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The Organizational-Economic Mechanism for Enhancing Technoparks' Participation in Innovation Development in China and Belarus

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KEYWORDS

innovation;
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ABSTRACT

The issue of cooperation between the Republic of Belarus and China in the field of innovation is currently becoming increasingly relevant. The study examines the factors and conditions for effective operation of technology parks in China and Belarus, considering state regulation, focus on developing external markets, lobbying for budgetary spending on R&D, implementing preferential policies, and maintaining genuine communication with leading universities. This article explores the potential for collaboration between the Republic of Belarus and the People's Republic of China in establishing industrial parks, drawing on successful international technology park models such as the "Great Stone" and "Silk Road" initiatives.

INTRODUCTION

One of the key priorities in the foreign economic strategy of the Republic of Belarus is to further develop trade and economic cooperation with the People's Republic of China.

"Establishing innovation infrastructure entities stands as one of the most effective tools for fostering innovative entrepreneurship and the knowledge-based economy as a whole" [1, p. 37]. This perspective directly highlights the pivotal role of Belarusian tech parks, which serve as key platforms for technology transfer, startup support, and accelerating the commercialization of scientific innovations. In fact, technology parks are becoming the key infrastructure players that drive the entire innovation cycle—from idea to market launch.

In Belarus, the term "technopark" refers to a specialized organizational structure that typically employs no more than a hundred people, with its primary mission being to foster entrepreneurship growth in the scientific, technological, and innovation sectors.These organizations provide a structured ecosystem where both corporate entities and individual entrepreneurs recognized as residents can complete the full innovation cycle – from initial R&D to final implementation and market integration of new technologies. A startup specializing in advanced materials could develop prototypes of innovative composite materials within such a tech park before transitioning to industrial-scale production.

1.A study on Belarusian technology park operations

By early June 2025, Belarus had established a network of fourteen officially recognized science and technology parks: twelve state-owned and two privately operated [2, p. 59].

Показатели	2019 г.	2020 г.	2021 г.	2022 г.	2023 г.	2024 г.	2025 г.
Количество субъектов инновационной инфраструктуры, в том числе:	25	25	26	24	24	23	21
научно-технологические парки	14	14	14	14	14	16	14
центры трансфера	8	7	7	5	6	5	5

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технологий							
Количество иных организаций, имеющих статус субъекта инновационной инфраструктуры	1	1	1	1	1	2	2

Table.1. Number of innovation infrastructure entities in the Republic of Belarus from 2019 to 2025

Source: [2], [3], [4].

This network functions as a distributed innovation infrastructure, with each entity shaped by its specialized focus and local economic context. Private tech parks typically emphasize flexible residency policies or specialized technology sectors, while government-backed parks are often closely integrated with regional development initiatives or universities.

If we examine these parks based on the number of registered residents, we observe significant variation in the number of active residents. The largest science and technology parks are those with over twenty-five active residents, such as the Minsk City Technopark, Brest Science and Technology Park, and the Politechnical Park of BNTU. These parks often serve as regional hubs with extensive laboratory facilities and partnerships with major research institutes. The second tier includes parks that can accommodate between ten and twenty-five registered residents. This category includes the Coral Technopark in Gomel, the Russian Agency for Development and Investment Attraction, Mogilev Technopark, the Inkata Technopark, the small business incubator of the "Law and Order" legal group, and the Minsk Regional Technopark. These facilities support growing companies by providing essential services such as patent consulting, early-stage funding networks, and shared office space infrastructure. A cluster of small tech parks operates, each hosting up to ten residents, such as the Science-The Vitebsk State Technological University's technology park, a counterpart facility to the Polotsk State University, the "Tekhnolab" educational, scientific, and industrial center in Grodno, the "UNITECHPROM BGU" park, and the "Gorki" park. The BGUIR Technopark and Scientific-Technical Park, which are often focused on establishing subsidiaries in early stages and experienced production.

According to data from the Belarusian Institute of System Analysis and Information Support in the Scientific and Technical Sector [4], as of January 1, 2025, the total number of registered residents across all technology parks in the Republic of Belarus reached 276 organizations, marking an increase of 11 compared to the previous year. Meanwhile, the growth in the number of residents was accompanied by a significantly more dynamic increase in employment: the total workforce of resident organizations in technology parks increased by approximately 1,100 people, or about 20% compared to 2023, reaching around 6,400 employees [2], [3], [4].

This surge reflects not just a rise in the number of companies, but also a significant expansion in their operational scale. For instance, a software development firm based in Minsk City Technopark could double its development team to meet export demands, while a biotech startup in Grodno might hire new lab staff after securing venture capital funding. These details demonstrate how Belarusian tech parks are evolving from basic incubators into sophisticated innovation ecosystems. They not only drive regional development and sustain high-value-added employment, but also strengthen the country's competitive edge in global technology markets.

Economic data confirms this trend. Official statistics show that "the output volume of products manufactured by technology park residents increased by over 20% year-on-year, reaching approximately 1 billion rubles. The total value of products exported by these residents reached around 460 million rubles, accounting for 46% of the total output. Compared to 2023, this figure has risen by 29%." [3] These metrics demonstrate that the expansion of technology parks is reflected not only in increased resident numbers, but also in a substantial enhancement of their production and export capabilities, establishing them as a key driver of Belarus' high-tech economy.

1.1.Policy and Funding Dynamics in Belarus

In 2024, China's leadership initiated a new initiative to reevaluate the operational principles of science parks, calling for a fundamental overhaul of their regulatory framework. In line with this directive, the National Science and Technology Commission has developed a comprehensive set of guidelines designed to verify that park residents are genuinely committed to innovation. These recommendations also included standardized contracts regulating innovation activities and formalized reporting formats for tracking the use of funds from the Innovation Development Fund. This change reflects broader policy objectives: enhancing

accountability, transparency, and efficiency within the innovation ecosystem. Under the previous system, a small robotics company could receive government funding without demonstrating clear milestones or measurable results, which the new rules aim to address [3].

In the first half of 2024, MGT LLC emerged as the primary driver of employment growth among technology park residents, creating or upgrading 198 jobs. This expansion reflects not only rising demand for specialized skills but also demonstrates the ability to attract local engineering talent that might otherwise seek employment abroad. MGT LLC has attracted a large number of technical university graduates from Minsk by offering competitive terms to keep them in the country [3].

Beyond employment trends, the technology transfer sector demonstrated notable yet uneven dynamics. Supported by the Technology Transfer Center (TTC), eight agreements for transferring or acquiring rights to scientific, technical, or innovative achievements were signed between January and June 2024, totaling 14,200 rubles. This figure stands in stark contrast to 2023, when 11 such transactions amounted to 177,200 rubles [2, p. 63]. While 2024 saw fewer deals and lower total value, this shift indicates a focus on smaller, potentially more targeted early-stage transfers. For example, a university lab might license an algorithm or prototype to a young startup testing its market viability.

Funding reflects a complex situation. In the first half of 2024 alone, 47.6 million rubles from state funds were allocated to strengthen the physical and technical infrastructure supporting innovative enterprises. Of this amount, 44.6 million came from local innovation funds, a mere 0.2 million from the Republican Centralized Innovation Fund (RKIF), and 2.8 million from the republican budget. To gauge this scale, compare it with the funding allocation at the end of 2023: a total of 107.3 million rubles, with 104 million sourced from local sources, 2.5 million from the Republican Innovation Fund (RKIF), and 0.8 million from the republican budget. The funding structure underscores the crucial role of local authorities in enhancing innovation readiness – for instance, financing the reconstruction of shared laboratory spaces or equipping coworking spaces with cutting-edge prototyping tools [3].

It's worth noting that these investments deliver substantial returns. At the beginning of 2024, every ruble of government funding translated to 8.9 rubles in products developed by the technology park's residents, up from 7.6 rubles a year earlier [4]. This figure serves as a rough gauge of the multiplier effect of government spending on innovation. Imagine a small bioinformatics company that, thanks to subsidized equipment upgrades, secures a major data analysis contract for a pharmaceutical client – these examples help illustrate the improved ratio.

The diverse range of activities among the technology park's residents is truly impressive. Their work spans instrumentation engineering, precision mechanical systems, electronic design, cutting-edge IT services, software development, medical technologies and pharmaceuticals, fundamental and applied research and development, optical systems,Laser devices, energy solutions, energy-saving strategies, and cutting-edge bio-and nanotechnologies. For instance, one resident might develop specialized optical sensors for autonomous vehicles, while another focuses on creating software to manage smart energy grids.

1.2.The "Great Stone" Industrial Park

The "Great Stone" Industrial Park stands as a key driver of Belarus' innovative potential. Located near Minsk, this expansive international business hub spans over 11,000 hectares, featuring a sleek modern design and meticulously planned eco-friendly infrastructure. Beyond its impressive scale and aesthetic appeal, the "Great Stone" operates under a special legal framework designed to attract global investors through simplified regulations and attractive tax incentives. Its core mission is to serve as a bridge for economic partnership between Belarus and China – a vision realized through joint production capacities, collaborative research initiatives, and integrated logistics hubs designed to steer trade along the modern Silk Road.

The development of the China-Belarus "Great Stone" Industrial Park demonstrates Belarus 'gradual establishment of a core hub for high-tech investments and international supply chains. This park serves not only as a business incubation platform but also as a strategic tool for the country's integration into global economic systems. This is precisely why academic literature emphasizes that "particularly, it enables Belarus to develop as a mediator between the West and the East, while enhancing its appeal to foreign investment" [3]. This statement directly reflects the strategic role of the "Great Stone" as a pivotal element in Belarus' foreign economic policy and underscores its significance in shaping a new model of international

cooperation.

The functions of the "Great Stone" are as follows:

developing joint economic cooperation between China and Belarus; establishing nationally competitive technologies; creating jobs for highly skilled professionals; attracting foreign direct investment; fostering a favorable investment climate in Belarus; and encouraging indigenous innovation.

The establishment of the massive China-Belarus industrial park "Great Stone" inevitably sparks debates about whether Russia can create a similar joint venture with China on its own soil. This question is hardly academic; both countries have already accumulated substantial cooperation experience, as evidenced by projects like China's "Silk Road" High-Tech Park in Fengdong and Russia's "Skolkovo" Innovation Center. It's easy to envision a new Russian-Chinese complex being developed in Russia's Far East. This facility will serve as a vital bridge for investment flows from Northeast Asia and a launchpad for high-tech startups built on the foundations of research clusters in Moscow or Novosibirsk.

2.China's Technoparks: A Study in Progress

China's leadership in the global technopark movement is no accident. Through decades of policy and strategic planning, the country has developed a vast and diverse landscape of over 7,000 industrial parks spread across all provinces and regions – from Guangdong's factories to Sichuan's inland industrial hubs. These are not homogeneous spaces, but a kaleidoscope of development zones: high-tech districts focused on advanced manufacturing, free trade pilot zones testing policy reforms, border cooperation enclaves designed to streamline cross-border trade, export processing zones linked to coastal ports, and much more [1].

China's ambitions for these zones were clearly defined in a key government directive: the "Several Opinions of the State Council on Promoting the High-Quality Development of National Technology Parks" (State Council Document No.7-r, July 13,2020). This comprehensive policy statement serves not merely as a dry administrative document, but rather as a master plan for state-led innovation. It outlines comprehensive ideological frameworks, a set of guiding principles, and a series of development goals aimed at transforming these national technology parks into engines of economic modernization by 2035. For policymakers in Beijing, these zones serve as tools for redistributing high-value-added domestic production, advancing cutting-edge research, and safeguarding China's technological sovereignty amid growing global competition [7].

By 2024, China's national technology park system had maintained a state of near-constant growth and evolution. While no single authoritative report comprehensively captures all aspects of this expansion, local and industry reports paint a vivid picture: new parks are emerging at breakneck speed, the number of resident companies keeps growing, R&D budgets are increasing, and patent applications are surging. The Chinese model isn't static—it's designed for perpetual motion. In areas like the Pearl River Delta, municipal governments are offering free lab space to biotech startups, while local universities are overhauling their engineering programs to meet industry demands.

Figure.1. Development indicators of major technology parks in China in 2024. Source: [8].

The results speak for themselves. According to CGTN, the combined net profit of China's top 500 tech park enterprises surged nearly 5% in 2024, surpassing the 4.5 trillion yuan mark [4]. This isn't just a testament to corporate efficiency—it reflects a meticulously crafted ecosystem designed to sustain profitability, from generous subsidies to tax incentives and seamless logistics networks. While it is often mentioned that there are over 169 "national-level" science parks, this figure hardly reflects the underlying complexity. Each of these high-tech zones serves as a regional growth hub, specifically designed as a cluster where research institutes, factories, venture capital, and government incentives come together to transform ideas into market-ready technologies [7].

What truly sets the Chinese approach apart is its governance structure. Unlike many Western science parks that often operate with significant autonomy for the private sector, China's technology parks are under strict state oversight. This centralized model isn't just bureaucratic control per se, but a meticulously designed system that fosters collaboration

between local governments, universities, research institutes, major manufacturers, and small tech startups. Imagine a tech hub in Tianjin where the municipal government funds AI training programs, a local university establishes an applied robotics lab, and manufacturers commit to implementing these systems in production – all under a unified policy framework.

The primary objective of establishing China's new high-tech development zones is to create an innovation-driven regional infrastructure that can transform theoretical research into practical technological solutions. These zones are typically located in the country's largest and most strategically important cities – Beijing, Shanghai, Guangzhou, Tianjin, Wuhan – where clusters of leading universities, research institutions, and technological hubs converge.The convergence of centers and production capabilities unlocks unprecedented collaboration potential. This strategic concentration of intellectual capital isn't accidental—it's a core component of our ecosystem strategy. By integrating top minds into a collaborative framework, we transform their breakthroughs into market-ready export products that meet global demand.

When it comes to government support, China and Belarus employ a wide range of incentives to maintain the competitiveness of their tech parks. In Belarus, these incentives often target specific needs: constructing new facilities, renovating existing infrastructure, co-financing equipment procurement, or offering preferential laboratory space rentals. Tax breaks and low-interest loans help alleviate the financial burden on residents. Regional authorities may introduce their own individual incentives, providing local support and aligning with economic development strategies.

In contrast, the Chinese model heavily relies on R&D-driven support. Companies operating in China's tech parks often enjoy full tax incentives during their growth phase, after which a reduced corporate income tax rate takes effect. Partial reimbursement of R&D costs has become standard practice, making innovation a more risk-tolerant proposition for businesses of all sizes. Imagine a startup in Shenzhen developing cutting-edge semiconductor technologies: in its first few years, it might not pay corporate income tax, instead receiving grants to hire additional engineers and purchase production equipment.

While Belarus is heavily investing in physical infrastructure for innovation – including modern laboratories, coworking spaces, and production facilities – China is equally committed to funding real-world R&D that will bring commercially viable ideas to life in these spaces. This divergence reveals contrasting philosophies: Belarus views technology parks as vital infrastructure for national development, while China sees them as integrated policy tools to advance strategic industries to global frontiers.

The core of China's tech park development strategy rests on an undeniable truth: the state serves as both a catalyst and guarantor for economic transformation, aiming to establish the country not merely as a participant in the global economy, but as a technological superpower that sets the rules.

"The implementation of the 'Belt and Road' strategy will not only help China better utilize its substantial foreign exchange reserves and boost economic development and cooperation along the 'Belt and Road', but also encourage China and the Republic of Belarus to jointly establish technology parks – which currently represent one of the most significant and promising focal points for bilateral cooperation" [6].

3.A comparative analysis of park operations in Belarus and China

The technological gap between Belarus and China creates opportunities for active innovation collaboration, particularly in joint educational and scientific initiatives, including through:

engaging Belarusian scientists and research institutions in executing China's international scientific and technological cooperation programs; designating Belarus as a co-sponsor for Chinese initiatives under national and regional science and technology programs and projects; attracting Chinese partners to undertake Belarusian scientific research projects establishing joint regional universities, laboratories, and research centers for cutting-edge studies to undertake unique projects.

In this context, priority areas such as technology transfer, establishing high-tech manufacturing facilities, and integrating Belarusian companies into China's regional innovation clusters gain particular significance. This is precisely why academic literature emphasizes that "the aforementioned initiatives can be viewed as preparatory steps for Belarus' more proactive innovation policies in China's regions, leveraging the potential of industrial parks"

[1]. This means that current initiatives—from developing the "Great Stone" to participating in China's regional programs—are laying the groundwork for Belarus to establish a more systematic presence in China's innovation ecosystem, while also expanding opportunities for Belarusian companies in the high-tech sector.

The ongoing efforts to improve working conditions at t he China-Belarus "Great Stone" Industrial Park and attra ct more high-tech Chinese tenants naturally point to bro ader prospects: the potential to establish joint Belarusian -Chinese agro-industrial complexes both on Belarusian s oil and in Chinese provinces. These promising agropark s could serve as powerful engines for cross-border food production innovations,unlocking collaboration opportuni -ties—particularly in organic farming, an area where Be larus has established significant competitive advantages across multiple regions. Consider, for instance, the farm ers in Mogilev who pioneered the export of organic dai ry products under a joint brand, or Chinese partners im plementing precision irrigation systems that boost yields while conserving water.

Such enterprises could serve as fertile ground for collaborative market development, which is not only expanding but also evolving as consumer demand for eco-friendly, certified organic products grows across both domestic and international markets. In this sense, agroparks would go beyond being mere processing and distribution hubs. They could become innovation laboratories for developing new production models, branding strategies, and export logistics chains tailored to environmentally conscious consumers across the country, from Moscow to Shanghai.

For Belarus, adopting this approach is not merely about diversifying exports; it represents a strategic shift that will benefit fromA thorough examination of China's industrial park management legislation. One of the most remarkable aspects of China's industrial park policy is its willingness to experiment: pilot zones serve as testing grounds for regulatory innovations, administrative streamlining, and fiscal incentives before these practices are rolled out nationwide. For Belarusian regions exploring the creation of their own joint science and technology parks, this model serves as an attractive example. By encouraging local experimentation in commercialization and public-private partnerships, Belarus could establish a more sophisticated and flexible innovation framework that aligns with market dynamics rather than resisting them.

These parks could go beyond being mere industrial space rentals. They could evolve into hubs for collaborative technological advancement, leveraging international research initiatives and commercial spin-offs. Imagine the Gomel Agro-Industrial Park conducting field trials of pest-resistant grain varieties co-developed with Chinese laboratories, or the Vitebsk Research Center adapting China's food industry automation systems to Belarusian production lines. Beyond technology transfer, these parks will foster cultural and institutional ties that transform one-off projects into enduring partnerships spanning decades.

To realize this vision, Belarus must expand its interregional cooperation framework. The key lies in forging stronger and more dynamic partnerships at the level of industrial, scientific, and technological parks – these hubs could serve as gateways to broader foreign economic integration. Such cooperation would not only strengthen Belarus's position in Chinese markets but also transform the nature of bilateral trade by replacing raw material flows with value-added and technology-intensive exchanges.

This transformation requires Belarusian regions to actively engage in international networks and specialized associations – membership that could provide access to standard-setting bodies, best practices, and cutting-edge research collaborations. Establishing new agro-industrial parks that leverage the natural and logistical strengths of specific Belarusian regions could further strengthen these connections, creating a solid local foundation for global engagement.

Equally important is learning from China's industrial parks: their strict adherence to international standards, effective use of tax incentives, and ability to establish flexible and productive partnerships with manufacturers, universities, and research centers. Belarusian policymakers could, for instance, establish pilot training exchanges enabling Belarusian specialists to work in Chinese industrial parks, or develop joint educational programs that introduce students to the regulatory frameworks and technological ecosystems of both nations.

Ultimately, developing such a network of cross-border innovation hubs will require Belarus to elevate its overall innovation capacity. This means moving beyond empty slogans and actively fostering the growth of small and medium-sized enterprises (SMEs) with innovative business models. It also involves boosting the proportion of

organizations that invest heavily in R&D, while expanding the production of high-quality innovative products tailored for both domestic and export markets.

Conclusion

Belarus's innovative infrastructure is developing steadily, as evidenced by the growing number of tech park residents, rising employment, and expanding business sectors.

Belarusian tech parks are strengthening their role as innovation hubs by delivering end-to-end innovation support—from R&D to commercialization—and showcasing growing manufacturing and export capabilities.

State policy is becoming more results-oriented, as evidenced by the updating of regulatory frameworks, standardization of innovation requirements for projects, and strengthened oversight of innovation fund utilization.

The Great Stone Industrial Park serves as a cornerstone of Belarusian-Chinese collaboration, driving investment attraction, creating high-tech jobs, and integrating Belarus into global value-added chains.

China's experience in establishing technology parks serves as a valuable model for adaptation, while expanding cooperation with China unlocks new opportunities for Belarusian companies in high-tech sectors and technology transfer.

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