УДК 339.9:330.341.1

THE ROLE OF UNIVERSITIES IN THE DISTRIBUTION OF INTELLECTUAL RESOURCES OF THE GLOBAL ECONOMY

РОЛЬ УНІВЕРСИТЕТІВ У РОЗПОДІЛІ ІНТЕЛЕКТУАЛЬНОГО РЕСУРСУ ГЛОБАЛЬНОЇ ЕКОНОМІКИ

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Abstract. *An increase in the world number of applicants for international academic mobility as well as updating of the list and dynamics of indicators of the structure of the world countries that receive the largest flows of foreign applicants has been revealed. The outflow of intellectual resources of the universities of the American continents to the institutions of the regions of Asia and Oceania has been showed in temporal dynamics as well as increasing innovation activity and international influence of institutions in these regions. An increase in the number of countries whose universities are competitive in an intellect-intensive global economy and intensification of competition for intellectual resources between universities within regions and individual countries has been identified. The transformation of university development strategies has been demonstrated in order to improve the competitive position in the global struggle for intellectual resources (in particular, based on the format of online education, increasing the supply of financial support and diversifying services provided to students). Emphasis has been placed on increasing and clearly formulating the requirements of business entities of the intellect-intensive global economy to university graduates as potential employees of companies. It has been argued that modern universities are becoming not only a source of knowledge, but also a motive for international intellectual migration as well as the center for the accumulation and integration of intellectual resources of the global economy.*

Keywords: *global economy, intellect-intensive economy, intellectual resource, uni*versity.

Анотація. *Виявлено зростання світової чисельності здобувачів, що вдаються до міжнародної академічної мобільності; оновлення переліку і динаміку показників структури країн світу, що приймають найбільші потоки іноземних здобувачів. В часовій динаміці показано відтік інтелектуального ресурсу університетів американських континентів до інституцій регіонів Азії та Океанії; підвищення інноваційної активності і міжнародної впливовості інституцій цих регіонів. Виявлено зростання кількості країн, чиї університети є конкурентоспроможними в інтелектоємній глобальній економіці; загострення конкуренції за інтелектуальний ресурс між університетами всередині регіонів та окремих країн. Продемонстровано трансформацію стратегій розвитку університетів з метою покращення конкурентних позицій в глобальній боротьбі за інтелектуальний ресурс (зокрема на основі формату онлайн-освіти, збільшення пропозиції фінансової підтримки та урізноманітнення послуг, надаваних здобувачам освіти). Акцентовано увагу на підвищенні і чіткому формулюванні вимог бізнес-суб'єктів інтелектоємної глобальної економіки до випускників університетів як потенційних працівників компаній. Стверджується, що сучасні університети стають не лише джерелом знань, але й мотивом міжнародної*

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Ключові слова: *глобальна економіка, інтелектоємна економіка, інтелектуальний ресурс, університет.*

Problem statement. According to the World Economic Forum experts, the innovation vector has been a trend in the global economy since the late 20th century and it is innovation that will determine 80-90% of the next 40 years of economic growth in both developed and developing countries [*Policy Pathways for the New Economy, 2019*]. Innovative development is increasingly gaining signs of intellectualization: intellectual technologies are a global trend of Industry 4.0 [*World Economic Forum & McKinsey&Company, 2019*]; technological inventions are becoming more intellectually intensive and require more knowledge from various sciences for their implementation (the average number of authors of one patent application in 2014 - 2019 increased by 5.3%) [*Derwent Top 100 Global Innovators, 2020*]; there is an intensification of intellectual migration (almost 2/3 of international migrants go to high-income countries, including for education) [*Global Education Monitoring Report, 2019*]; the number of applicants for higher education is growing (global growth in 2014-2019 was 5.21%, including 8.55% for STEM; global enrollment of young people in higher education - 34%) as well as the labor of science and engineering sector (the number of employees in the United States was 182 thousand in 1950, 5.4 million - in 2009) [*Higher Education Statistics Agency, 2020; A World on the Move, 2017; National Science Board, 2013: 3/5; National Science Board, 2018: 3/6*]. These facts objectively indicate the urgency of the problem of formation, accumulation and distribution of intellectual resources of the global economy in accordance with one of its main sources - higher education institutions or universities.

The purpose of the article. The article aims to determine the role of universities in modern processes of global distribution of intellectual resources based on the analysis of international academic rankings, trends in international academic mobility and initiatives to provide financial support to foreign applicants.

Literature review. O. Adedeji, O. Campbell note that as knowledge becomes important in modern global economy, countries need higher standards of education for their youth, which must be provided by national higher education institutions, taking into account the requirements of international competitiveness [*Adedeji and Campbell, 2013*]. The model of development of modern universities is becoming innovatively active [*Ponomarenko, Rayevnyeva, Yermachenko, 2021*].

Proclaiming the availability of higher education as a sector revolution in the 21st century, P. Altbach identifies two main trends in its development: massification or "academic anarchy" and the focus on the global knowledge economy [*Altbach, 2017*]. Worldwide, more than 200 million applicants study at 22,000 universities and even more other educational institutions. The tendency to complicate processes in the global knowledge economy determines the central role of university research, the participation of universities in international research and development projects. Academic institutions are becoming key points of global communication. According to P. Altbach, there is a differentiation of education systems - the functions and roles of higher education, institutions, systems and organizational structures designed to manage and coordinate the development of the sector are diversifying across countries. The action of Industry 4.0 can be considered as the most obvious factor in the transformation of the role of universities [*Higher Education in the Era, 2018*].

Researchers Kr. Wu and Mt. Wu found that between 1996 and 2019, China, India, Australia, Brazil and South Korea were ahead of developed countries such as the United States, Germany, Canada, and the United Kingdom (UK) in terms of human capital growth [*Wu and Wu, 2022*]. Scientists attribute the significant increase in human capital in China to the positive impact of knowledge growth (due to the number of researchers), increasing the quality of education (number of university graduates in Science and Physics), improving the health of the country's population (number of employees in the field of medicine and sports).

T. Scott and N. Mxunpiew argue that international students are critical to the success and competitiveness of an institution in the higher education market [*Scott and Mxunpiew, 2021*]. The inflow of foreign students to the UK from non-EU countries provided in 2018/2019 academic year almost £ 6 billion in tuition income or more than 30% of the income of all higher education courses. Given the obvious financial advantages, international competition for foreign applicants from non-traditional markets is growing, which introduce English-language programs, provide financial and other types of bonuses. As a strategic perspective for the development of educational institutions of UK T. Scott and N. Mxunpiew see the implementation of more aggressive recruitment campaigns in markets with high growth potential: South America (Colombia, Brazil), European non-EU countries (Russian Federation), African countries (Nigeria, Kenya, Côte d'Ivoire) and Southeast Asia (Vietnam, Thailand).

Despite the availability of scientific developments in some areas, in our opinion, a comprehensive approach to the problem of allocation of intellectual resources of the global economy is needed. In this article, the author tries to reconcile the trends of university rankings, international academic mobility and initiatives to provide financial support to foreign applicants.

Results. The activity of universities has been evaluated and analyzed by many global and national institutions. In this way, in our opinion, the international dissemination of the best practices for ensuring the quality of education and research, the effectiveness of commercialization of scientific results and the aggregation of intellectual resources is occuring. Based on these considerations, the top lists of the following rankings have been analyzed: The Academic Ranking of World Universities (ARWU), QS World University Rankings (QS), Times Higher Education "The World University Rankings" (THE) (Table 1).

Table 1

The structure of the top lists of international rankings of universities by nationality in 2006 - 2019, %

Ranking	Years, country			
	2006	2011	2016	2019
	USA			
ARWU top 20	85	85	75	80
THE top100	“-”	53	39	41
QS top100	“-”	31	“-”	30
ARWU top100	54	53	50	45
	United Kingdom			
ARWU top 20	10	15	15	15
THE top100	“-”	14	16	11
QS top100	“-”	19	“-”	18
ARWU top100	11	10	8	8
	Japan			
ARWU top 20	5	0	5	0
THE top100	“-”	2	2	2
QS top100	“-”	6	“-”	5
ARWU top100	6	5	4	3
	China**			
ARWU top 20	0	0	0	0
THE top100	“-”	5	4	6
QS top100	“-”	3	“-”	11
ARWU top100	0	0	2	4

"-" no data, as the TNE rating has been compiled since 2009, and QS provides access to the last 4 annual ranking lists;

* calculated by the author, based on (*Academic Ranking of World Universities 2006, 2006; Academic Ranking of World Universities 2011, 2011; Academic Ranking of World Universities 2019, 2019; The World University Rankings 2010-11, 2012; The World University Rankings 2016, 2017; The World University Rankings 2019, 2020; QS World University Rankings 2019, 2020; Innovative function of higher education, 2012*). ** The "China" category includes the mainland of China, Chinese Hong Kong, Chinese Taiwan, Chinese Macau

The dynamics of the structure of the analyzed ranking of the top 100 universities by nationality shows a reduction in the share of institutions of the two largest education systems – the United States (US) and the United Kingdom (UK). The US presence in the corresponding THE ranking decreased from 53% in 2011 to 41% in 2019, in ARWU – from 54% in 2006 to 45% in 2019. Similar reduction rates for UK ranged from 14% to 11% in TNE ranking and from 11% to 8% in ARWU. It is interesting to note that in 2006-2011, Chinese universities were not even included in the top 100 ARWU ranking: their representation was limited to three educational institutions in the top 200.

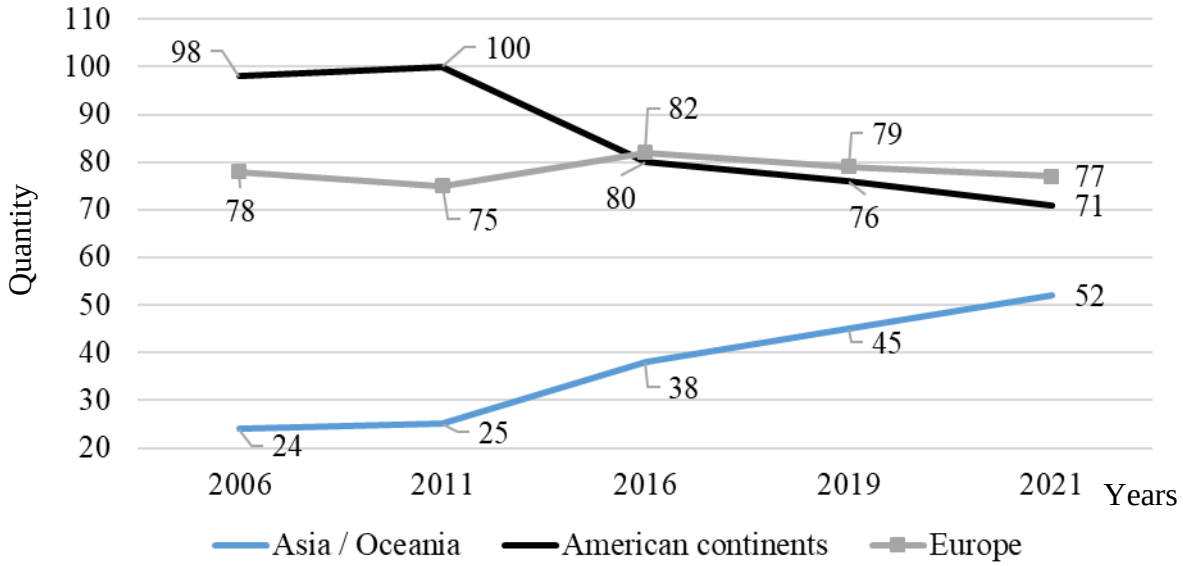
It should be emphasized that the trend of disintegration of China is manifested in the appropriation of intellectual resources of educational institutions by territories and economies. If in 2006 in the ARWU ranking all achievements in the intellectual resources development were combined within one national group "China", in 2019 the statistics of achievements of Chinese institutions have already been detailed by separate elements of their origin: mainland China, Chinese Hong Kong, Chinese Taiwan, Chinese Macau.

The outflow of intellectual resources from the American region is clearly demonstrated by the representation of educational institutions in the ARWU top 200 ranking (Fig. 1).

As we see from Fig. 1, the outflow of intellectual resources from the American region was accompanied by its inflow to the Asia and Oceania region (increase in 2006 - 2021 was up to 116.7%). The overall list of national representations of educational institutions in the top 200 has changed significantly: if in 2006 the ranking included universities from 35 countries, in 2019 this number increased to 61 countries, that is an increase was 74.3% [*Academic Ranking of World Universities 2006, 2006; Academic Ranking of World Universities 2019, 2019*].

Figure 1

Regional representation of universities in the top 200 ARWU ranking, units of institutions*



* compiled by the author, based on [*Academic Ranking of World Universities 2006, 2006; Academic Ranking of World Universities 2019, 2019; Academic Ranking of World Universities 2021, 2021*]

But the flow of intellectual resources to Asia and Oceania was uneven: Japan has reduced its presence in the top lists of ARWU 2019, while there was an increase in presence of Australia, China, South Korea, India and to less extent Singapore (the number of national institutions in the overall ranking increased from 3 to 16). As a result of this trend, the number of institutions from Asia and Oceania in 2019 in the top 501 - 1000 exceeded the number of North American and UK (149 vs. 104), and there were more institutions from China than from America in the ranking (88 vs. 69) [*Academic Ranking of World Universities 2006, 2006; Academic Ranking of World Universities 2019, 2019*].

A comparison of ARWU rankings for 2006 and 2019 of the analyzed universities by regions shows that the representation of Asia and Oceania has increased in the list (Saudi Arabia, Iran, Malaysia, Thailand, Pakistan, Lebanon, Oman, United Arab Emirates, Vietnam) as well as the African continent (Nigeria, Tunisia), the former Soviet republics (Estonia, Romania, Slovenia, Bulgaria, Slovakia), South America (Colombia, Uruguay), "young" EU member states and candidates for integration (Cyprus, Croatia, Turkey). The largest representation among the new participants in the ranking was considered for Iran (14 institutions), Saudi Arabia and Turkey (12 each), Malaysia (6), Thailand, Pakistan and Mexico (4 each). As of 2019, the educational institutions of these countries had low positions in the total list of the 1000 most influential and productive (only 2 institutions of Saudi Arabia were in the top 200), but this trend cannot be ignored.

The integrative role of national universities in the global distribution of intellectual resources can be evaluated on the basis of international flows of academically mobile people (AMP) (Table 2).

Table 2

Countries – world leaders in AMP inflows in 2000-2020*

Years	2000	2014	2016	2018	2020
Top – 9 (%)	USA (28)	USA (22)	USA (25)	USA (22)	USA (20)
	UK (14)	UK (11)	UK (12)	UK (10)	UK (10)
	Germany (12)	China (8)	China (10)	China (10)	Canada (9)
	France (8)	Germany (7)	France (8)	France (7)	China (9)
	Australia (7)	France (7)	Australia (7)	Australia (7)	Australia (8)
	Japan (4)	Australia (6)	Russia (7)	Canada (7)	France (6)
	Spain (3)	Canada (6)	Germany (6)	Russia (6)	Russia (6)
	Canada (2)	Japan (3)	Canada (6)	Germany (5)	Germany (5)
	Others (22)	Others (31)	Others (19)	Others (25)	Others (27)
Total AMP, million people	1,6	4,5	4,1	5,0	5,6

* compiled by the author, based on (*A World on the Move, 2017*; *A World on the Move, 2018*; *Project Atlas, 2015; Project Atlas, 2018; Project Atlas, 2020*)

Analysis of Table 2 shows that in 2000-2020 the number of AMP increased (more than 3 times), the representation of the largest host countries changed (China and the Russian Federation entered the top 9, which in 2020 accounted for a total of 15% of the world incoming flows of AMP), there was a geographical redistribution of the flow of foreign applicants (outflow from the United States and the United Kingdom in favor of Canada, China, Russia and other countries). The largest outflows of AMP in 2016 were formed in Asia and Europe (25% and 23% of the world flow, respectively). Almost half of the global AMP flow to five English-speaking countries: Australia, Canada, New Zealand, the UK and the USA [*Global Education Monitoring Report, 2018*]. About 76% of AMP from Europe who went to study abroad remained in the region. The share of foreigners in the total number of students in Australia, Canada and the UK exceeded 22%, for PhD applicants – 30% [*Global Education Monitoring Report, 2018; Project Atlas, 2020*].

The undisputed leader in terms of the number of involved AMP is the United States: in 2020 they accounted for almost 19.2% of the global flow, and the quality, diversity of educational institutions and programs were positively evaluated by 75% of respondents from 19 countries [*Global Education Monitoring Report, 2018; Project Atlas, 2020*]. The status of English as the most motivating language for international academic mobility is supported by the following facts: the introduction of English-language curricula provides coverage of places in national educational institutions in Japan and South Korea, and their increase in France and Germany has led to an increase in foreign inflows of applicants by 4.3% and 7.1% respectively [*Global Education Monitoring Report, 2018; Project Atlas, 2020*].

The role of universities in the global distribution of intellectual resources can also be determined by intensification of their global talent search, facilitating access to education and expanding the supply of financial support to foreign applicants. According to the statistics of the Scholarship Portal, as of July 23, 2020, the list of registered scholarship programs offered to students at the international level numbered 379 positions [*379 Scholarships to Study in All Locations, 2020*]. Analysis of 178 random units in the list of entities offering scholarship programs allowed to identify the following results (Table 3).

Table 3

Structure of the database of international scholarship programs by sectoral and regional characteristics of the initiators (as of July 23, 2020) *

By Regions	Share, %	By Operations Sector	Share, %
USA and Canada	39.33	Services for applicants, total	55.06
UK	8.43	including educational	31.46
China and Japan	5.06	related	15.73
India and Africa	7.86	those that precede entry	6.74
Australia	1.12	those accompanying the entrance	1.12
EU, total	16.29	Institutions	5.62
Others	21.91	Business practice	39.33
TOTAL	100.00	TOTAL	100.00

* summarized and compiled by the author, based on (*379 Scholarships to Study in All Locations, 2020*)

The offer of a scholarship program is not always characterized by clarity and transparency of information about its initiator, the subject area of its activities, and this increases uncertainty. The vast majority of scholarship programs are offered by initiators (including universities, educational institutions and other entities) that provide services to applicants (55.06% of the total number of analyzed scholarships): educational (offline education, online education, educational courses), related (study assistance, communication with other applicants, educational crediting, rental housing), those that precede entry (recruitment of foreign applicants, regional university reviews) and accompany the entrance of foreign applicants into the territory of the countries of education (registration of visa documents, insurance).

The second largest segment of the researched scholarship database is the segment of programs from business entities that offer business practice (39.33% of the total number of analyzed scholarships). The analysis of such scholarship programs revealed the predominant specialization of initiators in information and IT services, financial, legal and technological consulting services or production activities, which include the provision of digital services (online stores selling manufactured goods, refining oil and secondary raw materials). Medicine and sports, renewable energy, tourism, shipping, and construction have been identified as other sectors of business operations. A significant number of entities in this segment specialize in online advertising and digital marketing, cybersecurity, reviews of intellectual technologies, and blogging.

The third segment of the suggested scholarship programs is formed by institutional entities (5.62%): associations of companies (including energy – in the electricity, gas, oil sectors), international non-profit organizations (foundations, research organizations), government and diplomatic structures.

The analysis of the regional distribution of scholarship initiators revealed that universities that seek global foreign applicants are mainly based in the United States, the EU, the UK and the Asia-Pacific region (Indonesia, Australia, New Zealand). At the same time, online universities (including the University of Essex, Durheim, Brentwood, etc.) are widespread in the UK, specializing exclusively in online education services. American universities provide the greatest opportunities for offline learning for foreign applicants, and are also beginning to implement online education technologies. Characteristically, there are no universities in China and Japan that offer online education services.

Scholarships for educational courses and related educational services are offered mainly by American entities or those whose geographical location is difficult to determine. It is also difficult to determine the regional location of the initiators of scholarship programs in the field of services that precede the entry of foreign applicants into the territory of the countries of education. It can be noted that such initiators most often operate in the markets of the African continent (Nigeria,

Angola, Eritrea), the Middle East (Iraq, Syria), South Asia (India, Pakistan), island states (Philippines, Sri Lanka). It has been found that usually the services accompanying the entrance of foreign applicants into the territory of the countries of education are provided by the same entities that provide services precede the entry, except for services from relevant government agencies (including the production of invitation forms, visa documents, customs and border control, etc.).

There is a significant differentiation of conditions for candidates to participate in programs, the clearest of which are nominated by initiators offering business practices in the sector of information and IT services, financial, legal and technological consulting services or production sector, which include the provision of digital services.

Conclusions. The growth of the intellectual capacity of the global economy again states the main tasks of universities: training qualified specialists, producing innovative technologies and promoting scientific, technical and intellectual development of society. The new conditions transform the activity of the modern university in the direction of strategic planning of its development and integrated perception of the problems of national, regional and global levels. Universities are becoming not only a source of knowledge, but also a motive for international intellectual migration, a center for the accumulation and integration of intellectual resources of the global economy.

The world leading universities are transforming from participants in national innovation systems to participants in global systems, providing countries with competitive advantages in the global intellect-intensive economy. Innovatively active universities determine the global redistribution of the inflow of foreign applicants; show an increase in international activity and influence. These processes identify regions of accelerated intellectual development (including Asia and Asia-Pacific region), which are experiencing a stage of formation, but are now successfully competing with regions of sustainable intellectual development (North America, Europe, Japan).

The intensification of competition in the intellect-intensive economy leads to the transformation of university development strategies: pursuing an aggressive recruitment policy in the markets of developing countries; transition to the model of online universities; expanding the offer of English-language educational programs; initiation of programs of targeted financial support of applicants; expanding the list of services provided to applicants (in particular in the markets of the African continent, the Middle East, South Asia, island states).

The results of the study open up prospects for further research in the direction of evaluating the impact of universities on the intellectual capital of countries.

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