

Abstract of the dissertation for the degree of Doctor of Philosophy (PhD) in the educational program «8D04101 – World economy» by Zhai Xuan on the topic: “Current state and prospects of cooperation between Kazakhstan and China in the natural gas sector”

Relevance of the dissertation research. The energy sector is inseparably linked to the nation's economic development. Looking back at the history of the world economy, the rapid economic growth of virtually every country has been driven by the consumption of fossil fuels. The economic characteristics of energy primarily include energy production and demand, energy transportation, pricing mechanisms, and industry trends. Modern energy cooperation includes exploration, development, transportation, and distribution. In terms of regional cooperation trends, the natural gas industry plays a significant role in regional economic cooperation. In particular, natural gas cooperation between Kazakhstan and China has made a meaningful contribution to the economic development and energy security of both countries. With the support of both governments, Kazakhstan and China have signed a series of bilateral agreements to enhance the efficiency of their oil and gas cooperation.

Cooperation between Kazakhstan and China in the natural gas sector has not only driven the development of Kazakhstan's natural gas industry but has also generated substantial returns for Chinese oil companies' oil and gas projects in Kazakhstan. Currently, the major natural gas projects being developed by Chinese companies in Kazakhstan include: Kashagan project, Kazgermunai project, Kozhasai project, Pridorozhnoye project, etc. In addition, natural gas cooperation between Kazakhstan and China is constrained by market structure, bargaining power, natural gas transportation capacity, and external competitive factors. While there are many issues that need to be solved, there is also enormous potential for cooperation.

Purpose of the research topic is to explore the main issues, the current state and prospects of trade and economic cooperation between Kazakhstan and China in the natural gas sector; is to develop practical recommendations for improving the efficiency of bilateral gas cooperation between Kazakhstan and China.

Achieving this goal required solving the **following tasks**:

1. To identify the conceptual methodologies employed in this field of study and to examine theoretical and methodological approaches to the establishment and growth of international energy cooperation.
2. To examine the complementarity between the gas resource advantages of Kazakhstan and the natural gas demand of China.
3. To examine the way Kazakhstan and China's natural gas collaboration has evolved historically and assess how national energy laws and policies have influenced this cooperation.
4. To evaluate the investment approach used by China in Kazakhstan in relation to the broader regional economic landscape, along with examining the current status of gas initiatives financed by Chinese oil corporations in Kazakhstan.
5. To conduct an empirical investigation into the natural gas trade between China and Kazakhstan, focusing on the impacts of population growth, economic development,

complementarity of gas resources, and gas production and consumption.

6. To create economic and mathematical models that simulate the optimal cooperation framework and transportation strategy for Kazakhstan, while also assessing the economic potential and future gas output of significant projects funded by Chinese firms in Kazakhstan based on changes in the cost-benefit structure.

7. To offer feasible recommendations for enhancing the effectiveness of Kazakhstan-China economic cooperation and to propose possible domains for collaborative efforts that would be advantageous for both parties in the gas sector.

The objects of the research – the natural gas sector of Kazakhstan and the natural gas sector of China.

The subject of the research – the foreign trade and economic policies of Kazakhstan and China, along with their economic and trade relations in the gas sector.

Methodological basis of the research consists of both general scientific methods and specialized methods. The literature review method, data analysis, empirical analysis, model-based analysis, and comparative analysis are widely used in this work. The methods described above made it possible to gather the necessary information on the current state of cooperation between Kazakhstan and China in the gas sector, as well as to obtain data for conducting an empirical analysis of the factors influencing natural gas trade between Kazakhstan and China and for assessing the economic potential of cooperation in the gas sector.

Description of the main findings of the study. This dissertation presents a comprehensive analysis and economic assessment of cooperation between Kazakhstan and China in the natural gas sector, examining aspects such as supply and demand dynamics, market structure, pricing mechanisms, investment strategies, and transportation safety. Regarding the future direction of natural gas cooperation between the two countries, the author proposes economic cooperation models that align with the economic interests of both countries, as well as perspective areas for collaboration.

Compared to other studies, this research applies empirical analysis and game theory models to conduct an in-depth analysis of the economic profitability of gas cooperation within the context of international politics and regional economics. From the economic theoretical perspective, the significance and huge potential of Kazakhstan-China cooperation in the natural gas sector have been presented for the economic development of both countries.

The dissertation presents the following results, which are characterized by **scientific novelty**:

1. The theoretical content of the development of the international cooperation in energy sector has been clarified with an emphasis on the role of geopolitical relations in the development of regional energy cooperation.

2. The complementarity between gas resource advantages of Kazakhstan and natural gas demand of China has been conducted based on the theories of comparative advantage and factor endowments.

3. The guiding role of national energy policies and related laws in gas cooperation has been identified, and the history of natural gas cooperation and the role of bilateral agreements between Kazakhstan and China have been analyzed.

4. The assessment has been conducted of the current state of natural gas projects invested in by Chinese oil companies in Kazakhstan based on collected data, and an author's strategy of natural gas cooperation centered on the principle of "investment in exchange for natural gas supplies" has been established. The competitiveness and bargaining power of Kazakhstan and China have been analyzed using gas import security indices.

5. The empirical analysis of oil and gas trade between Kazakhstan and China has been conducted employing regression analysis, and factors that may influence trade volume have been explained.

6. Factors influencing the cost-benefit structure of natural gas projects have been analyzed, and future revenue and production volumes for Chinese companies' natural gas projects in Kazakhstan have been predicted based on this structure. The competitive scenarios and the mathematical model has been developed to simulate transportation profits under different scenarios.

7. Proposals have been developed to improve the efficiency of Kazakhstan-China cooperation in the natural gas sector, including infrastructure improvements and the construction of 'Central Asian gas hub', the fields of coalbed gas and the gas chemical industry were proposed as mutually beneficial cooperation.

The main statements for the dissertation defense:

1. Cooperation on natural gas will not only help Kazakhstan increase its export revenues and diversify its exports, but also enhance China's energy security. Therefore, pipeline-based natural gas trade can establish a stable and cost-effective energy relationship between the two countries.

2. The main factors affecting natural gas supply and demand include natural gas reserves, production costs, transportation safety, and pricing mechanisms. In this research, the author proposes China's investment strategy of "investment in exchange for natural gas supplies" and the concept of forming a "community with a shared future" through the establishment of joint ventures.

3. The higher the strategic importance of a natural gas-supplying country, the greater its geopolitical influence, and the more stable its supply, the greater its dominance in natural gas pricing negotiations. The original price bargaining model simulates the bidding strategies and bargaining thinking of Kazakhstan and China during natural gas price negotiations, reflecting the equilibrium of interests between the two parties in the bargaining process.

4. Based on the results of the pricing mechanism simulation, the natural gas trade between Kazakhstan and China is not a zero-sum game. The empirical analysis demonstrates the significant potential for natural gas trade between the two countries and examines the key factors influencing this trade to provide insights for further evaluating the economic benefits of natural gas cooperation between Kazakhstan and China.

5. The models for assessing the investment prospects of the natural gas industry emphasizes the need to adjust tax policies and operational models in response to the development status of different natural gas projects to ensure stable project revenue and natural gas production, and identifies future natural gas production as a potential

indicator for expanding natural gas cooperation between Kazakhstan and China.

6. Based on the analysis of the competitive model, it was concluded that Kazakhstan's optimal strategy is to maintain the volume of natural gas exports sourced from Chinese oil companies in order to sustain its market competitiveness while leveraging its geographical advantages to establish a hub for natural gas exports from Central Asia and Russia to China, maximizing its interests.

7. Practical recommendations were proposed to stimulate the efficiency of Kazakhstan-China cooperation in natural gas sector, including infrastructure construction, application of advanced technologies, and the concept of "Central Asian gas hub."

The theoretical significance of the research. The results obtained and the methodologies developed by author have the potential for further development of theoretical and applied research in the field of energy economy and the development of international energy cooperation and the supply chain of natural gas. The proposed approaches allow us to establish the cooperation mechanisms between countries in the natural gas sector. This will contribute to expanding investment, increasing natural gas production, and improving the natural gas supply chain, which has a crucial role to play in improving the competitiveness of the natural gas industry of Kazakhstan.

The practical significance of the research is illustrated in the proposed recommendations for improving the diversification of cooperation mechanism and creating effective supply chains of natural gas. The findings and solutions developed within the dissertation can be used by the government agencies in elaborating cooperation strategies with China in natural gas sector, by national enterprises in developing programs in possible areas for further cooperation and supporting joint projects in natural gas industry, and by investors in creating investment plan for the supply chains of natural gas in Kazakhstan.

Publication of the research results. There a total of 20 research papers have been published on the topic of the dissertation, including: 6 articles in the Scopus-indexed journals; 4 in journals recommended by the Committee for Quality Assurance in Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan; 10 in the materials of international scientific journals and international scientific conferences.

The structure of the dissertation. The work consists of an introduction, three chapters, a conclusion, as well as a list of references and an Appendix. The Chapter 1 examines the theoretical foundations and economic prerequisites for the development of cooperation between Kazakhstan and China in the natural gas sector. The Chapter 2 analyzes the topical issues of the development of interaction between Kazakhstan and China in the system of modern gas relations. The Chapter 3 presents the prospects of transformation of economic mechanisms of bilateral cooperation in the gas sector. The dissertation consists of 130 pages of typewritten text in MS Word, including 28 tables, 26 figures, and the list of references contains 161 titles.