

Research paper / Оригинальная статья
<https://doi.org/10.51176/1997-9967-2023-3-25-39>
MPHTI 06.52.13
JEL: I25, I26, O40



The Role of Education in Economic Growth: An Exploratory Literature Review

Saltanat K. Kondybayeva^{a*}, Aitolkyn A. Sagynbayeva^a, Gulden M. Manarbek^a, Katarzyna Czerewacz-Filipowicz^b

^a*Al-Farabi Kazakh National University, 71 Al-Farabi Ave., 050040, Almaty, Kazakhstan;* ^b*Bialystok Technological University, 45A Wiejska Str., 15-351 Bialystok, Poland*

For citation: Kondybayeva, S.K., Sagynbayeva, A.A., Manarbek, G.M., & Czerewacz-Filipowicz, K. (2023) The role of education in economic growth: an exploratory literature review. *Economics: the strategy and practice*, 18(3), 25-39, <https://doi.org/10.51176/1997-9967-2023-3-25-39>

ABSTRACT

Human capital occupies a leading position in economic development and determines the importance of education as a system responsible for its production. Attention has increasingly been paid in recent years to the role of education in the economic growth of countries. Researchers began to study the impact of education on economic growth in the 19th century and continue to this day. Hence, the growth in the number of publications and scientific studies studying the importance of education in economic growth actualizes the need to use bibliometric analysis methods to identify patterns and trends studied by scientists from various countries around the world. The article examines the works of economists who formulated theories emphasizing the importance of education for economic development. This study reviews scientific works to determine the underlying concepts in the field of the role of education in economic growth. The purpose of this research is to analyze the structure and dynamics of academic research aimed at studying the role of education in economic growth. A bibliometric analysis of the literature was carried out using the VOSviewer software. The sample consists of 2,432 publications from the WoS database. A result of the analysis is a compiled bibliometric map of five clusters. The research outcomes apply to both local higher education establishments and governmental bodies responsible for state educational oversight.

KEYWORDS: Economics, Education, Economic Growth, Literature Review, Bibliometric Analysis, VOS viewer, Cluster

CONFLICT OF INTEREST: the authors declare that there is no conflict of interest.

FINANCIAL SUPPORT: the study was carried out within the framework of grant IRN AP19576425, funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan «The impact of higher education quality on the competitiveness of national economy in the era of digitalization and technological change».

Article history:

Received 01 June 2023

Accepted 13 August 2023

Published 30 September 2023

***Corresponding author: Kondybayeva S.K.** – PhD, Acting Associate Professor, Al-Farabi Kazakh National University, 71 Al-Farabi Ave., 050040, Almaty, Kazakhstan, 87058747895, email: saltanat.Kondybaeva@kaznu.edu.kz

Экономикалық өсудегі білім берудің рөлі: зерттеу әдебиеттеріне шолу

Кондыбаева С.К.^{a*}, Сағынбаева А.А.^a, Манарбек Г.М.^a, Czerewacz-Filipowicz K.^b

^a әл-Фараби атындағы Қазақ ұлттық университеті, даң. әл-Фараби 71, 050040, Алматы, Қазақстан; ^b Белосток технологиялық университеті, көш. Вейска 45А, 15-351 Белосток, Польша

Дәйексөз үшін: Кондыбаева С.К., Сағынбаева А.А., Манарбек Г.М., Czerewacz-Filipowicz K. (2023) Экономикалық өсудегі білім берудің рөлі: зерттеу әдебиеттеріне шолу. Экономика: стратегия және практика, 18(3), 25-39, <https://doi.org/10.51176/1997-9967-2023-3-25-39>

ТҮЙІН

Адами капитал экономикалық дамуда жетекші орын алады, осыған байланысты оның өндірісіне жауапты жүйе ретінде білім берудің маңыздылығын анықтайды. Соңғы жылдары әртүрлі елдердің экономикалық өсудегі білім беру жүйесінің рөліне көбірек көңіл бөлінуде. Зерттеуші - ғалымдар білім берудің экономикалық өсуіне әсерін 19 ғасырда белсенді түрде талдап, зерттей бастады және бүгінгі күнге дейін осы бағыттағы зерттеулер жалғасуда. Осыған байланысты, экономикалық өсудегі білім беру маңыздылығын зерттейтін жарияланымдар мен ғылыми зерттеулер санының өсуі әлемнің әртүрлі елдерінің ғалымдары зерттейтін заңдылықтар мен тенденцияларды анықтау үшін библиометриялық талдау әдістерін қолдану қажеттілігін өзекті етеді. Мақалада экономиканы дамыту үшін білімнің маңыздылығын көрсететін теорияларды тұжырымдаған атақты ғалым-экономистердің еңбектері қарастырылады. Бұл зерттеу экономикалық өсудегі білім беру рөлі саласындағы негізгі тұжырымдамаларды анықтау үшін ғылыми әдебиеттерге шолу және талдау жасауға бағытталған. Бұл ғылыми жұмыстың негізгі мақсаты – экономикалық өсудегі білім беру жүйесінің рөлін зерттеуге бағытталған академиялық зерттеулердің құрылымы мен динамикасын талдау. Ғылыми әдебиетке библиометриялық талдау VOSviewer бағдарламалық құралы арқылы жүзеге асты. Үлгі Web of Science дерекқорындағы 2432 жарияланымнан тұрады. Осы ғылыми зерттеу нәтижесінде бес кластерден тұратын библиометриялық карта құрастырылды. Зерттеу барысында алынған нәтижелер жергілікті жоғары оқу орындары мен мемлекеттік білім беру қадағалауына жауапты мемлекеттік ұйымдарымен қолданылуы мүмкін.

ТҮЙІН СӨЗДЕР: экономика, білім беру, экономикалық өсу, әдебиеттерге шолу, библиометриялық талдау, VOSviewer, кластер

МҮДДЕЛЕР ҚАҚТЫҒЫСЫ: авторлар мүдделер қақтығысының жоқтығын мәлімдейді.

ҚАРЖЫЛАНДЫРУ: зерттеу Қазақстан Республикасы Ғылым және жоғары білім министрлігі Ғылым комитетінің ЖТН АР19576425 «Цифрландыру және технологиялық өзгерістер дәуірінде жоғары білім сапасының ұлттық экономиканың бәсекеге қабілеттілігіне әсері» гранттық қаржыландыру бағдарламасы шеңберінде әзірленген.

Мақала тарихы:

Редакцияға түсті 01 Маусым 2023

Жариялау туралы шешім қабылданды 14 Тамыз 2023

Жарияланды 30 Қыркүйек 2023

***Хат-хабаршы авторы:** Кондыбаева С.К. – PhD докторы, м.а доценті, әл-Фараби атындағы ҚазҰУ, даң. әл-Фараби, 71, 050040, Алматы, Қазақстан, 87058747895, email: saltanat.Kondybaeva@kaznu.edu.kz

Роль образования в экономическом росте: обзор исследовательской литературы

Кондыбаева С.К.^{а*}, Сагынбаева А.А.^а, Манарбек Г.М.^а, Czerewacz-Filipowicz K.^б

^а *Казахский национальный университет имени аль-Фараби, пр. аль-Фараби 71, 050040, Алматы, Казахстан;*

^б *Белостокский технологический университет, ул. Вейска 45А, 15-351 Белосток, Польша*

Для цитирования: Кондыбаева С.К., Сагынбаева А.А., Манарбек Г.М., Czerewacz-Filipowicz K. (2023) Роль образования в экономическом росте: обзор исследовательской литературы. Экономика: стратегия и практика, 18(3), 25-39, <https://doi.org/10.51176/1997-9967-2023-3-25-39>

АННОТАЦИЯ

Человеческий капитал занимает лидирующие позиции в экономическом развитии, и тем самым определяет важность образования как системы, ответственной за его производство. В последние годы все больше внимания уделяется роли образования в экономическом росте разных стран. Ученые начали активно изучать влияние образования на экономический рост с 19 века и продолжают исследования и по сей день. В связи с этим, рост числа публикаций и научных исследований, изучающих важность образования в экономическом росте, актуализирует необходимость использования методов библиометрического анализа для выявления закономерностей и тенденции исследуемых ученых из различных стран по всему миру. В статье рассматриваются работы известных экономистов, которые сформулировали теории, подчеркивающие важность образования для экономического роста. Данное исследование направлено на проведение обзора научных работ для определения основополагающих концепций в области роли образования в экономическом росте. Цель данной научной работы — проанализировать структуру и динамику академических исследований, направленных на изучение роли образования в экономическом росте. Был проведен библиометрический анализ литературы с помощью программного обеспечения VOSviewer. Выборка состоит из 2 432 публикации из базы данных Web of Science. В результате анализа была составлена библиометрическая карта из пяти кластеров. Результаты, полученных от данного исследования применимы как к местным высшим учебным заведениям, так и к государственным органам, осуществляющим государственный надзор в сфере образования.

КЛЮЧЕВЫЕ СЛОВА: экономика, образование, экономический рост, обзор литературы, библиометрический анализ, VOSviewer, кластер

КОНФЛИКТ ИНТЕРЕСОВ: авторы заявляют об отсутствии конфликта интересов.

ФИНАНСИРОВАНИЕ: исследование проведено в рамках грантового финансирования Комитета науки Министерства науки и высшего образования Республики Казахстан ИРН AP19576425 «Влияние качества высшего образования на конкурентоспособность национальной экономики в эпоху цифровизации и технологических изменений».

История статьи:

Получено 01 июня 2023

Принято 14 августа 2023

Опубликовано 30 сентября 2023

***Корреспондирующий автор:** Кондыбаева С.К. – PhD доктор, и.о. доцента, КазНУ им. аль-Фараби, пр.аль-Фараби, 71, 050040, Алматы, Казахстан, 87058747895, email: saltanat.Kondybaeva@kaznu.edu.kz

Introduction

The entry of human capital to a leading position in economic development draws attention to education as the system responsible for its production. Education has a pivotal role in fostering the economic progress of a nation. It is widely recognized as a critical driver of productivity, innovation, and overall economic development. Attention has increasingly been paid in recent years to the place of education in the economic growth of different countries. This is a result of the increasing complexity of technology, as well as a certain acceleration of its changes, which naturally emphasize the importance of innovation, and consequently of humans, in today's economy. Education enhances human capital by equipping individuals with knowledge, skills, and competencies. A well-educated workforce is more productive and adaptable, leading to increased economic output. Higher levels of education are often associated with higher incomes and better job opportunities.

Not only technological change but also social, financial and human innovation, i.e. the speed of social and economic absorption of new technologies in all their diversity, is of great importance for the economic development of a country in today's world. This is determined by the content of education and the educational technologies used, the development of the educational environment, and the digital environment (which should ensure greater accessibility of quality education). Education fosters innovation and technological advancements by providing individuals with the necessary knowledge and skills to develop new ideas, products, and processes.

The world's leading economists attribute a significant role to education in increasing productivity and economic growth rates. For instance, Galbraith et al. (1975) argued that allocating resources to education can result in a more significant rise in a country's overall income compared to directing investments towards physical infrastructure such as railways, dams, and machinery. He emphasized that education is a crucial component of human capital, which contributes significantly to economic growth and development. His argument stemmed from the idea that investment in education leads to developing a more skilled and productive workforce. With improved education, individuals acquire knowledge, skills, and abilities that enable them to contribute more effectively to the economy. Increased productivity and human capital development can result in higher incomes, more significant innovation, and overall economic progress.

The growth in the number of publications and scientific studies studying the importance of education in economic growth actualizes the need to use bibliometric analysis methods to identify patterns and trends studied by scientists from various countries around the world. Bibliometric methods are used to analyze the effectiveness of scientific work and map science. The analysis of the effectiveness of scientific research primarily focuses on evaluating the outcomes and impact of individual researchers, research groups, institutions, or organizations. On the other hand, science mapping aims to reveal the structure and dynamics of scientific fields. It goes beyond evaluating individual researchers or organizations and focuses on visualizing and analyzing the relationships between scientific publications, disciplines, and research topics. Science mapping techniques, including bibliographic coupling, co-citation analysis, keyword analysis, and network analysis, are used to construct maps or visual representations of the scientific landscape. This scientific work aims to analyze the structure and dynamics of academic research aimed at studying the role of education in economic growth.

Literature review

Many economic historians believe that the Industrial Revolution, which began in the 19th century, gained momentum only because of reforms in the world's education systems. Free primary education was introduced in most European countries and North America some 200 years ago and at the end of the 19th century, it became widespread. The poor had a chance to get a free higher education in the early 20th century. R. Easterlin (1981) found a link between the spread of education worldwide and the beginning of economic growth. It usually took 25 to 30 years after educational reform for a country to begin to see significant economic growth. In his 1981 paper titled "Why Isn't the Whole World Developed? Lessons from the Cotton Mills," Richard Easterlin examines the relationship between education and economic growth. Easterlin's study focused on the historical development of the cotton textile industry and its impact on economic growth. He argued that the spread of education played a crucial role in initiating economic development in countries that underwent educational reforms.

The underlying rationale behind Easterlin's findings is that education provides individuals with the necessary knowledge and skills to engage in more productive economic activities. By increasing the overall human capital of a nation, education

contributes to technological progress, innovation, and productivity improvements. Furthermore, education can have broader societal effects beyond individual productivity. It can lead to improved health outcomes, increased social mobility, and the formation of more efficient institutions, all of which can positively influence economic growth. While Easterlin's findings suggest a connection between the spread of education and the onset of economic growth, it is essential to consider his research within the broader context of other studies and the diverse factors influencing economic development.

Piao and Manag (2023) conducted a study that includes 37 countries and analyzes the relationship between the level of education and the sustainable development of the economy and environmental protection. The analysis concluded that a high level of education positively affects household income in all 37 countries, which indicates economic growth and development.

Osuntuyi and Lean's (2023) study examines education's direct and moderating roles in the growth-energy-environment relationship of African countries and recommends transforming the school educational program to increase environmental awareness, competence, and mindset to improve the African environment. Over the last decades, the growth-energy-environment relationship has been debated.

Abidin et al. (2023) analyzed the role of households' education and labour skills in Malaysia's economic growth. They determined that variables of capital and labour with tertiary education can influence economic growth in Malaysia in the long run. Furthermore, in alignment with the study's outcomes, it becomes evident that certain variables, such as capital, labor force possessing tertiary and secondary education, and the proportion of skilled labor, notably influence short-term economic growth. Consequently, it is imperative for the nation to channel increased resources towards the education and training sector, given that investments in education and the enhancement of labor skills are poised to yield favorable outcomes for economic progress.

The basic economic theory follows the concept of the human capital model, which considers the schooling process as an investment in human capital. Thus, the transition to compulsory schooling aims to increase the productivity of the group with a low level of education, which leads to an increase in their wages while not influencing the educational decisions of other groups. Molchanova and Guliyeva (2022) discussed the importance of

an economic approach to the analysis of education and the study of how the duration of compulsory education affects economic growth and well-being. Economic theory predicts that governments in developing and less developed countries, by investing in education and supporting schooling, can improve the quality of their workforce and stimulate economic growth and prosperity. The findings suggest that education policy can play a crucial role in the strategy of developing countries, allowing them to catch up with more prosperous states. Thus, the governments of less developed countries should adhere to public policies in the field of education, including the extension of compulsory education. This will improve the quality of human capital and, ultimately, increase the productivity and innovativeness of the economy. According to the conclusions of economic theory, political action in this direction will contribute to both economic growth and the general welfare of these countries.

Schweke (2004), in his 2004 viewpoint, emphasizes the importance of investing in "human capital" as a priority for countries worldwide. He argues that investments in healthcare, education, and vocational training contribute to increased labor productivity and play a crucial role in mitigating social problems that significantly burden national economies. Education is vital in fostering an entrepreneurial culture and promoting economic dynamism. Well-educated individuals are more likely to start businesses, create jobs, and contribute to economic development. Education provides aspiring entrepreneurs with the necessary skills, knowledge about market opportunities, and the ability to manage and grow their enterprises. Schweke's viewpoint underscores the interdependence between social and economic development. By prioritizing investments in human capital, countries can not only improve labor productivity and economic outcomes but also address social problems that hinder progress and create economic burdens. In his work "Education and Economic Development," American economist Haynes (1987) scrutinised the encounters of information technology companies. He deduced that in the era of the electronic revolution, the link between education and economic advancement has gained even greater significance. This perspective aligns with the understanding that the rapid advancement of technology and the digital age have significantly increased the importance of education for economic growth. Education promotes social and economic mobility by providing individuals from disadvantaged backgrounds with opportunities to improve their lives. Access to quality education

enables individuals to break the cycle of poverty, acquire better jobs, and contribute to the economy. A well-educated population can reduce income inequality and promote inclusive economic growth.

During the 1960s, there was a growing realization that advancements in technology and knowledge were becoming increasingly important for economic productivity and overall development. Researchers and economists argued that countries could achieve higher levels of economic growth by investing in education to improve the skills and knowledge of their workforce. Countries with a well-educated population tend to be attractive destinations for foreign direct investment (FDI). Investors are more likely to invest in countries that offer a skilled workforce, advanced research and development capabilities, and a supportive educational infrastructure. Education, therefore, plays a significant role in attracting foreign investment and stimulating economic growth. Overall, the perspective that investment in education is a key to accelerating economic growth emerged in the 1960s as researchers recognized the role of technological progress in economic development. Education was seen as a means to develop human capital, foster innovation, and drive productivity, leading to enhanced economic growth and prosperity.

Minser (1958) and Becker (1962; 1975; 1990) viewed investment in education as the future present value of an individual's income, i.e. an individual invests in education in order to have a higher income in the future. Ben-Porath (1967) was the first to propose the notion of the production function of human capital. He pointed out that an individual makes most of his investments in education when he is young. Therefore, the income received at this time is relatively small, but the investment in education is compensated by higher income in the future. Education is seen as a resource by the individual and has an impact on output, so the impact of education on the growth of the economy as a whole is unquestionable.

Economists were faced with the need to account for new growth factors due to the enormous technological change that was taking place in the world economy. Robert Solow (1956) was the first to try to account for this technological change, they viewed newly produced productive capital as a vehicle for technological progress.

Schultz (1960; 1961) was actually the first to assess the contribution of education to economic growth. He assessed the education sector of the economy in terms of public expenditure on education. Although Gary S. Becker and Theodore W. Schultz are often credited with pioneering the

economic analysis of education, Schultz's work focused more on human capital theory rather than specifically assessing the contribution of education to economic growth.

Schultz's influential work on human capital theory, particularly his book "Investment in Human Capital" published in 1961, argued that education and training contribute to the development of individuals' human capital, which in turn enhances their productivity and earning potential. Schultz emphasized the importance of investing in education and training to increase labor productivity and economic development. While Schultz's work acknowledged the link between education and economic growth indirectly through human capital, he did not specifically assess the education sector's contribution to economic growth in terms of public expenditure on education.

In Denison's (1962) studies, various origins of economic growth are recognized, with a specific focus on enhancing the quality of the workforce. Denison closely ties this aspect to the educational level of the employed populace. In his work, he identified several factors contributing to economic growth, one of which was improved labor quality. Denison specifically highlighted the role of education in enhancing the quality of the employed population. According to Denison, a more educated workforce can lead to increased productivity and innovation, which are crucial drivers of economic growth. Education equips individuals with the knowledge and skills necessary to perform more efficiently in their jobs, adapt to new technologies, and contribute to the overall productivity of the economy. By linking education to labor quality, he emphasized the importance of investing in human capital. Human capital refers to the knowledge, skills, and abilities that individuals possess and can contribute to economic production. Denison argued that policies and investments aimed at improving the labour force's education and skills can positively affect economic growth. Griliches (1960), an influential economist known for his contributions to the field of econometrics and the measurement of productivity and technological change, conducted studies parallel to Denison's on measuring changes in the quality of work. This study established the basis for investigating how education influences shifts in work excellence, extending to its effects on economic advancement.

The work of Nelson and Phelps (1966) has had a significant influence on all subsequent research in the field of education and economic growth. While it is important to note that their research was not the sole contributor to this study area, their find-

ings and insights have made notable contributions. According to their analysis, an economic system with a high level of education possesses a greater capacity to adapt to technological changes. This adaptability allows the economy to respond more swiftly to innovations, leading to higher economic growth rates. The rationale behind this argument lies in the idea that education equips individuals with the skills, knowledge, and problem-solving abilities necessary to embrace and exploit new technologies, leading to increased productivity and innovation.

Nelson and Phelps view education not as a separate factor in the production function along with productive capital and labor but as a determinant of aggregate productivity value (total factor productivity). They offered two models. The first model assumes that the level of education contributes to the fact that this country more quickly accepts new inventions made somewhere. The difference between the theoretical and real level of technological development is reduced. The second model assumes that the rate of technology development in a country depends on the level of education and the difference between the theoretical level of technology development and its true value.

In 1992, N. Gregory Mankiw, David Romer, and David N. Weil made noteworthy advancements in the realm of education's influence on economic growth. The authors incorporated measures of human capital, particularly average years of schooling, into the production functions of different countries to evaluate the significance of education for individual economies. In their research, Mankiw, Romer, and Weil aimed to examine the determinants of economic growth across countries empirically. They expanded the traditional production function framework by including human capital as an additional factor of production alongside physical capital and labor. By doing so, they recognized education as a critical component of human capital and sought to assess its impact on economic growth. Their empirical findings supported the positive relationship between education and economic growth. They arrived at the conclusion that increases in average years of schooling were associated with higher levels of output per worker. This relationship suggested that education was crucial in driving economic productivity and development.

These models essentially included education as a factor in the production function along with capital and labor. The new production function would be as follows, assuming that a Cobb-Doug-

las production function describes economic growth in a country:

$$Y_t = A_t K_t^\alpha L_t^\beta H_t^\gamma \varepsilon_t \quad (1)$$

Y - gross national product
 A - total productivity of factors;
 L - labor resources,
 K - capital resources.

Multiplier H_t - level of education. Using regression analysis methods, estimates were obtained for the coefficients α , β , and γ . Nelson and Phelps assumed that education has an impact on economic growth as a factor of production through its influence on factor A . That is, education determines the total productivity of factors. Including education in production functions and growth, models has become a common approach in studying the role of education in economic development.

It is worth highlighting that while the work of Nelson and Phelps has had a significant impact on subsequent research, it is just one among many influential contributions in the field. The relationship between education and economic growth is a complex and multifaceted topic, and researchers continue to explore and refine our understanding of this relationship in contemporary studies. Many contemporary researchers share Nelson and Phelps' views on the mechanism of the impact of education on economic growth. Benhabib and Spiegel (1994) accept Phelps' premise that the economic growth rate depends on the gap between the theoretical level of knowledge in the economy and its practical level. A country with a large gap has excellent growth potential as it can adopt new technologies. Authors do not use the concept of the theoretical level of knowledge, which is very difficult to define and, moreover, to use in empirical research. They consider not the gap between the theoretical and practical level of knowledge but the gap between the level of technological development of a given country and the leading country.

In their paper published in 1994, "Theories of Learning and the Economics of Growth," Seyla Benhabib and Mark Spiegel explore the relationship between knowledge, learning, and economic growth. They examine various theories of learning and their implications for economic growth and argue that knowledge accumulation and technological progress play crucial roles in fostering economic growth. According to their framework, economic growth occurs due to the gap between the potential or theoretical level of knowledge available in an economy and its practical or realized level. Their

analysis emphasises the importance of technological innovation and learning in bridging this knowledge gap. As an economy advances, it can develop new technologies and improve its productive capabilities through the accumulation of knowledge and learning processes. This, in turn, can lead to increased productivity and economic growth.

Their analysis emphasises the importance of technological innovation and learning in bridging this knowledge gap. As an economy advances, it can develop new technologies and improve its productive capabilities through the accumulation of knowledge and learning processes. This, in turn, can lead to increased productivity and economic growth.

Nelson and Phelps concluded that investing in education means higher growth rates only for already technologically advanced countries. They did not consider that while it may remain difficult for developing countries to adopt their new technologies, even with a sufficiently high level of education, they can borrow technologies from the leading country. New studies have proved that education holds significance for the growth rate not only in developed countries but also in developing countries.

Human capital indicators, such as educational attainment, workforce skills, and access to health-care, provide insights into a nation's potential for sustained growth and development. The works by Kussaiynov et al. (2023) and Kulzhanova et al. (2021) seem to align with the commonly held view that investments in human capital are a critical component of evaluating the economic systems of Kazakhstan. In the era of post-industrial development, the national economy and its economic entities can achieve their goals and be successful if they have sufficient creative potential, primarily due to the quality of their intellectual resources. For instance, the input of education and innovation on economic growth in the case of Kazakhstan was analysed by Kireyeva et al. (2023).

According to experts, in economically developed countries, human capital makes up 70-80% of national wealth. Scientists and specialists believe that human capital, like natural and physical capital, has value and needs revitalisation and development. In this regard, the international community evaluates each individual state in terms of the effectiveness of the country's education system. Therefore, this study aims to identify the main directions of research, concepts, and topics in the role of education in economic growth and to identify gaps in existing publications for future research.

Methodology

A bibliometric analysis of the literature was chosen to highlight the main concepts and essential areas in the study of the role of education in economic growth. A bibliometric analysis of the papers on the place of education in economic growth can offer valuable visions into the core ideas and significant areas of study in this field. By examining the features and tendencies of published articles, citations, and related metrics, bibliometric examination permits scientists to recognize important subjects leading authors, and developing research directions. The study might discover by what means education contributes to economic growth by increasing productivity and survey the influence of education on labor market results, technological progressions, innovation, and general productivity levels. The literature may well argue the economic incomes related to different education levels. This possibly will consist of analyzing the salary differentials among individuals with different education levels, measuring the social welfare of education, and observing the connection between education and income inequality. The study could discover research on education policies and interventions targeted at supporting economic growth and consist of research on the efficiency of educational reforms, investments directed to educational infrastructure, and skill improvement programs. The papers might contain relative studies examining the title role of education in economic growth from corner to corner-different countries and regions. It might search for differences in education systems' educational attainment levels and their effect on economic endings. The bibliometric analysis may highlight the methodologies and databases ordinarily used in studying the correlation in the middle of education and economic growth. It may well include sources like panel data analyses, econometric models, experimental studies, and national or international databases used for empirical research.

In addition, bibliometric analysis makes it possible to identify relationships between various terms and concepts. Also, it helps to identify keywords that often accompany each other in scientific publications and identify citation networks between them. This approach helps better understand the interactions and links between various aspects of the role of education in the economy.

The study was undertaken using the Web of Science (WoS): Core Collection database in May 2023. Core Collection stands out as one of the primary and extensively utilized bibliographic databases, offering a comprehensive examination of

research literature spanning diverse fields like sciences, social sciences, humanities, and arts.

A sample was collected for bibliometric analysis, the source was the Web of Science database, which was analyzed using the VOSviewer program, which allows clustering and network analysis of bibliometric information.

In the first stage, a search query was carried out, which included keywords and their combinations according to the research topic.

The co-occurrence method using the VOSviewer program was chosen as the primary method of data analysis. The integration of the VOSviewer tool further enhances the analysis by facilitating the visualization of complex networks and clusters of related terms. This visual representation aids in identifying prominent themes, central concepts, and emerging trends within the scholarly landscape. It enables us to discern the interdependencies and interrelationships between various research areas and provides a comprehensive overview of the multidimensional nature of the phenomenon under investigation. This method helps to cluster keywords according to the degree of how often they occur together in one work. Thus, the keywords form thematic clusters according to the research topic and form “science maps”. On the “science maps” below, the clusters are marked with different colors, the «total link strength» indicator, i.e. the strength of the association of a given keyword with all others, determines the size of

each keyword and the lines reflect the associations between two separate keywords.

It is essential to remember that the specific findings of a bibliometric analysis would be determined by the literature selection and the study’s scope. The education and economic growth field is enormous and continuously growing, so a bibliometric analysis can deliver a widespread overview of the research background and assist in classifying areas for additional analysis.

Results and Discussion

The keywords were analysed using the tools provided by the “VOSviewer” program, enabling an evaluation of the co-occurrence strength between different terms.

A specialized thesaurus comprising 72 terms was used to create a scientometric map. The primary objective was to merge similar terms and eliminate typographical errors within the keywords. For the map construction, we exclusively considered keywords that appeared at least 15 times in the dataset. Query terms were intentionally excluded from this selection as they are present in nearly all documents and could distort the clustering process. Consequently, the final set of keywords consists of 72 terms.

The visualization of the results is illustrated in Figure 1, wherein the dimensions of each element symbolize its overall connection potency, and the thickness of the lines indicates the potency of the link between the two terms.

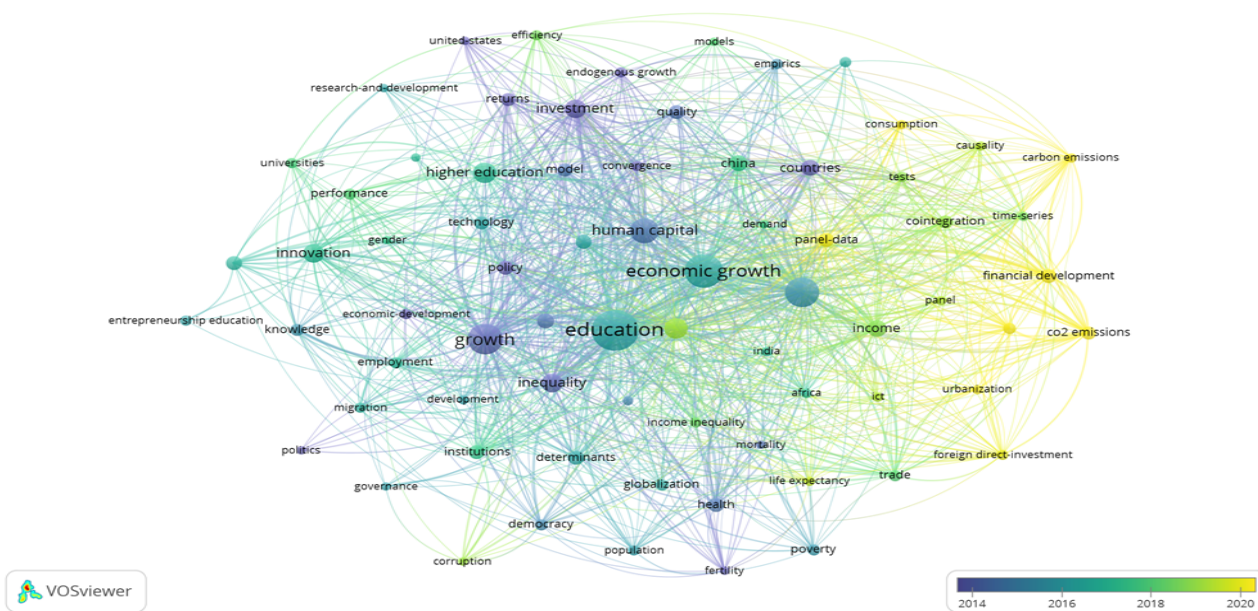


Figure 1 - Bibliometric map of publications View

Note: compiled by authors based on the VOSviewer software

Based on the results of the visualization of the temporal actualization of terms, it can be concluded that the first studies were mainly focused on the traditional method of education. This suggests that early research may have explored the impact of conventional educational approaches, such as formal schooling systems, on economic growth. Then, on research in the field of environmental protection and financial development. This suggests there may have been a growing recognition of the relationship between education, sustainability, and economic development. Studies in this cluster might have explored how education contributes to environmental awareness, conservation efforts, and sustainable economic practices. Another trend identified in the visualization is the actualization of research in financial development. This suggests that there may have been a significant body of

literature examining the relationship between education and financial outcomes, such as financial literacy, access to financial services, and the role of education in promoting economic stability and development. In addition, it is possible to identify trends in the actualization of certain research areas in each cluster separately.

Education's role in economic growth has been extensively studied and researched by scholars and economists over the years. It is a well-established field of inquiry, with numerous studies examining the relationship between education and economic outcomes. Between 1992 and 2023, 2432 research papers on the role of education in economic growth were published based on WoS, and its growth is observed, which actualizes this topic (Figure 3).

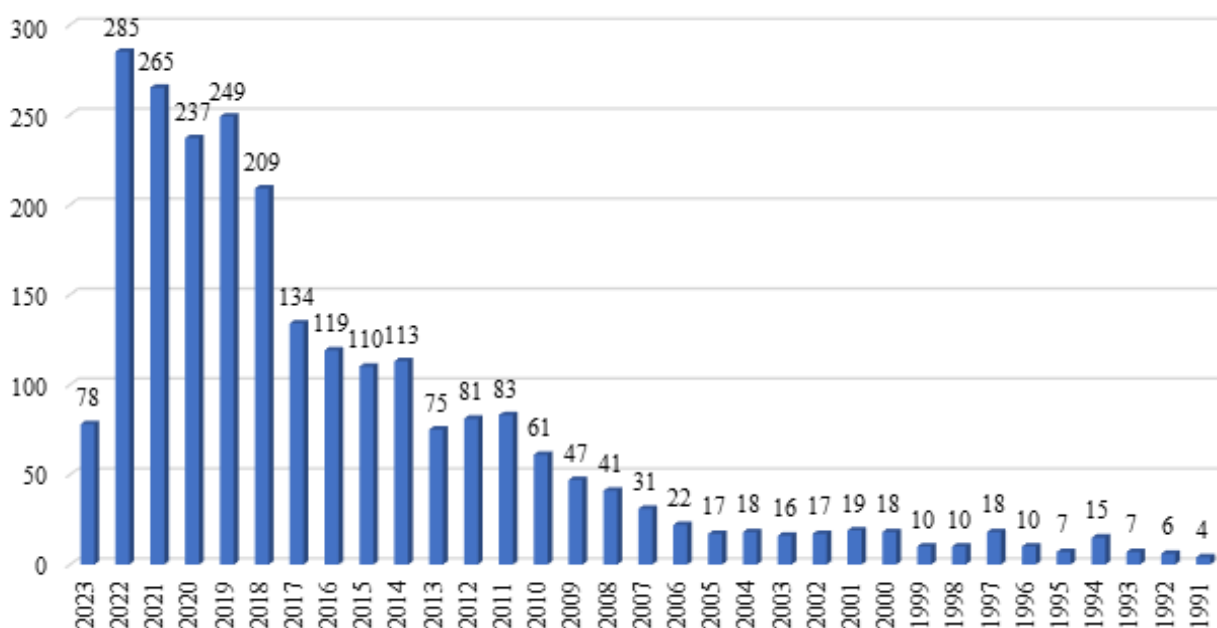


Figure 3 - Number of publications in WoS

Note: compiled by authors

An analysis of publication activity according to Web of Science data showed that until 2000, only about 90 articles were published regarding the role of education in economic growth, while since 2000, the number of publications has steadily increased, peaking in 2022 (285 documents).

Analyzing the area of journals published in research papers on the topic «the role of education in economic growth», we can draw the following conclusions. Most of the work has been published in the field of Economy (28%), Educational Research (15%), Management (10%), and Business (10%) journals (Figure 4).

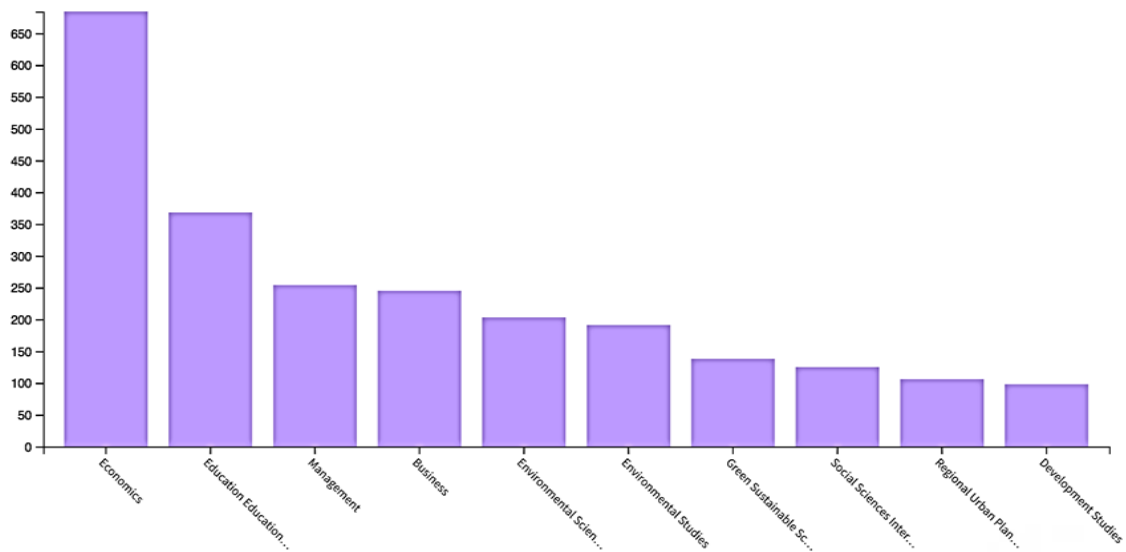


Figure 4 - Area of journals according to the topic WOS

Note: compiled based on the source WOS

The same dynamics are observed in the number of citations of articles in the field under study.

Citations indicate the impact of research on the role of education in economic growth. A

high citation level indicates the importance and relevance of research in the scientific community. The citation score allows you to identify influential and authoritative works that significantly impact the development of this field (Figure 5).

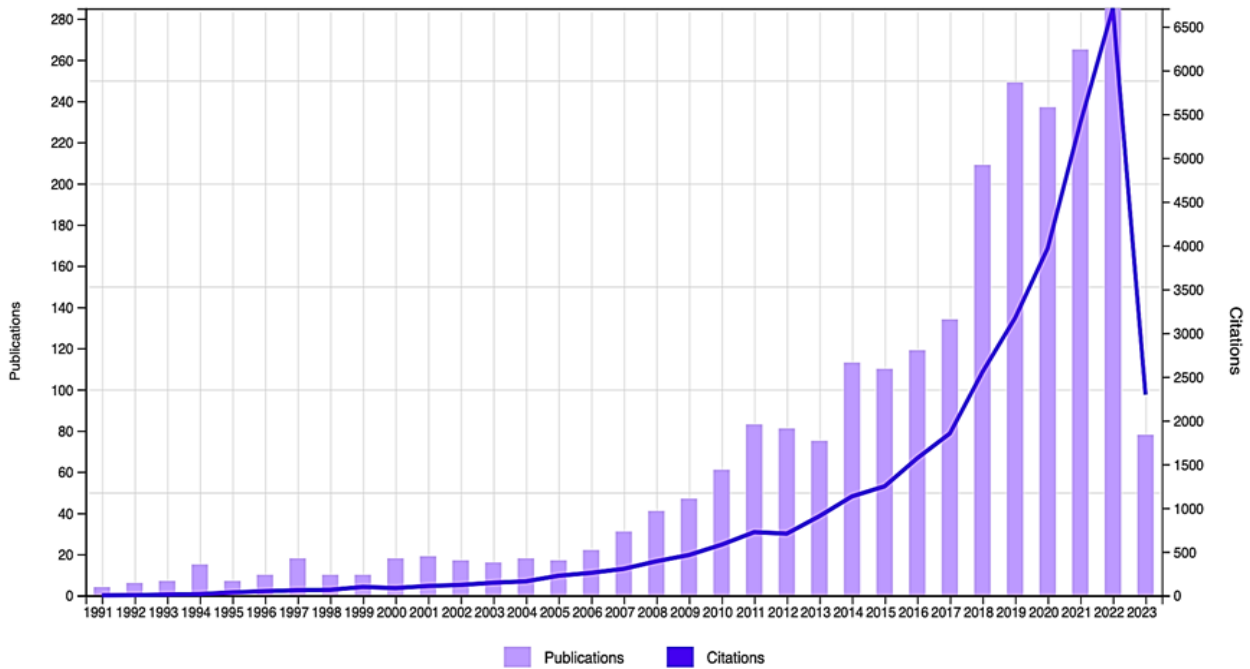


Figure 5 – Publication and citation WOS

Note: compiled based on the source WOS

From 1991 to 2023, publications were cited 35362 times and h-index 79. Citation analysis makes it possible to assess the dynamics of the development of the research area of the role of education in economic growth. By tracking the number and trend of citations, we could determine which works and ideas are gaining the most recognition and influence over time. This allows us

to understand the evolution and direction of this area of research.

In order to identify the most popular articles published and aimed at studying the role of education in economic growth, based on WoS data, five publications were selected with the most significant number of citations during the study period (Table 2).

Table 2 - Five most cited papers examining the role of education in economic growth, 1991-2023

| Article title | Author(s) | Journal title | Publication year | Cited, total |
|--|------------------------------------|--------------------------------|------------------|--------------|
| Increased educational attainment and its effect on child mortality in 175 countries between 1970 and 2009: A systematic analysis | Gakidou E., Cowling K., Murray CJL | Lancet | 2010 | 886 |
| The Role of Cognitive Skills in Economic Development | Hanushek E.A., Woessmann L. | Journal of Economic Literature | 2008 | 757 |
| International comparisons of educational-attainment | BARRO R.J., LEE J.W. | Journal of monetary economics | 1993 | 746 |
| Does schooling cause growth? | Bils M., Klenow P.J. | American economic review | 2000 | 579 |
| Globalization, Brain Drain, and Development | Docquier F. and Rapoport H. | Journal of economic literature | 2012 | 404 |

Note: compiled by authors

According to the data from Table 2, most of the journals in which the most cited articles were published are highly rated. They are included in the so-called first quartile, and most journals are top-rated in the scientific community.

Conclusions

Academic publication activity on the chosen research topic worldwide is steadily increasing, which indicates an increasing importance in the field of knowledge. Bibliometric investigations of extensive datasets offer valuable insights into the structuring and identification of research trends that would be challenging to attain without the aid of specialized tools. By employing the analysis tools provided by WoS and the VOSviewer program, we successfully achieved the intended objectives of research work with the desired level of depth and meticulousness.

The visualization of our study's findings revealed the interconnectedness of thematic areas (clusters) and citation networks, thereby indicating the intricate and multidimensional nature of the role of education in economic growth. This scientific research presents prospects for further comprehensive exploration of the mechanisms underlying the influence of education on economic growth by using metrics such as citations and

indexability of publications to identify the most influential and authoritative works in a given field. This helps to highlight the most significant studies and determine their contribution to understanding the role of education in economic growth.

It is important to note that the results analyzed in this article represent only a fraction of the potential afforded by bibliometric analysis programs. Consequently, it is fitting to continue investigating trends and promising research areas about education's impact on economic growth within specific clusters.

Thus, bibliometric analysis makes it possible to obtain an objective assessment and a deeper understanding of the role of education in the economy. It allows you to explore current trends, highlight key concepts and relationships, and assess the impact of academic work.

The place of education in economic progress has been a topic of widespread study and research. Many studies have presented a strong positive correlation between education and economic growth, emphasizing the numerous ways in which education leads to economic growth. Nevertheless, it is significant to remember that the relationship between education and economic growth is complex and complicated. The influence of education on development can differ depending on aspects

such as the quality of education, the significance of skills acquired, the attendance of complementary issues similar to infrastructure and institutions, and the overall economic environment. At the end of the study, it can be concluded that the quality and availability of education are central factors in defining its impact on economic growth. The analysis of literary sources proves the place of the level of education in the economy, which means governments and policymakers need to prioritize investments in education, ensure equitable access to education opportunities, and continuously upgrade the curriculum to meet the changing needs of the economy.

References

1. Abidin, N. Z., Saraih, U. N., Rashid, I. M. A., & Khairuddin, K. N. (2023, April). The role of education and skills on economic growth in Malaysia. In *AIP Conference Proceedings* (Vol. 2544, No. 1). AIP Publishing. <https://doi.org/10.1063/5.0116306>
2. Barro, R. J., & Lee, J.W. (1993). International comparisons of educational attainment. *Journal of Monetary Economics*, 32(3), 363-394. [https://doi.org/10.1016/0304-3932\(93\)90023-9](https://doi.org/10.1016/0304-3932(93)90023-9)
3. Becker, G. S. (1962). Investment in human capital: A theoretical analysis. *Journal of political economy*, 70(5, Part 2), 9-49. <http://dx.doi.org/10.1086/258724>
4. Becker, G. S. (1975). Investment in human capital: effects on earnings. In *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education, Second Edition* (pp. 13-44). NBER.
5. Becker, G. S., Murphy, K. M., & Tamura, R. (1990). Human capital, fertility, and economic growth. *Journal of Political Economy*, 98 (5, Part 2), S12-S37. <https://www.journals.uchicago.edu/doi/abs/10.1086/261723>
6. Benhabib, J., & Spiegel, M. M. (1994). The role of human capital in economic development evidence from aggregate cross-country data. *Journal of Monetary Economics*, 34(2), 143-173. [https://doi.org/10.1016/0304-3932\(94\)90047-7](https://doi.org/10.1016/0304-3932(94)90047-7)
7. Ben-Porath, Y. (1967). The production of human capital and the life cycle of earnings. *Journal of political economy*, 75(4, Part 1), 352-365. <https://doi.org/10.1086/259291>
8. Bills, M., & Klenow, P. J. (2000). Does Schooling Cause Growth? *American Economic Review*, 90(5), 1160-1183. <https://doi.org/10.1257/aer.90.5.1160>
9. Denison, E. F. (1962). Sources of Economic Growth in the United States and the Alternative Before Us (Committee for Economic Development, New York). Denison, EF (1967). *Why Growth Rates Differ: Post-War Experience in Nine Western Countries*, 179-218. <https://doi.org/10.1017/S0022050700104206>
10. Docquier, F., & Rapoport, H. (2012). Globalization, Brain Drain, and Development. *Journal of Economic Literature*, 50(3), 681-730. <https://doi.org/10.1257/jel.50.3.681>
11. Easterlin, R. A. (1981). Why isn't the whole world developed? *The Journal of Economic History*, 41(1), 1-17. <https://doi.org/10.1017/S0022050700042674>
12. Gakidou, E., Cowling, K., Lozano, R., & Murray, C. J. L. (2010). Increased educational attainment and its effect on child mortality in 175 countries between 1970 and 2009: a systematic analysis. *Lancet*, 376(9745), 959-974. [https://doi.org/10.1016/S0140-6736\(10\)61257-3](https://doi.org/10.1016/S0140-6736(10)61257-3)
13. Galbraith, J. K., Weidenbaum, M. L., Hession, C. H., Deckard, B., Sherman, H., & Thompson, C. C. (1975). Economics and the public purpose. *Journal of Economic Issues*, 9(1), 87-100. <https://doi.org/10.2307/2149269>
14. Griliches, Z. (1997). Education, human capital, and growth: a personal perspective. *Journal of Labor Economics*, 15(1, Part 2), S330-S344. https://doi.org/10.1007/978-1-4757-3161-3_10
15. Griliches, Z. (1960). Measuring inputs in agriculture: a critical survey. *Journal of Farm Economics*, 42(5), 1411-1427. <https://doi.org/10.2307/1235702>
16. Hanushek, E.A., & Woessmann, L. (2008). The Role of Cognitive Skills in Economic Development. *Journal of Economic Literature*, 46 (3), 607-668. <https://doi.org/10.1257/jel.46.3.607>
17. Haynes, Ch. J. (1987). Education and economic development. *ERIC digest series*, 23, 1-5.
18. Kireyeva, A. A., Kuandyk, Z., Kredina, A.A., Kangalakova, D., & Doszhan, R. (2023) Analysis of the Input of Education and Innovation on Economic Growth in Kazakhstan. *Journal of Distribution Science*, 21(1), 23-31. <https://doi.org/10.15722/jds.21.01.202301.23>
19. Kulzhanova, G. T., Kulzhanova, Z. T., & Efimov, L. A. (2021). Human Capital and Sustainable Development in a Religious Context. *Journal of Ethnic and Cultural Studies*, 8(3), 169-182. <https://doi.org/10.29333/ejecs/757>
20. Kussainov, T. A., Mussina, G. S., Bulkhairova, Z. S., & Saimagambetova, G. A. (2023). Financing the development of human capital and the efficiency of the economy of Kazakhstan: analysis of the relationship. *International Journal of Business Information Systems*, 42(2), 153-169. <https://doi.org/10.1504/IJBIS.2020.10031671>
21. Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. *The quarterly journal of economics*, 107(2), 407-437. <https://doi.org/10.2307/2118477>

22. Molchanova, A. V., & Guliyeva, A. (2022). Impact of the Duration of Compulsory Education on Economic Growth and Welfare. In *X Euro-Asian Symposium on Economic Theory "Viability of Economic Theories: through Order and Chaos"* (pp. 103-116). Cham, Springer International Publishing. https://doi.org/10.1007/978-3-031-27785-6_8
23. Nelson, R. R., & Phelps, E. S. (1966). Investment in humans, technological diffusion, and economic growth. *The American Economic Review*, 56(1/2), 69-75.
24. Osuntuyi, B. V., & Lean, H. H. (2023). Environmental degradation, economic growth, and energy consumption: The role of education. *Sustainable Development*, 31(2), 1166-1177. <https://doi.org/10.1002/sd.2480>
25. Schultz, T. W. (1961). Investment in human capital. *The American Economic Review*, 51(1), 1-17. https://doi.org/10.1007/978-1-349-19806-1_19
26. Schultz, T. W. (1960). Capital formation by education. *Journal of Political Economy*, 68(6), 571-583. <https://doi.org/10.1086/258393>
27. Schweke, W. (2004). Smart money: Education and economic development. *Economic Policy Institute, Bulgaria*, VI, 74.
28. Solow, R. M. (1956). A contribution to the theory of economic growth. *The quarterly journal of economics*, 70(1), 65-94. <https://doi.org/10.2307/1884513>
29. Piao, X., & Managi, S. (2023). The international role of education in sustainable lifestyles and economic development. *Scientific Reports*, 13(1), 8733. <https://doi.org/10.1038/s41598-023-35173-w>

Information about the authors

***Saltanat Kondybaeva** – PhD, Acting Associate Professor, Al-Farabi Kazakh National University, Almaty, Kazakhstan, email: saltanat.kondybaeva@kaznu.edu.kz, ORCID ID: <https://orcid.org/0000-0003-3496-3545>
Aitolkyn Sagynbayeva – PhD student in the specialty Economics, Al-Farabi Kazakh National University, Almaty, Kazakhstan, email: sagynbayeva1@gmail.com, ORCID ID: <https://orcid.org/0000-0002-9910-7777>
Gulden Manarbek – PhD, Al-Farabi Kazakh National University, Almaty, Kazakhstan, email: gulden.manarbek@kaznu.kz, ORCID ID: <https://orcid.org/0000-0002-1913-1858>
Katarzyna Czerewacz-Filipowicz – PhD, Professor, Bialystok Technological University, Faculty of Engineering Management, Director of the International Department of Logistics and Service Engineering, Bialystok, Poland, email: czerewacz.k@gmail.com, ORCID ID: <https://orcid.org/0000-0002-5987-2896>

Авторлар туралы мәліметтер

***Кондыбаева С.К.** – PhD докторы, м.а. доценті, әл-Фараби атындағы ҚазҰУ, Алматы, Қазақстан, email: saltanat.kondybaeva@kaznu.edu.kz, ORCID ID: <https://orcid.org/0000-0003-3496-3545>
Сағынбаева А.А. – «Экономика» мамандығының докторанты, әл-Фараби атындағы ҚазҰУ, Алматы, Қазақстан, email: sagynbayeva1@gmail.com, ORCID ID: <https://orcid.org/0000-0002-9910-7777>
Манарбек Г.М. – PhD докторы, әл-Фараби атындағы ҚазҰУ, Алматы, Қазақстан, email: gulden.manarbek@kaznu.kz, ORCID ID: <https://orcid.org/0000-0002-1913-1858>
Czerewacz-Filipowicz K. – PhD, профессор, Белосток технологиялық университеті, инженерлік менеджмент факультеті, Халықаралық логистика және сервистік инженерия департаментінің директоры, Белосток, Польша, email: czerewacz.k@gmail.com, ORCID ID: <https://orcid.org/0000-0002-5987-2896>

Сведения об авторах

***Кондыбаева С.К.** – PhD, и.о. доцента, Казахский Национальный Университет имени аль-Фараби, Алматы, Казахстан, email: saltanat.kondybaeva@kaznu.edu.kz, ORCID ID: <https://orcid.org/0000-0003-3496-3545>
Сағынбаева А.А. – PhD докторант по специальности «Экономика», Казахский Национальный Университет имени аль-Фараби, Алматы, Казахстан, email: sagynbayeva1@gmail.com, ORCID ID: <https://orcid.org/0000-0002-9910-7777>
Манарбек Г.М. – PhD, Казахский Национальный Университет имени аль-Фараби, Алматы, Казахстан, email: gulden.manarbek@kaznu.kz, ORCID ID: <https://orcid.org/0000-0002-1913-1858>
Czerewacz-Filipowicz K. – PhD, профессор, Белостокский технологический университет, факультет инженерного менеджмента, директор международного департамента логистики и сервисной инженерии, Белосток, Польша, email: czerewacz.k@gmail.com, ORCID ID: <https://orcid.org/0000-0002-5987-2896>