“Analysis of production, fiscal, and external sector channels of economic growth in Kazakhstan’s oil and gas sector”

AUTHORS	Peter Karácsony Aliya Uralova Assel Bekbossinova Medet Konyrbekov Vivien Valko

ARTICLE INFO	Peter Karácsony, Aliya Uralova, Assel Bekbossinova, Medet Konyrbekov and Vivien Valko (2026). Analysis of production, fiscal, and external sector channels of economic growth in Kazakhstan’s oil and gas sector. *Problems and Perspectives in Management*, *24*(1), 438-453. doi: 10.21511/ppm.24(1).2026.29
DOI	http://dx.doi.org/10.21511/ppm.24(1).2026.29
RELEASED ON	Monday, 02 March 2026
RECEIVED ON	Friday, 05 December 2025
ACCEPTED ON	Monday, 09 February 2026
LICENSE	This work is licensed under a Creative Commons Attribution 4.0 International License
JOURNAL	"Problems and Perspectives in Management"
ISSN PRINT	1727-7051
ISSN ONLINE	1810-5467
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
43	3	10

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine

www.businessperspectives.org

Type of the article: Research Article

Received on: 5th of December, 2025
Accepted on: 9th of February, 2026
Published on: 2nd of March, 2026

Peter Karácsony, Ph.D., Professor, Department of Marketing, Management and Methodology, Keleti Karoly Faculty of Business and Management, Obuda University, Hungary.

Aliya Uralova, Ph.D. Candidate, Department of Economics and Finance, Yessenov University, Kazakhstan. (Corresponding author)

Assel Bekbossinova, Ph.D., Faculty of Finance and Accounting, University of International Business named after K. Sagadiyev, Kazakhstan.

Medet Konyrbekov, Ph.D., Associate Professor, Institute of Economics of the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan, Kazakhstan.

Vivien Valkó, Ph.D., Assistant Professor, Faculty of Economics, Health Sciences and Social Studies, Institute of Economics and Management, Károli Gáspár University of the Reformed Church in Hungary, Hungary.

Conflict of interest statement:
Author(s) reported no conflict of interest

Peter Karácsony (Hungary), **Aliya Uralova** (Kazakhstan), **Assel Bekbossinova** (Kazakhstan), **Medet Konyrbekov** (Kazakhstan), **Vivien Valkó** (Hungary)

ANALYSIS OF PRODUCTION, FISCAL, AND EXTERNAL SECTOR CHANNELS OF ECONOMIC GROWTH IN KAZAKHSTAN'S OIL AND GAS SECTOR

Abstract

Given the instability of global energy markets and recurring price shocks, it is increasingly important to assess the sustainability of economic growth in countries heavily dependent on oil and gas, such as Kazakhstan. The purpose of this study is to assess the impact of the oil and gas sector's production, fiscal and external sector transmission channels on Kazakhstan's economic growth during 2010–2024. The empirical base includes official data from the Bureau of National Statistics of Kazakhstan, the Ministry of Finance, and the World Bank, as well as economic indicators related to exchange-rate dynamics and inflation. The study employs a combination of cointegration analysis, vector error correction models (VECM), and short-term ordinary least squares (OLS) specifications. The results show that oil production and GDP are linked by a stable long-term relationship, with the error-correction term indicating that about 24% of deviations from equilibrium are eliminated per year. Gas production emerges as a key short-term growth factor: a one-thousand-ton increase in gas production is associated with a 5.26 billion tenge (11.8 million USD) in GDP ($p = 0.002$). Tax revenues from the oil and gas sector exert a moderate positive effect on economic dynamics ($p = 0.065$), reflecting fiscal sensitivity to external conditions. The external sector channel exhibits the strongest short-term effect: a one-unit depreciation of tenge is associated with an average increase of 2.61×10^5 tenge in nominal GDP ($p < 0.01$). Overall, the results indicate that Kazakhstan's economic growth is shaped by long-term dependence on production and short-term transmission of price and financial shocks.

Keywords oil and gas, energy market, energy economy, production channel, fiscal channel, industry policy, Kazakhstan

JEL Classification C32, E22, Q33

INTRODUCTION

In the context of heightened volatility in global commodity markets and growing uncertainty in the world economy, the sustainability of resource-dependent countries increasingly depends on the mechanisms through which strategic sectors transmit external shocks to economic dynamics. For hydrocarbon-exporting economies, fluctuations in global energy prices, financial conditions, and exchange rates create persistent risks for economic growth, fiscal stability, and long-term development trajectories. Understanding how these shocks propagate through national economies remains a central issue in contemporary economic research.

Kazakhstan is a particularly relevant case for examining these issues. Despite large-scale reforms and modernization initiatives, structural features of the Kazakh economy – such as a high concentration of extractive industries, limited diversification, and institutional inertia – continue to create vulnerability to external price shocks. Periods of

http://dx.doi.org/10.21511/ppm.24(1).2026.29

GDP growth are often accompanied by a deepening dependence on global market conditions, complicating strategic planning and reducing the stability of long-term economic trajectories. This context highlights the need for an in-depth analysis of the mechanisms through which the oil and gas sector influences economic dynamics, including production, fiscal, and external sector transmission channels.

Empirical evidence confirms the structural importance of the oil and gas sector in Kazakhstan's economy. Over the past decade, hydrocarbons have typically contributed around one-fifth of Kazakhstan's GDP, accounted for more than half of export earnings, and remained a major source of budget revenues through both direct and indirect fiscal channels. Oil and gas exports also dominate foreign-currency inflows, making macroeconomic performance highly sensitive to fluctuations in global energy prices and exchange-rate dynamics. Despite ongoing diversification efforts, these structural characteristics have remained essentially unchanged, reinforcing the oil and gas sector's role as a primary transmission channel for external shocks into domestic economic activity (OECD, 2017; IEA, 2023).

The existing literature provides a substantial body of research on the resource cycle and the "resource curse", as well as on the effects of oil shocks on exchange rates, fiscal systems, and economic growth. However, most studies focus on individual dimensions such as production volumes, price dynamics, and tax revenues without integrating them into a unified analytical framework.

For Kazakhstan, this limitation is particularly pronounced. Empirical studies tend to examine the production sector (including the gas industry), fiscal mechanisms, and currency dynamics separately, which constrains the identification of complex causal relationships. Issues of internal structural dynamics in the industry, including employment, wages, investment activity, and institutional parameters, have also not been adequately studied.

In addition, much of the existing research relies on static or short-horizon approaches that provide limited insight into the stability of sector–macro relationships over time. Such approaches make it difficult to assess how the economy adjusts to structural shocks in the oil and gas sector and how different transmission channels contribute to economic dynamics. An integrated examination of production, fiscal, and external sector transmission channels, therefore, offers a more coherent perspective on how the oil and gas sector shapes economic growth in resource-based economies and serves as a key conduit for the transmission of external shocks.

1. LITERATURE REVIEW

The impact of the oil and gas sector on economic growth has been examined across multiple theoretical and empirical traditions, reflecting the complex, multi-channel nature of resource dependence. Prior research has shown that production dynamics, fiscal mechanisms, exchange-rate adjustments, and institutional factors jointly shape growth outcomes in resource-rich economies. However, the absence of an integrated analytical framework has led to a fragmented body of evidence, motivating a channel-based systematization of literature.

Early theoretical research establishes that dependence on natural resources constitutes a structurally persistent feature of economic development rather than a transitory phenomenon. Gelb (1988) conceptualized oil revenues as a macroeconomic shock with long-lasting implications for growth trajectories, while Auty (1993) and Gylfason (2001) formalized the "resource curse" hypothesis, arguing that resource-rich economies face systematic structural constraints that reinforce reliance on extractive sectors and limit diversification. Empirical validation of this framework was provided by Sachs and Warner (1995), who demonstrated that natural resource abundance is associated with weaker long-term growth performance. Subsequent extensions of this literature linked macro-level resource dependence to structural dynamics within the oil and gas industry itself, showing that sectoral organization and market integration shape development outcomes (Baille & Gir, 1998; Frankel, 2010). Collectively, these studies establish that long-term dependence on the oil and gas sector represents a stable structural condition of economic development rather than a temporary or accidental occurrence.

A large body of empirical studies demonstrates that the acceleration of economic activity in the United States, combined with lower oil prices, leads to increased consumption of petroleum products and gas, increased imports, and increased dependence on external supplies (Balke et al., 2010; De Michelis et al., 2020). Other research also highlighted the role of economic recovery in Europe and Japan, and raised key questions about OPEC's behavior and the balance of the global hydrocarbon market (Pierru et al., 2018; Almutairi et al., 2023). While these approaches provide valuable insights into average effects, they abstract from country-specific structural mechanisms and adjustment dynamics.

An important strand of the literature examined the fiscal and institutional dimensions of resource dependence, emphasizing how governance frameworks shaped macroeconomic outcomes in resource-rich economies. Previous comparative research on Norway and Venezuela highlighted the importance of rules-based fiscal frameworks and intertemporal revenue management for reducing procyclicality and stabilizing growth in resource-dependent economies (Bjerkholt & Niculescu, 2004). Building on this institutional perspective, subsequent empirical studies employed panel data approaches to analyze how resource rents affect economic performance across countries. Bulte and Damania (2008) showed that rents operated through political competition and fiscal incentives, while Arezki and Van der Ploeg (2010) highlighted the role of public investment allocation and rent management. Van der Ploeg (2011) systematized these mechanisms by emphasizing exchange-rate appreciation and capital reallocation toward non-tradable sectors, whereas Ross (2012) focused on labor-market distortions that reinforced the persistence of extractive growth models. Despite their contributions, this literature relied primarily on average cross-country effects and static or quasi-dynamic specifications, which limited its ability to capture country-specific long-run relationships and adjustment dynamics.

More recent research shifted attention toward financial, fiscal, and external adjustment mechanisms associated with oil and gas dependence. Early contributions emphasized fiscal constraints arising from structural transformations in the energy sector. Sun et al. (2018) highlighted the budgetary implications of introducing low-carbon technologies in upstream production, while Fuinhas et al. (2015) provided cross-country evidence that oil rents exert adverse growth effects in the presence of weak fiscal institutions. Subsequent studies increasingly focused on financial and external channels. Koilo and Grytten (2019) demonstrated that hydrocarbon revenues influence economic performance primarily through capital flows and balance-of-payments dynamics, amplifying cyclical instability. Extending this analysis, Bibi (2024) showed that oil revenues reshape the structure of foreign capital inflows and external financing, increasing macroeconomic vulnerability through investment channels. Recent evidence from China further emphasized that the simultaneous pursuit of energy security and emission reduction intensifies fiscal pressures and investment trade-offs in resource-dependent economies (Bai et al., 2024; Zhu et al., 2024).

A growing body of research also highlighted the role of external sector transmission channels operating through exchange rates, inflation, and macroeconomic volatility. For Eurasian economies, Korhonen and Mehrotra (2009) documented high sensitivity of exchange rates to external commodity price shocks. Empirical studies confirmed that oil price fluctuations are rapidly transmitted to the currencies of exporting countries, with short-term causal effects observed even in the absence of stable long-run cointegration relationships (Chen & Rogoff, 2003; Lizardo & Mollick, 2010; Schaling et al., 2014).

At the production level, research emphasized the role of physical output dynamics and technological constraints. Hamilton (2009) showed that stable production, combined with rising global demand, contributed to major oil price shocks, while Esfahani et al. (2014) found a stable relationship among output, external demand, and oil revenues in commodity-exporting economies. More recent evidence highlighted growing interdependencies between oil and natural gas markets and increasing volatility spillovers across regions (Zhong et al., 2019). The combination of these findings demonstrated that integration of energy markets increased the impact of external price and financial

http://dx.doi.org/10.21511/ppm.24(1).2026.29

shocks on economic stability, creating a key mechanism for the external sector channel.

Against this broader international backdrop, regional and country-specific factors become particularly important for Central Asia, where energy development is shaped not only by market dynamics but also by geopolitical, infrastructural, and institutional constraints. Javaid and Rashid (2015) noted that, despite the significant energy potential of Kazakhstan, Uzbekistan, and Turkmenistan, the implementation of interregional projects is constrained by political risks and infrastructure barriers. In turn, Saddam and Mansor (2015) found that the low efficiency of oil and gas companies was often associated with a shortage of qualified personnel, making strategic human resource management a critical factor for the industry.

These institutional arguments were particularly relevant for transition and post-Soviet economies, where resource dependence emerged alongside deep structural and governance transformations. Early country-specific research on Kazakhstan by Esanov et al. (2004) showed that weak fiscal institutions, limited transparency, and procyclical budgetary policies amplified the macroeconomic risks associated with oil dependence, increasing volatility rather than supporting sustainable growth. Building on this perspective, Kalyuzhnova and Nygaard (2008) demonstrated that resource abundance reshaped state–business relations in transition economies, reinforcing state control over extractive sectors while constraining broader institutional development.

Subsequent studies focusing on Kazakhstan's long-term trajectory emphasized the structural limits of export-led growth based on hydrocarbons. Kalyuzhnova and Patterson (2016) showed that economic performance depended critically on the effectiveness of resource management institutions and diversification policies, while Azretbergenova and Syzdykova (2020) and Kireyeva et al. (2021) provided empirical evidence of persistent path dependence and limited expansion of non-resource sectors despite prolonged periods of high hydrocarbon revenues. Alongside institutional analyses, a separate strand of literature examined the production foundations of Kazakhstan's oil and gas sector. Azhgaliev et al. (2018) identified geological exploration in Western Kazakhstan as a key driver of production growth. In contrast, Nadirov et al. (2019) and Maldynova et al. (2023) emphasized the increasing role of technological modernization in sustaining efficiency and international competitiveness.

Investment-related mechanisms were analyzed in studies highlighting the role of foreign capital. Otarbayeva and Arupov (2020) showed that foreign direct investment contributed to infrastructure modernization and field development but also risked reinforcing extractive dependence in the absence of strong domestic spillovers. Recent quantitative evidence further confirmed a close relationship between energy consumption and economic growth in Kazakhstan, underscoring the continued macroeconomic reliance on hydrocarbons (Zhai et al., 2024; Beisembayev & Akhmetkyzy, 2025).

Taken together, these studies demonstrate that Kazakhstan's oil and gas sector affects economic development through a combination of production, fiscal-institutional, and investment-related mechanisms, each operating with different time horizons and adjustment dynamics. However, despite extensive country-specific research, existing studies typically analyze these channels in isolation and rely predominantly on static or partial frameworks. The absence of an integrated dynamic approach that simultaneously captures long-run equilibrium relationships and short-run adjustment mechanisms across multiple transmission channels constitutes a critical gap in the literature. The present study addresses this gap by applying a unified econometric framework that combines cointegration analysis, vector error correction modeling, and short-term regression techniques.

Thus, the purpose of this study is to assess the production, fiscal, and external sector channels through which the oil and gas sector influences Kazakhstan's economic growth over the period 2010–2024.

2. METHODS

A review of the literature shows that existing studies of the impact of the oil and gas sector on economic growth often focus either on the short-term effects of price shocks or on long-term dependencies within static models. This limits the understanding of both stable structural relationships and short-term adjustment mechanisms. Therefore, this paper uses an integrated econometric approach that combines tools for analyzing long-term equilibrium and short-term dynamics. Using only one method does not allow for proper investigation of the processes, so a combination of correlation analysis, regression models, cointegration analysis, and a vector error correction model is used.

Unlike traditional studies based on a single econometric model, this study employs an integrated methodological framework that combines correlation analysis, regression analysis, Augmented Dickey–Fuller stationarity testing, Johansen cointegration analysis, and a vector error correction model (VECM). All econometric estimations and data processing were conducted using Stata 18, ensuring the reproducibility of results and the consistency of statistical testing procedures. The use of this combination of methods allows the identification of temporal patterns, the distinction between periods of economic stability and instability, and the assessment of which oil and gas sector indicators exert the greatest influence on economic growth, exchange rate dynamics, and fiscal outcomes. Within this study, a clear distinction is made between the concepts of channel and parameter. Channels are understood as economic mechanisms through which the oil and gas sector's functioning affects macroeconomic dynamics. Parameters, in turn, are observable quantitative indicators used as empirical measures to identify and assess the corresponding channels within econometric models.

We use official statistical data for the period 2010–2024. This time interval is chosen because comparable, continuous data are available for all key indicators. In addition, the period under review spans various stages of the global oil price cycle, allowing analysis of both long-term stable relationships and the economy's short-term reactions to external shocks. The data sources were the Bureau of National Statistics, the Ministry of Finance of the Republic of Kazakhstan (tax revenues of the oil and gas sector), and the World Bank Worldwide Governance Indicators (WGI) database, used to account for institutional factors.

The indicator of gross domestic product, which reflects economic growth dynamics, is used as the dependent variable. To identify the production channel, the analysis includes indicators of oil and natural gas production volumes that characterize the actual scale of activity in the oil and gas sector. The fiscal channel is represented by tax revenues from the oil and gas sector, reflecting the industry's contribution to overall budget revenues. The external sector channel is represented by exchange rate, as fluctuations in oil prices directly affect the foreign exchange market and broader macroeconomic conditions. Additionally, the analysis includes indicators of investment activity in the oil and gas sector, the inflation rate, and employment and wages in the industry. To control for the institutional environment, an indicator of public administration quality is used, reflecting the influence of institutional factors on the nature of macroeconomic and fiscal responses. A complete list of variables, their definitions, units of measurement, and sources is presented in Table 1.

Table 1 provides descriptions of all variables used in the empirical analysis, including their definitions, units of measurement, and data sources. The set of indicators covers economic, production, fiscal, and institutional characteristics, providing

Table 1. Description of variables used in the empirical analysis

Variable code	Full variable description	Definition	Unit	Data Source
GDP	Gross domestic product	Total annual GDP of Kazakhstan	million KZT	Bureau of National Statistics Database
INF	Inflation rate	Annual CPI inflation	percentage	Bureau of National Statistics Database
UNEMP	Unemployment rate	Share of unemployed in the labor force	percentage	Bureau of National Statistics Database
EXCH	Exchange rate	Average annual KZT/USD rate	KZT per USD	Bureau of National Statistics Database
INV_OIL	Foreign investment in the oil and gas sector	Annual inflow of FDI into the oil and gas industry	million USD	Bureau of National Statistics Database

http://dx.doi.org/10.21511/ppm.24(1).2026.29

Table 1 (cont.). Description of variables used in the empirical analysis

Variable code	Full variable description	Definition	Unit	Data Source
TAX_OIL	Oil-sector tax revenues	Total tax revenues generated by the oil sector	million KZT	Ministry of Finance of the RK Database
POP	Population	Total resident population	persons	Bureau of National Statistics Database
OIL_PROD	Oil production	Annual crude oil output	thousand tons	Bureau of National Statistics Database
GAS_PROD	Natural gas production	Annual production of natural gas	million m³	Bureau of National Statistics Database
EMP_OIL	Employment in the oil and gas sector	Number of workers employed in the oil and gas industry	persons	Bureau of National Statistics Database
WAGE_OIL	Average monthly wage in the oil and gas sector	Average real wage of employees in the sector	KZT per month	Bureau of National Statistics Database
GOV_IND	Government Effectiveness Index	Institutional/governance effectiveness indicator (World Bank WGI)	percentile (0–100)	World Bank Databank

a comprehensive assessment of the oil and gas sector's impact on Kazakhstan's economic dynamics. This multi-level combination of variables enables a comprehensive assessment of the links between economic growth and various aspects of the oil and gas industry's functioning, including production, fiscal, and economic mechanisms.

Figure 1 summarizes the stages of the empirical analysis.

According to Figure 1, the methodological approach is based on the consistent use of econometric tools to identify both short- and long-term links between the oil and gas sector and Kazakhstan's economic growth. The analysis begins with an assessment of the industry's dynamics from 2010 to 2024, including oil and gas production, export volumes, investment flows, and tax revenues. These data demonstrate the structure of the economy's oil dependence and justify the need to use dy-

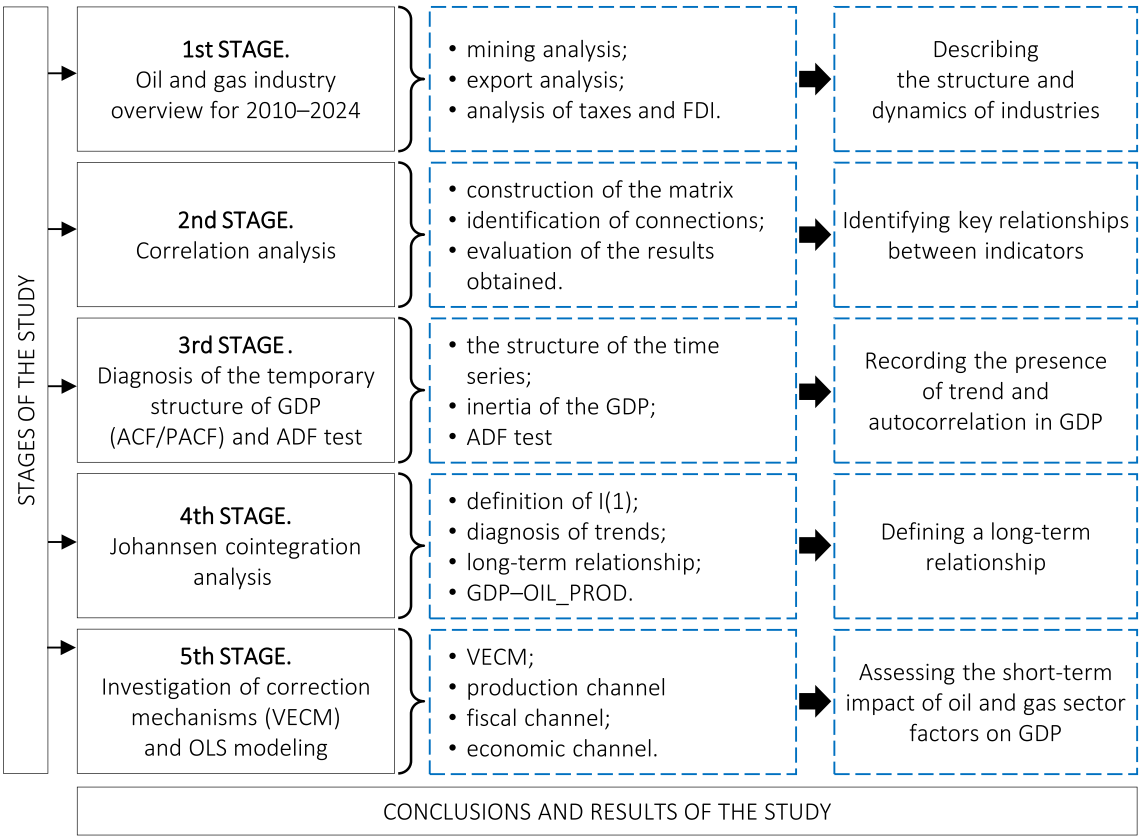

Figure 1. Stages of research

Table 2. Short-term OLS models of the impact of oil and gas factors on economic growth

Model	The purpose of the analysis	Dependent variable	Explaining variables	The role of the model within the framework of the research objective
The production channel	Assessing the impact of oil and gas production on economic growth	GDP	OIL_PROD, GAS_PROD	Short-term effect of production factors in the oil and gas industry
The fiscal channel	Assessing the impact of oil and gas sector tax revenues on GDP	GDP	TAX_OIL	Fiscal contribution of oil and gas rents to the short-term dynamics of economic growth
The external sector channel	Assessing the impact of economic conditions and foreign investment on GDP	GDP	INF, EXCH, INV_OIL	Short-term impact of the currency mechanism and external economic factors

namic models that account for the impact of external shocks and structural shifts. To determine the initial relationships, correlation diagnostics are conducted for key indicators. The coefficients obtained allow identifying the main channels of influence of oil factors and assessing the risk of multicollinearity before regression analysis. Next, formal verification of stationarity using ADF tests shows that the variables are integrated of order I(1), which makes the application of cointegration analysis appropriate.

A series of OLS regressions is used to assess the rapid effects of oil shocks on production, fiscal, and economic channels. These models allow clarification of short-term relationships that VECMs do not capture and reveal differences in the sensitivity of economic indicators to industry changes. Indicators reflecting the logic of oil dependence are used as explanatory variables: production volumes reflect the sector's production potential. In contrast, fiscal and economic indicators capture the economy's response to short-term fluctuations. Thus, the OLS regression methodologically complements long-term analysis and allows the quantification of the economy's instantaneous reactions to oil and gas factors.

The choice of variables for short-term OLS models differs from the VECM variables, as cointegration analysis revealed a long-term relationship between GDP and OIL_PROD. The remaining indicators are included exclusively in short-term specifications, where they reflect production, fiscal, and currency channels. The summary results presented in Table 2 reflect the specifications of the three short-term models.

Together, the three OLS models form a single methodological framework that allows a systematic assessment of the short-term manifestations of oil dependence in the Kazakh economy. The inclusion of production, fiscal, and economic specifications provides coverage of the main areas of impact of oil shocks. It allows them to be compared with the long-term structural effects identified in the framework of cointegration analysis and VECM. This integration of short-term and long-term approaches forms a holistic analytical framework necessary to identify the functioning of the oil and gas sector and its role in shaping the country's economic dynamics.

3. RESULTS

The oil and gas sector remains a system-forming element of the national economy, accounting for about 20% of GDP and shaping the key economic, fiscal, and external dimensions of the country's development. Over the period 2010–2024, GDP increased by 627%, while fiscal revenues from the oil sector grew by 169%, reflecting a strong dependence of macroeconomic dynamics on external price conditions rather than on physical expansion of production. In contrast, production indicators evolved more moderately: oil output increased by only 8%, while natural gas production rose by 159%.

These dynamics confirm the cyclical nature of Kazakhstan's resource-based growth model. Periods of high global oil prices (2011–2014, 2018–2019, 2022) coincided with sharp increases in fiscal revenues and exchange-rate effects, whereas price downturns (2015–2016, 2020) were associated with contraction of the fiscal base and reduced investment activity (Table 3).

The structure of the oil and gas sector also changed over the period under study. Foreign direct invest-

http://dx.doi.org/10.21511/ppm.24(1).2026.29

Table 3. Dynamics of economic and oil and gas indicators in Kazakhstan for 2010–2024

Year/ indicator	GDP, million KZT	FDI in the oil and gas industry, million USD	Taxes, thousand KZT	Oil production, million tons	Gas production, million tons	Average monthly salary in OGI, KZT
2010	21,815,517.0	4,739.8	2,256,345,640	79.7	37.4	273,864
2011	28,243,052.7	3,534.3	3,360,214,853	80.0	39.5	311,840
2012	31,015,186.6	5,440.0	3,411,930,968	79.0	40.2	308,940
2013	35,999,025.1	5,715.4	3,396,515,723	81.0	42.4	391,267
2014	39,675,832.9	7,302.2	3,467,394,959	80.1	43.4	488,769
2015	40,884,133.6	2,709.3	1,613,152,959	79.5	45.5	542,710
2016	46,971,150.0	5,740.1	1,130,056,793	78.0	46.7	599,372
2017	54,378,857.8	9,614.3	2,001,135,951	86.1	53.0	659,189
2018	61,819,536.4	12,141.0	3,200,814,177	90.3	55.4	704,677
2019	69,532,626.5	12,168.6	2,837,206,846	90.5	56.7	785,660
2020	70,649,033.2	6,450.8	1,400,987,517	85.7	55.4	837,428
2021	83,951,587.9	6,644.6	2,605,146,856	85.9	54.0	912,538
2022	103,765,518.2	9,588.1	6,398,366,444	84.2	53.6	1,139,936
2023	119,442,289.7	5,805.3	4,557,417,579	90.0	59.5	1,307,537
2024	136,693,318.3	3,109.1	3,808,971,479	87.7	59.4	1,453,790
Growth	114,877,801.3	–1,630.7	1,552,625,839	8.0	22.0	1,179,926
Growth rate, %	626.6	65.6	168.8	110	158.8	531

ment in the industry declined from USD 4.7 billion to USD 3.1 billion (–34%), whereas average monthly wages in the oil and gas sector increased more than fivefold (+531%). In general, the data demonstrate a model typical of a resource-based economy, in which production volumes change only marginally, while fiscal, economic, and social outcomes depend strongly on external price conditions and cycles in the global oil market.

Furthermore, to examine the direction of the relationship between economic growth and key indicators of the oil and gas industry, a correlation analysis was conducted using data for 2010–2024. This approach describes the structure of statistical relationships between variables and determines which characteristics of the oil and gas sector are most closely associated with GDP dynamics. The analysis includes indicators reflecting production activity (oil and natural gas production), social characteristics of the sector (employment and wages), fiscal relevance (tax revenues), investment activity (foreign direct investment), as well as macroeconomic and institutional variables (inflation, exchange rate, and government effectiveness). The resulting correlation matrix is presented in Table 4.

The results indicate that Kazakhstan's GDP exhibits strong positive correlations with several oil and gas sector indicators over the sample period. The highest correlation is observed between GDP and natural gas production (r = 0.998), followed by employment in the oil and gas sector (r = 0.997) and average wages in the industry (r = 0.923). GDP is

Table 4. Correlation matrix of key variables for 2010–2024

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
GDP	1.000	0.998	0.653	0.769	0.808	0.997	0.923	0.888	0.759	–0.352	0.421
GAS_PROD	0.998ss	1.000	0.698	0.764	0.790	0.994	0.929	0.889	0.752	–0.369	0.397
OIL_PROD	0.653	0.698	1.000	0.409	0.359	0.644	0.672	0.645	0.387	–0.455	–0.045
FDI_OIL	0.769	0.764	0.409	1.000	0.314	0.732	0.836	0.476	0.863	–0.168	0.567
TAX_OIL	0.808	0.790	0.359	0.314	1.000	0.830	0.576	0.901	0.370	–0.373	0.190
EMP_OIL	0.997	0.994	0.644	0.732	0.830	1.000	0.926	0.882	0.763	–0.301	0.452
WAGE_OIL	0.923	0.929	0.672	0.836	0.576	0.926	1.000	0.660	0.924	–0.062	0.642
GDP_PC	0.888	0.889	0.645	0.476	0.901	0.882	0.660	1.000	0.375	–0.659	0.000
EXCH	0.759	0.752	0.387	0.863	0.370	0.763	0.924	0.375	1.000	0.242	0.863
INF	–0.352	–0.369	–0.455	–0.168	–0.373	–0.301	-0.062	-0.659	0.242	1.000	0.664
GOV_IND	0.421	0.397	–0.045	0.567	0.190	0.452	0.642	0.000	0.863	0.664	1.000

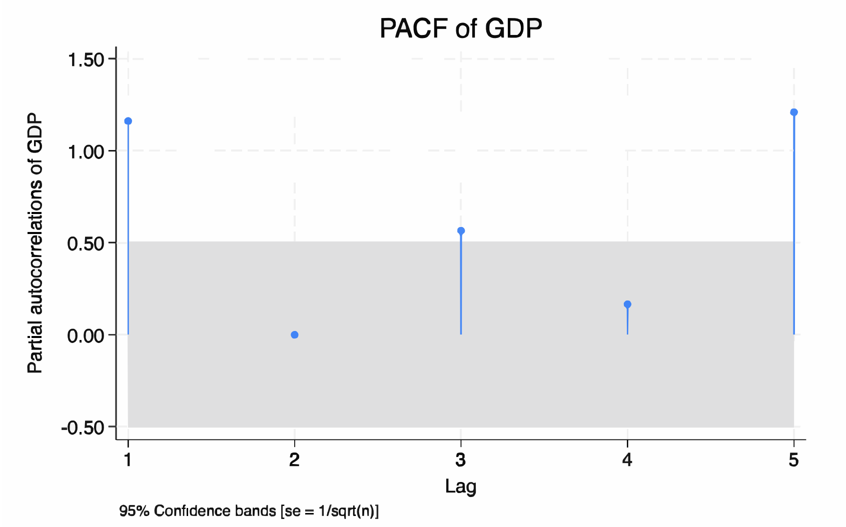

Figure 2. PACF GDP

also positively correlated with oil and gas tax revenues (r = 0.808) and foreign direct investment in the sector (r = 0.769). By contrast, the correlation between GDP and inflation is negative and relatively weak (r = –0.352). These results describe the strength and direction of pairwise associations between economic growth and key sectoral variables during 2010–2024.

Despite the strong pairwise correlations identified above, correlation analysis does not capture the dynamic properties of GDP or its time-series behavior. To examine the stochastic structure of economic growth, autocorrelation (ACF) and partial autocorrelation (PACF) functions were analyzed for Kazakhstan's GDP over the period 2010–2024.

The PACF reveals statistically significant spikes at lags 1 and 5, both exceeding the 95% confidence bounds (Figure 2).

The results of the analysis of the private autocorrelation function of GDP indicate the presence of a pronounced peak in the first lag, at which the value of the private autocorrelation coefficient exceeds 0.7 and exceeds the 95% confidence interval. This indicates a high short-term inertia of economic dynamics and means that more than 70% of current changes in GDP are related to its value in the previous period. An additional statistically significant peak is observed on the fifth lag. This result indicates the presence of delayed effects in the dynamics of economic activity and may have an impact on the level of GDP for up to five years.

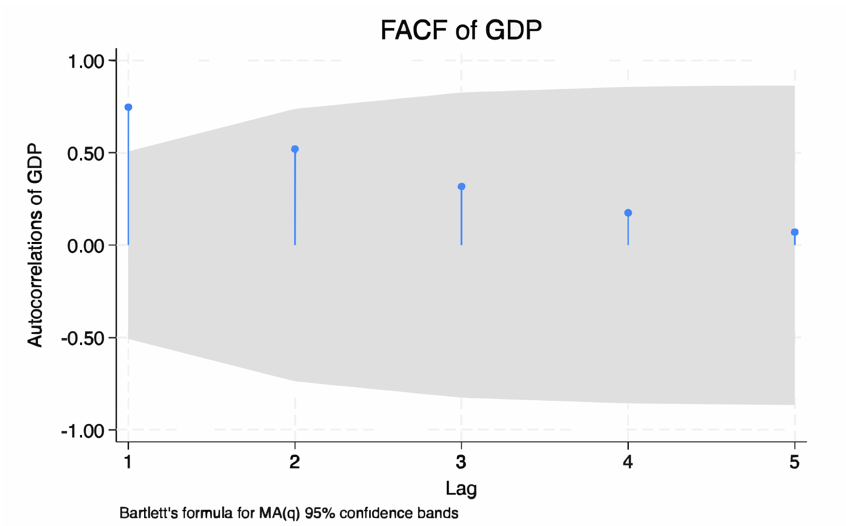

Figure 3. ACF GDP

http://dx.doi.org/10.21511/ppm.24(1).2026.29

Collectively, the revealed structure of private autocorrelation, characterized by stable coefficient values, confirms the trend nature of the GDP time series.

The ACF exhibits a slow and monotonic decay of autocorrelations, with the first lag exceeding 0.7 and subsequent lags declining gradually without crossing into negative values (Figure 3).

This pattern of slowly decaying autocorrelations is characteristic of non-stationary time series with a pronounced trend component and long memory. The autocorrelation value in the first lag exceeds 0.9 and remains statistically significant (beyond the 95% confidence interval) for several subsequent lags. Even in the fifth lag, the autocorrelation coefficient remains at about 0.6, which indicates a strong dependence of current GDP values on previous periods.

Since the joint analysis of ACF and PACF indicated non-stationarity in GDP, formal unit root testing was conducted for all key macroeconomic and sectoral variables. Augmented Dickey–Fuller (ADF) tests were applied to GDP, oil production (OIL_PROD), exchange rate (EXCH), and oil-sector tax revenues (TAX_OIL). The results reported in Table 5 show that all variables are non-stationary in levels, as the test statistics do not exceed the corresponding critical values at conventional significance levels. The associated *p*-values also fail to reject the null hypothesis of a unit root.

These results indicate that the variables exhibit trending behavior and are integrated of order one, which allows further analysis of potential long-run relationships among them. For GDP, the ADF test statistic equals +4.310, which is well above the critical value even at the 10% significance level (–2.630). This result means that the null hypothesis of a unit root cannot be rejected. Similar results are obtained for the oil and gas sector indicators. For oil production (OIL_PROD), the ADF statistic equals –1.516 with a p-value of 0.525. For the exchange rate (EXCH), the test statistics equal 0.449 with a p-value of 0.902. For oil-sector tax revenues (TAX_OIL), the ADF statistic equals –2.247 with a p-value of 0.190. In all cases, the absolute values of the test statistics are smaller than the critical values at the 1%, 5%, and 10% significance levels, indicating the absence of stationarity in levels.

Table 6 presents the results of the Johansen cointegration test for GDP and oil production.

The trace statistic exceeds the corresponding critical value at the 10% significance level, indicating the presence of a single long-run equilibrium relationship between the variables. According to the trace test, the test statistic for the null hypothesis of no cointegration (r = 0) equals 14.036, which exceeds the 10% critical value (13.4294), although it remains below the 5% critical value (15.4943). This result provides evidence of one cointegrating relationship at the 10% significance level. For the null hypothesis of at most one cointegrating vector (r ≤ 1), the trace statistic equals 4.711, which is above the 10% critical value (2.7055) and exceeds the 5% critical value (3.8415). This confirms that only one stable long-run relationship characterizes the interaction between GDP and oil production.

Table 5. ADF unit root tests (levels)

Variable	Test Statistic Z(t)	1% CV	5% CV	10% CV	p-value	Result
GDP	+4.310	–3.750	–3.000	–2.630	1.000	Non-stationary
OIL_PROD	–1.516	–3.750	–3.000	–2.630	0.525	Non-stationary
EXCH	–0.449	–3.750	–3.000	–2.630	0.902	Non-stationary
TAX_OIL	–2.247	–3.750	–3.000	–2.630	0.190	Non-stationary

Table 6. Results of the Johansen cointegration test for GDP and oil production

Test Type	Rank Hypothesis	Statistic	Critical 90%	Critical 95%	Critical 99%
Trace Test	r = 0	14.036	13.4294	15.4943	19.9349
	r ≤ 1	4.711	2.7055	3.8415	6.6349
Max-Eigen	r = 0	9.325	12.2971	14.2639	18.5200
	r ≤ 1	4.711	2.7055	3.8415	6.6349

Table 7. Vector error-correction model (VECM)

Dependent Variable	Error-Correction Term (ECM_{t-1})	Std. Error	z-stat	p-value	R^2
ΔGDP	0.2369	0.0701	3.38	0.0007	0.88
ΔOIL_PROD	−0.0000447	0.0000734	−0.61	0.5422	0.04

Although the maximum eigenvalue statistic provides weaker statistical support, this divergence is typical in small samples and does not undermine the evidence from the trace test. Taken together, these findings point to a stable long-term association between the variables.

To examine short-term adjustment dynamics toward the identified long-run equilibrium, a vector error correction model (VECM) was estimated. The model captures the response of economic variables to deviations from the long-term cointegrating relationship between GDP and oil production. The VECM estimates are reported in Table 7.

The results indicate that the error-correction term is statistically significant only in the ΔGDP equation. The estimated coefficient of the error-correction term equals 0.2369 ($p = 0.0007$), suggesting that deviations from the long-run equilibrium are corrected through adjustments in GDP. By contrast, the error-correction term in the ΔOIL_PROD equation is not statistically significant ($p = 0.5422$), indicating the absence of short-term adjustment in oil production.

The explanatory power of the two equations differs substantially. The ΔGDP equation exhibits a high coefficient of determination ($R^2 = 0.88$), whereas the ΔOIL_PROD equation shows a low R^2 value (0.04), indicating limited short-term variability explained by the model. These results point to asymmetric adjustment dynamics, with short-term corrections occurring through changes in GDP rather than through oil production.

While the VECM captures long-run equilibrium and adjustment mechanisms, it does not account for short-term transmission effects operating through fiscal and exchange-rate channels. Therefore, additional OLS regressions are employed to assess short-term responses of economic indicators to oil and gas sector variables.

The OLS regression for the production channel examines the short-term association between oil and gas production and GDP. The results reported in Table 8 show that natural gas production (GAS_PROD) is positively and statistically significantly associated with GDP.

The estimated coefficient equals 5257.49 and is significant at the 1% level ($p = 0.002$). By contrast, oil production (OIL_PROD) does not exhibit a statistically significant relationship with GDP ($p = 0.282$). The model explains a substantial share of short-term GDP variation, with an R^2 value of 0.782.

The fiscal channel model assesses the short-term relationship between oil and gas tax revenues and GDP. As shown in Table 9, the coefficient on TAX_OIL is positive and statistically significant at the 10% level ($p = 0.065$).

The estimated coefficient equals 0.0127, indicating a positive association between oil-sector tax revenues and GDP. The explanatory power of the fiscal model is relatively limited ($R^2 = 0.238$), suggesting that fiscal revenues account for only part of short-term GDP variation.

Table 8. OLS regression for the production channel (determinants of GDP)

Variable	Coefficient	Std. Error	t-stat	p-value	95% CI
OIL_PROD	−2519.72	2238.34	−1.13	0.282	[−7396.65, 2357.20]
GAS_PROD	5257.49	1298.09	4.05	0.002	[2429.20, 8085.77]
Constant	1.44×10^7	1.35×10^8	0.11	0.917	[-2.8×10^8, 3.08×10^8]
R^2	0.782				
Adj. R^2	0.745				
F(2,12)	21.47			0.0001	

http://dx.doi.org/10.21511/ppm.24(1).2026.29

Table 9. OLS regression for the fiscal channel (determinants of GDP)

Variable	Coefficient	Std. Error	t-stat	p-value	95% CI
TAX_OIL	0.0127	0.0063	2.015	0.065	[–0.001, 0.026]
Constant	2.466×10^7	2.07×10^7	1.192	0.254	[-2.0×10^7, 6.93×10^7]
R^2	0.238				
Adj. R^2	0.179				
F(1,13)	4.061			0.065	

Table 10. OLS regression for the external sector channel (determinants of GDP)

Variable	Coefficient	Std. Eror	t-stat	p-value	95% CI
INF	1.06×10^5	1.15×10^6	0.092	0.928	[-2.42×10^6, 2.63×10^6]
EXCH	2.611×10^5	3.70×10^4	7.06	0.000	[1.8×10^5, 3.42×10^5]
FDI_OIL	–2503.55	1489.79	–1.68	0.121	[–5783, 775]
Constant	-1.47×10^6	1.43×10^7	–0.103	0.920	[-3.29×10^7, 3.0×10^7]
R^2	0.849				
Adj. R^2	0.808				
F(3,11)	20.66, $p = 7.95\times10^{-5}$				

The external sector channel model evaluates the short-term effects of economic variables related to the oil and gas sector. The results presented in Table 10 indicate that the exchange rate (EXCH) has a positive and statistically significant association with GDP at the 1% level. The estimated coefficient equals 2.61×10^5 ($p < 0.001$).

Inflation does not show a statistically significant relationship with GDP ($p = 0.928$). Foreign direct investment in the oil and gas sector is negatively signed but statistically insignificant ($p = 0.121$). The model demonstrates high explanatory power, with an R^2 value of 0.849.

Overall, the empirical results reveal a differentiated interaction between Kazakhstan's economic growth and the oil and gas sector. The cointegration analysis confirms a stable long-run relationship between GDP and oil production, while the VECM results indicate asymmetric short-run adjustment, with deviations from equilibrium corrected primarily through changes in GDP rather than production. Short-run transmission mechanisms operate through multiple channels: natural gas production shows a significant association with GDP, whereas oil production does not; fiscal effects are positive but limited; and exchange-rate dynamics emerge as the dominant short-term driver. Taken together, the findings suggest that Kazakhstan's resource-based growth is shaped less by physical expansion of production and more by external market conditions and macroeconomic adjustment mechanisms.

4. DISCUSSION

The empirical results provide new insights into the mechanisms through which the oil and gas sector influences Kazakhstan's economic growth. The identified long-term cointegration between GDP and oil production confirms the existence of a stable structural relationship, which is consistent with the literature on resource-dependent economies. Similar to the findings of Sachs and Warner (1995) and Van der Ploeg (2011), the results suggest that hydrocarbon production serves as a long-run anchor for economic dynamics, even though short-term adjustments occur primarily outside the extractive sector.

The asymmetry of the adjustment mechanisms in the VECM analysis, whereby deviations from long-run equilibrium are corrected through changes in GDP rather than through adjustments in oil production, reflects the capital-intensive and rigid nature of the extractive industry. This finding is consistent with previous studies emphasizing the low short-term flexibility of oil production due to technological constraints, long investment cycles, and high fixed costs (Hamilton, 2009; Esfahani et al., 2014). As a result, the burden of adjustment to external shocks is shifted toward the broader economy, increasing its exposure to volatility.

The OLS results for the production channel, indicating a statistically significant association between natural gas production and GDP, are consistent with the findings of Zhong et al. (2019) on the growing importance of the gas segment in global energy chains. These results also align with the evidence reported by Azhgaliev et al. (2018), who emphasize the strategic role of natural gas resources in Western Kazakhstan for the country's long-term energy balance.

The fiscal model demonstrates a moderate but positive relationship between oil and gas tax revenues and economic growth, consistent with the observations of Bjerkholt and Niculescu (2004) regarding the need for effective institutions to transform oil rents into sustainable growth. At the same time, the partial statistical significance of the fiscal channel echoes the conclusions of Fuinhas et al. (2015), who noted that oil rents may have a limited effect under weak fiscal institutions and insufficient diversification.

The results obtained for the external sector channel support the 'commodity currency' hypothesis described by Chen and Rogoff (2003) and Lizardo and Mollick (2010). The observed exchange-rate response of the KZT in response to rising external oil-related factors is consistent with the notion that the currencies of oil-exporting countries are susceptible to commodity market dynamics. These findings are also aligned with the evidence reported by Korhonen and Mehrotra (2009) for Eurasian economies, and our analysis reveals a similar transmission mechanism whereby external shocks are propagated through the exchange rate into Kazakhstan's economic dynamics. This result is consistent with broader evidence that external shocks are transmitted through interconnected financial and real-economy channels, amplifying volatility at the macroeconomic level (Koilo & Grytten, 2019).

In addition, the revealed absence of a short-term impact of foreign investment on GDP is consistent with the results of Otarbayeva and Arupov (2020), who emphasized that investments in the oil and gas sector have a long lag and manifest themselves only in the medium term. The weak relationship between oil production and GDP also aligns with the approach of Balke et al. (2010), who noted that physical production volumes in developed and developing economies often change slowly and are endogenous to global demand rather than to domestic economic conditions.

Taken together, the results indicate that Kazakhstan's growth model remains structurally dependent on the oil and gas sector but is characterized by asymmetric adjustment mechanisms. Long-term stability is anchored in hydrocarbon production, whereas the broader economy primarily absorbs short-term volatility through exchange rate and fiscal channels. This combination amplifies sensitivity to global energy price cycles and highlights the importance of complementary macroeconomic and institutional policies.

CONCLUSION

This study examined the role of the oil and gas sector in shaping Kazakhstan's economic growth through production, fiscal, and external sector transmission channels over the period 2010–2024. The analysis aimed to clarify how resource-dependent economies absorb external shocks and how long-term structural relationships interact with short-term macroeconomic adjustments.

The empirical results provide evidence of a stable long-run relationship between hydrocarbon production and economic growth, confirming the system-forming role of the oil and gas sector in Kazakhstan's economy. At the same time, short-term dynamics are characterized by pronounced asymmetry: economic adjustment occurs primarily at the macroeconomic level, while sectoral production remains relatively rigid. Quantitatively, natural gas production exhibits a stronger short-term association with GDP than oil output. At the same time, fiscal revenues and exchange rate movements act as key conduits for transmitting external shocks into domestic economic activity.

From a policy perspective, the results underscore the importance of strengthening fiscal stabilization frameworks, enhancing monetary policy credibility, modernizing extractive technologies, expand-

http://dx.doi.org/10.21511/ppm.24(1).2026.29

ing gas processing infrastructure, and improving the efficiency of oil and gas revenue management. Strengthening institutional resilience and developing human capital in the industry can reduce short-term volatility and support more balanced growth trajectories.

Future research may extend the present analysis by incorporating ESG indicators, examining the growing role of renewable energy in resource-dependent economies, using higher-frequency data, and conducting comparative cross-country studies. The integrated approach used in the study can serve as a methodological basis for assessing structural effects and for developing strategies for long-term economic diversification.

AUTHOR CONTRIBUTIONS

Conceptualization: Peter Karácsony, Assel Bekbossinova, Medet Konyrbekov, Vivien Valkó.
Data curation: Peter Karácsony, Vivien Valkó.
Formal analysis: Aliya Uralova, Assel Bekbossinova, Vivien Valkó.
Funding acquisition: Aliya Uralova, Assel Bekbossinova, Medet Konyrbekov.
Investigation: Peter Karácsony, Aliya Uralova, Assel Bekbossinova, Medet Konyrbekov.
Methodology: Peter Karácsony, Aliya Uralova, Assel Bekbossinova, Medet Konyrbekov, Vivien Valkó.
Project administration: Peter Karácsony, Aliya Uralova, Assel Bekbossinova, Medet Konyrbekov.
Resources: Peter Karácsony, Vivien Valkó.
Software: Peter Karácsony, Aliya Uralova, Assel Bekbossinova, Medet Konyrbekov, Vivien Valkó.
Supervision: Peter Karácsony, Aliya Uralova, Assel Bekbossinova, Medet Konyrbekov.
Validation: Peter Karácsony, Assel Bekbossinova, Medet Konyrbekov.
Vizualization: Vivien Valkó.
Writing – original draft: Peter Karácsony, Aliya Uralova, Assel Bekbossinova, Medet Konyrbekov, Vivien Valkó.
Writing – review & editing: Peter Karácsony, Aliya Uralova, Assel Bekbossinova, Medet Konyrbekov.

ACKNOWLEDGMENTS

This paper has been funded by the Science Committee MSHE RK (Grant "Strategy for the structural and technological modernization of the basic sectors of the economy of the Republic of Kazakhstan, taking into account ESG approaches: criteria, implementation mechanisms, and forecast scenarios" BR24993089).

REFERENCES

1. Almutairi, H., Pierru, A., & Smith, J. L. (2023). Oil Market Stabilization: The Performance of OPEC and Its Allies. *The Energy Journal, 44*(6), 1-22. https://doi.org/10.5547/01956574.44.6.halm
2. Arezki, R., & van der Ploeg, R. (2010). Do natural resources depress income per capita? *International Trade eJournal, 15*(3), 504-521. https://doi.org/10.1111/j.1467-9361.2011.00623.x
3. Auty, R. (1993). *Sustaining development in mineral economies: The resource curse thesis* (1st ed.). London: Routledge. https://doi.org/10.4324/9780203422595
4. Azhgaliev, D. K., Karimov, S. G., & Isaev, A. A. (2018). Regional study is the next important stage in evaluation of oil and gas industry potential of sedimentary basins of Western Kazakhstan. *Georesursy = Georesources, 20*(1), 16-24.
5. Azretbergenova, G., & Syzdykova, A. (2020). The dependence of the Kazakhstan economy on the oil sector and the importance of export diversification. *International Journal of Energy Economics and Policy, 10*(6), 157-163. https://doi.org/10.32479/ijeep.9997
6. Bai, T., Xu, D., Bi, S., Zhu, K., & Dávid, L. D. (2024). Impact of green fiscal policy on the collaborative reduction of pollution and carbon emissions: Evidence from energy saving and emission reduction policy in China. *Oeconomia Copernicana, 15*(4), 1263-1302. https://doi.org/10.24136/oc.3159
7. Baille, D., & Gir, R. (1998). Maximising the economic efficiency of oil and gas fields through technology and teamwork: Key elements

for creating growth. *26th Annual Convention Proceedings, 3,* 145-160. https://doi.org/10.29118/ipa.1378.145

8. Balke, N. S., Brown, S. P. A., & Yücel, M. K. (2010). *Oil price shocks and U.S. economic activity: An international perspective* (Globalization Institute Working Paper 20). Federal Reserve Bank of Dallas. Retrieved from https://ideas.repec.org/p/fip/feddwp/1003.html
9. Beisembayev, G., & Akhmetkyzy, A. (2025). Assessment of ESG efficiency of the oil and gas sector in Kazakhstan. *Eurasian Journal of Economic and Business Studies, 69*(1), 18-31. https://doi.org/10.47703/ejebs.v69i1.455
10. Bibi, S. (2024). Oil revenues, FDI and balance of payment dynamics: The case of Kazakhstan between the supercycle commodity boom and financial subordination. *Resources Policy, 90,* Article 104789. https://doi.org/10.1016/j.resourpol.2024.104789
11. Bjerkholt, O., & Niculescu, I. (2004). Fiscal rules for economies with nonrenewable resources: Norway and Venezuela. In G. Kopits (Ed.), *Rules-based fiscal policy in emerging markets: Procyclicality of financial systems in Asia* (pp. 164-179). London: Palgrave Macmillan. https://doi.org/10.1057/9781137001573_11
12. Bulte, E., & Damania, R. (2008). Resources for sale: Corruption, democracy and the natural resource curse. *The B.E. Journal of Economic Analysis & Policy, 8*(1). https://doi.org/10.2202/1935-1682.1890
13. Chen, Y., & Rogoff, K. (2003). Commodity currencies. *Journal of International Economics, 60*(1), 133-169. https://doi.org/10.1016/S0022-1996(02)00072-7
14. De Michelis, A., Ferreira, T. R. T., & Iacoviello, M. (2020). Oil prices and consumption across countries and U.S. states. *International Journal of Central Banking, 16*(2), 3-43. https://doi.org/10.17016/IFDP.2019.1263
15. Esanov, A., Raiser, M., & Buiter, W. (2004). *Nature's blessing or nature's curse: Kazakhstan's oil revenues* (ZEF – Discussion Papers On Development Policy No. 81). University of Bonn, Center for Development Research (ZEF). https://doi.org/10.22004/ag.econ.18761
16. Esfahani, H. S., Mohaddes, K., & Pesaran, M. H. (2014). An empirical growth model for major oil exporters. *Journal of Applied Econometrics, 29*(1), 1-21. https://doi.org/10.1002/JAE.2294
17. Frankel, J. A. (2010). *The natural resource curse: A survey* (NBER Working Paper No. 15836). National Bureau of Economic Research. Retrieved from https://www.nber.org/system/files/working_papers/w15836/w15836.pdf
18. Fuinhas, J. A., Marques, A. C., & Couto, A. P. (2015). Oil rents and economic growth in oil producing countries: Evidence from a macro panel. *Economic Change and Restructuring, 48,* 257-279. https://doi.org/10.1007/S10644-015-9170-X
19. Gelb, A. (1988). *Oil windfalls – Blessing or curse? (English).* Washington, DC: World Bank. Retrieved from http://documents.worldbank.org/curated/en/536401468771314677
20. Gylfason, T. (2001). Natural resources, education, and economic development. *European Economic Review, 45*(4-6), 847-859. https://doi.org/10.1016/S0014-2921(01)00127-1
21. Hamilton, J. D. (2009). *Causes and consequences of the oil shock of 2007–08.* FRB Atlanta CQER Working Paper No. 09-02. https://doi.org/10.2139/ssrn.2583456
22. International Energy Agency (IEA). (2023). *Energy system of Kazakhstan.* Retrieved from https://www.iea.org/countries/kazakhstan
23. Javaid, U., & Rashid, A. (2015). Oil and gas potentials of Central Asian republics and relations with Pakistan. *South Asian Studies, 30.* Retrieved from https://sasj.pu.edu.pk/9/article/view/866/866
24. Kalyuzhnova, Y., & Nygaard, C. (2008). State governance evolution in resource-rich transition economies: An application to Russia and Kazakhstan. *Energy Policy, 36*(6), 1829-1842. https://doi.org/10.1016/j.enpol.2008.01.035
25. Kalyuzhnova, Y., & Patterson, K. (2016). Kazakhstan: Long-term economic growth and the role of the oil sector. *Comparative Economic Studies, 58,* 93-118. https://doi.org/10.1057/CES.2015.31
26. Kireyeva, A., Kangalakova, D., Kredina, A., Satpayeva, Z., & Urdabayev, M. (2021). Managing research and development process in conditions of economic growth of Kazakhstan: Methods and analysis. *Problems and Perspectives in Management, 19*(3), 185-196. http://dx.doi.org/10.21511/ppm.19(3).2021.16
27. Koilo, V., & Grytten, O. H. (2019). Maritime financial instability and supply chain management effects. *Problems and Perspectives in Management, 17*(4), 62-79. http://dx.doi.org/10.21511/ppm.17(4).2019.06
28. Korhonen, I., & Mehrotra, A. N. (2009). *Real exchange rate, output and oil: Case of four large energy producers.* BOF: Transition Economies BOFIT Discussion Papers. https://dx.doi.org/10.2139/ssrn.1428238
29. Lizardo, R. A., & Mollick, A. V. (2010). Oil price fluctuations and U.S. dollar exchange rates. *Energy Economics, 32*(2), 399-408. https://doi.org/10.1016/J.ENECO.2009.10.005
30. Maldynova, A., Bodaukhan, G., Aitkhojaeva, G., Ilyas, A., & Murzabekova, B. (2023). Innovative potential of the oil and gas industry of Kazakhstan. *Eurasian Journal of Economic and Business Studies, 67*(2), 33-44. https://doi.org/10.47703/ejebs.v2i67.253
31. Nadirov, N. K., Shirinskikh, A. V., Nurzhanova, S. B., Solodova, E. V., & Abilmagzhanov, A. Z. (2019). New on preparation of heavy oil to its refining. *The Eurasian Scientific Journal, 3*(11). Retrieved from https://esj.today/PDF/63NZVN319.pdf
32. OECD. (2017). *Multi-dimensional Review of Kazakhstan:*

Volume 2. In-depth analysis and recommendations. Paris: OECD Publishing. https://doi.org/10.1787/9789264269200-en

33. Otarbayeva, A., & Arupov, A. A. (2020). Analysis of the influence of direct foreign investments on the development of the oil and gas industry of Kazakhstan. *The Journal of Economic Research & Business Administration, 134*(4), 66-80. https://doi.org/10.26577/be.2020.v134.i4.06

34. Pierru, A., Smith, J. L., & Zamrik, T. (2018). OPEC's impact on oil price volatility: The role of spare capacity. *The Energy Journal, 39*(2), 173-196. https://doi.org/10.5547/01956574.39.2.apie

35. Ross, M. L. (2012). *The oil curse: How petroleum wealth shapes the development of nations*. Princeton University Press. https://doi.org/10.1515/9781400841929

36. Sachs, J. D., & Warner, A. M. (1995). *Natural resource abundance and economic growth* (NBER Working Paper 5398). National Bureau of Economic Research. https://doi.org/10.3386/W5398

37. Saddam, A. K., & Mansor, N. N. (2015). The role of recruitment and selection practices in the organizational performance of Iraqi oil and gas sector: A brief literature review. *Review of European Studies, 7*(11). https://doi.org/10.5539/RES.V7N11P348

38. Schaling, E., Ndlovu, X., & Alagidede, P. (2014). Modelling the rand and commodity prices: A Granger causality and cointegration analysis. *South African Journal of Economic and Management Sciences, 17*(5), Article a334. https://doi.org/10.4102/SAJEMS.V17I5.334

39. Sun, H., Yi, B-W., Xu, J-H., Zhao, W-Z., Zhang, G-S., & Lu, Y-F. (2018). Assessment of CO2 emission reduction potentials in the Chinese oil and gas extraction industry: From a technical and cost-effective perspective. *Journal of Cleaner Production, 201,* 1101-1110. https://doi.org/10.1016/j.jclepro.2018.08.044

40. Van der Ploeg, R. (2011). Natural resources: Curse or blessing? *Journal of Economic Literature, 49*(2), 366-420. https://doi.org/10.1257/JEL.49.2.366

41. Zhai, X., Juman, J., Makulova, A. T., Khamzayeva, A. V., & Du, B. (2024). Research on relationship between energy consumption and GDP in Kazakhstan. *Economies, 12*(8), Article 212. https://doi.org/10.3390/economies12080212

42. Zhong, J., Wang, M., Drakeford, B., & Li, T. (2019). Spillover effects between oil and natural gas prices: Evidence from emerging and developed markets. *Green Finance, 1*(1), 30-45. https://doi.org/10.3934/GF.2019.1.30

43. Zhu, Y., Hu, Y., & Zhu, Y. (2024). Can China's energy policies achieve the "dual carbon" goal? A multi-dimensional analysis based on policy text tools. *Environment, Development and Sustainability*. https://doi.org/10.1007/s10668-024-05190-4