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PROSPECTS OF ASSESSING THE IMPACT OF EXTERNAL STUDENT MIGRATION ON RESTORING COUNTRY'S INTELLECTUAL POTENTIAL (THE CASE STUDY OF UKRAINE)

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ABSTRACT. Our paper suggests a new approach to assessment of external student migration consequences. While considering the socioeconomic impact of youth intellectual potential on economic and human development, we have used the regression method for forecasting the most obvious indicators of the country's intellectual capability losses. These include the following: the ratio of students (or university staff as a connected indicator) and total population, economically active and employed population. All of the estimated data include projected losses of talented students due to their studying abroad. We have employed the data of Ukraine as an origin country to emphasize that intellectual migration can cause significant destructive consequences for national competitiveness. In particular, we have indicated the point at the double decrease of all indicators of the intellectual potential losses. In general, it is possible to achieve different types of indicators in 16–20 years. In conclusion, we argue that passive policy with regard to external student migration can lead to disastrous effects for national competitiveness from the perspective of innovation and development, which are driven by talents.

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Introduction

External student migration of young people is becoming more intense in the context of globalisation processes' intensification. Its positive effects for recipient (destination) countries are well known and need no further study. On the other hand, for donor (origin) countries, such migration can have both positive and threatening consequences for the preservation and restoration of intellectual potential. Human mobility increase, which generally has positive effects on the personal level, is increasingly becoming a challenge for the state human resource management in the countries that face rapidly expanding processes of washing out human capital, i.e., the most talented and productive part of population: creative youth, motivated for training and professional development. Therefore, monitoring factors, forecasting impacts and elaborating measures for external student migration regulation are urgent scientific tasks, especially for transitive economies within which young people do not put a premium on training and work prospects.

Hence, the *overall objective* of our paper is to assess the trends and forecast the effects of external student migration to restore the intellectual potential of the country, which can serve as a benchmark for improving the state programmes of external student migration regulation.

We have substantiated our research by the international statistics on monitoring of outbound mobility processes (UNESCO), supplemented by the data of the State Statistics Service of Ukraine (SSSU) on the development of national employment market and educational services.

We have applied the original *author's approach* in order to assess migration trends and forecast their impact on restoration of intellectual capital of the society. The aforementioned approach anticipates that scholars use research methodology known for statistical analysis (in particular, regression method) to forecast the values of indicators which rarely become the subject of study for demographers and specialists in educational economics. Thus, in order to ensure the comprehensive analysis of intellectual potential reproduction we suggest taking into account not only migratory trends and their long-term demographic consequences, as they typically do in many modern studies on migration issues. We believe that in view of the economy competitiveness formation (current and future) it is more important to consider the development of regulatory programmes as projections of student youth losses in the national market of higher education and the indicator related to it – the staff of universities, the number of which directly depends on the number of students. By losing not only potential student youth, but also high-level professionals who should provide them with training, donor (origin) countries are intensifying intellectual losses in two manifestations simultaneously: talented youth and professional teachers who also often decide to emigrate and/or to change their occupation. In both cases, society has unreasonable and uncompensated losses as it has been training specialists who are now using their intellectual potential for other purposes and/or in other countries. Another serious loss is that possibilities for innovation and knowledge-based economic development as well as talent development reduce significantly.

While investigating the trends and forecasting the consequences of external student migration among young people we have relied on the theoretical framework of preconditions and consequences of migration, including intellectual one (Literature review); the subsequent section (Data and method) provides the methodology of our research, discusses the indicators used in forecasting along with the methodology of their definition; the following section (Results) concludes with a brief discussion of the evaluation. Finally, we made conclusions based on the main trends and perspectives of intellectual potential losses, defined in this research.

1. Literature review

The external student migration of young people as a distinct research subject mainly attracts attention of practitioners who investigate the relevant issues with regard to national or international analytical generalisations, and the UNESCO monitoring data is the most well-known study. The problem of student migration is researched from different cognitive perspectives like: social, economic, demographic or even cultural (Sulkowski, 2012, Przytula, 2019). At the same time, the intensification of the processes of intelligence outflow from countries with a lower level of economic development in favour of countries with innovation-oriented economy determines the activation of not only applied but also scientific research pertaining to the causes and consequences of student mobility, including irreversible migratory losses.

Hence, the research on the causes of student migration and the links between time-varying country characteristics conducted by Kritz M.M. and Gurak D.T. is one of the most significant ones in this field. These scholars proved that student mobility does not always clearly correlate with supply and demand indicators of the education of different levels, particularly it demonstrates a low correlation with tertiary expenditures (as a% of GDP), but student outbound mobility has a significant impact on GDP per capita (Kritz & Gurak, 2018, p.233; Simionescu et al., 2016). Such conclusions confirm the dependence between the intensity of intellectual migration in various age and professional groups, including student migration, and the economic development of countries, which is recognised by many other scientists. On the one hand, the effect of such migration can be manifested immediately through the employment of trained highly skilled employees, on the other hand, student mobility contributes to the fact that people who are the most active in the migration aspect, and consequently, in general, highly mobile ones, choosing to study at foreign universities that they believe to be in more attractive countries, create such an effect at a certain interval from the beginning of migration. Of course, in the latter case, there is a certain lag effect. However, the fact that the intellectual potential of young people is transforming with time into a powerful economic resource in the form of intellectual capital is an undeniable fact.

In particular, the aspect of assessing the links between information economy development and increase in migration of highly skilled individuals, especially in science and technology confirms such dependencies. Consequently, study abroad can be part of a deliberate immigration strategy (Tremblay, 2005; Vdovtsova, 2008). Even more, in this and other researches we find obvious evidence that some countries tend to form their migration policy aiming at talented youth attracting. For instance, in one of the works it is stressed that highly qualified workforce positively influences economic situation and its attracting still remains a challenge (for example, it is proved for the Czech Republic) (Čuhlová & Potužáková, 2017).

Other researchers of the benefits and losses of intellectual migration, including academic mobility, being aware of the existence of close links between migratory loss of intelligence and the level of economy innovation, tend to focus their research on mitigating the negative effects on donor countries through positive effects in the form of a transfer (Beech, 2019; Kalantaryan & Salamońska, 2019; Teichler, 2017), on emphasising the benefits of changing the brain gain processes in terms of brain circulation and diffusion of knowledge (Rashidi-Kollmann & Pyka, 2016; Solimano, 2016; Kahn et al. 2019), including the use of national academic diasporas sources (Amagoh & Rahman, 2016). Asymmetry of losses of intellectual potential of youth, including inventors, is evident even within the EU, where the gap in economic and innovation development is not so tangible. In particular, one of the papers (Wachowska, 2018) that analysed the loss of intellectual potential from countries with a lower level of economic development (Poland) in favour of countries such as the US, Germany and the UK, revealed the branches of the economy, for which imbalances of migration exchange

are most noticeable. More directions that need further investigation, particularly for the Europe and Central Asia region, are defined in research initiated by World Bank. They include factors affecting the demand and supply of international students; impact of foreign direct investment in higher education services as well as impact of international student and scholar mobility on global collaborative patents (Chellaraj, 2019).

It is apparent that the student emigration of young people has significant positive personal benefits. Many studies focused on their maximization, however, the ones that, through large-scale sociological surveys, estimated migratory aspirations and actions by stages of career as well as chances of breaking the "path dependence" in academic career caused by different personal characteristics (Czaika & Toma, 2017), those that discussed the motives for making migration decisions and particularly focused on student perceptions of good teaching, good learning, peers and evaluation (Foster, 2017) or those that emphasized on political and social push-pull factors influenced high-skilled STEM migration, regardless only economic reasons (Gesing & Glass, 2019), including future labour expectations (Libanova, 2019) can be considered rather untypical.

At the same time, the scientists emphasize in their works (Lapshyna, 2012; Docquier & Iftikhar, 2019) that social consequences of student migration for restoring the intellectual capital of donor and recipient countries are currently too asymmetric in favour of more developed countries. Simultaneously, one more dangerous trend associated with student migration was the migration of well-educated entrepreneurs. Hence, one study found that for many countries entrepreneurs have become the utmost importance as a source of highly skilled migrants (Rashidi-Kollmann & Pyka, 2016). It goes without a doubt that these migrants have gained the knowledge and skills that are highly valued in destination countries in the countries of origin. This further worsens the prospects for the development of the intellectual capital of these countries, considering the fact that, along with the entrepreneur, they face not only the migration of human resources, but also financial capital. The same applies to potential high-skilled workers or entrepreneurs as the students who do not intend to return home will surely become those, after completing their studies.

Such negative impacts on donor (source) countries for migrant student have led to a trend that scientists focus on finding the causes and possibilities for migratory regulation even in high-developed countries, for instance, impact of external and personal factors influencing intentions and plans of immigrants, their behaviour and adaptation on local labour markets are proved on example of German migrants (Steiner, 2019).

As for Ukraine, the emigration in which is the subject of the study in this article, we revealed the corresponding reasons as well as their interrelation with socioeconomic basis of migration decisions in our preceding papers (Bilan, 2017; Mishchuk & Grishnova, 2015; Mishchuk et al. 2018) and some other researches (Cohen, 2017; D'Silva & Samah, 2018; Holovaty, 2014; Máté et al., 2018). At the same time, Ukrainian scientists, like their European counterparts who are studying the problem of brain gain in favour of more developed countries, for instance (Grenčíková et al. 2017), are trying to find a common solution for all source countries in order to transform the process of intellectual migratory losses into the brain circulation and justify the policy measures that can enforce the benefits of circulation of knowledge and skills (Bilan & Bilan, 2011; Puraite et al., 2017; Sadova, 2010; Semiv & Hvozdoanych, 2012; Stakanov, 2018).

However, despite the fact that the causes, implications of migration and methods for assessing its trends are well-known, the possibilities of assessing its long-term effects not only on quantitative and structural changes in the population and on the linkages of migration with economic development indicators are still underdeveloped. Such connections can be mathematically confirmed with different probabilities for different conditions, but the logical link between intellectual migration and social productivity is obvious and no longer constitutes

a significant interest for scientific discussion. We believe that an assessment of the prospects with regard to what student emigration entails in the form of consequences for the intellectual component of human capital of society deserves more attention. It is these forecasts in the form of the ratio of young migrants, as well as scientific and pedagogical employees who should provide their training, in relation to different groups of the population, are essential for assessing the possibilities of qualitative restoration of intellectual potential, and hence the formation of an innovative economy.

2. Data and method

We selected data and research methods, considering that the external student emigration directly influences the volume of intellectual potential of the country, and we suggest evaluating it in natural units of measurement by the following absolute and relative indicators:

- a) the number of students, persons;
- b) the number of scientific and pedagogical staff (hereinafter – SPS) of higher educational establishments, persons;
- c) the number of students per 10 thousand population, persons;
- d) the number of SPS in higher educational establishments per 10 thousand population, persons;
- e) the share of graduates of the higher educational establishments per 10 thousand of economically active population, persons;
- f) the share of SPS in higher educational establishments for 10 thousand of employed population, persons.

We carried out the research basing on the case study of Ukraine, since this country has got one of the highest in Europe volumes and rates of external student emigration of youth.

For analysis and forecasting we used data from special statistical bases, which most informatively illustrate educational processes:

- with regard to the volumes of geographic migration flows – data from UNESCO;
- with regard to the assessment of the correlation of migration flows with the contingents forming the basis of the intellectual potential of the country, the data of the State Statistics Service of Ukraine (hereinafter – SSSU) on the population, including economically active ones and employed, as well as the number of scientific and pedagogical employees.

Due to the existing restrictions on the timing of disclosure of data, we used the information from 2006 to 2016 as the calculation basis in international comparisons.

We used regression analysis method for the forecasting of changes in the intellectual potential of the country as a result of student emigration. Since the nature of the processes in the dynamics corresponds most closely to the linear dependence, we used the well-known model of linear additive convolution based on our own forecast.

Unlike other research in the field of demography, including migration, we used this forecasting technique not to predict actual demographic changes. Our major objective and that is a fundamental difference from other researches of the prospects for restoring intellectual potential, is the forecast of the dynamics of relative indicators of intellectual potential losses, i.e. the a-f indicators given above.

The forecast was carried out for the next 20 years. Furthermore, we determined the expected period of a double reduction of the indicator from the level of 2016 for each of the relative indicators of changes in intellectual potential. We have defined this forecasting condition (double reduction) as a critical point, and quite real prospects of its achievement

should be a compelling argument of the importance of improving migration policy for the relevant government bodies.

3. Conducting research and results

Migration flows in developing countries and borders with developed European countries vary greatly in terms of volumes and qualifications of migrants. The case study of Ukraine and student migration, we can state the same asymmetry. Thus, according to UNESCO, since 2015, students' emigration flows in Ukraine have not been compensated by immigrant students; and in 2016 the situation has got even worse: the migration balance was -10,696 and -22,041 people (UNESCO, 2017a) respectively. Immigration flows to Ukraine are directed mainly from countries with even lower human and economic development, therefore, there is no reason to expect significant economic benefits and the transfer of social capital from the training of immigrants, as well as the prospects of replenishing demographic losses thanks to them in the long-term perspective: often these students view Ukraine as a transit country for further relocations to Europe.

After assessing the ratio of students studying in Ukraine and those young Ukrainians who chose to study abroad, one can see the following dynamics of the net student transfer coefficient (see Fig.1). As you can see, in 2015, for every 100 Ukrainian students studying at home, there were 3.40 students who came from Ukraine but study abroad. Over the past 10 years, the value of the net student emigration has grown more than 4.747 times: from 0.95% in 2007 to 4.51% in 2016.

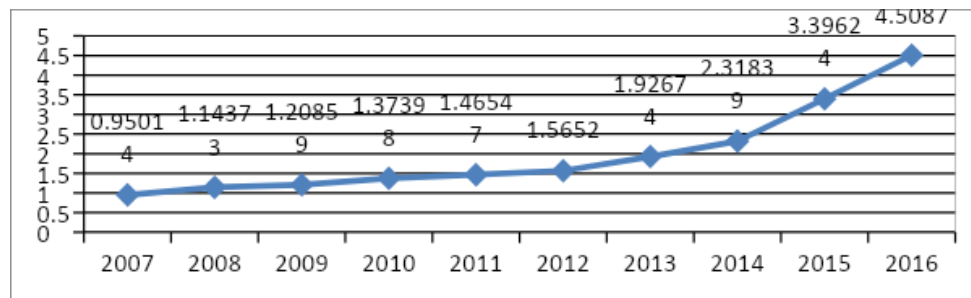


Figure 1. Dynamics of net student emigration rate for Ukraine, %
Source: (UNESCO, 2017c)

In order to estimate the consolidated losses of intellectual potential of students, we will make calculations based on the total rates of reduction of the contingent of students and the scientific and pedagogical staff of higher educational establishments relative to different groups of population, please see them in Table 1.

Consequently, due to the intensification of student emigration, Ukraine has lost more than 60 thousand students in 2016 and more than 400 thousand people in the last 10 years. As a result, the number of students declined annually by an average of 9 people per 10 thousand population or 2%. In 2016, this figure reached a record of 14 people per 10 thousand population. In addition to the losses in the contingent of students, student migration automatically led to the reduction of lecturers of higher educational institutions of Ukraine, since their number directly depends on the number of students. In particular, in 2016, the number of lecturers of higher educational establishments decreased under the influence of external educational emigration by 5,801 persons (3.6% of the total number of SPS), and over the past 10 years it has dropped by more than 30 thousand people in total or more than 3 thousand people annually.

Table 1. Consolidated calculation of intellectual potential (IP) losses of Ukraine

Year	Absolute loss of IP		Relative loss of IP per 10 thousand population of the corresponding group:			
	students, persons	SPS of higher educational institutions, persons	total population		economically active population	employed population
			students	SPS of higher educational institutions	graduates	SPS of higher educational institutions
2006	25,817	1,805	6	0.387	2.497	0.871
2007	26,787	1,873	6	0.404	2.144	0.896
2008	32,570	2,294	7	0.497	2.782	1.094
2009	33,825	2,416	7	0.526	3.013	1.197
2010	36,204	2,764	8	0.604	3.089	1.441
2011	37,608	2,938	8	0.644	3.205	1.528
2012	37,424	3,093	8	0.679	3.905	1.606
2013	42,496	3,761	9	0.828	4.061	1.947
2014	49,753	4,523	12	1.054	4.543	2.503
2015	60,324	5,745	14	1.344	5.195	3.494
2016	60,328	5,801	14	1.362	5.211	3.564
Average value	38,784	3,365	9	0.757	3.604	1.831

Source: Own calculations based on (UNESCO, 2017b, 2017d; SSSU, 2017a, 2017b, 2017c)

Apart from the negative consequences for the market of educational services and employment, there is another negative macroeconomic consequence: as a result of emigration, the intellectual structure of the economically active population worsens. In particular, if we consider that the average length of study at foreign universities is 4 years, the potential graduates with higher education for the Ukrainian economy will range from 2.5 in 2006 to 5.2 persons per 10 thousand people of economically active population in 2016; that is 3,604 persons annually. Such trained specialists will not replenish the labour market of their country and will not provide an innovative growth of the economy in case of irreversible migration.

Therefore, forecasting possible variants of changes in the intellectual potential with regard to our indicators and assessing such prospects is an extremely important task. In order to do this, we determine possible losses of intellectual potential in absolute and relative indices for two groups of population (students and SPS) in relation to the total population, economically active and employed population based on the given linear line regression models for each of the dynamic series of indicators, as the professional development of these groups is a prerequisite for economic prosperity (see Table 2).

As we see, a significant reduction of intellectual potential can be expected for all indicators. The fact that such scenarios and negative consequences for the prospects of innovative economic development are quite real can be confirmed by another calculation. In order to do this, we transform the goal of the forecast: instead of the number of students and SPS for the next 20 years, we do quite the opposite and define the indicative period for achieving such a situation, using the regression equation indicated in the previous table (see Table 3) based on the threshold (each indicator declines twice).

Table 2. Forecasting intellectual potential (IP) losses of Ukraine

Year	Absolute loss of IP		Relative loss of IP per 10 thousand population of the corresponding group:			
	students, persons	SPS of higher educational institutions, persons	total population		economically active population	employed population
			students	SPS of higher educational institutions	graduates	SPS of higher educational institutions
2021	71,115	7061	16	1.656	6.383	4.265
2026	88,243	9114	21	2.155	7.927	5.617
2031	105,371	11168	25	2.655	9.471	6.969
2036	122,499	13221	29	3.154	11.016	8.322
Index for 2016-2036	2.031	2.279	2.061	2.316	2.114	2.335
Linear trend equation for 2006-2016*	$3425.582x+19731.60$	$410.673x+900.782$	$0.827x+4.036$	$0.100x+0.158$	$0.309x+1.751$	$0.270x+0.208$
Determination coefficient R ²	0.907	0.908	0.855	0.893	0.944	0.868

* x – years: 2006=1, ..., 2016=10.

Source: Own calculations

Table 3. Forecast of the period when we expect to achieve the double increase of intellectual potential (IP) losses in Ukraine

No.	Indicator of IP losses	The value of the indicator with a double increase compared to 2016	Period of achievement of the limit value of the indicator, years
1	Number of students of higher educational establishments, persons	120,656	20
2	Number of scientific and pedagogical staff (hereinafter – SPS) of higher educational establishments, persons	11,602	17
3	Number of students per 10 thousand population, persons	28	19
4	Number of SPS in higher educational establishments per 10 thousand population, persons	2.724	16
5	Number of graduates of higher educational establishments per 10 thousand population, persons	10.422	19
6	Number of SPS in higher educational establishments per 10 thousand employed population, persons	7.128	16

Source: Own calculations

Conclusion

As we see from our analysis, external student emigration is increasing in Ukraine at a high pace. Trends and forecasts basing on absolute indicators of student migration are known from the point of view of demographic analysis and have clear negative consequences for both

Ukraine and other donor countries of educational migrants with a lower standard of living, and hence the dubious prospects for the return of talented, ambitious young people. However, estimating and forecasting comparative losses in relation to the contingents of the population, which are the basis of innovative economic development, is even more important for the formation of macroeconomic policies. As we have established basing on the proposed forecasting method for relative indicators of intellectual potential losses, one can expect further losses of educational potential both in absolute and relative indicators, which will inevitably affect the pace of innovation development of the economy as a result of the deterioration of the age and educational structure of the population. If the existing trends preserve, the intellectual potential loss will double in 16-20 years.

The proposed composition of indicators for estimating and predicting intellectual potential losses, as well as forecasting them, does not intend to promote strict methods of limiting student migration. This contradicts the ideas of human development and human rights; moreover, it can also be extremely harmful to economic development due to intellectual isolation and the limitation of opportunities for knowledge sharing. We by no means advocate the idea of "closing the borders" in the form of direct prohibitions or indirect restrictions for migrants. At the same time, in a modern world where human talents, abilities and creative potential are playing an increasingly important role in achieving personal well-being and prosperity of countries, timely assessment of the current state and prospects of preserving talent is important. Student migration can be mutually beneficial in a globalised world: these benefits for both sides of migration do not require proof. However, "donor (source) countries", due to the greater vulnerability of their economic position, cannot afford passive behavioural strategies to reproduce their own intellectual potential. Therefore, assessments of migration trends, including those basing on the approach suggested herein, should become the base of the choice of response mechanisms. In case of Ukraine, where our trends have obvious destructive effects on the prospects for restoring intellectual potential, such a forecast should serve as the basis for the development of circular migration mechanisms, the return of students who have studied abroad, and the creation of opportunities for using their acquired skills in their homeland.

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