

THE CONTRIBUTION OF INNOVATIONS TO THE ECONOMIC DEVELOPMENT OF THE REGIONS OF KAZAKHSTAN

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The development of an innovative economy is one of the key directions of Kazakhstan's strategic development. In the context of global competition and rapid technological progress, the ability of regions to introduce and adapt innovations is becoming a decisive factor in economic growth and increasing the country's competitiveness on the world stage. Kazakhstan, with its significant natural resource potential, is striving to move to a new model of economic development based on knowledge, innovation and technology.

The article examines the impact of innovations on the economic development of the regions of Kazakhstan. The study covers an analysis of the current state of innovation infrastructure, including science and technology parks, incubators and accelerators, as well as government support programs aimed at stimulating innovation activity in the regions. The paper examines the main problems and barriers to innovation, as well as analyzes the correlation between innovation and key economic indicators such as gross regional product, unemployment and investment attraction.

Special attention is paid to international experience, which is being considered in order to develop recommendations for improving regional innovation policy in Kazakhstan. The study is based on statistical data and includes methods of correlation analysis to identify the relationship between innovation and economic development. As a result of the analysis, recommendations have been formulated to improve regional policies aimed at stimulating innovation, which, in turn, can help accelerate economic growth and increase the competitiveness of Kazakhstan's regions at the global level.

Keywords: innovation; development; management; management mechanisms; innovation potential; forecast; level; region; efficiency; strategy; modernization; priorities; technological processes; prerequisites.

ҚАЗАҚСТАН ӨНІРЛЕРІНІҢ ЭКОНОМИКАЛЫҚ ДАМУЫНА ИННОВАЦИЯЛАРДЫҢ ҚОСҚАН ҮЛЕСІ

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Инновациялық экономиканы дамыту Қазақстанның стратегиялық дамуының негізгі бағыттарының бірі болып табылады. Жаһандық бәсекелестік пен қарқынды технологиялық прогресс жағдайында өңірлердің инновацияларды енгізу және бейімдеу қабілеті елдің әлемдік аренадағы экономикалық өсуі мен бәсекеге қабілеттілігін арттырудың шешуші факторына айналууда. Қазақстан айтарлықтай

табиғи ресурстық әлеуетке ие бола отырып, білімге, инновациялар мен технологияларға сүйенетін экономикалық дамудың жаңа моделіне көшуге ұмтылады.

Мақалада инновациялардың Қазақстан өңірлерінің экономикалық дамуына әсері қарастырылады. Зерттеу инновациялық инфрақұрылымның, оның ішінде ғылыми және технологиялық парктердің, инкубаторлар мен үдеткіштердің ағымдағы жай-күйін, сондай-ақ өңірлердегі инновациялық белсенділікті ынталандыруға бағытталған мемлекеттік қолдау бағдарламаларын талдауды қамтиды. Жұмыста инновацияларды енгізудің негізгі мәселелері мен кедергілері қарастырылады, сондай-ақ инновациялық қызмет пен жалпы өңірлік өнім, жұмыссыздық деңгейі және инвестициялар тарту сияқты негізгі экономикалық көрсеткіштер арасындағы корреляциялық тәуелділіктер талданады.

Қазақстанда өңірлік инновациялық саясатты жақсарту бойынша ұсынымдар әзірлеу мақсатында қаралатын халықаралық тәжірибеге ерекше назар аударылды. Зерттеу статистикалық мәліметтерге негізделген және инновация мен экономикалық даму арасындағы байланысты анықтау үшін корреляциялық талдау әдістерін қамтиды. Жүргізілген талдау нәтижесінде инновацияларды ынталандыруға бағытталған өңірлік саясатты жақсарту үшін ұсынымдар тұжырымдалды, бұл өз кезегінде экономикалық өсуді жеделдетуге және жаһандық деңгейде Қазақстан өңірлерінің бәсекеге қабілеттілігін арттыруға ықпал етуі мүмкін.

Түйін сөздер: инновация; даму; басқару; басқару тетіктері; инновациялық әлеует; болжам; деңгей; аймақ; тиімділік; стратегия; жаңғырту; басымдықтар; технологиялық процестер; алғышарттар.

ВКЛАД ИННОВАЦИЙ В ЭКОНОМИЧЕСКОЕ РАЗВИТИЕ РЕГИОНОВ КАЗАХСТАНА

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Развитие инновационной экономики является одним из ключевых направлений стратегического развития Казахстана. В условиях глобальной конкуренции и стремительного технологического прогресса, способность регионов внедрять и адаптировать инновации становится решающим фактором экономического роста и повышения конкурентоспособности страны на мировой арене. Казахстан, обладая значительным природным ресурсным потенциалом, стремится перейти к новой модели экономического развития, которая опирается на знания, инновации и технологии.

В статье рассматривается влияние инноваций на экономическое развитие регионов Казахстана. Исследование охватывает анализ текущего состояния инновационной инфраструктуры, в том числе научных и технологических парков, инкубаторов и акселераторов, а также программ государственной поддержки, направленных на стимулирование инновационной активности в регионах. В работе рассматриваются основные проблемы и барьеры внедрения инноваций, а также анализируются корреляционные зависимости между инновационной деятельностью и ключевыми экономическими показателями, такими как валовой региональный продукт, уровень безработицы и привлечение инвестиций.

Особое внимание уделено международному опыту, который рассматривается с целью выработки рекомендаций по улучшению региональной инновационной политики в Казахстане. Исследование

основано на статистических данных и включает в себя методы корреляционного анализа для выявления взаимосвязи между инновациями и экономическим развитием. В результате проведенного анализа сформулированы рекомендации для улучшения региональной политики, направленной на стимулирование инноваций, что, в свою очередь, может способствовать ускорению экономического роста и повышению конкурентоспособности регионов Казахстана на глобальном уровне.

Ключевые слова: инновации; развитие; управление; механизмы управления; инновационный потенциал; прогноз; уровень; регион; эффективность; стратегия; модернизация; приоритеты; технологические процессы; предпосылки.

Introduction. With the goals of diversifying the economy and lowering reliance on raw commodities, the subject of innovations' role in the economic growth of Kazakhstan's regions is pertinent. The adoption of innovations at the regional level helps to draw in investments, boost labor productivity, grow small and medium-sized enterprises, and create new jobs. With the rise of digitization, innovation's importance is only growing.

By examining how innovation contributes to the economic growth of Kazakhstan's regions, it is possible to evaluate the success of the state's current innovation support initiatives, pinpoint the best regional strategies, and create suggestions for future innovative activity stimulation. Furthermore, the topic is pertinent to international cooperation since Kazakhstan's entry into global innovation networks has the potential to quicken the country's economic modernization process and guarantee long-term sustainable growth.

The aim of this research is to examine the role that innovation plays in the economic growth of Kazakhstan's regions and to pinpoint the main drivers of the rise in regional innovation activity.

A review of previous research demonstrates that innovation's role in the economic growth of Kazakhstan's regions is acknowledged as a critical component of sustainable growth. However, despite significant efforts to develop innovation infrastructure and support from the state, there are serious barriers that impede the effective implementation of innovations in the regions. These include inadequate resources, a dearth of skilled workers, a poor degree of collaboration between industry and academia, and a poor integration into international innovation processes.

The article examines the theoretical aspects of innovations, their impact on the economy, and analyzes the current state of innovation infrastructure in Kazakhstan. The operation of technology parks, business incubators, and other components of the innovation ecosystem are studied in particular, as is the degree of state support at the regional level. The collected statistical data on the gross regional product, unemployment rate, investment attraction and number of patents are used to conduct an empirical analysis of the relationship between innovation and regional economic performance. The study also includes the identification of problems and barriers to innovation through surveys and interviews with representatives of business, academia and government. As a result, recommendations are formulated to stimulate innovative activity and infrastructure development, as well as consider the possibilities of expanding international cooperation to increase the competitiveness of the regions of Kazakhstan.

Materials and methods. The process of introducing new or significantly enhanced goods, services, technology, production and management organizational strategies, and other elements that lead to a notable improvement in the overall performance of economic systems and organizations is known as innovation. They are essential to the process of economic expansion because they boost competitiveness, open up new markets, and enhance people's quality of life.

Innovations can be classified according to various criteria, the most common of which are classification by the object of innovation, by the level of novelty and by the degree of impact on the market.

These classifications help to better understand the nature of innovation and its impact on economic development, allowing for more effective strategies and approaches for its implementation and development at the regional and national levels.

The emergence of new markets and employment opportunities is one of the key ways that innovation influences economic development. Both the creation of new economic sectors and the growth of already-existing market niches are facilitated by innovation processes. This opens up new business opportunities and creates additional demand for labor, which in turn helps to reduce unemployment and improve social conditions. As an illustration, the proliferation of digital platforms and information technology has given rise to sectors like cybersecurity and e-commerce, which actively support economic expansion and employment creation.

Furthermore, innovation helps to increase competitiveness both domestically and globally. Companies that implement innovative solutions can offer unique products and services that stand out from the competition. This allows them to capture new markets and strengthen their position in existing ones. Competitiveness, in turn, stimulates further investment and development, creating a vicious circle of positive impact of innovation on economic development.

In addition, innovation has an impact on the sustainability of the economy. In the context of global economic change and instability, innovative solutions can provide a more flexible and adaptive approach to resource and process management, which helps to cope with external and internal challenges. This contributes to long-term sustainable development and reduces the vulnerability of economic systems.

Finland is an outstanding example of how investing in education programs can help create skills and stimulate innovative development. The high caliber of training for experts in the fields of science and technology is the main goal of the Finnish educational system. The "Innovations for Growth" program implemented in Finland supports startups and innovative companies through

grants, tax incentives and other forms of state support. These steps boost competitiveness in the global market and aid in the development of new technologies.

Finland has made large investments in STEM (science, technology, engineering, and mathematics) education as well as scientific research and technology development. As a result, Finland has been able to create a strong innovation ecosystem, which has led to a significant increase in the number of successful startups and the development of high-tech sectors of the economy. One instance is the triumphant growth of Nokia, which has emerged as a global frontrunner in the domains of telecommunications and mobile technologies. This success was due to the availability of qualified specialists and a strong scientific base created thanks to an effective educational system [1].

South Korea also demonstrates a successful approach to innovative development, focusing on the integration of science and business. The country is actively investing in scientific research and the creation of technology parks, such as the technology park in Seoul, which has become a hub for science and technology startups. In South Korea, considerable attention is paid to the training of highly qualified personnel through the reform of the educational system and the development of scientific research [2]. These efforts have contributed to the creation of a strong innovation infrastructure, which has played a key role in making South Korea one of the world's leaders in technology and innovation. Advances in the development of semiconductors and information technology have brought significant economic dividends and strengthened the country's position in international markets.

Science and technology parks, such as Astana Technopark and Almaty Technopark, play a key role in supporting innovative startups and technology projects. These business parks give entrepreneurs access to the facilities they need, such as offices, labs, and consulting services. Nevertheless, as of 2023, just 1.2% of all small and medium-sized businesses in Kazakhstan were registered in these parks, according to a report from the Statistics

Agency of the Republic of Kazakhstan. [3]. This indicates that, despite the existence of appropriate structures, the level of their use remains limited.

Research and development (R&D) spending is a key metric for assessing innovative activities. In 2023, overall R&D spending in Kazakhstan was approximately 0.3% of GDP, a far smaller proportion than the average for developing nations, where this number is closer to 1% of GDP. [4]. Insufficient investment in research and development restricts the potential for developing and promoting novel technologies, hence impeding the advancement of innovation.

Educational programs play a key role in the formation of qualified personnel necessary to support innovative activities. New curricula aimed at training specialists in the field of STEM disciplines are being introduced in Kazakhstan. However, according to the Ministry of Science and Higher Education of the Republic of Kazakhstan, there is a lack of interaction between educational institutions and industry. This limits the opportunities for students to apply knowledge in practice and develop innovative projects [5].

Although Kazakhstan is modernizing its educational system, prosperous nations like Singapore demonstrate how tight collaboration between academic institutions and business enterprises promotes more efficient expert training and the growth of new industries. Innovative startups in Singapore, such as Start-up SG, provide students and young entrepreneurs with access to funding and mentorship, enabling their businesses to grow. [6].

Science and technology parks give researchers and entrepreneurs access to the tools they need to create and market new innovations, which helps to shape the innovation ecosystem. The creation of these parks is seen as one of Kazakhstan's top strategic goals for quickening the country's economic growth and shifting it toward a knowledge-based economy. However, in order to achieve significant results in this area, additional efforts are needed to overcome existing barriers and use the best world practices.

Several science and technology parks are

currently operating in Kazakhstan, such as the Astana Technopark, Almaty Technopark and the Saryarka Innovation Center. These parks were created with the aim of supporting start-ups and small innovative enterprises by providing them with access to research infrastructure, office space and advisory services. However, according to the Ministry of Science and Higher Education of the Republic of Kazakhstan, in 2023, only 15% of registered companies in these parks have reached the stage of commercialization of their products [7]. This indicator indicates that, despite the availability of infrastructure, the level of efficiency of these parks remains low.

The absence of private funding for advancements in science and technology is one of the main obstacles. As per the World Bank research, Kazakhstan's private sector's share of R&D financing in 2023 was less than 20%, whereas in OECD nations, it was over 60%. [8]. The low level of private financing limits the opportunities for startups and innovative companies, which slows down their development and the introduction of new technologies to the market.

Kazakhstan can learn from the experiences of other nations that have made substantial progress in this field with the construction of science and technology parks. One such example is Israel, where the creation of technology parks and incubators has become a key element in the country's emergence as a global leader in the field of high technology. In Israel, technology parks such as Tel Aviv Technopark have fostered the development of more than 4,000 startups, attracting significant investment from the private sector and venture capital funds. In 2022, the total volume of venture capital investments in Israeli startups exceeded \$10 billion, which is more than 4% of the country's GDP [9].

The advantage of the Israeli model is the high level of coordination between the state, universities and the private sector. The state actively supports innovative companies through grants, tax incentives and support programs, while private investors and venture funds provide significant funding at the stage of growth and scaling of projects. This approach ensures the sustainable development of the

innovation ecosystem and the rapid growth of high-tech sectors of the economy.

Kazakhstan can benefit from the Israeli model by enhancing collaboration between public and private sectors, as well as by establishing more conducive environments to draw private investment in advances in science and technology. A higher volume of venture capital investments and the establishment of favorable conditions for the more successful commercialization of scientific discoveries will greatly improve the effectiveness of the nation's current technology parks and spur its creative economy.

One of the main things that helps innovation activities grow around the world is state backing. In Kazakhstan, the state is actively implementing various programs aimed at stimulating scientific research, technological development and commercialization of innovations. An examination of current programs reveals both their strengths and areas for development.

One of the most significant programs to support innovation in Kazakhstan is the commercial Road Map 2025 program, which provides funding for small and medium-sized commercial endeavors, including creative firms. Under this program, businesses may be eligible to get loan guarantees, subsidies to cut loan interest rates, and other forms of financial help. 40% of the more than 2,000 innovative projects that got support between 2020 and 2023 were successful in breaking into the market, according to the Ministry of National Economy of the Republic of Kazakhstan. [10].

However, the effectiveness of these programs is limited by several factors. First, there is a lack of coordination between different government agencies, which makes it difficult for entrepreneurs to access the necessary information and resources. Secondly, the process of obtaining state support remains complex and requires significant administrative costs on the part of enterprises [11]. These barriers reduce the attractiveness of programs to potential participants and limit the scope of their implementation.

Kazakhstan can learn from the experiences of

other nations that have successfully implemented comparable procedures in order to increase the efficacy of its state support programs. A prime example is Finland, where Business Finland plays a central role in supporting innovation. Finland actively supports start-ups and small businesses through grant programs that cover all stages of the innovation process, from scientific research to entering international markets. In 2022, Business Finland invested more than 600 million euros in the development of innovative projects, which led to the creation of more than 1,500 new jobs and an 8% increase in exports of high-tech products [12].

The advantage of the Finnish model lies in its high degree of integration with the national innovation strategy, as well as in close cooperation with the private sector and international partners. Government programs are complemented by private investment and venture financing, which allows for sustainable growth in the innovation sector. For Kazakhstan, this experience can be useful in the context of improving coordination between various public and private structures, as well as for creating more transparent and accessible mechanisms of state support.

Several methodological approaches were used to assess the impact of innovation on the economic development of the regions of Kazakhstan and to analyze the effectiveness of state support for innovative activities. Each of the methods allows you to gain a comprehensive understanding of the current situation, identify key problems and offer recommendations based on the analysis of both national and international data.

Economic and statistical analysis was used to assess the current state of innovation infrastructure and the level of innovation implementation in various regions of Kazakhstan. Data from official sources, including the Ministry of National Economy, the National Bank of the Republic of Kazakhstan, and the Agency on Statistics of the Republic of Kazakhstan, were gathered and examined for this study. Specifically, metrics pertaining to the amount of funds allocated to research and development (R&D), the proportion of inventive businesses, and GDP growth rates in

areas that are actively implementing innovations were taken into account [13]. The information acquired indicates that areas with high levels of innovative activity also exhibit greater rates of economic growth, confirming the beneficial effects of innovation on regional development.

The experience of other nations with regard to state funding for innovation initiatives and setting up frameworks for the growth of science and technology parks was examined through comparative research. Finland was chosen as an example, which demonstrates high indicators of innovation activity and the effectiveness of state support. In 2022, Finland ranked first in the Global Innovation Index, with a score of 64.6, well above the world average [14]. The study analyzed data from Business Finland, which showed that over the past five years, the number of innovative startups in Finland has increased by 25%, which contributes to sustainable economic growth and the development of high-tech sectors of the economy [15].

The economic development of the regions is largely determined by the level of their innovative activity. Important indicators characterizing the economic state of the regions are the gross regional product, the unemployment rate, as well as the volume of attracted investments. It is feasible to evaluate the effect of innovation on economic development and pinpoint important patterns that influence a region's success by analyzing these metrics.

Gross regional product is an important indicator of the economic state of the region, reflecting the total volume of goods and services produced. Significant regional variations in GRP exist in Kazakhstan, and these variations are linked to varying levels of industry growth, agro-industrial complex development, and innovation activity. Due to their high levels of economic activity and concentration of creative businesses, Almaty and Astana recorded the largest GRP in 2023—13.2 trillion and 8.7 trillion tenge, respectively—according to the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan. [16]. At the same time, in several rural regions, such as North Kazakhstan and Zhambyl regions, GRP remains below the

national average, which is associated with a low level of innovation and insufficient development of scientific and technical infrastructure.

The unemployment rate is another important indicator that reflects the economic state of the region and its ability to adapt to the challenges of the labor market. Regions with high innovation activity have lower unemployment rates, which is associated with the creation of new jobs in high-tech sectors of the economy. The unemployment rates in Almaty and Astana in 2023 were 4.2% and 4.5%, respectively, according to the Ministry of Labor and Social Protection of the Population of the Republic of Kazakhstan. These figures are considerably lower than the 5.8% national average [17]. At the same time, in regions with low innovation activity, such as Mangistau and Turkestan regions, the unemployment rate remains high, reaching 7% and above.

Attracting investment, especially in research and development (R&D), is a key factor in determining the success of regions in the field of innovation. In Kazakhstan, there is a significant gap in investment between regions. According to the Ministry of National Economy of the Republic of Kazakhstan, in 2023, the largest volume of investments in R&D was attracted in the cities of Almaty and Astana, where it amounted to 65 billion and 48 billion tenge, respectively [18]. Science and technology parks are actively operating in these regions, which helps to attract investors and create favorable conditions for the development of innovative business. At the same time, in a number of rural regions, such as Kyzylorda and Aktobe regions, the volume of investment in innovative projects remains extremely low, which limits the opportunities for economic growth and diversification of the economy.

The experience of other countries shows that effective innovation policy and attracting investment can significantly accelerate the economic development of regions. For example, in South Korea, which is actively developing regional innovation clusters, it was possible to significantly increase GRP and reduce unemployment in provinces where advanced technologies are being introduced. According to the Korea Trade and

Investment Promotion Agency, in 2022, the volume of investments in innovation clusters exceeded \$5 billion, which led to a 6% increase in GRP and a 1.5% decrease in the unemployment rate in the most active regions [19]. This experience highlights the importance of investing in innovation to ensure sustainable economic growth and improve the quality of life of the population.

An analysis of statistical data for Kazakhstan shows significant regional differences in the level of economic development, which is largely due to the degree of innovation and the volume of attracted investments. Regions with high innovation activity demonstrate higher GRP, low unemployment and significant investment volumes, which confirms the positive impact of innovation on economic development. At the same time, the experience of other countries, such as South Korea, shows that comprehensive measures to support innovation can significantly accelerate the development of regions and increase their competitiveness in the global market.

The relationship between the level of innovation activity and the main economic indicators of the regions is an important aspect for understanding the mechanisms of economic growth and development. In this study, a correlation analysis was carried out aimed at identifying the degree of dependence between innovations and such economic indicators as gross regional product (GRP), unemployment rate and the volume of attracted investments in the regions of Kazakhstan.

To conduct a correlation analysis, data for 14 regions of Kazakhstan for the period from 2019 to 2023 were used, including GRP indicators, unemployment rate, volume of investment in research and development (R&D), as well as the number of registered patents and innovative enterprises. The data was collected from official sources, such as the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan and the Ministry of National Economy of the Republic of Kazakhstan [16-17].

The results of the correlation analysis showed that there is a significant positive correlation between the level of innovation activity and the

gross regional product (correlation coefficient $r = 0.68$). This indicates that regions with higher innovation activity, expressed in the number of patents registered and the volume of investment in R&D, show higher GRP growth rates. For example, the cities of Almaty and Astana, where the concentration of innovative enterprises and investments in R&D is much higher, show an annual increase in GRP at the level of 4.5% and 3.8%, respectively [16].

Correlation analysis also revealed a negative relationship between the level of innovation activity and the unemployment rate ($r = -0.54$). In regions with a high level of innovation, there is a decrease in unemployment, which is associated with the creation of new jobs in high-tech sectors of the economy. In particular, in Almaty, where the largest number of innovative enterprises are registered, the unemployment rate decreased to 4.2% in 2023, which is significantly lower than the national average [20].

In terms of the volume of attracted investments, a positive correlation ($r = 0.62$) was found between investments in R&D and GRP. This indicates that regions that attract more investment in research and development are showing higher rates of economic growth. For example, in the Atyrau region, where the volume of investment in R&D increased by 15% in 2023, GRP increased by 3.6%, which emphasizes the importance of attracting investment in innovative projects [20].

International experience confirms the existence of a strong positive correlation between innovation and economic performance. For example, in South Korea, one of the leading countries in terms of innovation activity, a high correlation was found between the volume of investment in R&D and economic growth at the level of $r = 0.75$ [21]. Between 2015 and 2022, R&D investment in South Korea increased by 20%, resulting in a 7% GDP growth and a 2% decrease in the unemployment rate [21]. This experience highlights the importance of public and private financing of innovation activities for sustainable economic growth.

The process of introducing innovations into the economy of Kazakhstan faces a number of

significant problems and barriers that slow down the pace of innovative development and limit the potential for economic growth of the regions. This section examines the key obstacles identified in the course of the study and analyzes foreign experience that can be useful in overcoming these barriers.

One of the main barriers to the introduction of innovations in Kazakhstan is the insufficient development of the scientific and technical infrastructure. In most regions of the country, there is a lack of the necessary number of technology parks, incubators and research centers, which complicates the implementation of innovative projects and limits access to modern technologies. For example, in 2023, there were only 13 technology parks in Kazakhstan, of which 8 are concentrated in Almaty and Astana, while access to such resources is extremely limited in rural areas [22].

A comparison with international experience, in particular with Finland, shows a significant lag in the development of infrastructure. In Finland, a country with a high level of innovative activity, there are more than 50 technology parks and research centers that ensure close interaction between science and business, which contributes to the accelerated introduction of innovations [23]. This experience underscores the need to expand the network of technology parks and other innovative facilities throughout Kazakhstan.

Financial constraints remain one of the main barriers to innovation in Kazakhstan. Despite the Government's efforts to support research and development, funding remains inadequate. In 2023, R&D expenditures amounted to only 0.13% of GDP, which is significantly lower than the average level for the countries of the Organization for Economic Cooperation and Development (OECD), where this figure averages 2.4% [24]. This situation limits the possibilities for research and development of new technologies, which negatively affects the country's innovative potential.

In addition, private sector activity in financing innovation remains low. Most businesses in Kazakhstan prefer to invest in traditional low-risk activities, which limits opportunities for innovation. In 2023, the share of the private sector in total

R&D investment was only 18%, while in leading innovative economies such as Germany, this figure exceeds 60% [25]. To overcome this problem, it is necessary to stimulate the participation of the private sector in financing innovative projects through tax incentives, subsidies and public-private partnerships.

Another significant barrier is weak cooperation between scientific institutions and business. In Kazakhstan, there is a low level of interaction between universities and enterprises, which makes it difficult to commercialize scientific developments and introduce innovations into industry. According to the Ministry of Education and Science of the Republic of Kazakhstan, in 2023, only 12% of state-funded scientific projects were implemented in cooperation with business, which indicates insufficient integration of the scientific and business environment [26].

International experience, for example, in the United States, demonstrates the importance of close cooperation between science and business. In the United States, there are a number of programs aimed at stimulating interaction between universities and enterprises [27], which leads to a high level of commercialization of scientific developments. As a result, more than 70% of innovative startups in the United States arise in university incubators and technology parks, which contributes to the rapid introduction of innovations into the economy [28].

Another significant impediment to innovation is staffing limitations. The possibilities for the creation and use of new technologies are restricted by the shortage of skilled experts in the fields of science and technology. In 2023, specialists working in R&D made up only 0.8% of Kazakhstan's entire workforce, a much smaller percentage than in OECD nations, where the percentage is above 3% [29].

To overcome the personnel shortage, Kazakhstan should pay attention to the experience of South Korea, where the successful development of educational programs in the field of science and technology has become a key factor in increasing innovative activity. Specifically, in South Korea, advanced training courses and special

education programs have been implemented, leading to a notable increase in the number of competent workers and a faster pace of innovation introduction. [30].

Results and discussions. The results of the study confirmed the key role of innovation activity in the economic development of the regions of Kazakhstan, identifying both significant successes and significant barriers that the country faces on the way to building an innovative economy.

The study showed that regions with a high concentration of innovative projects demonstrate higher rates of economic growth and sustainability. For example, the GRP of Almaty, one of the leaders in innovation activity, grew by 4.5% in 2023, which is significantly higher than the average for Kazakhstan, which is 3.3% [16]. Such results confirm the effectiveness of investment in innovation as a tool for stimulating regional development.

Foreign experience also confirms this pattern. In Finland, where state support for innovation is central to economic policy, GDP growth consistently exceeds 2% annually, which is associated with active investment in R&D and close cooperation between science and business [14]. The application of this experience in Kazakhstan can contribute to a more even distribution of economic benefits between regions and reduce interregional disparities.

The study identified significant barriers that limit the potential for innovative development in Kazakhstan. Lack of financing remains a major challenge: despite the growth of investment, it remains low compared to international standards. In 2023, R&D expenditures amounted to only 0.13% of GDP, which is significantly lower than the level of OECD countries [24]. This limits the opportunities for the development of new technologies and the introduction of innovations in industry.

In addition, the underdevelopment of the scientific and technical infrastructure and weak cooperation between scientific institutions and business hinder the effective implementation of innovative projects. In Kazakhstan, only

12% of state-funded scientific projects were implemented in cooperation with business [26]. At the same time, in the United States, the share of commercialized scientific developments is much higher, which indicates the importance of interaction between science and business for the successful implementation of innovations [28].

An analysis of international experience has shown that the successful development of an innovative economy requires an integrated approach, including state support, infrastructure development and incentives for the private sector. In particular, the experience of South Korea, where active government intervention in support of innovation has led to significant economic growth, can be useful for Kazakhstan. South Korea pays special attention to the training of qualified personnel and the development of science parks, which has allowed the country to become one of the world leaders in terms of innovation activity [30].

For the successful implementation of innovations in Kazakhstan, it is necessary to revise the current policy in the field of science and technology, taking into account successful international practices. This includes increasing the share of R&D funding, developing a network of technology parks and incubators across the country, and strengthening cooperation between science and business.

Based on the study, the following recommendations can be made for the further development of the innovative economy in Kazakhstan:

1. Raising the percentage of R&D spending to at least 1% of GDP would greatly expand the opportunities for new technology research and development.
2. Increasing the number of technology parks and incubators in the nation will be a significant step in ensuring that innovation activity is distributed equally across the nation, particularly in less developed areas.
3. The percentage of private investment in R&D will expand if tax breaks and other financial aid are made available to businesses that invest in innovation.
4. The creation of platforms and programs for

interaction between universities and enterprises contributes to the faster commercialization of scientific developments and their implementation in industry.

The implementation of these measures will allow Kazakhstan to accelerate the development of an innovative economy, reduce regional imbalances and increase the country's competitiveness in the global market.

In this context, the following recommendations are proposed to complement the previously presented measures and help to enhance their impact.

Regional authorities should integrate the innovation strategy into general plans for socio-economic development. At the moment, in many regions of Kazakhstan, innovation initiatives are often considered as separate projects, which limits their large-scale impact on the economy [31]. To improve the situation, it is necessary to develop strategic plans that include long-term goals for innovative development, integrated with other aspects of regional development, such as infrastructure and education.

It is important to create conditions for the development of start-ups and small innovative enterprises that can become engines of economic growth. Kazakhstan should develop special business incubators, accelerators and venture capital funds that will support startups at all stages of their development [32]. Successful examples of such initiatives can be found in the United States, where accelerator networks such as Y Combinator and Techstars provide startups with access to resources and investment, contributing to their rapid growth and successful commercialization [33].

The creation of regional competence centers that will specialize in advanced technologies and innovations can significantly increase the efficiency of scientific and research projects. These centers can serve as platforms for knowledge exchange, joint research and development of new technologies [34]. In Switzerland, for example, such centers actively support research in the field of biotechnology and medical technology, which has

contributed to the significant growth of these sectors [35]. Kazakhstan should consider the possibility of creating such centers in key regions for the development of advanced industries.

Scientific tourism, which attracts scientists and entrepreneurs from other countries to participate in research and conferences, can be an effective tool for raising the international status of regions. The creation of scientific and technical events, such as conferences and symposia, will facilitate the exchange of knowledge and the establishment of international relations [36]. The scientific conferences in China, which draw experts from all over the world and aid in the creation of cutting-edge technologies and creative solutions, are an illustration of how scientific tourism has been successfully implemented [37].

Administrative and bureaucratic barriers can significantly hinder innovation activity and business development. In Kazakhstan, it is necessary to carry out reforms aimed at simplifying the procedures for registering enterprises, obtaining permits for scientific research and introducing new technologies [38]. A notable example in the global arena is New Zealand, where the introduction of electronic services for business and the streamlining of registration procedures have drawn substantial investment in innovation and produced a favorable business climate [39].

These recommendations will complement previously proposed measures and help create a more sustainable and innovative economy in the regions of Kazakhstan. The application of the best international practices, combined with adaptation to local conditions, will ensure the effective development of the regions, improve the investment climate and increase the country's competitiveness in the international arena.

Conclusions. The study's findings demonstrated that innovations significantly influence the economic growth of Kazakhstan's regions. Integrating innovation strategies into regional planning and infrastructure development to support innovation is a prerequisite for sustainable growth. Science and technology parks, incubators, and accelerators can help increase start-ups and

draw private investment, which in turn increases economic metrics like employment rates and gross regional product. These facilities can be developed and implemented in the regions.

International experience demonstrates that effective infrastructure initiatives and government support implemented in countries such as Israel and the United States lead to significant improvements in innovation activity and commercialization of scientific developments. In particular, the creation of specialized technology parks and accelerators helps startups gain access to resources and investments, accelerating their growth and integration into the economy.

The data indicate the need to create regional competence centers that will focus on advanced technologies and innovation. These centers contribute to the concentration of knowledge and resources, which allows for more efficient research and the development of new technologies. The experience of Switzerland shows that the creation of such centers can accelerate the development of

key industries and increase the international status of the regions.

The analysis shows that scientific tourism and international conferences can be effective tools for improving the scientific status of regions and developing high technologies. Successful examples from China confirm that the organization of major scientific events contributes to the exchange of knowledge and the strengthening of international relations, which in turn stimulates innovative activity.

New Zealand's experience shows how simplifying administrative processes can help create a favourable business climate and attract investment.

Thus, the comprehensive application of recommendations based on international practice and adapted to the local conditions of Kazakhstan can significantly increase the level of innovation activity and economic growth in the regions. These measures will help to use resources more efficiently, improve the investment climate and strengthen the country's competitiveness in the global arena.

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