practical approaches to improve its functioning in the economy of Ukraine. To achieve this goal, it is necessary to proceed from the following basic assumptions and means of proving them:

- on the differentiation of the HEM structure in the EU countries for the accumulation of HC. This involves conducting a comparative analysis of the dynamics of its development by educational and qualification levels of higher education in the EU (2013-2019) and in Ukraine and estimating the indicators of variation of this market for EU countries;
- on the existence of correlations between the capacity of the HEM in the EU countries and a set of economic and socio-demographic indicators of development. Their definition is based on the methodology of multiple econometric modelling.

This will make it possible to formulate recommendations for improving the functioning of the HEM in the accumulation system of the HC of Ukraine.

#### 4. Methodology

This involves the use of induction and deduction, analysis and synthesis, comparison, historical and logical methods to determine the main regularities of development of the HEM in the EU countries; statistical evaluation during the determination of variation peculiarities of the major market functioning indicators; multiple econometric analysis to characterize the essential factors influencing the development of the HEM in these countries.

#### 5. Results

The HEM in the EU countries is mainly state-oriented (Table 1), with the exception of countries such as Belgium, Estonia, Cyprus, Latvia and Liechtenstein. This is due to the historical peculiarities of the formation of the HEM in each EU country, the state's financial capacity to provide the activity of HEIs, the existing institutional and organizational conditions for higher education services to the private sector, the nature of interaction with potential employers and the labour market state. In Ukraine, a state-centric model of the HEM functioning has also been formed, because

Table 1:  
The structure of the higher education market in the EU countries, % of students enrolled in tertiary education\*

Country	2013						2015						2017						2019					
	PHEIs			PrHEIs			PHEIs			PrHEIs			PHEIs			PrHEIs			PHEIs			PrHEIs		
	Total	BEL	MEL	Total	BEL	MEL	Total	BEL	MEL	Total	BEL	MEL	Total	BEL	MEL	Total	BEL	MEL	Total	BEL	MEL	Total	BEL	MEL
European Union - 27 countries (from 2020)	82.5	52.1	25.9	17.5	10.6	4.8	83.4	50.6	24.6	16.6	10.2	4.4	82.6	49.9	24.4	17.4	10.5	4.7	80.4	51.1	25.1	19.6	12.1	5.7
Belgium	42.4	31.9	6.9	57.6	42.6	10.6	43.4	31.9	7.7	56.6	40.6	11.7	38.1	28.5	6.4	61.9	44.5	13.0	42.4	31.1	7.8	57.6	41.5	12.2
Bulgaria	82.4	55.4	25.2	17.6	13.5	4.0	84.7	55.4	27.0	15.3	11.6	3.7	86.4	56.4	27.4	13.6	9.9	3.6	87.5	56.1	28.7	12.5	9.1	3.2
Czech Republic	86.7	52.5	28.1	13.3	10.1	3.1	88.1	51.0	30.7	11.9	8.9	3.0	89.3	50.2	32.2	10.7	8.2	2.4	89.2	50.5	31.8	10.8	8.4	2.3
Denmark	97.9	60.9	23.2	2.1	1.7	0.0	97.7	60.4	23.5	2.3	1.7	0.0	99.0	62.0	22.8	1.0	0.7	0.0	99.6	63.0	22.5	0.4	0.1	0.0
Germany	92.1	51.9	32.6	7.9	7.0	0.9	91.1	52.5	32.0	8.9	7.7	1.2	90.0	51.7	31.9	10.0	8.5	1.5	85.2	48.3	30.7	14.8	12.8	1.7
Estonia	16.2	15.9	0.3	83.8	53.2	26.0	16.1	14.3	0.2	83.9	51.4	28.8	90.3	55.2	29.8	9.7	8.1	1.4	92.4	55.8	31.5	7.6	6.3	1.2
Ireland	98.4	59.6	13.8	1.6	1.1	0.4	95.0	71.6	12.1	5.0	3.5	1.2	96.4	71.5	12.5	3.6	2.7	0.9	97.0	70.6	13.8	3.0	1.4	1.3
Greece	100	89.2	7.3	...	...	...	100	87.5	7.7	...	...	...	100	86.3	9.8	...	...	...	100	85.5	10.6	...	...	...
Spain	83.7	46.4	22.2	16.3	8.7	3.9	82.2	51.5	14.2	17.8	9.8	3.9	79.5	49.8	11.8	20.5	10.5	4.8	77.5	47.5	11.2	22.5	11.0	5.4
France	79.2	34.2	27.7	20.8	5.6	7.9	79.5	34.9	28.0	20.5	6.0	7.9	78.9	35.3	27.7	21.1	5.9	8.8	75.8	34.3	25.9	24.2	6.1	11.2
Croatia	93.2	56.9	34.2	6.8	5.6	1.2	92.9	56.5	34.4	7.1	5.7	1.4	91.8	53.5	36.2	8.2	6.4	1.7	91.1	51.4	37.5	8.9	7.0	1.9
Italy	90.9	53.3	35.9	9.1	5.9	3.0	89.7	52.4	35.5	10.3	6.5	3.4	87.9	52.3	34.1	12.1	7.7	3.7	84.8	50.4	33.0	15.2	9.7	4.5
Cyprus	39.7	23.7	13.2	60.3	38.9	11.5	38.7	22.6	13.1	61.3	31.2	21.7	32.2	18.5	11.1	67.8	29.3	28.1	26.8	16.1	7.2	73.2	31.3	33.0
Latvia	7.5	...	...	92.5	67.0	12.0	7.8	...	...	92.2	59.0	19.7	7.9	...	...	92.1	58.3	21.4	...	...	...	91.9	56.4	22.7
Lithuania	89.3	68.3	19.4	10.7	9.7	0.9	90.3	68.1	20.3	9.7	8.7	0.9	91.4	68.1	21.2	8.6	7.9	0.7	90.5	65.2	22.9	9.5	8.4	1.1
Luxembourg	...	...	...	...	...	...	100	46.9	36.4	0.0	0.0	0.0	96.0	41.9	34.2	4.0	3.4	0.7	100	41.4	35.5	...	...	...
Hungary	82.8	57.3	19.0	17.2	8.9	2.4	86.9	60.7	21.1	13.1	9.1	3.0	86.8	56.3	24.1	13.2	9.0	3.4	86.6	55.5	25.2	13.4	9.3	3.4
Malta	99.2	54.2	24.7	0.8	0.7	0.1	97.5	52.0	25.7	2.5	1.2	1.1	93.8	56.0	25.8	6.2	1.9	3.5	86.5	51.9	25.3	13.5	2.9	6.0
Netherlands	...	...	...	...	...	...	84.8	69.7	12.6	15.2	7.1	6.7	83.1	67.5	13.0	16.9	7.8	7.2	...	...	...	...	...	...
Austria	84.2	33.8	29.4	15.8	8.8	3.7	82.9	33.6	28.7	17.1	9.5	4.3	81.5	35.1	26.8	18.5	10.5	4.7	79.3	35.2	25.5	20.7	11.4	5.8
Poland	72.0	46.7	22.7	28.0	19.8	8.0	74.6	48.4	23.6	25.4	17.9	7.3	74.7	48.2	24.0	25.3	18.1	7.0	71.2	45.9	22.8	28.8	20.6	7.9
Portugal	81.6	49.1	27.5	18.4	13.0	5.0	83.6	48.8	29.3	16.4	11.6	4.5	83.5	46.4	29.2	16.5	11.4	4.2	82.0	44.4	29.1	18.0	12.2	4.5
Romania	65.1	51.2	10.6	34.9	15.1	19.7	85.7	54.2	28.0	14.3	11.2	3.1	87.4	55.9	27.9	12.6	9.5	3.0	87.7	55.3	28.6	12.3	9.4	2.9
Slovenia	85.7	47.6	24.4	14.3	8.5	2.1	86.9	49.7	24.5	13.1	7.4	1.8	85.0	47.2	25.3	15.0	8.3	2.2	84.0	45.7	25.2	16.0	8.7	2.5
Slovakia	82.4	46.6	29.8	17.6	11.0	6.0	84.0	46.8	31.6	16.0	8.8	6.4	86.7	47.6	33.4	13.3	7.1	5.4	87.1	48.3	33.1	12.9	6.5	5.5
Finland	72.2	47.7	17.8	27.8	26.2	1.6	60.4	35.6	18.3	39.6	37.0	2.6	52.7	27.9	18.5	47.3	43.5	3.7	52.5	26.6	19.7	47.5	43.0	4.5
Sweden	91.1	54.9	28.7	8.9	3.1	2.5	90.8	54.5	29.0	9.2	3.0	2.6	90.4	53.4	30.4	9.6	3.1	2.6	89.5	53.1	29.8	10.5	3.2	2.5
Iceland	81.3	58.6	19.2	18.7	13.5	3.8	...	...	...	...	...	...	...	54.5	19.1	...	15.3	5.2	78.8	53.4	19.8	21.2	14.8	5.4
Liechtenstein	0.0	0.0	0.0	100	62.5	27.7	0.0	0.0	0.0	100	52.4	32.4	0.0	0.0	0.0	100	47.7	36.2	0.0	0.0	0.0	100	50.3	31.4
Norway	83.5	57.5	20.9	16.5	13.7	1.2	85.2	58.5	21.6	14.8	11.9	1.5	84.7	57.8	22.0	15.3	12.8	1.5	84.4	54.6	24.6	15.6	12.7	1.8
Switzerland	83.3	54.3	20.5	16.7	12.3	1.0	83.3	53.8	21.2	16.7	12.6	0.9	85.1	54.8	21.9	14.9	12.8	0.8	83.6	53.4	22.0	16.4	14.0	1.1

Notes: \* - tertiary education (levels 5-8); PHEIs - public higher education institutions; PrHEIs - private higher education institutions; BEL - Bachelor's or equivalent level; MEL - Master's or equivalent level.

Source: Calculated by the author based on data by Eurostat (2021)

in 2019-2020 the share of graduates of public universities was 86-90% of their total number. In terms of the possibilities of adapting the functioning of the Ukrainian HEM to EU standards, we note the similarity of the models, which will accelerate its integration into the European educational space. In the long run, we should expect increased competition at the HEM of Ukraine due to activated mobility of applicants caused by reduced barriers to acquiring vocational skills in EU countries, growing supply of such services in connection with European integration and unification of standards, worsening demographic crisis in our country and EU countries. This will have ambiguous consequences for the accumulation of HC in the economy of Ukraine, as it will not only improve its quality, but also accelerate the «brain drain».

It should be noted that the structure of the HEM is differentiated by the levels of higher education in the EU countries (Table 1). The general trend is that in 2013-2019, about 70% of its share was accounted for by students obtaining a bachelor's degree or equivalent degree (BDED), and almost 30% were students pursuing a master's degree or equivalent degree (MDED). It follows that on average in the EU countries every second student seeks to improve personal vocational skills and develop competitive advantage through training in master's educational programs, bachelor's degree forms sufficient professional competencies to build a successful career according to the chosen field of activity and provide the desired material well-being.

In Ukraine, in 2019-2020, 45.5-51.9% were students admitted to BDED, 31.8% - to MDED. Structurally, the Ukrainian HEM is inferior to the one developed in the EU countries, the peculiarity is that there is a smaller share of people studying at the bachelor's level, a larger share of students obtains a master's degree. In Ukraine, this is due to better employment opportunities for graduate students and career advancement, because the master's degree is subjectively perceived as the final stage of higher education. In the long run, the situation at the Ukrainian HEM will change and adapt to the approaches that have emerged in the relevant market in the EU. This will be facilitated by modifying the qualifications of workers in accordance with EU standards, intensifying the exchange of information about the situation in the labour market in Ukraine and EU countries, empowering people with a bachelor's degree to form a personal career path and provide the desired level of material well-being. In this way, the processes of accumulation of HC in Ukraine are consistent with the trends that exist in the EU countries.

The structure of the HEM in the EU countries by forms of ownership is quite heterogeneous (Table 1). In 2013-2019, in some EU countries we record the share of students studying in public HEIs at BDED at 60-90% (Greece, Denmark, Ireland, Lithuania, the Netherlands), in other countries - 45-59% (Bulgaria, the Czech Republic, Germany, Spain, Croatia, Italy, Hungary, Malta, Poland, Portugal, Romania, Slovakia, Slovenia, Finland, Sweden, Iceland and Norway), in a number of countries - at the level of 0-44% (Belgium, Estonia, France, Cyprus, Austria, Liechtenstein). Similar structuring exists for students studying at HEIs on MDED, the differences are in the grouping by EU countries. In 2013-2019, we can single out the group of countries with the largest share of master's students in public HEIs (25-35%) - Bulgaria, the Czech Republic, Germany, France, Croatia, Italy, Austria, Luxembourg, Portugal, Slovakia, the average share (19-24%) - Denmark, Spain, Lithuania, Hungary, Malta, Poland, Slovenia, Iceland, Norway, Switzerland), low share (up to 18%) - Belgium, Estonia, Ireland, Greece, Cyprus, Romania, Finland, Liechtenstein.

A mirror image of these trends is the grouping of countries by the share of students of bachelor's, master's and equivalent levels who study in private HEIs. Such differentiation of the HEM by educational and qualification levels and forms of ownership is connected with the existing priorities of the state educational policy, with measures to provide equal opportunities in acquiring vocational skills in higher education for different socio-demographic groups, functioning of a developed network of private HEIs. In Ukraine, the structure of the HEM is such that in 2019 only about 10% of students studied in private HEIs, public HEIs practice the provision of educational services on a paid basis. In 2019-2020, about 37% of students studied at Ukrainian public HEIs at the bachelor's and master's levels at the expense of the state budget, 63% - on a contract basis (Higher education of Ukraine, 2021). This indicates that the transformation of the Ukrainian HEM in terms of ownership is quite slow. This was caused by the expansion of educational services provided by public HEIs on the basis of contracts with higher education seekers, the complexity of the procedure for obtaining a license to provide services in higher education, low mobility of the teaching staff and long payback periods in this sector. In view of the integration of Ukraine's HEM into the EU educational space, this means focusing on those groups of

countries in which the state will continue to influence significantly the supply of such services and the accumulation of HC.

Structural features of the HEM in the EU countries we will assess with the help of indicators of variation (Table 2). In 2013-2019, the largest value of the slope of variation was recorded for public and private HEIs in general, public HEIs where students study at BDED, the least - for public and private HEIs where students study at MDED. This indicates the existence of a significant amplitude of fluctuations between countries in the structure of higher education services. It is relatively homogeneous in the EU countries for the HEIs where students study at MDED. The dynamics of the sample variance shows that the deviation of the values of the share of students studying in public and private HEIs in general, at the bachelor's, master's or equivalent levels, in 2013-2019 gradually decreased.

There was a steady trend that the magnitude of the deviation of values was highest for public and private HEIs in general, and lowest for MDED. In 2013-2019, the dynamics of the coefficient of variation of the share of students studying in public HEIs in the EU countries showed the strengthening of homogeneity of this segment of the HEM and high heterogeneity for the segment of higher education services provided by private HEIs. As structurally this market in Ukraine is focused on the dominance of higher education services provided by public HEIs, integration into the European educational space and adaptation of the educational process to educational standards

Table 2:  
Indicators of variation of the higher education market structure in the EU countries,  
% of students enrolled in tertiary education\*

Year	Type of higher institutions	Indicator	Scope of variation	Sample variance	Coefficient of variation
2013	PHEIs	Total	100	732.33	0.363
		BEL	89.2	281.79	0.346
		MEL	35.9	89.80	0.453
	PrHEIs	Total	99.2	734.74	1.031
		BEL	66.3	334.08	1.049
		MEL	27.7	54.65	1.216
2014	PHEIs	Total	100	719.28	0.352
		BEL	88.4	284.70	0.343
		MEL	35.9	92.91	0.436
	PrHEIs	Total	98.8	727.82	1.061
		BEL	63.6	293.51	1.027
		MEL	29.3	55.82	1.264
2015	PHEIs	Total	100	733.60	0.356
		BEL	87.5	306.57	0.357
		MEL	36.4	99.759	0.454
	PrHEIs	Total	100	738.74	1.101
		BEL	59	271.46	1.055
		MEL	32.4	71.72	1.315
2016	PHEIs	Total	100	731.94	0.357
		BEL	87.2	268.19	0.325
		MEL	36.4	82.73	0.396
	PrHEIs	Total	98.3	736.44	1.089
		BEL	57	215.97	1.039
		MEL	33.6	58.72	1.354
2017	PHEIs	Total	100	646.40	0.327
		BEL	86.3	270.53	0.331
		MEL	36.2	83.68	0.397
	PrHEIs	Total	99	651.08	1.105
		BEL	57.6	218.73	1.030
		MEL	36.2	69.19	1.361
2018	PHEIs	Total	100	462.88	0.270
		BEL	86	264.56	0.331
		MEL	36.9	84.08	0.396
	PrHEIs	Total	99	616.99	1.030
		BEL	55.9	210.80	0.989
		MEL	33.3	66.57	1.252
2019	PHEIs	Total	100	495.28	0.282
		BEL	85.5	261.56	0.337
		MEL	37.5	84.27	0.391
	PrHEIs	Total	99.6	650.87	1.022
		BEL	56.3	223.19	0.976
		MEL	33	72.65	1.277

Notes: \* - tertiary education (levels 5-8); PHEIs - public higher education institutions; PrHEIs - private higher education institutions; BEL - Bachelor's or equivalent level; MEL - Master's or equivalent level.

Source: Calculated by the author based on data by Eurostat (2021)

present in the EU will modify its activities in the Ukrainian economy. It is advisable to expect diversification of the supply of educational services by public HEIs by strengthening their interaction with the educational space of the EU countries and creating conditions for increasing exports of such services, intensification of educational services by private universities in Ukraine through the formation of atypical forms of education. This will create favourable conditions for further accumulation of HC in the economy of Ukraine through the expansion of investment in education.

To define the factors influencing the development of the HEM for public and private HEIs in the EU countries, we use the methodology of multiple regression analysis. Dependent variables that determine the capacity of the HEM for public and private HEIs in the EU countries are:

$Y_1$  - students enrolled in public HEIs, persons;

$Y_2$  - students enrolled in public HEIs at bachelor's or equivalent level, persons;

$Y_3$  - students enrolled in public HEIs at master's or equivalent level, persons;

$Y_4$  - students enrolled in private HEIs, persons;

$Y_5$  - students enrolled in private HEIs at bachelor's or equivalent level, persons;

$Y_6$  - students enrolled in private HEIs at master's or equivalent level, persons.

As independent variables we take such as:

$X_1$  - gross domestic product at market prices (GDP), million euro;

$X_2$  - average population, total;

$X_3$  - total annual earning of a single person without children, 50% of the average earning, euro;

$X_4$  - total annual earning of a single person without children, 100% of the average, euro;

$X_5$  - annual net earnings of a single person without children, 100% of the average earning euro;

$X_6$  - annual net earnings of an one-earner couple with two children, 100% of the average earning, euro;

$X_7$  - annual net earnings of two-earner couple with two children, both earning 100% of the average earning, euro;

$X_8$  - general government expenditures on education, million euro;

$X_9$  - general government expenditures on tertiary education, million euro;

$X_{10}$  - general government expenditures on education, % of GDP;

$X_{11}$  - general government expenditures on tertiary education, % of GDP;

$X_{12}$  - healthy life years in absolute value at birth, years;

$X_{13}$  - employment with tertiary education (levels 5-8) aged 15-64, thousand people;

$X_{14}$  - unemployment with tertiary education (levels 5-8) aged 15-74, % of population in the labour force;

$X_{15}$  - unemployment with tertiary education (levels 5-8) aged 20-64, thousand people;

$X_{16}$  - unemployment with tertiary education (levels 5-8) aged 20-64, % of population in the labour force.

Statistical data for the identification of multiple econometric models were taken for 28 EU countries for 2013-2019. To determine the independent variables  $X_i$ , which will be included in the sample regression functions  $Y_1, Y_2, Y_3, Y_4, Y_5, Y_6$ , the step-by-step regression method was used. According to it, the following multiple econometric dependences are obtained (Table 3, Table 4). Evaluation of the main parameters of these multiple regression equations shows that they are adequate for Fisher's criteria and Student's  $t$ -test, they have no auto-correlation.

The economic interpretation of multiple regression equations is as follows. With a probability of 94.24% ( $Y_1$ ) it can be affirmed that the number of students enrolled in public HEIs depends on the current socio-economic and income levels in the EU countries ( $X_1, X_3$ ), the general government expenditures on higher education ( $X_9$ ), healthy life expectancy ( $X_{12}$ ) and unemployment rate of people with tertiary education (5-8 levels,  $X_{14}$ ). According to the parameters of the econometric model in the EU countries with: an increase in GDP by 1 million euros expect an increase in the number of students enrolled in public HEIs an average of 0.755 people; increase in the total annual earnings of a person without children, which corresponds to 50% of the average earnings, by 1 euro reduces the number of students studying in public HEIs by an average of 6.385 people; increasing the general government expenditure on higher education by 1 million euros increases the number of students enrolled in public HEIs by an average of 23.525 people; prolonging a healthy life from birth for 1 year increases the number of students enrolled in public HEIs an average of 9,386.507 people; with the increase in the unemployment rate among people with tertiary education (levels 5-8) aged 15-74 by 1%, the number of students enrolled in public HEIs is expected to increase by an average of 29,467.033 people.

With a probability of 91.79% ( $Y_2$ ), it can be affirmed that the number of students in EU countries studying in public HEIs at BDED depends on demographic processes ( $X_2$ ), material well-being of the individual ( $X_5$ ), general government expenditures on education ( $X_8$ ) and unemployment rate of

Table 3:  
The Sample Regression Functions and Reporting Regression Results  
for Public Higher Education Institutions

Variables	Intercept and slope parameters	Standard error*	t-statistic	Confidence interval, 95%		DW, 99%
				low-level	high-level	
Y <sub>1</sub> -meet	-418584.883	148114.637	-2.826	-708889.571	-128280.196	2.068
variable X <sub>1</sub>	0.755	0.046	16.591	0.666	0.845	d <sub>t</sub> =1.623
variable X <sub>3</sub>	-6.385	0.602	-10.601	-7.566	-5.205	d <sub>U</sub> =1.725
variable X <sub>9</sub>	23.525	6.300	3.734	11.176	35.873	
variable X <sub>12</sub>	9386.507	2446.266	3.837	4591.826	14181.187	
variable X <sub>14</sub>	29467.033	3487.711	8.449	22631.120	36302.946	
<b>Regression statistics</b>			<b>Analysis of variance</b>			
R	0.9708		df	SS	MS	F
R <sup>2</sup>	0.9424	Regression	5	8.321E+13	1.664E+13	638.434
Normalized R <sup>2</sup>	0.9413	Residual	195	5.0830E+12	26066580672	
Standard error**	161451.481	Total	200	8.829E+13		
Y <sub>2</sub> -meet	-71293.463	22127.720	-3.222	-114663.793	-27923.133	1.908
variable X <sub>2</sub>	0.019	0.001	16.204	0.017	0.022	d <sub>t</sub> =1.633
variable X <sub>5</sub>	2.122	0.711	2.9858	0.729	3.515	d <sub>U</sub> =1.715
variable X <sub>8</sub>	-2.002	0.793	-2.523	-3.557	-0.447	
variable X <sub>14</sub>	15267.451	2372.609	6.435	10617.138	19917.764	
<b>Regression statistics</b>			<b>Analysis of variance</b>			
R	0.9581		df	SS	MS	F
R <sup>2</sup>	0.9179	Regression	4	2.574E+13	6.4357E+12	534.079
Normalized R <sup>2</sup>	0.9166	Residual	191	2.301E+12	12048167631	
Standard error**	109764.146	Total	195	2.804E+13		
Y <sub>3</sub> -meet	23466.734	9588.265	2.447	4673.735	42259.733	1.915
variable X <sub>2</sub>	0.008	0.001	16.512	0.009	0.009	d <sub>t</sub> =1.633
variable X <sub>6</sub>	-0.678	0.259	-2.614	-1.186	-0.170	d <sub>U</sub> =1.715
variable X <sub>8</sub>	1.567	0.339	4.623	0.903	2.231	
variable X <sub>16</sub>	-4495.109	1018.051	-4.415	-6490.489	-2499.730	
<b>Regression statistics</b>			<b>Analysis of variance</b>			
R	0.9794		df	SS	MS	F
R <sup>2</sup>	0.9592	Regression	4	1.005E+13	2.513E+12	1122.779
Normalized R <sup>2</sup>	0.9586	Residual	191	4.275E+11	2.238E+09	
Standard error**	47308.765	Total	195	1.048E+13		

Notes: \* - the slope parameters and intercept; \*\* - the regression.

Source: Calculated by the author based on data by Eurostat (2021)

Table 4:  
The Sample Regression Functions and Reporting Regression Results for Private Higher Education Institutions

Variables	Intercept and slope parameters	Standard error*	t-statistic	Confidence interval, 95%		DW, 99%
				low-level	high-level	
Y <sub>4</sub> -meet	-95154.468	16743.612	-5.683	-127971.947	-62336.988	1.808
variable X <sub>7</sub>	0.383	0.173	2.217	0.045	0.722	d <sub>t</sub> =1.633
variable X <sub>9</sub>	-23.672	2.175	-10.881	-27.935	-19.408	d <sub>U</sub> =1.715
variable X <sub>11</sub>	100941.311	14643.841	6.893	72239.382	129643.240	
variable X <sub>13</sub>	82.444	3.825	21.553	74.947	89.942	
<b>Regression statistics</b>			<b>Analysis of variance</b>			
R	0.9219		df	SS	MS	F
R <sup>2</sup>	0.8500	Regression	4	3.518E+12	8.794E+11	254.948
Normalized R <sup>2</sup>	0.8475	Residual	180	6.209E+11	3.449E+09	
Standard error**	58729.998	Total	184	4.138E+12		
Y <sub>5</sub> -meet	17897.362	4644.941	3.853	8793.278	27001.446	1.967
variable X <sub>8</sub>	-2.297	0.340	-6.753	-2.964	-1.630	d <sub>t</sub> =1.643
variable X <sub>13</sub>	50.987	4.554	11.195	42.061	59.914	d <sub>U</sub> =1.707
variable X <sub>15</sub>	-93.557	26.837	-3.486	-146.157	-40.957	
<b>Regression statistics</b>			<b>Analysis of variance</b>			
R	0.8179		df	SS	MS	F
R <sup>2</sup>	0.6689	Regression	3	9.402E+11	3.134E+11	123.239
Normalized R <sup>2</sup>	0.6653	Residual	183	4.654E+11	2.543E+09	
Standard error**	50427.957	Total	186	1.406E+12		
Y <sub>6</sub> -meet	-36216.292	13413.892	-2.700	-62507.521	-9925.063	1.949
variable X <sub>3</sub>	-0.910	0.240	-3.786	-1.381	-0.439	d <sub>t</sub> =1.643
variable X <sub>10</sub>	10203.986	2779.837	3.671	4755.516	15652.456	d <sub>U</sub> =1.707
variable X <sub>13</sub>	13.956	0.829	16.840	12.332	15.580	
<b>Regression statistics</b>			<b>Analysis of variance</b>			
R	0.7884		df	SS	MS	F
R <sup>2</sup>	0.6215	Regression	3	2.894E+11	9.645E+10	95.787
Normalized R <sup>2</sup>	0.6172	Residual	175	1.762E+11	1.007E+09	
Standard error**	31732.665	Total	178	4.656E+11		

Notes: \* - the slope parameters and intercept; \*\* - the regression.

Source: Calculated by the author based on data by Eurostat (2021)



persons with tertiary education aged 15-74 (levels 5-8,  $X_{14}$ ). In view of the parameters of the multiple regression equation, if the average population in these countries increases by an average of 1,000 people, the number of students enrolled in public HEIs at BDED will increase by an average of 19 people; if the net annual earnings of an individual without children, which corresponds to 100% of the average earnings, increase by 1 euro, the number of students enrolled in public HEIs at BDED will increase by an average of 2.122 people; if the general government expenditures on education grow by 1 million euros, the number of students enrolled in public HEIs at BDED will decrease by an average of 2.002 people; if the unemployment rate of people with tertiary education (levels 5-8) aged 15-74 increases by 1%, the number of students enrolled in public HEIs at BDED will increase by an average of 15,267.451 people.

With a probability of 95.92% ( $Y_3$ ) it can be affirmed that the number of students in EU countries studying in public HEIs at MDED depends on the demographic situation ( $X_2$ ), material well-being of the family ( $X_6$ ), general government expenditures on education ( $X_8$ ) and the unemployment rate of persons with higher education aged 20-64 (levels 5-8,  $X_{16}$ ). Taking into account the parameters of multiple regression, it can be expected that in the EU countries the growth of the average population per 1,000 people will lead to an increase in the number of students enrolled in public HEIs at MDED, by an average of 8 people; an increase in the net annual earnings of a couple with 2 children, in which one working person receives 100% of the average earnings, by 1 euro on average will reduce the number of students enrolled in public HEIs at MDED by 0.678 people; an increase in the general government expenditures on education by 1 million euros will lead to an increase in the number of students enrolled in public HEIs at MDED by an average of 1.567 people; an increase in the unemployment rate of people with higher education (levels 5-8) aged 20-64 by 1% will lead to an average decrease in the number of students enrolled in public HEIs at MDED by 4,495.109 people.

In view of the situation in the HEM for public HEIs, the accumulation of HC in the EU countries is associated with the formation of positive expectations for the development of the national economy, career prospects and future incomes of students. According to multiple econometric equations, the factors influencing the number of students enrolled in public HEIs, it is appropriate to include the current social, economic and demographic situation, the state of the labour market and the level of material well-being of households. We believe that the situation with the COVID-19 pandemic will have a negative impact on the HEM for public HEIs due to the decline in business activity, the formation of unfavourable expectations of households regarding earnings prospects and budget funding opportunities for higher education in the EU countries. For the HEM of Ukraine these factors are also important, they should be taken into account when forming a state order for training specialists and developing directions of reforming the higher education system. State regulatory measures aimed at forecasting the situation on the labour market, achieving macro-economic stabilization, mitigating the effects of the demographic crisis and the COVID-19 pandemic in Ukraine are relevant.

With a probability of 85.00% ( $Y_4$ ) it is expected that the number of students in the EU countries studying in private HEIs will be affected by the level of income of married couples ( $X_7$ ), the amount of general government expenditures on education ( $X_9$ ), the level of general government expenditures on higher education ( $X_{11}$ ) and the number of employees with tertiary education (5-8 levels,  $X_{13}$ ) aged 15-64 (Table 4). According to the parameters of the multiple econometric model, an increase in the annual net earnings of a couple with 2 children, in which 2 working persons receive 100% of average earnings, by 1 euro on average will increase the number of students enrolled in private HEIs by 0.383 people; an increase in the general government expenditures on education by 1 million euros will lead to an average reduction in the number of students enrolled in private HEIs by 23.672; an increase of 1% of GDP in general government expenditures on higher education will lead to an average increase in the number of students enrolled in private HEIs by 100,941.311 people; an increase in the number of employees with tertiary education (levels 5-8) aged 15-64 per 1,000 people will increase the average number of students enrolled in private HEIs by 82.444 people.

With a probability of 66.89% ( $Y_5$ ) it can be affirmed that the number of students in EU countries studying in private HEIs at BDED will depend on the general government expenditures on education ( $X_8$ ), the employment situation and unemployment of people with tertiary education (5-8 levels,  $X_{13}$ ,  $X_{15}$ ). In view of the parameters of the multiple regression equation, the increase in government expenditures on education by 1 million euros will lead to an average reduction in

the number of students enrolled in private HEIs at BDED by 2.297 people; an increase in the number of employees with tertiary education (levels 5-8) aged 15-64 per 1,000 people will increase the average number of students enrolled in private HEIs at BDED by 50.987 people; an increase in the number of unemployed with tertiary education (levels 5-8) aged 20-64 per 1,000 people will lead to an average decrease in the number of students enrolled in private HEIs at BDED by 93.557 people.

With a probability of 62.15% ( $Y_6$ ) we affirm that the number of students in EU countries studying in private HEIs at MDED will be affected by the material well-being of the individual without children ( $X_3$ ), the level of general government expenditures on education ( $X_{10}$ ), the number of employees with tertiary education (5-8 levels,  $X_{13}$ ). From the parameters of the multiple regression model it follows that the improvement of the total annual earnings of a person without children, which corresponds to 50% of average earnings, by 1 euro on average will reduce the number of students enrolled in private HEIs at MDED by 0.91 person; an increase of 1% of GDP in general government expenditures on education on average will increase the number of students enrolled in HEIs at MDED by 10,203.986 people; an increase in the number of employees with tertiary education (levels 5-8) aged 15-64 per 1,000 people will increase the average number of students enrolled in private HEIs at MDED by 13.956 people.

The accumulation of HC in the EU countries in the HEM through studying in private HEIs is associated with the financial capacity of the individual or spouse to improve the educational level, the situation with employment in the country and the nature of budget funding for education. Under COVID-19, this process may slow down, as in the HEM the behaviour of applicants targeted at private HEIs will induce signals aimed at finding alternative ways to acquire vocational skills. In view of the experience of EU countries, in Ukraine the expansion of higher education services on a private basis is sensitive to the ability of households to pay for education, assess employment opportunities and the nature of the budgeting of the educational process at the state level.

## 6. Conclusions

The HEM in the EU countries in terms of the accumulation of HC is characterized by a number of structural peculiarities, namely: the focus on education in public HEIs with a slight trend to reduce the share of students studying in them in 2013-2019; differentiation by educational and qualification levels of higher education, according to which preference is given to study at BDED; heterogeneity in forms of ownership, when the system of providing educational services is dominated by public HEIs, the basis of which is the evolution of the transformation of funding for educational activities in European countries. The following scientific and methodological approach to structuring and identification of factors influencing the development of the HEM in EU countries and accumulation of HC is proposed: evaluation of the dynamics of variations of this market (scope of variation, sample variance, coefficient of variation), which helped determine the nature of its homogeneity; establishing the strength of the correlation between the quantitative parameters of the HEM in the EU countries and a set of economic and socio-demographic indicators using multiple econometric modelling.

Accordingly, the existence of such structural features as the relative homogeneity of the HEM of these countries for public HEIs and a high degree of differentiation for private HEIs is justified. This means that public HEIs contribute to a more stable accumulation of HC in EU countries compared to private HEIs. Considering the multiple regression models, the development of the HEM in the EU countries in 2013-2019 was influenced by a number of factors: the material well-being of households, the demographic situation and healthy life expectancy, the state of budget funding for educational activities, employment and unemployment. It was found out that the number of students studying in public HEIs was influenced to a greater extent by the relevant factors than the number of students studying in private HEIs in the EU countries. Improving the accumulation of HC in the EU countries provides a focus on supporting the development of public HEIs and creating favourable conditions for the functioning of private HEIs, will depend on trends that at the macro level affect business activity, demographic processes and material well-being of households. In view of the experience of the EU countries, in Ukraine it is important to pay attention to improving the functioning of the segment of the HEM, which represents public HEIs and create a favourable environment for the revitalization of private HEIs. In our opinion, in the system of state regulation of the Ukrainian HEM it is

expedient to form policy measures aimed at ensuring macroeconomic stability, labour market development and growth of household incomes. Prospects for further research include an evaluation of the factors influencing the structuring of the HEM in the EU countries by the types of training specialists.

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