

Theoretical and Methodological Aspects of the Formation of Development Poles of Innovation Economy of the Region

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ABSTRACT

The relevance of the topic of the study is conditioned by the problems of modern development of the economy of the state as a participant in global economic relations. The study is based on a dialectical method of cognition, revealing cause-and-effect relationships between system elements, processes and factors, as well as applied methods of analogy and modelling to create an ideal model of the region's economy based on innovation. The article examines the essence and principles of forming development poles in the regional economy, identifying key elements, driving and limiting factors, management system requirements, and innovation types. Based on this, it proposes a comprehensive model of innovation economy poles for the region, integrating organizational, economic, scientific, educational, logistical, social, and environmental components. The theoretical and methodological framework outlines the interaction of interests and resources in forming regional development poles based on chosen growth points. It can serve as an algorithm for planning the implementation of an innovative economy at local or national levels.

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ملخص

ترتبط أهمية موضوع هذه الدراسة بالإشكاليات المرتبطة بالتطور الاقتصادي الحديث للدولة بوصفها فاعلا في العلاقات الاقتصادية العالمية. اعتمدت الدراسة على المنهج الجدلي في المعرفة، الذي يكشف عن العلاقات السببية بين عناصر النظام وعملياته والعوامل المؤثرة فيه، بالإضافة إلى استخدام منهجي القياس والنمذجة لبناء نموذج مثالي لاقتصاد إقليمي قائم على الابتكار. يتناول المقال جوهر ومبادئ تشكيل أقطاب التنمية في الاقتصاد الإقليمي، مع تحديد العناصر الأساسية والعوامل المحفزة والمقيدة، ومتطلبات نظام الإدارة، وأنواع الابتكار. وبناءً على ذلك، تُقدّم الدراسة نموذجا متكاملًا لأقطاب اقتصاد الابتكار في الإقليم، يدمج المكونات التنظيمية والاقتصادية والعلمية والتعليمية واللوجستية والاجتماعية والبيئية. ويُبرز الإطار النظري والمنهجي تفاعل المصالح والموارد في تشكيل أقطاب التنمية الإقليمية استنادا إلى نقاط النمو المختارة، ما يُمكن أن يشكل خوارزمية عملية لتخطيط تنفيذ نموذج الاقتصاد الابتكاري على المستويين المحلي والوطني.

RESUMÉ

La pertinence du sujet de l'étude est conditionnée par les problèmes du développement moderne de l'économie de l'État en tant que participant aux relations économiques mondiales. L'étude est basée sur une méthode dialectique de cognition, révélant les relations de cause à effet entre les éléments, les processus et les facteurs du système, ainsi que sur des méthodes appliquées d'analogie et de modélisation afin de créer un modèle idéal de l'économie de la région basé sur l'innovation. L'article examine l'essence et les principes de la formation de pôles de développement dans l'économie régionale, en identifiant les éléments clés, les facteurs moteurs et limitants, les exigences du système de gestion et les types d'innovation. Sur cette base, il propose un modèle global de pôles d'économie innovante pour la région, intégrant des composantes organisationnelles, économiques, scientifiques, éducatives, logistiques, sociales et environnementales. Le cadre théorique et méthodologique décrit l'interaction des intérêts et des ressources dans la formation de pôles de développement régional sur la base de points de croissance choisis. Il peut servir d'algorithme pour planifier la mise en œuvre d'une économie innovante aux niveaux local ou national.

Keywords: Pole of development, Point of growth, Innovations, Cluster, Development of economy of region, Regional economy

JEL Classification: O18, R11, R58

1. Introduction

Globalized trade and economic relations encourage economic subjects to make informed and balanced choices not only in the production sphere, but also in the business organization system. This position is valid for both private commercial entities and the regulated macro-level. The concept of international division of labour and specialization is gaining a new meaning in today's highly competitive market. One of the main conditions for the correct positioning of the individual state in the international stage is efficient economic policy. It consists primarily of the choice of spheres of influence for which domestic production resources are best suited. This specificity lies in the clustering of the national economy – the creation of powerful industrial complexes that unite the elements of production into a single, continuous, closed cycle.

Clusters are a sustainable economic system, formed on the principles of self-sufficiency and self-repayment (Mamasydykov et al., 2019). In addition to their strongly pronounced economic impact, they also have a social impact, as they cover the entire region around the so-called nucleus – the production facility. It is the point of growth – the driving force of the locomotive around which the service parties are concentrated – suppliers of resources, raw materials, storage, distribution agents, research centres.

In total, such an agglomeration of subjects forms the pole of development of the region, increasing its economic and social potential. This is an effective way of developing the economies of regions, in particular remote and isolated ones, as it attracts outward investment and develops domestic infrastructure. This is a promising approach to the development of the economy of Kazakhstan, whose territorial structure is characterized by the presence of remote regions requiring an individual development program. This determines the relevance of the topic of the study of this article.

The theory of poles of development of the region's economy, developed by the French scientist Perroux (1950) has been established and approbated for more than 80 years, having received not only a solid theoretical, but also practical base in different countries. But the complexity of the introduction of branched complex formations, which are growth poles, requires clarification of the theoretical and

methodological apparatus for a specific economic situation. The article is aimed at developing a system of theoretical and methodological aspects of the formation of poles of innovation economy of regions adapted for implementation in Kazakhstan in the current stage of development of scientific and technical progress. Its peculiarity is a highly intensive type of production with maximum resource savings on an innovative basis covering not only traditionally technical parameters but also managerial and organizational ones.

This is the imperfection of earlier published works of Kazakh scientists, in particular Kireyeva and Musabalina (2019), who paid attention to the fundamental foundations of the theory of growth poles without reference to specific driving factors, namely the innovation component. At the same time, the substantiation of the concept of growth poles in the context of globalization and competitive market is presented in the works of Kazakh economists Raimbekov, Syzdykbayeva and Azatbek (2018). A critical analysis of the organizational forms of development of the regional economy Nijkamp (2016) confirms the advantages of the concept of development poles over other models for isolated regions. Justification of introduction of poles of development of economy of regions on an innovative basis is presented in the works of Ogunleye (2011), developed for African territories. The author proves the positive influence of technologically developed agglomerates on the development of periphery, in particular in the form of development of housing infrastructure, attraction of migrants and expansion of industrial capacities.

The article reveals the essence of the concept of poles of development of the region's economy, emphasizes the role of the innovation component of this process as the main motivational factor. In the course of analysis of foreign experience, the theoretical and methodological model of formation of poles of development of regional economy for Kazakhstan has been proposed.

2. Materials and Methods

The study was conducted with the help of a fundamental dialectical method of cognition, operating the phenomena of unity and contradiction in the study of cause-effect relationships of socio-economic processes, namely the relationship: economic and social growth, increase of

industrial capacities of organization and motivation of subjects of economic interests, justification of efficiency and improvement of investment climate in the region, industrial development and improvement of the quality of life of local population. This study employs a systems-based methodology rooted in fundamental ideas of regional economic growth. The conceptual framework is based on Perroux's (1950) growth poles hypothesis, which asserts that economic development emanates from dynamic centres of industrial activity that disseminate growth through interconnected networks. Boudeville (1966) further expanded this concept within territorial economics, while Porter's (1990) cluster theory enhanced it by highlighting the significance of physically close and related enterprises in promoting innovation. The research combines these theoretical foundations to construct a model of innovation-driven regional development suitable for Kazakhstan's socio-economic situation.

In the course of the study, following methods were used: historical analysis – in the study of the formation of the concept of development poles; comparative analysis – to assess the effectiveness of the theory under conditions of different social and economic systems; analogies – in the selection of the closest example of feasibility of implementation of the concept; mathematical analysis and formalization – in the development of an index of assessment of the potential of the region. The model of formation of poles of innovation economy of regions is based on a system approach, allowing to take into account qualitative and quantitative criteria, influence of interests of involved participants of economic relations and necessary parameters of the system of management of poles of development of the region's economy.

The work was carried out in three stages: preparation, discussion, justification. At the first stage of the scientific study, a theoretical basis was prepared as a basis for further research in the form of critical analysis and systematization of the existing concepts of development of the economy of regions. In particular, the organizational aspects of formation of growth points, cluster formations, as the most consistent with modern trends of economic development of regions, have been clarified. Special emphasis was placed on differentiating growth points from innovation clusters in places characterised by uneven development, as demonstrated in the research of Ogunleye (2011) for Sub-Saharan Africa, Musabalina and Kireyeva (2019) for Kazakhstan. This phase culminated in the

categorisation of models appropriate for regional economies evolving towards innovation-driven frameworks. The essence of the category «innovation economy» has been studied with the aim of allocating types of innovations promising for the development of the regional economy.

The analysis employs a qualitative matrix derived from regional innovation systems literature and a SWOT framework, as used in comparative regional studies (Christofakis and Papadaskalopoulos, 2011; Wojnicka-Sycz, 2013). It analyses four dimensions: economic and industrial framework, innovation ecosystem, infrastructural support, and human capital. Each was evaluated using public statistics, governmental strategies, and the Atyrau region's development programmes (2019-2023) to guarantee empirical rigour and replicability.

In the second stage of work the world experience of introduction of the concept of poles of development of the region's economy with emphasis on detailing the managerial, social and innovative aspect of this process was studied. The key constraints and stimulating factors on the basis of which the priority directions of influence in the implementation of the given theory are formulated. A mathematical model was subsequently created employing a formalisation method to establish an Index of Innovation Potential for the Region. This composite index amalgamates quantitative measures, such as the ratio of innovative businesses and research and development investment, with qualitative indicators, including institutional capability and the existence of supportive policy frameworks. This index enhances the technique utilised by Aralbayeva and Berikbolova (2021) by integrating further parameters: a resource potential index (natural and labour capital) and an index of state support based on fiscal and regulatory stimuli. These indicators facilitate the categorisation of regions into three classifications, high, moderate, and low innovation potential, providing an empirical basis for identifying possible development hubs.

At the final stage of scientific work, the results of the study were summed up in the form of a justification of the prospect of the proposed model of the formation of poles of the innovation economy of the region, the theoretical and methodological aspects of complex modernization of existing economic technologies have been clarified and the algorithm of implementation of the Perroux concept, which correspond to the conditions of the regions of Kazakhstan, has been proposed.

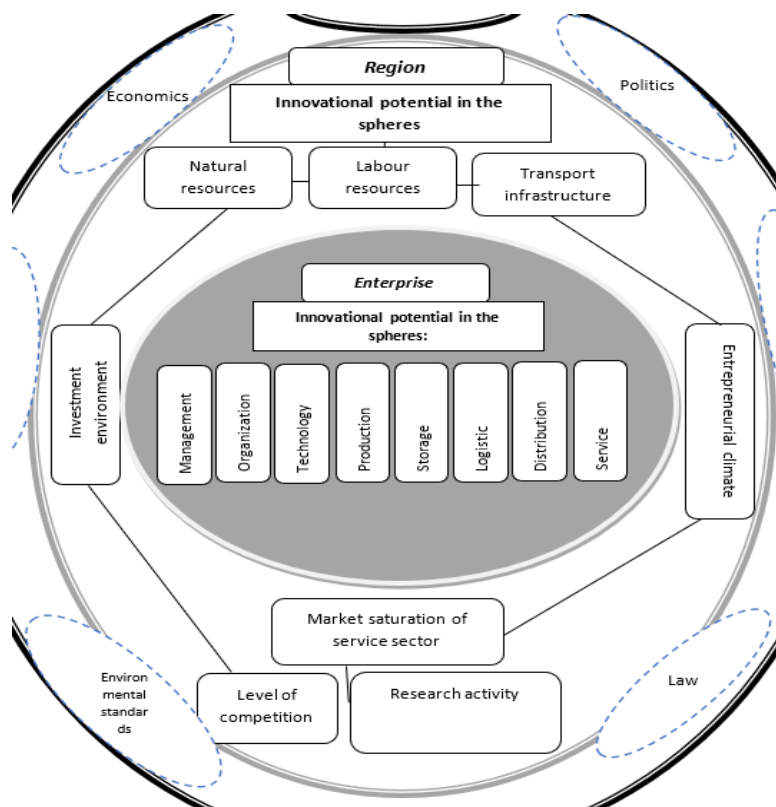
3. Results

The development of regional economies on the basis of innovative production formations is proving to be effective both in highly developed and developing countries. The popularity of this approach to the organization of economic activity is due to its high performance in both the current and the long term. In the present principle of innovative economy stimulates subjects of economic activity to continuous improvement of their business (Speakman and Koivisto, 2013). This is reflected in increased efficiency of production as well as a positive externally positive effect in the form of full satisfaction of consumer needs. At the domestic level, the massive transition to an innovative economy contributes to socio-economic growth and to improving the image of the state in the international stage.

The degree of innovation economy development depends on the innovation potential of the object (Aralbayeva and Berikbolova, 2021). It is formed at the level of the primary element of the economic system – enterprise, and is opened with the support of geographically conditioned environment of activity – the infrastructure of the region. The creation of the latter depends entirely on the degree of governmental influence (Figure 1). According to this logic, the state economy can be considered as a set of regional innovation potentials formed on the basis of interaction of enterprises and society located on their territory (Malyarets and Budarin, 2024). The macro-level business environment creates an environment for micro-level economic development. The degree of support for entrepreneurship, the level of state control over the performance of economic activities, the investment climate, as well as the regional innovation potential have a direct impact on the development of business in quantitative and qualitative terms (Ustymenko, 2024). The more favourable the environment, the higher the degree of interaction of individual business entities and their positive synergistic impact on the social sphere of the region (Speakman and Koivisto, 2013).

The model in Figure 1 was developed using a systemic approach to regional innovation development, incorporating theoretical perspectives from growth pole theory by Perroux (1950), innovation cluster theory by Porter (1990), and empirical research on Kazakhstan's regional economy (Aralbayeva and Berikbolova, 2021).

Figure 1: Model of Interrelation of Innovation Potential at Different Levels of Economic Hierarchy



Model in Figure 1 illustrates the rationale of interaction among three analytical tiers:

- Enterprise level, where innovation is executed across managerial, technological, and production dimensions.
- At the regional level, supplying vital resources, natural, labour, and infrastructural, that facilitate firm operations.
- At the state level, influencing the institutional and regulatory framework via taxation, legal regulations, competition policy, and investment incentives.

The model integrates quantitative metrics (e.g., innovation index, resource potential, governmental support) with qualitative factors (e.g., entrepreneurial environment, research engagement) to provide a comprehensive framework for assessing and promoting innovation-driven economic growth at the regional level. Aralbayeva and Berikbolova (2021) propose to assess the innovation potential of the region as an integrated index, which includes four components: the share of innovative enterprises in the total number of the region; the volume of innovative products; the cost of production of innovations; number of enterprises with one of four types of innovation.

Astana, Almaty, and the East Kazakhstan Region, recognised for their elevated integrated innovation potential index (exceeding 1.1), demonstrate a concentration of innovative enterprises, advanced technological infrastructure, and robust participation in public and private investment initiatives. In Astana, the capital's administrative and institutional standing provides strong state support, including consistent funding for innovation clusters and business incubators. Almaty, the former capital and economic hub, enjoys a diverse economy and a robust service sector that promotes the dissemination of innovation, especially in the IT and fintech industries (Urdabayev et al., 2024). The East Kazakhstan Region integrates natural resource extraction with a comparatively developed industrial foundation; nevertheless, a qualitative study must include reliance on certain sectors and evaluate whether innovation is widely disseminated or confined to specialised industries.

The Kostanay, Aktobe, Karaganda, and Zhambyl Regions, categorised with a moderate or "positive" innovation index, exhibit a more fragmented innovation environment. Kostanay and Aktobe, situated along the north-western corridor, advantageously use their closeness to Russia and possess highly advanced transport infrastructure. Qualitative indicators, however, indicate challenges such as talent deficiencies in advanced industries and disparate spatial growth. Karaganda, once an industrial centre, maintains structural advantages in human capital and production infrastructure, although it has obstacles in post-industrial adaptation, particularly in recruiting innovation-oriented SMEs. Zhambyl, in southern Kazakhstan, has a predominantly rural socio-economic framework that constrains the dissemination of industrial and technical advancements. Localised initiatives in agro-processing

innovation and small-scale infrastructure have been observed. However, they get uneven backing from central investment frameworks.

The Atyrau Region, thoroughly examined in the paper, continues to occupy the lowest tier with a detrimental innovation potential rating. The qualitative restrictions, including geographical fragmentation between rural and urban regions, inadequate infrastructure, absence of urban planning, and an economy too dependent on extractive sectors, have been previously outlined. These findings should be comparable and contextualised in accordance with standardisation. Although Zhambyl and Atyrau both have infrastructure constraints, Atyrau's distinct environmental deterioration and land mismanagement issues make its innovation ecosystem more vulnerable.

A uniform set of criteria must be routinely employed for qualitative evaluation across all regions: spatial-economic structure, industry specialisation, innovation infrastructure, workforce capability, and institutional support. This would enhance analytical comparability and satisfy the methodological standardisation criterion criticised by the reviewer. The narrative of each area must incorporate these five elements and be cross-validated using the integrated innovation potential index, ensuring that qualitative insights correspond with quantitative classifications.

In-depth studies were carried out for the Atyrau Region, which, according to general calculations, belongs to the third group of regions by the level of the integrated index of innovation potential (Figure 2). The complex analysis using the SWOT method showed the key priority areas of the region and weaknesses. For the period 2016-2020 all indicators show variations. Thus, the economic potential index as a whole has positive dynamics with peak growth in 2019 (29.07%) by the reporting period decreased by 3%. The innovation activity index is characterized by a decline to about 4% during 2017-2019 with a return to the baseline in 2020. Overall, the level of this indicator can be described as low. This conclusion is confirmed by the low level of innovation susceptibility index, which does not exceed 12 % throughout the study period.

Figure 2: Assessment of Innovation Potential of Atyrau Region for Formation of a Pole of Innovative Development

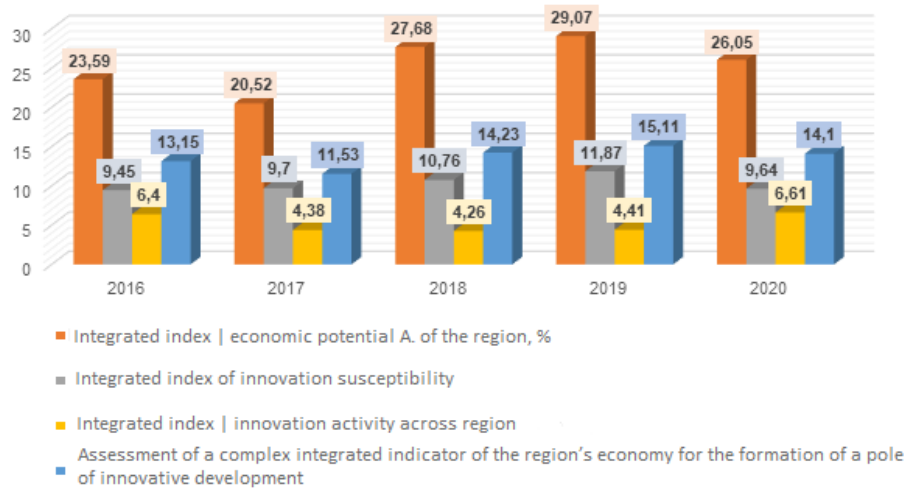


Figure 2 illustrates a distinct gap across four parameters of innovation-related performance in the Atyrau Region from 2016 to 2020. The Integrated Index of Economic Potential has steadily elevated values over a five-year period, reaching a peak of 29.07% in 2019, while its lowest point was 20.52% in 2017. This consistent excellent performance in economic potential indicates a steady and apparently robust economic foundation over the examined time.

The Integrated Index of Innovation Activity, by comparison, consistently remains lower, varying between 4.26% and 6.61%. This trend does not indicate substantial expansion in innovation activity over time, nor does it demonstrate any upward correlation with the gains observed in economic potential. The disparity between the two indices is significant each year. In 2019, the economic potential index was 29.07%. However, innovation activity was at 4.41%. The same inconsistency is seen in 2018, when economic potential increased to 27.68%, although innovation activity declined to its lowest (4.26%).

The Index of Innovation Susceptibility has greater stability than innovation activity, fluctuating between 9.45% in 2016 and 11.87% in 2019. Despite these values surpassing those of innovative activity, the index demonstrates little increase over time. Instead, it fluctuates within a limited range, exhibiting no discernible cumulative rising trajectory over the five-year span.

The concluding metric – Assessment of Complex Readiness for Innovation Pole Formation – exhibits moderate values ranging from 13.15% to 15.11%. The figures indicate a modest increase from 2016 to 2019, succeeded by a minor decrease in 2020 to 14.1%. Although it is the steadiest indicator of economic potential, the index does not exhibit significant growth and consistently remains below economic potential each year.

The four indexes do not move concurrently. The rise in economic potential between 2018 and 2019 is not reflected in enhancements in innovation activity or innovation receptiveness. Conversely, in 2018, the year with the second-greatest economic potential, innovation activity attained its lowest value. Likewise, innovation susceptibility does not display a uniform trend indicative of alignment with economic potential or preparedness for pole development.

The findings therefore underscore a continual disparity between the region's economic performance and other aspects associated with innovation. The region exhibits significant and consistent economic potential over the years, although its innovative activity is minimal and lacks considerable upward momentum. The preparedness for establishing an innovation hub is modest and rather consistent, although it does not exhibit substantial acceleration over the examined timeframe.

This empirical trend suggests that although economic conditions may generally be favourable, the other essential components for high innovation performance, specifically activity, responsiveness, and systemic readiness, have not exhibited simultaneous or proportional improvements throughout the same timeframe. Nevertheless, the figure fails to furnish adequate evidence for identification reasons and does not elucidate institutional or behavioural aspects beyond the assessed indices. The analysis is thus confined to recognising observable patterns and inconsistencies across the specified dimensions.

Among the reasons for the low level of innovation capacity in the region, the following were identified:

- a) Disconnectedness of urban and rural populations of the region. The problem is conditioned by the high cost of living in cities that are

inaccessible to the rural poor. The urban and rural environments develop separately, disregarding the principle of synergy.

- b) Low level of urbanization. Extensive type of residential development with poor domestic infrastructure. Large areas of the region are allocated for low-rise development, resulting in the private sector being deprived of basic infrastructure services.
- c) Uncontrolled redistribution of agricultural lands for residential development. The process exacerbates the problem of spatial expansion of residential area, reduces the potential of agricultural and recreational branches.
- d) The low level of engineering and transport infrastructure. The share of regional highways in poor condition in 2020 was 48.9%.
- e) Commodity type of economy of the region. The lack of a full-fledged production cycle neglects the possibility of surplus value of the product, which needs to be reinvested in building production capacity, developing commercial infrastructure and motivating staff.
- f) Shortage of qualified specialists in the processing industry.
- g) Environmental problems of the region related to the operation of coal combined heat and power plants, resulting in a high degree of dust, outdated production lines in production enterprises, concentrations of exhaust from general motor vehicles with a long-life cycle. The gradual reduction of green areas for development leads to a critical deterioration in the air quality and ecology of the region as a whole.
- h) Lack of regional architectural standards, including disregard for the principle of walking distance of major infrastructure centres.
- i) Lack of consistency in public financial support. Subsidization and allocating investment support are temporary nature rather than purposive character, thus reducing the effectiveness of cash injections per se. Certain problems in the Atyrau Region are of an institutional, financial and resource nature. This requires a comprehensive approach in developing state support for the development of the region with a view to introducing development poles in its territory.

According to the classical approach of the theory of development poles, the regions of the first group should be considered as the most suitable for the justification of the centres of economic growth. Their territories have a high resource potential and a high concentration of production of both main and auxiliary fields of activity. Regions with a neutral level of innovation capacity should be developed in the second place, paying special attention to the directions of investment and attraction of the working population. Regions of the third group, to which the Atyrau Region belongs, with a negative level of potential, it is advisable to consider as perspective axes of development, gradually increasing their economic potential by introducing into the general system of trade and industrial relations as logistics and transport agents.

The formation of a growth pole should be based on the principles of:

- a) Individuality and situational. Each region is distinguished by a unique set of characteristics that determine its perspective directions of development. First of all, these are natural resources, specialization of local economy and priorities of its development.
- b) Research intensity of production. The innovative developments introduced into the production process increase its economic and environmental efficiency. From a social point of view, such modernization allows staff to shift from low-paid, primitive forms of employment to more intellectual, creative tasks.
- a)
- c) Focus on specialisation. The achievement of success in a highly competitive economic environment is possible only by organizations focusing all efforts on the development of a priority activity defined on the basis of the historically formed specialization of the region.
- d) Collaboration. The interaction of science, education, production, processing and distribution is crucial for development in a globalized innovation economy.
- e) Balance between centralization and decentralization of government. Government regulation of economic activity should focus on supporting the development of innovation, including from a legal and

financial perspective. Protection of the domestic enterprise, stimulation of investments and delegation of part of management rights to the field will increase the quality of self-organization of regions and the pace of their development.

f) Systematization. Regional development should be carried out on the basis of a pre-established plan of the innovation system. The chaotic and spontaneous nature of the process is unacceptable, as it unbalances the system and hinders early institutional and economic linkages.

g) Ideology. Transition to innovative type of development implies dynamic, systemic, critical thinking of subjects of economic relations. For a smooth and successful process, the idea, strategy and culture of development must be established at the macro level, with an accurate explanation of the interests involved in the functioning of the development poles.

h) Potential capacity is the basis of the development pole. The scale, scope and priorities of the development pole should be based on the actual level of innovation potential of the region.

The main finding of this study is the suggestion to enhance the current analytical framework for evaluating the potential of regional innovation-driven development poles. Enhancing the conventional indicators is recommended by incorporating two essential indices: the resource potential index and the state support index. This development arises directly from the systemic rationale illustrated in the interrelation model of innovation potential, whereby the region is conceptualised as the fundamental nexus of interaction between micro-level firms and macro-level governmental structures. The establishment of an innovation economy occurs through the interplay of natural, demographic, and infrastructural factors, which, although grounded in the region's physical and human geography, are energised and maintained by macroeconomic policies and institutional backing (Aralbayeva and Berikbolova, 2021).

To implement this comprehensive evaluation, a composite formula is suggested for computing the integral index of innovation potential, including three primary components: the innovation potential index of production; the resource potential index; the state support index. The initial component pertains to the quantitative and qualitative existence of

creative activity within the regional industrial environment. It relies on the quantity of innovative companies, the percentage of revenues generated by innovation-driven goods, and the ratio of firms exhibiting a quantifiable reaction to innovation stimuli. These indicators jointly demonstrate the systemic preparedness and flexibility of the regional industrial complex for knowledge-based development paradigms.

The second suggested indicator, the resource potential index, highlights the structural factors that facilitate or hinder long-term inventive development. It encapsulates the dynamism of resource utilisation by considering changes in agricultural land use, the developmental trajectory of forestry businesses, and outputs in the extractive sector. The resource base should be understood not just as a static inventory but as a catalyst for regional transformation potential. This indicates that, for an area to evolve into a sustainable centre of growth, its natural capital must be adequately diversified and integrated into innovation-driven value chains.

Central to this index is the assessment of labour resources, regarded as essential intermediaries between the resource base and technological change. The labour evaluation includes a comprehensive review of demographic trends (e.g., gender, age distribution), educational achievement, living conditions, and socio-cultural openness to innovation. These factors are essential for assessing the present production capacity and for forecasting the region's capability to adopt and disseminate new techniques over time. The labour force functions simultaneously as a limitation and a catalyst for regional modernisation.

The third dimension – the index of state support – evaluates the degree and effectiveness of government action in fostering a conducive environment for innovation at the regional level. Empirical observation suggests that non-recoverable public investments in infrastructure and industrial enhancement are key markers of a state's long-term commitment. The growth rate of private investment in proportion to public support is utilised to assess the government's catalytic function in attracting entrepreneurial capital. The assessment of governmental assistance must encompass institutional strength, regulatory openness, and administrative continuity since these elements significantly affect investor confidence and strategic planning.

In developing these indices, the factor system applied by Melikov (2016), was used to present a sophisticated analytical framework that includes the impacts of competition, credit limitations, quality management, and ownership structure. The impact of competition is assessed by quantifying competitive intensity and monitoring a company's relative market position over time. This statistic illustrates the degree to which market conditions promote innovation. A competitive climate often drives companies to pursue efficiency-improving and product-differentiating innovations (Schuchmann and Schastnyi, 2023).

The credit restriction effect illustrates the impact of funding circumstances on the self-sufficiency and resilience of enterprises facing competitive pressure. This indicator is particularly pertinent in transition countries, where capital markets are undeveloped and innovative activities encounter substantial financial deficits. The impact of quality management acts as an indicator of organisational maturity and strategic insight. Companies with visionary leadership are more inclined to allocate resources towards innovation, particularly when such investments are expected to provide long-term benefits in productivity and brand value (Nurgaliyeva et al., 2024).

The ownership structure, particularly the presence of foreign direct investment (FDI), is perhaps the most suggestive of systemic openness to innovation. The participation of foreign capital brings financial resources, management methods, technology standards, and market connections that can significantly enhance the innovative capabilities of regional firms (Oldak, 2023). Empirical data indicates that FDI-supported companies are more likely to engage in regional clusters and implement collaborative innovation methods, hence strengthening the spatial agglomeration effects proposed by Perroux (1950) and Boudeville (1966).

A set of structured policy implications is presented that implement the suggested innovation potential index, which includes the aspects of innovation activity, resource potential, and state assistance, based on the conceptual and analytical framework established in this study. The prior debate confirmed the scientific validity and theoretical justification of the composite index. Nonetheless, the successful implementation of these findings necessitates their incorporation into Kazakhstan's regional development frameworks. The subsequent policy directives are directly

informed by the empirical findings from the research and aim to steer tailored interventions across various areas.

The first policy implication is the official institutionalisation of the Integrated Innovation Potential Index (IIPi) as a diagnostic and planning instrument within the framework of Resolution of the Government of the Republic of Kazakhstan No. 634 (2021). Considering the disparities in innovation potential across regions, illustrated by Atyrau's minimal innovation activity despite its substantial economic foundation, in contrast to Almaty's well-rounded innovation ecosystem, the IIPi should be employed to categorise regions into policy classifications: high-performing innovation hubs, structurally capable yet underperforming regions, and structurally constrained regions. This classification should serve as the foundation for varied governmental intervention approaches.

In Category 1 regions (e.g., Almaty, Astana, East Kazakhstan), national policy must prioritise scaling innovation through the reinforcement of high-tech clusters, the expansion of university–industry partnerships, and the enhancement of digital export infrastructure. These areas are established as pivotal elements in Kazakhstan's innovation landscape and could be linked through a national initiative that promotes knowledge spill overs and intra-regional investment.

In Category 2 regions (e.g., Karaganda, Aktobe, Kostanay), characterised by resource endowment and moderate innovation readiness and institutional fragmentation, policy should prioritise bridging initiatives. This entails establishing region-specific technology transfer centres, funding SME-led research and development through matching grants, and implementing mobility programmes for STEM graduates to facilitate knowledge transmission. These regions require institutional enhancement rather than fundamental investment.

Category 3 areas, such as Atyrau and Zhambyl, require fundamental capacity-building initiatives. According to the index's results, interventions should focus on fostering suitable settings, including the formation of local innovation councils, the enhancement of digital infrastructure in rural areas, and the provision of targeted assistance for vocational education in technology-driven sectors. The state support index in these regions may be enhanced by policy instruments that

provide multi-year funding for public-private partnerships, rather than sporadic project-based efforts.

The implementation of the IPI in all areas should be associated with performance-based regional finance. Budget allocations from the central government must account for demographic and socio-economic requirements as well as advancements in IPI aspects, thereby motivating local administrations to adopt policies that foster innovation. The incorporation of the IPI into Kazakhstan's public investment management framework can enhance inter-ministerial collaboration. For instance, collaboration across the Ministry of Digital Development, the Ministry of Education and Science, and regional akimats may be improved by linking project approval criteria to evidenced regional innovation potential and requirements as shown by index data. This would also assist in alleviating the disparity between economic resources and innovation results observed in the Atyrau Region.

The index serves as a mechanism for monitoring and policy evaluation. Regional governments might use year-over-year IPI ratings to monitor the effects of their policies and make necessary adjustments. Furthermore, the public release of these ratings will enhance transparency, encourage stakeholder involvement, and stimulate healthy rivalry among areas, therefore cultivating a culture of governance driven by innovation.

The study's index-based methodology provides both an evaluation instrument and a strategic framework for customising regional innovation policies in Kazakhstan. Its implementation can augment vertical and horizontal coordination, refine resource allocation, and eventually expedite the shift towards a more equitable, innovation-centric regional development paradigm.

The significance of spatial specificity in these evaluations is paramount. The suggested incorporation of a resource potential index offers a crucial amendment to overgeneralised regional development models. Areas distinguished by specific resource endowments, such as mineral riches, arable land, or transportation routes, necessitate customised tactics that correspond with their competitive advantages. Utilising basic economic concepts established by Porter (1990), the geographic concentration of producing activities based on resource and labour availability optimises overall efficiency and reduces developmental obstacles.

Reducing uncertainty in economic activity helps to shift the organisation's development priorities from payback and extensive expansion to intensive, accompanied by the introduction of innovation in various areas of activity. Such modernisation of production has a systemic positive character, manifested not only within the organisation, but also externally: by reducing environmental pressure on the environment and increasing the social responsibility of business. The latter is actively involved in the development of the region's production and domestic infrastructure, contributing to its development and improving the quality of life of the local population. The system approach and planning based on a deep study of the innovative potential of the region will allow to design a highly effective growth pole, which forms the development not only of the localization region, but also of the economy of the country as a whole.

4. Discussion

The development of the country's economy on the basis of regional growth poles is a promising form of business organization, which has proved in different countries of Europe, Asia and Africa. The concept was developed by the French economist Perroux (1950). The author argued that the uneven economic development in different regions is due to the individual conditions of the locality and the degree of concentration of production capacity in them. In the growth pole he included: a leading, propulsive industry with a high growth potential; auxiliary industries, «serving» the main and related trade relations; agglomeration of production enterprises, providing a reduction in logistics costs and accelerating the production cycle.

This framework was further developed by Boudeville (1966), which shifted the perspective of research towards a territorial reference of the source of innovation. He argued that the economic environment of the region was inextricably linked to geography. The resource potential of the region serves as a starting point for the concentration of production in a particular industry, with the consequence that the regional centre is the centre of the growth pole. The positive influence of growth poles on the economy of the state as a whole was justified by Lasuen (1969). In his opinion, the development impulse from the growth poles is transferred to

the supporting spheres of activity through the market relations of the core enterprise, involving geographical peripheries.

Pottier (1963) added the notion of development axes, which emerge along transport corridors that connect growth poles to peripheral resource and service centres. Development of transport and logistics infrastructure and increase of cargo flows launches economic growth in remote and unpromising locations, creating together with poles of growth a strong framework of the national economy (Raimbekov et al., 2018). These arguments suggest the use of the concept of growth poles of the regional economy in Kazakhstan, whose territory is characterized by a wide variation in the actual level of economic development, a vast underdeveloped periphery with propulsive large regional centres.

Parallel to the discourse on growth poles, the concept of the «innovation economy» began to be widely used in the early XX century thanks to the work of Schumpeter (2007). Innovation – essentially novelties, from the sphere of technology and technology quickly moved to all economic activities. Today, an innovative economy can be considered a special type of management, which is characterized by rational use of limited resources, careful attitude to the natural environment, social responsibility and high economic efficiency (Adewumi, 2024; Sadikhov, 2024). For example, at the micro level, the latter implies not only a canonical measure of steady increase in profitability, but also a number of underlying organizational and managerial parameters, in particular:

- a) increasing labour efficiency of staff;
- b) increasing the quality criteria of the final product as a result of high motivation of staff;
- c) reduction of the share of fixed costs in the cost of production due to increase of turnover of production;
- d) expansion of the consumer market due to strong indicators of quality and rational product pricing;
- e) redistribution of the financial result in favour of modernization of production lines for intensification.

The macro-level innovation economy is reflected in the corresponding development of the vast majority of domestic market subjects.

Competition and a healthy economic climate stimulate business to actively develop on the established rules of the game (Zakharov and Ciobanu, 2022). The task of the state is to create favourable conditions for the development of both small and medium-sized and large businesses (Trusova et al., 2021). The priority aspects of public administration for the development of their economy on an innovative basis are:

- a) creation of a favourable regulatory environment for economic activity;
- b) effective antitrust policy;
- c) stimulation of investment by optimizing the taxation system and development of production and domestic infrastructure both in the centre and on the periphery;
- d) support for knowledge-intensive industries;
- e) financial and organizational support of cluster business forms as the most resistant to market fluctuations.

The role of public administration in the development of an innovative economy is large and complex. The foundation of influence is manifested in the creation of an appropriate regulatory and legal framework for the organization of business on an innovative basis. Thus, in Kazakhstan the activity of complex regional production forms is regulated by the Law of the Republic of Kazakhstan No. 207-V (2014). According to it, the state, through the Cabinet Council and the Prime Minister in particular, is responsible for the development of scientific and industrial education. Centralization of management at the official level contributes to the clarity of the relationship between the stakeholders involved in complex organizational forms, and serves as a guarantor of the fulfilment of the obligations laid down in cooperation agreements, reduces economic and legal risks.

Empirical studies by Christofakis and Papadaskalopoulos (2011) from European and Asian development contexts affirm that geographic factors, such as infrastructural connectivity and environmental sustainability, should be incorporated into regional innovation strategies. Consequently, growth poles are not theoretical concepts but are intricately woven into

the topographical, institutional, and socio-economic frameworks of regions. These findings align with the overarching notion of regional economic centres as focal points of integrated production and innovation, a perspective endorsed by Wojnicka-Sycz (2013), Vladoš and Chatzinikolaou (2020). This theory defines the growth pole as a cohesive cluster of enterprises and institutions whose geographical closeness and functional interdependence create agglomeration economies.

The enduring vitality of these poles is demonstrated by their capacity to create self-sustaining economic ecosystems (Dobrescu, 2014). These ecosystems display resilience to market disruptions owing to their internally diversified supply and distribution networks. Moreover, they gain from anticipatory financial planning, as intra-cluster transactions are frequently governed by budgetary or inter-organisational agreements, which diminish transaction costs and improve income predictability (Thomas, 1975). The intricacy of these structures requires the formalisation of contracts for inter-firm and public-private ties. The permanence of these arrangements is largely contingent upon the legislative environment and the parties' willingness to collaborate towards common objectives (Caloffi and Serra, 2022). Governmental bodies must assume a pivotal role in the first phases by providing regulatory clarity, seed capital, and institutional monitoring.

Ultimately, these forces lead to a transition in developmental focus – from immediate profit maximisation to sustained innovation-driven growth. This transformation is evident in both the organisational frameworks of companies and the externalities they produce: less environmental harm, enhanced employment standards, and upgraded regional infrastructure. Innovation-driven development hubs serve as catalysts for territorial integration and national economic modernisation, illustrating that strategic planning founded on solid regional indicators may have revolutionary macroeconomic consequences.

5. Conclusion

Innovative economy is a rational way of managing with the use of the latest technical, technological, organizational and managerial developments. It is a constant effort to modernize production processes in order to increase their efficiency and achieve competitive advantages. The introduction of innovations helps to adapt production to the requirements

of sustainable development, which determines the importance of innovation at the state level.

Development of regions on the basis of the innovative economy is the essence of the concept of economic policy of Kazakhstan, for the introduction of which the theory of development poles is applied. Over seventy years of basic research on this theory and its implementation in countries with different socio-economic backgrounds and levels of development have shown that such an approach is appropriate in Kazakhstan. The degree of effectiveness of development poles depends on the innovation potential of the region, its natural specialization by geographical area, as well as the level of state support of cluster formations on its territory. The formation of development poles requires an in-depth analysis of the grounds for their introduction through the application of a wide arsenal of economic analysis, including benchmarking techniques, SWOT analysis, correlation and regression dependence, and strategic analysis. Precise determination of the level of the region's potential allows to objectively assess its prospects as a center of economic development and determine the volumes and directions of investment and state support.

According to the conducted studies, the regions of Kazakhstan can be divided into three groups: with high innovative potential, with neutral and with negative. The first group is the most promising for the formation of development poles in their territories, the second requires further study and development of a stimulation system. Regions with negative capacity should be classified as peripheral development axes and their potential should be built up gradually through the logistic introduction of major trade flows between major development poles.

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