Л.Н. Гумилев атындағы Еуразия ұлттық университетінің ХАБАРШЫСЫ.
ISSN (Print) 2789-4320. ISSN (Online) 2789-4339

ЭКОНОМИКА/ ECONOMICS/ ЭКОНОМИКА

IRSTI 06.52.17 https://doi.org/10.32523/2789-4320-2025-1-52-66
Type of Article: Scientific Research Article

The effectiveness of science financing to increase the competitiveness of the national economy

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Abstract. Financing of science is a strategically important factor determining the competitiveness of the national economy. This article analyzes approaches to financing science with an emphasis on the possibility of its development in Kazakhstan in the context of global economic changes. The article covers various financing mechanisms, including government grants, private investments, public-private partnerships, and alternative models. The research methodology is based on a comparative study of international experience, statistical analysis, and econometric modeling of projected science funding in Kazakhstan for 2025-2030. The results obtained indicate that the current level of investment in science is insufficient, which may slow down the country's innovative development. Forecasts show that if the current dynamics are maintained, the share of science in GDP may decrease, which will negatively affect the competitiveness of the national economy. The article offers recommendations for increasing the share of science funding, attracting private investment, and improving the effectiveness of grant financing. The presented conclusions and recommendations may be useful for government agencies involved in the development of a concept for the development of science, as well as for the scientific community and investors.

Keywords: science, innovation, grant financing, targeted program financing, private investment, public-private partnership

Received 06.02.2025. Revised 20.02.2025. Accepted 12.03.2025. Available online 31.03.2025

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Introduction

Funding for scientific research plays a key role in economic growth, technological progress, and enhancing a country's competitiveness in the global economy. Developed countries consistently increase investments in science, allowing them to create advanced technological clusters, develop innovative industries, and strengthen their position in the world economy. Kazakhstan, with its significant scientific potential, is also working on reforming its science funding system. However, the current model faces several challenges, including a low share of research funding in GDP, insufficient private sector involvement, inefficient allocation of budgetary resources, and weak integration of science into the real economy.

The relevance of this topic is driven by the need to find effective funding models that ensure sustainable scientific and technological progress and enhance the country's innovation potential. In recent years, there has been growing interest in various research funding mechanisms, including government grants, private investments, public-private partnerships, and alternative approaches such as crowdfunding. Despite the extensive research in this field, questions remain about the effectiveness of science funding in countries like Kazakhstan, highlighting the scientific and practical significance of this study.

The study aims to identify the most effective models of science funding, assess their impact on the country's innovative development, and provide recommendations for optimizing the allocation of financial resources.

The research is based on theoretical studies related to science policy, innovation economics, and government support for research, as well as official data from international organizations such as the OECD and the World Bank.

The research hypothesis suggests that the current level of science funding in Kazakhstan is insufficient to ensure the sustainable growth of an innovation-driven economy and requires diversification of funding sources with active private capital involvement. In particular, combined strategies that integrate public funding, private investment, and public-private partnerships can enhance the efficiency of scientific research and strengthen the integration of science into the real sector of the economy.

This research is significant both scientifically and practically, as it contributes to the development of public policy in science and innovation. The findings can be used to improve science funding mechanisms in Kazakhstan and to develop long-term strategies aimed at integrating research into the economy and enhancing the country's global competitiveness in science and technology.

Literature Review

In the modern scientific landscape, several funding models are utilized, including government grants, private investments, public-private partnerships, venture capital, and crowdfunding.

Government investments have traditionally been the primary source of funding for scientific research, particularly in fundamental science. According to OECD [1], a significant portion of research projects in developed countries is financed through government grants and subsidies.

The European program *Horizon Europe* is designed to support research and innovation at the EU level, fostering international collaboration [2]. Similar programs exist in the United States (NSF, NIH), China, and Japan.

Despite the significant advantages of government support, such as stability and long-term planning, there are also drawbacks, including bureaucratic barriers and complex application procedures, as noted by Dasgupta and David [3]. In some cases, bias in the allocation of funds has been identified, which is highlighted in the studies of V. Tartari and C. Kolympiris [4].

The private sector plays an important role in applied research aimed at the commercialization of scientific discoveries. According to NSF [5], more than 70% of research expenditures in the United States are covered by private corporations. In Japan and Germany, private businesses actively participate in scientific development using tax incentive mechanisms, as noted by HBS Kraft [6].

Venture financing and corporate investments enable the rapid commercialization of research but are often focused on short-term profit. Among the disadvantages of private funding, a high level of risk can be highlighted, as well as the concentration of investments in certain sectors, such as biotechnology and information technology, at the expense of fundamental research, as emphasized by Azoulay, Zivin, and Wang [7].

Public-private partnerships combine elements of government and private funding, ensuring a balance between the stability of the public sector and the flexibility of business. In Germany and the United Kingdom, PPP models are widely used to finance research in high-tech industries, as reported by the Fraunhofer Society [8].

PPP models have proven to be highly effective in applied sciences but require clear regulations to prevent conflicts of interest between academic institutions and commercial entities [9].

With the advancement of digital technologies, alternative funding models such as crowdfunding and decentralized distribution mechanisms have emerged in scientific research. Fang & Casadevall proposed using modified lottery-based distributions to eliminate expert bias [10]. Studies by Fossum et al. explore decentralized platforms for scientific funding [11].

Although alternative models show promise, their large-scale implementation requires further testing and refinement of project selection mechanisms.

Thus, the analysis suggests that modern science funding systems involve a complex interplay of government, private, and alternative mechanisms. The most successful models are hybrid strategies that integrate government support, venture investment, and international collaboration. In the future, special attention should be given to the introduction of new funding models, increasing transparency in grant distribution, and encouraging high-risk innovative projects.

Methodology

The research methodology is based on an analysis of the science funding system in Kazakhstan within the context of global economic changes. The study relies on statistical data, including the volume of domestic expenditures on research and development, their share in the gross domestic product (GDP), the number of scientific organizations, and research personnel. The

primary sources of information include official data from the Ministry of Science and Higher Education of the Republic of Kazakhstan, the National Center for State Scientific and Technical Expertise, the World Bank, and the Organization for Economic Co-operation and Development (OECD).

The study aims to identify the relationship between the level of science funding and Kazakhstan's development pace, allowing for the verification of the hypothesis that current research funding is insufficient to ensure the competitiveness of the national economy.

The research consists of several stages, starting with an analysis of the dynamics of science funding over the past twenty years. This is followed by a comparison with global practices, after which a forecast of the share of science funding in Kazakhstan's GDP for the coming years is conducted. Econometric models based on linear regression methods are employed to predict potential changes in the science funding system. The use of scenario analysis has allowed for an assessment of how different levels of investment in science impact economic growth, considering both optimistic and pessimistic forecasts. This approach provides a comprehensive understanding of current trends and enables the development of recommendations for improving the science funding system in Kazakhstan.

Results and Discussion

Funding for scientific activity is one of the key factors in a country's economic and technological development. Various models and mechanisms for supporting science exist worldwide, including government funding, private investments, and public-private partnerships.

An analysis of government programs for science development in the Republic of Kazakhstan highlights several key stages and trends reflecting the evolution of state policy in the field of science (Figure 1).

Figure 1. Stages of Modern State Policy in the Field of Science in Kazakhstan

Note: Compiled by the authors

The First Stage (2000-2010). This period was marked by the adoption of the first State Program "Education" (2000), which laid the foundation for reforms in the education system. The main focus was on expanding access to education and improving its quality. In 2005, a new program for 2005-2010 was approved, emphasizing the modernization of the educational system and the introduction of new teaching technologies. During the same period (2007–

2012), the first specialized Science Development Program was adopted, reflecting the growing recognition of the importance of science for the country's socio-economic development.

The Second Stage (2011–2020). This period was characterized by active modernization and integration into the global scientific community. The State Program for Education Development (2011–2020) took a more comprehensive approach, focusing on enhancing educational competitiveness and integrating Kazakhstan into the international academic space. During this time, there was an increase in academic mobility, reforms in higher education aligned with the Bologna Process, and the establishment of scientific research centers.

The 2016–2019 program continued these initiatives, emphasizing digitalization in education and strengthening the scientific infrastructure. However, despite the rise in scientific publications and international collaborations, the commercialization of research remained low, and science funding was insufficient for qualitative development.

The Third Stage (2020–2025). This stage is characterized by the strengthening of science's role and digitalization. The State Program for the Development of Education and Science (2020–2025) was developed more comprehensively, taking into account modern global challenges. It emphasized the integration of science and the economy, applied research, and the development of intellectual potential. The program also aimed to enhance research institutes, increase state funding for science, and support young scientists.

However, in practice, the effectiveness of these initiatives remains uncertain, particularly in terms of research commercialization and collaboration between science and business.

Table 1. State Programs for the Development of Education and Science in the Republic of Kazakhstan

Program Name	Main Objectives	Key Outcomes	Major Initiatives
State Program "Education" (2000–2005)	Establishing the foundations for education system reform	Development of the legal framework for education	Development of the legal framework for education
State Program for Education Development (2005–2010)	Modernization of the education system, introduction of new teaching technologies	Implementation of new educational standards, improved access to education	Development of new learning formats, adaptation to global standards
State Program for Science Development (2007–2012)	Increasing the competitiveness of science, stimulating research activities	Growth in the number of scientific publications, but weak commercialization of research	Creation of research centers, expansion of grant programs
State Program for Education Development (2011–2020)	Higher education reform, promotion of academic mobility	Strengthening academic mobility, university reforms	Accession to the Bologna Process, international cooperation

State Program for Education and Science Development (2016–2019)	Development of digital education and research infrastructure	Digitalization of education, expansion of research activities	Implementation of online education, strengthening academic freedom
State Program for Education and Science Development (2020–2025)	Digitalization, development of research universities, integration of science and the economy	Increased science funding, creation of scientific clusters	Development of research universities, integration of science and business
Note: Compiled based on data from [12]			

Kazakhstan's state policy for science development demonstrates a consistent commitment to reform. However, its effectiveness largely depends on practical implementation and a systematic approach to addressing existing challenges. The following key issues in the field of science have been identified:

– Despite an increase in science funding, its level remains below that of developed countries. Strengthening grant funding mechanisms and attracting private capital to research activities are necessary.

– Effective mechanisms for collaboration between universities, research institutes, and businesses are needed to facilitate the integration of scientific achievements into the economy.

In the context of global competition, investments in research and development (R&D) have become one of the main drivers of national economic competitiveness. Kazakhstan, with its significant potential in science and technology, aims to build an innovation-driven economy. Achieving this goal requires increased R&D funding, enhanced research efficiency, and better integration of scientific advancements into industrial production.

Table 2 presents an analysis of key indicators of the state and development of science in Kazakhstan for the period 2003–2023.

Table 2. Key Indicators of the State and Development of Science in the Republic of Kazakhstan

Indicator Name	2003	2004	2010	2020	2023
Domestic R&D Expenditures, million KZT	11 643,5	14 579,8	33 466,8	89 028,7	172 585,9
Share of Domestic R&D Expenditures in Gross Domestic Product, %	0,25	0,25	0,15	0,13	0,14
Note: Compiled based on data from [13]					

The dynamics of domestic expenditures on research and development in Kazakhstan from 2003 to 2023 demonstrate a steady increase, suggesting growing attention from both the state and businesses to the development of science. However, an analysis of the share of domestic R&D expenditures in GDP presents a different perspective. Despite the absolute growth in funding, the relative indicator has declined from 0.25% in 2003 to 0.12–0.14% in recent years. This trend indicates that the pace of economic growth has outstripped the increase in science funding, which may suggest that this sector has not been prioritized sufficiently in state policy.

A comparison with leading economies highlights significant disparities in science funding. In 2023, Israel allocated 6% of its GDP to research and development, while South Korea invested 5.2%, Taiwan 4%, the United States 3.6%, and Sweden, Belgium, and Japan each reached 3.4%. These figures emphasize Kazakhstan's lag in terms of R&D investment relative to global leaders, where higher expenditure on research and innovation has played a key role in driving economic growth. Strengthening financial support for scientific research and development could significantly enhance the country's economic prospects and contribute to technological modernization.

An analysis of global funding models reveals that the most successful approaches are characterized by a high proportion of private investment, transparent mechanisms for fund allocation, and active international collaboration. Countries that seek to improve the efficiency of science financing emphasize the importance of integrating public and private resources, developing public-private partnerships, implementing tax incentives for innovative enterprises, and participating in international research programs.

The experience of leading economies demonstrates diverse approaches to science financing that reflect specific economic, political, and technological priorities. The United States, China, Germany, and Japan employ mixed funding models that combine government grants, corporate investments, and tax incentives. The European Union places strong emphasis on international cooperation through initiatives such as *Horizon Europe*, which facilitates resource optimization and enhances the efficiency of research activities. In the United States, private sector contributions constitute a significant share of total R&D expenditures, while public funding focuses on fundamental research and strategic areas such as defense, healthcare, and artificial intelligence. A similar model is applied in Japan, where major corporations, including Toyota and Sony, invest in technological advancements, while government policies encourage private participation through tax incentives.

China demonstrates a contrasting approach, where public funding dominates the research sector. According to the Ministry of Science and Technology of China, government R&D expenditures have exceeded 2.4% of GDP, with a particular focus on strategic industries such as quantum computing, biotechnology, and green energy. This centralized model, based on long-term planning and state-driven initiatives, has enabled China to rapidly expand its scientific and technological potential.

Germany maintains a balanced strategy that integrates government support for universities and research institutes with active industrial involvement. Key organizations, such as the Fraunhofer Society and the Max Planck Society, receive financial support from both public and private sources, contributing to the country's leadership in applied research. A similar structure is evident in the United Kingdom, where the UK Research and Innovation agency provides funding for academic research, while corporate investors and venture funds support applied scientific developments.

In contrast, emerging economies such as Brazil and India remain heavily reliant on government funding for scientific research. The share of private investment in these countries remains relatively low compared to advanced economies. According to a World Bank report,

financial constraints and weak institutional integration between science and industry represent major obstacles to the expansion of research activities in developing economies.

The analysis of international practices highlights the necessity of adopting combined financing models that integrate public and private resources. Such an approach ensures sustainable growth in the scientific sector and contributes to economic modernization by fostering a stronger link between research and industry.

The state policy of Kazakhstan also reflects efforts to increase funding for science. For the period 2024–2026, the government has allocated 476.9 billion KZT for applied research, with specific budgetary allocations directed toward program-targeted financing, grant-based funding, and the commercialization of scientific developments. The National Center for State Scientific and Technical Expertise regularly announces grant and program-based funding competitions, including initiatives aimed at supporting young researchers under the Zhas Galym program for 2025–2027, as well as funding opportunities for scientific and technical projects for the same period.

The increasing number of scientific institutions and research personnel indicates a positive trend in Kazakhstan's scientific development. However, ensuring long-term progress requires a continuous focus on enhancing the efficiency of financial resources, strengthening mechanisms for the commercialization of scientific outputs, and promoting stronger integration between research institutions and the business sector. Addressing these challenges is essential for fostering an innovation-driven economy and enhancing the country's competitiveness in the global scientific and technological landscape.

Table 3. Number of Organizations and Employees Engaged in R&D

Indicator Name	2003	2004	2010	2020	2023
Number of organizations (enterprises) conducting R&D, units	273	295	424	396	425
Number of employees engaged in R&D, persons	16 578	16 715	17 021	22 665	25 473
– Researchers	9 899	10 382	10 870	18 228	21 534
– Doctor of Science	979	1 013	1 341	1 883	2 061
– Doctors in the field (Doctor by Specialty)	–	–	–	62	85
– PhD (Doctor of Philosophy)			59	1 757	3 458
– Candidates of Science	2 782	2 740	3 012	4 329	4 842
Note: Compiled based on data from [13]					

An analysis of the number of organizations engaged in research and development in Kazakhstan reveals an upward trend until the mid-2010s, followed by significant fluctuations. In 2012, a sharp decline was observed, which may be attributed to changes in the science funding system, sectoral reforms, or the reduction of small research enterprises due to insufficient support. In recent years, the number of such organizations has partially recovered, potentially reflecting the impact of new government programs aimed at stimulating research activities. However, the overall trend remains unstable, indicating ongoing structural challenges.

The number of employees in the R&D sector exhibits similar inconsistencies. Growth was observed until 2014, after which a decline occurred, followed by a gradual recovery. The highest number of researchers was recorded in 2014, after which their numbers decreased. This decline may be linked to shifts in the structure of scientific activities, a reduction in the number of research projects, or inadequate incentives for specialists to remain in the scientific field. Although the number of researchers has been increasing in recent years, it has not yet established a stable upward trajectory.

The qualification structure of researchers has also undergone substantial changes. The number of Doctor of Science holders has increased, but this growth has not been uniform, as both periods of expansion and contraction have been observed. The emergence of PhD holders in statistical records reflects the reform of the academic degree system and the implementation of international standards for training researchers. However, their numbers are increasing slowly, which may be attributed to limited career prospects for young scientists. At the same time, the number of Candidate of Science holders, which remained stable for a long period, has declined in recent years. This trend may be linked to the transition to the PhD system or a decrease in the influx of new specialists into the scientific workforce.

The analysis suggests that while science funding in Kazakhstan has increased in absolute terms, its relative share in the economy remains low. This indicates that within the structure of public and private financing, research and development do not hold a priority position. The initial growth in the number of research organizations and researchers observed in the first half of the study period was followed by instability, which may reflect ongoing reforms or challenges related to workforce retention in the sector. The adoption of international standards for scientific training has led to an increase in the number of PhD graduates, but has not resulted in a sustained rise in the overall number of highly qualified specialists. This may indicate a lack of long-term support mechanisms for scientific activities.

Ensuring the sustainable development of science in Kazakhstan requires not only an increase in funding but also the establishment of a stable system of incentives for researchers and the creation of favorable conditions for the growth of research institutions. According to data from the International Monetary Fund, investments in science typically yield returns within approximately ten years and have a significant impact on national income levels. Projections suggest that if such investments had been made consistently from 1960 to 2018, per capita income would be about 12% higher than current levels.

Enhancing competitiveness in the scientific sector and stimulating economic growth in Kazakhstan necessitate a substantial increase in the share of R&D investments, aligning with the benchmarks set by leading economies. Expanding science funding would contribute to strengthening the country's research potential, fostering innovation, and ensuring long-term economic growth.

To assess the impact of science funding on Kazakhstan's economic growth, statistical and econometric analysis methods were applied. The data set includes information on research funding, the share of R&D in GDP, and Kazakhstan's total GDP from 2003 to 2023. Based on this data, projections for 2025 and 2030 were generated using linear regression. The dependent variable in this model was the share of science funding in GDP over the period 2003–2023, while the independent variable was the corresponding year.

The linear regression model is represented as follows:

$$Y=a+bX \quad (1)$$

where:

Y is the predicted share of science funding in GDP,

X represents the year,

a and b are coefficients obtained by minimizing the sum of squared errors.

Based on this model, the projected values for the share of science funding in GDP for 2025 and 2030 were calculated.

To estimate the forecasted volume of science funding, the following formula was used:

$$F_t=GDP_t \times S_t/100 \quad (2)$$

where:

F_t – is the forecasted volume of science funding, million KZT;

GDP_t – is the forecasted GDP of Kazakhstan, million KZT;

S_t – is the forecasted share of science funding in GDP, (%).

The projected GDP values for 2025 and 2030 were extrapolated based on historical data using the linear trend method.

Science funding plays a crucial role in economic development by creating the conditions for innovation and technological growth. This study presents a forecast of science funding in Kazakhstan for 2025-2030 and assesses its impact on gross domestic product (GDP). To achieve this, trend analysis and scenario modeling were applied.

A linear regression model was developed based on historical data, indicating that if the current trend persists, the share of science funding may continue to decline. The projected values are presented in the table.

Table 4. Forecast of the Share of Science Funding in Kazakhstan's GDP

Year	Forecasted Share of Science Funding in GDP, %
2003	0,25
2004	0,25
2010	0,15
2020	0,13
2023	0,14
2025	0,0774
2030	0,04
Note: Compiled by the authors.	

The data analysis indicates that without an increase in science funding, its share in GDP could decline to 0.077% by 2025 and remain around 0.08% by 2030. This trend highlights

the low priority given to science within the national budget structure, which may hinder the development of innovative industries.

The impact of science investments on economic growth was assessed by comparing projected GDP values under different science funding scenarios. Three scenarios were considered:

– the baseline scenario, in which science funding follows the current trend;

– the optimistic scenario, which assumes an increase in the share of science funding in GDP;

– the pessimistic scenario, which assumes a decrease in the share of science funding.

The assessment of how changes in science funding affect GDP was conducted by analyzing the percentage change in GDP under different funding levels. Linear regression modeling was applied to forecast the share of science funding in GDP for 2025 and 2030. The scenario analysis demonstrated that increased investments in scientific research positively contribute to economic growth, whereas insufficient funding could reduce Kazakhstan's competitiveness and slow down economic development.

Table 5. Science Funding Scenarios for Kazakhstan

Scenario	Share of Science Funding in GDP, %	Forecasted GDP, billion KZT
Pessimistic Scenario	0,12	123042,92
Baseline Scenario	0,0774	117689,27
Optimistic Scenario	0,18	130576,16
Note: Compiled by the authors.		

The analysis results indicate that a further reduction in the share of science funding will lead to a slowdown in economic growth. If funding decreases to 0.12%, the projected GDP will be 123,042 billion KZT, while maintaining the current trend will result in a GDP of 117,689 billion KZT. An increase in funding to 0.18% could drive GDP growth to 130,576 billion KZT. This underscores the significant role of science and innovation in ensuring the country's long-term development. To change the current situation, it is essential to increase science funding, encourage private investment, and improve the efficiency of allocated resources. Only targeted measures will allow the creation of a sustainable scientific ecosystem and support the growth of the national economy.

Conclusion

The development of the science funding system in Kazakhstan amid global economic changes is a critical task, as its resolution directly impacts the country's technological and economic progress. The analysis conducted reveals that despite the absolute increase in science funding, its share in the gross domestic product (GDP) has shown a declining trend. This indicates the insufficient prioritization of scientific research within the national budget structure, which may negatively affect Kazakhstan's innovation activity and international competitiveness.

The study of existing science funding models has established that mixed strategies, incorporating government subsidies, private investments, public-private partnerships, and tax incentives for innovative enterprises, are the most effective. An analysis of international

experience shows that countries with high economic growth rates allocate larger volumes of science funding and actively engage the private sector in research and development. Kazakhstan must adapt successful international practices by strengthening support for both fundamental and applied research while ensuring a more efficient allocation of public funds.

Forecasting the share of science funding in GDP for 2025 and 2030 using econometric methods has revealed a risk of further decline if appropriate measures are not taken. Specifically, the modeling results confirm that increased investment in science positively affects economic growth rates, supporting the research hypothesis on the necessity of diversifying funding sources and increasing financial allocations for scientific research.

The recommendations proposed in this study aim to enhance the efficiency of science funding in Kazakhstan. They include:

1. Developing mechanisms to stimulate private investment in science, such as introducing tax incentives for businesses investing in research and creating special government co-financing programs for private initiatives.

2. Improving the grant funding system by implementing transparent criteria for assessing grant efficiency and developing mechanisms for post-grant monitoring of results.

3. Expanding international cooperation by increasing Kazakhstan's participation in global scientific programs such as Horizon Europe and establishing partnerships with leading research centers.

4. Establishing specialized science and innovation funds, operating on a venture funding model to support promising applied research and startups.

5. Minimizing administrative and legislative barriers by reviewing bureaucratic procedures related to grant applications and funding access to facilitate engagement with public resources.

Implementing these measures will enhance research activities, strengthen the country's scientific potential, and ensure long-term economic growth. Moreover, adopting specific policy instruments supported by successful reform examples from other countries, such as Finland (Tekes system), Germany (Fraunhofer Society), and South Korea (KAIST), will enable Kazakhstan to integrate the most effective practices.

This study lays the foundation for further research in this field. In the future, it is advisable to continue exploring the impact of different science funding mechanisms on innovation activity in the country and to conduct a detailed analysis of the effectiveness of existing government science support programs. This will facilitate the development of new approaches to establishing a sustainable science funding system in Kazakhstan, considering global economic challenges and technological transformations.

Conflict of Interest

The authors declare no conflict of interest.

Authors' Contributions

Yessenbek Ch.N. developed the research concept, conducted an analysis of existing science funding models, and prepared the theoretical section of the article.

Sorokina L.N. analyzed international practices in science funding, conducted a comparative analysis, and contributed to formulating recommendations for improving the efficiency of research financing.

Zhumagulova A.K. performed statistical analysis, developed forecasting models for science funding in Kazakhstan, and formulated recommendations. All authors participated in the discussion of results, the formulation of conclusions, and the preparation of the final version of the article.

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Ұлттық экономиканың бәсекеге қабілеттілігін арттыру мақсатында ғылымды қаржыландырудың тиімділігі

Аннотация. Ғылымды қаржыландыру ұлттық экономиканың бәсекеге қабілеттілігін анықтайтын стратегиялық маңызды фактор болып табылады. Бұл мақалада ғылымды жаһандық экономикалық өзгерістер жағдайында оның Қазақстанда даму мүмкіндігіне баса назар аудара отырып, оны қаржыландыру тәсілдеріне талдау жүргізіледі. Мақалада қаржыландырудың әртүрлі тетіктері, соның ішінде мемлекеттік гранттар, жеке инвестициялар, мемлекеттік-жекеменшік серіктестік және балама модельдер қамтылған. Зерттеу әдістемесі халықаралық тәжірибені салыстырмалы зерделеуге, статистикалық талдауға және Қазақстанда ғылымды қаржыландырудың 2025-2030 жылдарға арналған болжамды мәндерін эконометрикалық модельдеуге негізделген. Алынған нәтижелер ғылымға инвестициялардың ағымдағы деңгейінің жеткіліксіздігін көрсетеді, бұл елдің инновациялық дамуын бәсеңдетуі мүмкін. Болжамдар қазіргі динамика сақталған кезде ЖІӨ-дегі ғылымның үлесі төмендеуі мүмкін екенін көрсетеді, бұл ұлттық экономиканың бәсекеге қабілеттілігіне теріс әсер етеді. Мақалада ғылымды қаржыландыру үлесін ұлғайту, жеке инвестицияларды тарту және гранттық қаржыландырудың тиімділігін арттыру бойынша ұсыныстар ұсынылған. Ұсынылған тұжырымдар мен ұсыныстар ғылымды дамыту тұжырымдамасын әзірлеумен айналысатын мемлекеттік органдар үшін, сондай-ақ ғылыми қауымдастық пен инвесторлар үшін пайдалы болуы мүмкін.

Түйінді сөздер: ғылым, инновация, гранттық қаржыландыру, бағдарламалық-нысаналы қаржыландыру, жеке инвестициялар, мемлекеттік-жекешелік әріптестік

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Эффективность финансирования науки в целях повышения конкурентоспособности национальной экономики

Аннотация. Финансирование науки является стратегически важным фактором, определяющим конкурентоспособность национальной экономики. В данной статье проводится анализ подходов финансирования науки с акцентом на возможности ее развития в Казахстане в условиях глобальных экономических изменений. Статья охватывает различные механизмы финансирования, включая государственные гранты, частные инвестиции, государственно-частное партнерство и альтернативные модели. Методология исследования основана на сравнительном изучении международного опыта, статистическом анализе и эконометрическом моделировании прогнозных значений финансирования науки в Казахстане на 2025-2030 годы. Полученные результаты свидетельствуют о недостаточности текущего уровня вложений в

науку, что может замедлить инновационное развитие страны. Прогнозы показывают, что при сохранении текущей динамики доля науки в ВВП может снизиться, что негативно отразится на конкурентоспособности национальной экономики. В статье предложены рекомендации по увеличению доли финансирования науки, привлечению частных инвестиций и повышению эффективности грантового финансирования. Представленные выводы и рекомендации могут быть полезны для государственных органов, занимающихся разработкой концепции развития науки, а также для научного сообщества и инвесторов.

Ключевые слова: наука, инновации, грантовое финансирование, программно-целевое финансирование, частные инвестиции, государственно-частное партнерство

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