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EMPIRICAL ANALYSIS OF PUBLIC SPENDING ON EDUCATION AND ITS RELATION TO ECONOMIC DEVELOPMENT

D.M. Kangalakova[1*], L.S. Koldasova[2], Zh.Zh. Temirova[3], O.Sh. Adilkhanov[1]

[1]Institute of economics of CS MSHE RK, Almaty, Kazakhstan
[2]M. Auezov South Kazakhstan University, Shymkent, Kazakhstan
[3]Tashenev University, Shymkent, Kazakhstan

**Corresponding author e-mail: dmuratbekovna@mail.ru*

Abstract. *The purpose of this article is an empirical analysis of the impact of government spending on education levels to economic development. This article uses an integrated approach to the choice of methodology. The methods include general scientific methods such as comparative analysis, induction, and deduction and mathematical and economic methods such as correlation analysis. In addition, tests were applied during the study to verify the significance of the results and indicators of the main predictors of the analysis. The study examined the dynamics of GDP and government spending on education, which showed that the state spends a significant share of funds on secondary education. In contrast, the shares of higher and primary education are insignificant. It was found that there is a close relationship between economic growth and overall education spending, and secondary education also significantly affects their level. In conclusion, the domestic education sector interacts closely with economic growth, generating qualified human resources that bring economic benefits. The study also noted that secondary education is funded to the greatest extent, so its impact on economic development is excellent. Consequently, an increase in government spending on higher education can significantly affect the country's economic development, which requires a review of the policy in the field of higher and postgraduate education. The theoretical value of this article lies in the fact that it highlights theoretical developments that can complement the theory of the importance of human capital in the formation of competent human resources. The practical significance of this study lies in the fact that the results obtained can be used by government agencies and the private sector providing educational services.*

Keywords: *economics, human capital, public educational expenditures, economic development, empirical analysis.*

Main provisions. The development of highly intellectual human capital is a key factor in ensuring Kazakhstan's competitiveness and sustainable economic growth. Government spending on education plays a strategic role, as it improves workforce skills, stimulates innovation, and has a proven positive effect on GDP, with international studies showing that a 1% increase in education expenditures can raise GDP by 0.4–0.6% in the long run. Theoretical foundations laid by A. Smith, G. Becker, and T. Schultz confirm the direct link between investment in education and national wealth. International experience (Finland, South Korea, Sweden) demonstrates that prioritizing secondary and higher education

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strengthens human competitiveness and fosters innovation. Empirical studies also indicate that while secondary education lays the basic foundation, higher education drives technological and research-based economic development. For Kazakhstan, government expenditures on education are of strategic importance, directly contributing to the formation of a knowledge-based economy. Therefore, the study aims to identify which levels of education have the greatest potential to enhance economic development.

Introduction. Today, to be a competitive country in the global economic market, highly intelligent human capital is needed in almost all areas of the economy. The country's highly intelligent human capital is characterized by the fact that it possesses deeper knowledge and high professional skills that will bring the economy to a high level of competition and ensure its sustainable development. In this regard, the formation of the appropriate intellectual capital of the country is relevant, since global development does not stand still.; Therefore, the formation and increase of human capital requires flexible conditions, and one of the main factors forming the corresponding human capital is the education sector in the country. In this regard, government spending on education plays a crucial role in the formation of a high-quality and affordable educational space, which contributes to improving the skills of the workforce, increasing innovation activity and, as a result, accelerating economic growth. World Bank research data shows that a 1% increase in government spending on education leads to a 0.4–0.6% increase in GDP over the long term [1].

Many well-known economists have proven the relationship between developing a country's human capital and its wealth or economic development, including A. Smith [2], G. Becker [3] and T. Schultz [4]. These scientists have laid the theoretical foundation of science between the development and financing of human capital for the benefit of economic growth. Thus, investment in education has a unique role in the development of the country and its economic aspects. This is reflected through financing education and developing the country's human potential. The field of education has its peculiarity, and its main trigger is the state since education provides economic benefits and ensures the country's social development. The field of education has several levels, divided into primary, basic, secondary, higher, and postgraduate education. Each level of education influences the formation of the country's highly intelligent human capital; therefore, do not underestimate the levels. In this study, the example of Kazakhstan will be used to consider government financing of education levels and its impact on economic growth. Thus, the purpose of this study is an empirical analysis of the impact of financing education on economic development.

Literature review. Much research is devoted to the issues of effective formation and use of human capital. The issues raised age of various kinds, ranging from its proper formation to building up the highly intelligent human resources potential of the country. The focus is on investments in education, healthcare, and vocational training, which form the basis for the competitiveness of the modern economy. Theoretical and empirical work in this area shows that the qualitative development of human capital is closely related to the level of government spending, the effectiveness of its distribution, and the quality of educational policy [5, 6, 7].

In countries with high levels of public investment in education, such as Finland [8], South Korea [9] and Sweden [10], there is a stable correlation between the level of education of the population and GDP growth. Foreign countries pay more attention to secondary higher education. Basic in-depth knowledge, additional classes, and more extensive skills of schoolchildren lead to faster and more profound development of professional knowledge,

which can serve as a factor in human competitiveness, as well as the fact that this highly intellectually prepared person can become an impetus for the development of innovations and technologies. Also, in higher education, foreign countries pay more attention to case studies, laboratories, and practical classes, which can demonstrate theoretical knowledge.

Financing the education sector provides vast opportunities for forming knowledgeable human resources, and scientists pay special attention to education levels. Different educational programs in the field of education support different economic developments in the country. Experimental work was carried out in African countries, where more attention was paid to secondary education, whereas in one period, more attention was paid to higher education. Scientists suggest that the basic knowledge in earlier educational programs is less practical when higher education significantly impacts economic development [11, 12, 13, 14]. Thus, public financing of education and government programs that can unlock the population's potential in favor of economic development is of great importance in forming a highly intelligent human capital of the country.

Kazakhstan and other Central Asian countries have not overlooked this issue. Kazakhstani scholars also emphasize the importance of prioritizing the development of high-quality education. Studies by Kazakhstani researchers confirm a positive relationship between education and economic development [15, 16]. It has been demonstrated that investments in secondary education are often more cost-effective than those in higher education. Furthermore, some studies argue that government spending on education has a stronger impact on economic growth compared to expenditures on science and higher education, since basic knowledge and motivation for learning are formed at the initial stage of human capital development [17, 18]. Other research also indicates that the level of education that receives greater funding tends to show stronger development outcomes [19, 20]. Therefore, government spending on education is of strategic importance, as it directly contributes to the formation of a knowledge-based economy in Kazakhstan. In this context, the present study aims to identify which levels of education have the greatest potential to foster the development of the knowledge economy.

Materials and methods. General scientific and empirical research methods were used in this study. Comparative analysis, induction, and deduction methods were used to identify the importance of government spending in education and to compare foreign countries that show positive dynamics in economic growth with increased spending on education. Further, the empirical analysis includes correlation analysis, which identifies the leading indicators that can impact the formation of a country's highly intellectual potential. The Pearson correlation coefficient was used to estimate the linear relationship between quantitative variables:

$$r = \frac{\sum_{i=n}^{n}(x_i-\overline{x})(y_i-\bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i-\bar{x})^2}*\sqrt{\sum_{i=1}^{n}(y_i-\bar{y})^2}}, \quad (1)$$

where x_i and $y_i$are observed values, and $\bar{y}$, $\bar{x}$ are their means.

The significance of the correlation coefficients was tested using the **t-test**:

$$t = \frac{r*\sqrt{n-2}}{\sqrt{1-r^2}}, \text{ df=n-2}, \quad (2)$$

where df denotes degrees of freedom.

In addition, the overall significance of the regression model was checked using the **F-test:**

$$F = \frac{R^2/k}{(1-R^2)/(n-k-1)} \quad (3)$$

where R^2 is the coefficient of determination, k is the number of explanatory variables, and n is the sample size.

The statistical database was compiled from the National Bureau of Statistics and covers 2009 to 2023 (table 1).

Table 1 - Dependent and independent indicators

Variables	Name of the Variables	Source
GDP	GDP	Bureau of national statistics Agency for strategic planning and reforms of the Republic of Kazakhstan [15]
Total expenses for education, thousand tenge	Exp_Gen_Ed	
Government expenditures on pre-school education, thousand tenge	Gov_exp_Pre	
Government expenditures on primary education, thousand tenge	Gov_exp_Prim	
Government expenditures on basic and general secondary education, thousand tenge	Gov_exp_Sec	
Government expenditures on technical and vocational secondary education, thousand tenge	Gov_exp_Voc	
Government expenditures on higher and postgraduate education, thousand tenge	Gov_exp_High	
Note: compiled by authors		

During the study, a correlation analysis and an additional analysis were carried out. The indicators were simplified, and the leading indicators contributing to the formation of highly intelligent human potential in Kazakhstan were identified.

Results and discussion. Improving the quality of education depends on financing it. As international practice shows, the higher the financing of education, the higher the return on it. In this regard, Table 2 show data on changes in GDP and education expenditures in the Republic of Kazakhstan and on the share of education expenditures in GDP. The data show that GDP is showing positive dynamics; if in 2010, the GDP was 21,815 million tenge, the in 2023, it approximately increased sixfold, amounting to 120 billion tenges. Spending on education show positive dynamics, increasing from KZT 728 million to KZT 5.5 billion from 2010 to 2023. The share of education in the Republic of Kazakhstan in GDP in 2023 was 4.6%. Thus, GDP growth and government financial expenditures demonstrate positive dynamics in Kazakhstan.

Table 2 - Dynamics of changes in GDP and expenditures on education (2010, 2015 and from 2020 to 2023)

Variables	2010	2015	2020	2021	2022	2023
GDP, million tenge	21815	40884	70650	82000	103631	120000
Exp_Gen_Ed, thousand tenge	728104	1393448	2902183	3661823	4589996	5545994
Share Exp in GDP, %	3,3	3,4	4,1	4,5	4,4	4,6
Note: compiled by authors						

The data in Figure 1 shows the dynamics of primary, secondary, and higher education expenditures in the Republic of Kazakhstan from 2009 to 2023. The data show that the state spends the lion's share of education funding on secondary education, followed by higher education and, finally, on preschool education. Several reasons can explain this. Firstly, Kazakhstan is one of the most literate nations in the world, and 99% of the population has a basic education. Secondly, providing high-quality secondary education requires financial costs, from building a school to providing students with basic stationery. Also, there is currently a government program where elementary grades in schools are provided with food. Thus, a large proportion of government funding relates to secondary education. However, preschool and postgraduate education also require huge investments. Preschool education helps formulate high-quality skills for children at an early age, and higher education substantially impacts the economy's development as developments and implementations occur due to the synergetic effect of financing higher education. Thus, the data shows an uneven distribution of public funds in education.

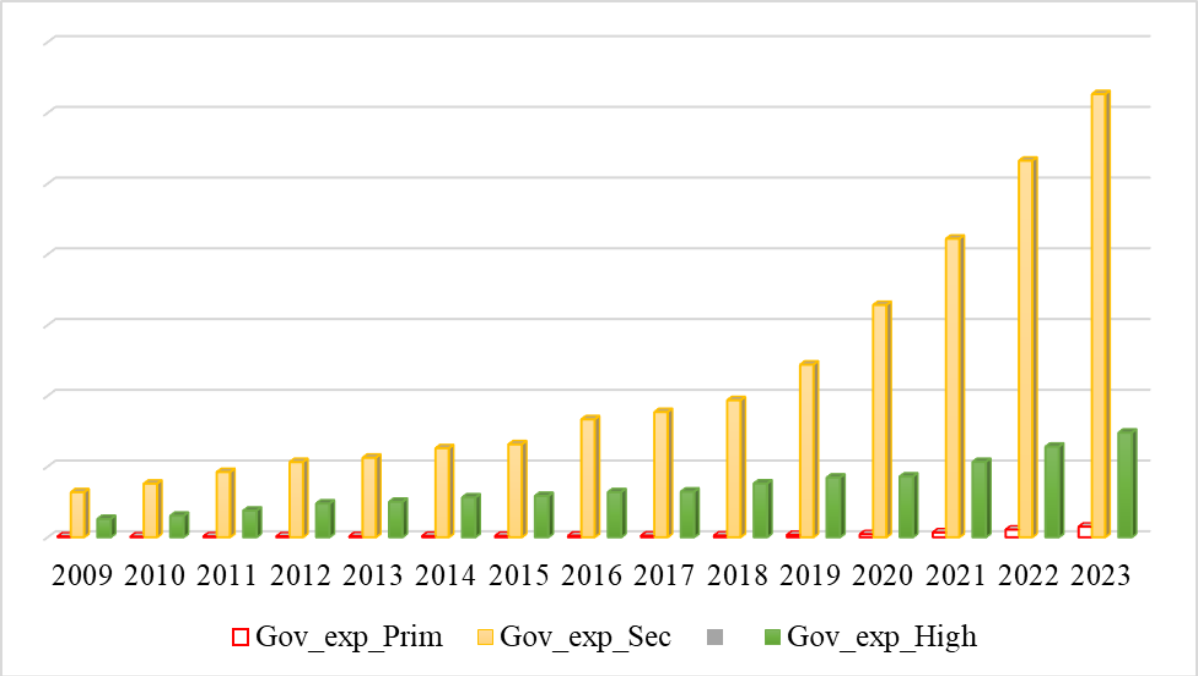

Figure 1 – The dynamics of expenditures on primary, secondary and higher education in the Republic of Kazakhstan (2009-2023), thousand tenge

Next, an empirical study was conducted to assess the impact of education levels and their sensitivity to economic development. A simple linear regression model was built, which look into account the financing of education and the financing of education at all levels and its impact on economic growth. The results were calculated using the Stata program. The results show that the constructed model is significant (R-squared: 0.998). However, the indicators are too close in value and have high multicollinearity with each other. Also, correlation analysis shows a high correlation between the indicators.

Table 3 – OLS Regression Results

Dep. Variable:		GDP		R-squared:		0.998	
Model:		OLS		Adj. R-squared:		0.996	
No. Observations:		15		F-statistic:		631.1	
Correlation analysis results							
Variables	GDP	Exp_Gen_Ed	Gov_exp_Pre	Gov_exp_Prim	Gov_exp_Sec	Gov_exp_Voc	Gov_exp_High
GDP	1	0,99	0,99	0,93	0,97	0,99	1
Exp_Gen_Ed	0,99	1	1	0,97	1	0,99	0,99
Gov_exp_Pre	0,99	1	1	0,96	0,99	0,99	0,99
Gov_exp_Prim	0,93	0,97	0,96	1	0,97	0,94	0,94
Gov_exp_Sec	0,97	1	0,99	0,97	1	0,99	0,98
Gov_exp_Voc	0,99	0,99	0,99	0,94	0,99	1	0,99
Gov_exp_High	1	0,99	0,99	0,94	0,98	0,99	1

In this regard, to verify the significance of the model, it was proposed to conduct a t-test, where the significance of individual indicators is checked. The test results show:

- General_Education: p=0.041 = 0.041p=0.041 (significant at 0.05).
- Preschool_Education: p=0.350p = 0.350p=0.350 (not significant).
- Primary_Education: p=0.010 = 0.010=0.010 (significant).
- Secondary_Education: p=0.046 = 0.046 p=0.046 (significant).
- Vocational_Education: p=0.053 = 0.053=0.053 (at the significance limit).
- Higher_Education: p=0.166p = 0.166p=0.166 (not significant).

Thus, the general model has a high explanatory power (R2=0.998R^2 = 0.998 R2=0.998). Not all indicators are statistically significant, which may be due to multicollinearity. Next, it was decided to build a simplified correlation model, where significant indicators were taken (table 4).

Table 4 – Simplified correlation model of the impact of education financing on the GDP

Variables	GDP	General_Education	Primary_Education	Secondary_Education
GDP	1,00	0.98	0.92	0,97
General_Education	0.98	1.00	0.96	0,99
Primary_Education	0.92	0.96	1.00	0,97
Secondary_Education	0.97	0.99	0.97	1,00

The results of the simplified model show that the coefficient of determination (R2) is 0.996 (practically unchanged after simplification), and the F-test: pp value is 9.27×10-149.27×10-14 (the model is significant). The indicators show that the overall financing of education is important and impacts the development of Kazakhstan's economy, in which secondary education has the most significant impact. This study proves that education financing has a direct impact, and a significant share of funding is for secondary education, as it accounts for the largest share of funding. An even more significant economic effect is expected if the share of funding for higher and postgraduate education increases, as this area contributes to the development of research and development, innovations, and technologies

that can be introduced into production. Thus, the study proved the close relationship between public education financing and economic development. Based on this, the study's results suggest that increased funding for higher education may provide more opportunities for economic development.

As the results indicate, there is a high degree of multicollinearity among the explanatory variables. However, this does not mean that the obtained indicators can be ignored. In this case, the interpretation requires special care. If the general relationship between education financing and GDP growth is confirmed, then the distribution of effects across individual levels of education needs further clarification and in-depth research. Thus, despite the presence of multicollinearity, the study's conclusions remain significant and confirm the need to improve the structure of financing the educational sector.

Conclusion. The importance of this problem lies in the fact that economic development requires more competitive human capital. For this purpose, the issue of the formation of highly intelligent human capital is being raised, which can become a driver of scientific and technological progress. In this regard, this study raises the issue of identifying the relationship between government spending and economic development since education has the opportunity to form and increase highly intelligent human capital. The study results show a strong and direct relationship between education spending and economic development and highlight the unique role of secondary education in the case of Kazakhstan. This can be explained by the fact that many state government educational expenditures are spent on secondary education. This conclusion suggests that increasing educational expenses at the higher and postgraduate levels will have an even more significant effect on economic development. This study shows that economic development requires reform of the education sector and a different distribution of public educational spending.

To enhance the effectiveness of public spending on education, several areas can be identified that will contribute to increasing the impact of financing this area on the country's economic development. One of the key areas is the restructuring of education expenditure items. It is necessary to develop a new approach to financing investments in higher and postgraduate education, while maintaining a sufficient level of support for primary and secondary education. This approach will enable us to more fully unlock the potential of universities and postgraduate training programs, thereby contributing to the development of a knowledge economy within the context of global digital transformation. The second important area is to improve the quality of public expenditure management. Here, the focus should be on linking funding to specific goals and results, such as increasing digital literacy levels, increasing the proportion of graduates in IT fields, and enhancing their employability. Digitalization of the education sector is of particular importance. It is necessary to actively implement educational technologies (EdTech) to help reduce costs and expand student enrollment. A crucial tool is the use of big data to predict demand for professions and make timely adjustments to educational programs. Additionally, it is necessary to introduce mechanisms that strengthen cooperation between the State and the private sector in financing education. Educational vouchers for training specialists in the field of IT, Big Data, and Data Science can become one of such tools. Thus, to enhance the effectiveness of the Kazakh education system, it is essential to continually modernize it in line with international standards, update its content and teaching tools, and prioritize the demands of the digital economy. Only under such conditions will the education system be able to make a substantial contribution to the country's economic development.

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МЕМЛЕКЕТТІК БІЛІМ БЕРУ ШЫҒЫНДАРЫНЫҢ ЭКОНОМИКАЛЫҚ ДАМУМЕН БАЙЛАНЫСЫН ЭМПИРИКАЛЫҚ ТАЛДАУ

Д.М. Кангалакова[1*], Л.С. Колдасова[2], Ж. Ж. Темирова[3], О.Ш. Әділханов[1]

[1]ҚР ҒжЖБМ ҒК Экономика институты, Алматы, Қазақстан
[2] Мұхтар Әуезов атындағы Оңтүстік Қазақстан университеті, Шымкент, Қазақстан
[3]Ташенов Университеті, Шымкент, Қазақстан

Түйін. *Бұл мақаланың мақсаты - білім деңгейлері бойынша мемлекеттік шығыстардың экономикалық дамуға әсерін эмпирикалық талдау. Бұл мақалада әдістемені таңдауда кешенді тәсіл қолданылады. Жалпы зерттеу әдістері бойынша салыстырмалы талдау, индукция және дедукция қолданылды және математико-экономикалық әдістің бірі корреляциялық талдау жүргізілді. Сонымен қатар, зерттеу барысында талдаудың негізгі нәтижелері мен көрсеткіштерінің маңыздылығын тексеру үшін тесттер қолданылды. Зерттеу барысында ЖІӨ динамикасы мен мемлекеттік білім беру шығындарының динамикасы зерттелді, бұнда мемлекеттің қаражаттың едәуір бөлігін орта білім беруге жұмсайтындығы анықталды. Бұдан басқа, жоғары және бастауыш білімнің үлесі шамалы екендігі қарастырылды. Экономикалық өсу мен жалпы білім беру шығындарының арасында тығыз байланыс бар екендігі дәлелденді, ал орта білім олардың деңгейіне айтарлықтай әсер ететіндігі анықталды. Қорытындылай келе, отандық білім беру жүйесі экономикалық дамумен тығыз байланыста екендігі анықталды, себебі экономикалық пайда әкелетін білікті адами ресурстарды білім жүйесі қалыптастырады. Сонымен қатар, білім беру жүйесін аса қаржыландырса, оның экономика дамуына әсері де өсетіндігі анықталды. Демек, жоғары білімге жұмсалатын мемлекеттік шығыстарды ұлғайтса, оның экономикалық дамуға әсер ету мүмкіндігі бар. Осы орайда, жоғары және жоғары оқу орнынан кейінгі білім беру саласындағы саясатты қайта қарау қажеттігі туындайды. Бұл мақаланың теориялық құндылығы оның адами капиталдың маңыздылығы туралы теорияны толықтыра алатындығында жатыр. Бұл зерттеудің практикалық маңыздылығы алынған нәтижелерді мемлекеттік органдар мен білім беру қызметтерін көрсететін жеке сектор пайдалана алатындығында.*

Түйін сөздер: *экономика, адами капитал, мемлекеттік білім беру шығындары, экономикалық даму, эмпирикалық талдау.*

ЭМПИРИЧЕСКИЙ АНАЛИЗ ГОСУДАРСТВЕННЫХ РАСХОДОВ НА ОБРАЗОВАНИЕ И ИХ СВЯЗИ С ЭКОНОМИЧЕСКИМ РАЗВИТИЕМ

Д.М. Кангалакова[1*], Л.С. Колдасова[2], Ж.Ж.Темирова[3], О.Ш. Адилханов[1]

[1]Институт экономики КН МНВО РК, Алматы, Казахстан
[2]Южно-Казахстанский университет им. М.Ауезова, Шымкент, Казахстан
[3]Университет Ташенова, Шымкент, Казахстан

Резюме. *Целью данной статьи является эмпирический анализ влияния государственных расходов уровней образования на экономическое развитие. В данной статье используется комплексный подход исследования. Методы включают в себя общенаучные методы, такие как сравнительный анализ, индукция и дедукция, а также математико-экономические методы, такие как корреляционный анализ. Кроме того, в ходе исследования были применены тесты для проверки значимости результатов и показателей анализа. В ходе исследования была проанализирована динамика ВВП и государственных расходов на образование, которая показала, что государство тратит значительную долю средств на среднее образование. Напротив, доли высшего и начального образования незначительны. Было установлено, что существует тесная взаимосвязь между экономическим ростом и общими расходами на образование, и среднее образование также существенно влияет на их уровень. В заключение отметим, что отечественный сектор образования тесно взаимодействует с экономическим ростом, создавая квалифицированные человеческие ресурсы, которые приносят экономические выгоды. В исследовании также отмечается, что среднее образование финансируется в наибольшей степени, поэтому его влияние на экономическое развитие является превосходным. Следовательно, увеличение*

государственных расходов на высшее образование может существенно повлиять на экономическое развитие страны, что требует пересмотра политики в области высшего и послевузовского образования. Теоретическая ценность данной статьи заключается в том, что в ней освещаются теоретические разработки, которые могут дополнить теорию о важности человеческого капитала в формировании компетентных человеческих ресурсов. Практическая значимость данного исследования заключается в том, что полученные результаты могут быть использованы государственными учреждениями и частным сектором, предоставляющими образовательные услуги.

Ключевые слова: *экономика, человеческий капитал, государственные расходы на образование, экономическое развитие, эмпирический анализ*

Information about authors:

Kangalakova Dana Muratbekovna* - *PhD, associate professor, Institute of economics of CS MSHE RK, Almaty, Kazakhstan, e-mail: dmuratbekovna@mail.ru, ORCID ID: https://orcid.org/0000-0001-8388-8559*

Koldasova Lyazzat Saparovna *– Senior Lecturer, M. Auezov South Kazakhstan University. Shymkent, Kazakhstan, e-mail: lazzatkoldasova@mail.ru, ORCID ID: https://orcid.org/0000-0001-5555-8392*

Temirova Zhannat Dzhambulovna *– Tashenev University, Shymkent, Kazakhstan, e-mail: zhannat_temirova@mail.ru, ORCID ID: https://orcid.org/0000-0002-0837-0319*

Olzhas Shaizandaevich Adilkhanov *– PhD, Institute of economics of CS MSHE RK, Almaty, Kazakhstan, e-mail: oljas_06@mail.ru, ORCID ID: https://orcid.org/0000-0002-4292-7408*

Авторлар туралы ақпарат:

Кангалакова Дана Мұратбекқызы* - *PhD, қауымдастырылған профессор, ҚР ҒжЖБМ ҒК Экономика институты, Алматы, Қазақстан, e-mail: dmuratbekovna@mail.ru, ORCID ID: https://orcid.org/ 0000-0001-8388-8559*

Колдасова Ляззат Сапаровна *– Аға оқытушы, М. Әуезов атындағы Оңтүстік Қазақстан Университеті, Шымкент, Қазақстан, e-mail: lazzatkoldasova@mail.ru, ORCID ID: https://orcid.org/0000-0001-5555-8392*

Темірова Жаннат Жамбылқызы *- Ташенев Университеті, Шымкент, Қазақстан, e-mail:zhannat_temirova@mail.ru, ORCID ID: https://orcid.org/ 0000-0002-0837-0319*

Әділханов Олжас Шайзандаевич *- PhD, ҚР ҒжЖБМ ҒК Экономика институты, Алматы, Қазақстан, e-mail: oljas_06@mail.ru, ORCID ID: https://orcid.org/0000-0002-4292-7408*

Информация об авторах:

Кангалакова Дана Муратбековна* - *PhD, ассоциированный профессор, Институт экономики КН МНВО РК, Алматы, Казахстан, e-mail: dmuratbekovna@mail.ru, ORCID ID: https://orcid.org/0000-0001-8388-8559*

Колдасова Ляззат Сапаровна – *Старший преподаватель, Южно-Казахстанский университет им. М. Ауэзова, Шымкент, Казахстан, e-mail: lazzatkoldasova@mail.ru, ORCID ID: https://orcid.org/0000-0001-5555-8392*

Темирова Жаннат Джамбуловна – *Университет Ташенова, Шымкент, Казахстан, e-mail: zhannat_temirova@mail.ru, ORCID ID: https://orcid.org/0000-0002-0837-0319*

Адильханов Олжас Шайдандаевич *– PhD, Институт экономики КН МНВО РК, Алматы, Казахстан, e-mail: oljas_06@mail.ru, ORCID ID: https://orcid.org/0000-0002-4292-7408*

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