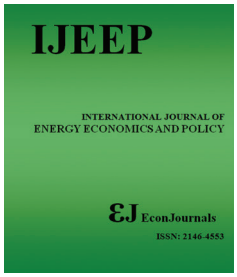

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Impact of World Oil Prices on the Formation of Macroeconomic Policies in Kazakhstan and the European Union: A Comparative Analysis

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ABSTRACT

The study examined the correlation between fluctuations in world oil prices and the development of macroeconomic policies in Kazakhstan and the European Union (EU). Kazakhstan is a country with a resource-based economy that is highly vulnerable to changes in crude oil prices. In turn, the EU has implemented regulatory measures to decouple its economic performance from reliance on fossil fuels. The methods include analyzing the economic structure to determine diversification criteria across sectors and the response of different sectors to price changes; dynamic analysis of the country's export potential using linear approximation and export structure, enabling the identification of long-term trends; correlation analysis between world oil prices and economic development indicators, export potential, and inflation to identify economic interrelationships and specific aspects of Kazakhstan's economy. The findings indicate that economic diversification, dominated by the service sector and significant domestic demand, renders the economy more resilient to external shocks. However, the high dependence of export potential on crude oil highlights insufficient diversification of the export base. This underscores Kazakhstan's strategic role in the global oil market and explains the correlation between world oil prices and the country's macroeconomic indicators. The data obtained confirm the need for fiscal buffers.

Keywords: Energy Markets Volatility, Fluctuations in Trade Balance, Geopolitics, Oil Market, Stability
JEL Classifications: E6, F4, O4

1. INTRODUCTION

Crude oil plays a significant role in the economic development of countries worldwide as one of the most crucial energy sources. The fluctuation in oil prices depends on the current political and economic situation globally (Masood et al., 2019). This is associated with escalating geopolitical tensions in the Middle East, responsible for one-third of global oil sea transportation; actions by OPEC members (overproduction, efforts to eliminate competitors); economic recessions (growth slowdown) resulting in reduced energy consumption; increased oil production in non-OPEC+ countries (Azerbaijan, Kazakhstan, Mexico, Oman, Russia), as well as in the US and Canada (shale oil) (International Energy Agency, 2024); expansion of oil production capacities in Libya; rising volumes of illegal oil; and potential sanctions relief for Iran (Tishkov et al., 2020). Experts of International Energy Agency (2024) forecast a reduction in oil production growth rates to 1.2 million barrels per day in 2024 compared to 2.3 million barrels per day in 2023 due to macroeconomic obstacles; dominance of production in non-OPEC+ countries; tightening efficiency standards; and expansion of the electric vehicle fleet. Additionally, China is expected to lead oil demand growth in 2024, with its expanding petrochemical sector capturing an increasing share. Ferrari Minesso et al. (2023) note that the connection between geopolitical events such as tensions between countries or terrorist attacks and oil prices is not straightforward and not systematically linked to higher or more volatile oil prices. On the contrary, after the September 11 attacks, benchmark oil prices, such as Brent

(Statista, 2023), initially rose by 5% but fell by 25% within 14 days due to concerns over weakening demand. After Russia's invasion of Ukraine in February 2022, prices of these oil grades initially surged by nearly 30% within the first 2 weeks but returned to pre-invasion levels within 8 weeks. Similarly, following the terrorist attacks in Israel on October 7, 2023, Brent crude oil prices rose by 4% and subsequently stabilized. Caldara and Iacoviello (2022) note that geopolitical risk can influence oil prices through two primary channels: Reducing economic activity and increasing supply chain risks for raw commodities. These channels impact oil markets in opposing directions, necessitating empirical investigation to determine the dominant influence.

Additional factors include actions by oil-producing companies to regulate production volumes to stabilize prices. Empirical data from researchers (Caldara and Iacoviello, 2022; Ferrari Minesso et al., 2023) indicate that geopolitical upheavals can have varying consequences depending on the countries involved. Recent increases in geopolitical uncertainty underscore the importance of understanding the nature of geopolitical shocks to assess their impact on oil prices and inflation (Deyshappriya et al., 2023).

The Caspian Sea region, one of the world's oldest oil-producing regions, shared by Kazakhstan, Russia, Azerbaijan, Iran, and Turkmenistan, is significant. Kazakhstan is one of the largest oil-producing countries in this region (Czech and Niftiyev, 2021) and ranks among the top 15 largest oil-dependent countries globally (Statista, 2024). The issue of Kazakhstan's economy sensitivity to oil price fluctuations has attracted the attention of several researchers (Bhat et al., 2022; Czech and Niftiyev, 2021; Sansyzbayeva et al., 2020) in the context of its contemporary dependencies.

The volatility of world oil prices acts as a non-linear disturbance—an external factor that disrupts macroeconomic stability and increases asymmetries within economic systems. In Kazakhstan, fluctuations cause direct fiscal shocks, limiting budgetary predictability and exchange rate stability. In the European Union, energy transition initiatives mitigate negative consequences, freeing economic growth from dependence on fossil fuels (Nanovsky, 2022). The resilience of Kazakhstan's economy to oil revenue fluctuations remains strong, with currency depreciations following price declines. This creates a feedback loop where the deteriorating trade balance coincides with external price shocks—a manifestation of resource-induced vulnerability (Moldabekova et al., 2022). The EU, in contrast, tends to implement regulatory countermeasures, including carbon pricing, targeted subsidies for certain sectors, and diversified supply chains. These actions aim to reduce the impact of inflation caused by oil prices (Paceskoski and Taskovski, 2024). The structural imbalance in Kazakhstan poses a risk of political isolation: countercyclical strategies fail due to income constraints, leading to increased vulnerability to external shocks (Ybrayev et al., 2022). In the context of energy transition in the EU, flexibility of policies transforms supply rigidities into an equilibrium. This alternative path allows macroeconomic stabilization mechanisms to absorb oil price volatility rather than exacerbating its systemic risks (Osintseva, 2022).

This study employs a panel data system to analyze the dependence of key macroeconomic parameters and export dynamics on oil price fluctuations. The research is characterized by an event-driven and comprehensive approach to analysis, a prolonged period of macroeconomic dynamics observation, and the practical relevance of results for the economy of Kazakhstan.

2. LITERATURE REVIEW

In the relevant literature, several directions are identified concerning the investigation of the relationship between oil price changes and a country's macroeconomic indicators. The first direction explores the correlation between oil prices and economic growth for oil-exporting countries, while the second direction focuses on oil-importing countries (Nurmakhanova, 2020). The effects of oil price fluctuations positively impact the economies of oil-exporting countries but negatively affect the economic growth of oil-importing countries (Czech and Niftiyev, 2021; Nurmakhanova, 2020; Zulfigarov and Neuenkirch, 2020). During periods of high oil prices, oil-exporting countries typically experience a positive trade balance, increased foreign reserves, and currency appreciation (Czech and Niftiyev, 2021). However, currency appreciation reduces the competitiveness of a country's exports by making exported goods more expensive in international markets. This complicates foreign sales and diminishes export revenues. Consequently, the country becomes less capable of diversifying its economy as high dependency on export income from raw materials hinders the development of other sectors. This, in turn, heightens economic vulnerability to commodity price fluctuations. In this context, exchange rate management should be a focal point for central banks and policymakers (Kolanovic, 2023).

Similarly, Kelesbayev et al. (2022b) argue that the stock market's response to oil price changes depends on various factors such as overall economic trends, volumes of oil exports and imports, and the level of economic development. According to the classical approach (Baimaganbetov et al., 2021), which posits that the economy responds to oil price changes through demand and supply mechanisms, in this context, an increase in oil prices raises production costs for oil and petroleum-dependent companies. This leads to a reduction in output levels as higher costs render production less profitable. Consequently, overall supply in the economy decreases, potentially leading to inflation and diminished economic growth. Moreover, this results in a general price level increase (Kelesbayev et al., 2022a), reducing consumers' purchasing power and adversely affecting demand, which in turn may lead to decreased investment (Ahmed et al., 2023).

Furthermore, Bolganbayev et al. (2021) examined the impact of oil price changes on economic growth and energy security, concluding that this impact has long-term implications for integration. Moldabekova et al. (2022) explore the influence of oil price dynamics on key macroeconomic indicators in Kazakhstan and the formulation of national social policies. Their analysis reveals Kazakhstan's economy is highly susceptible to oil price fluctuations. Therefore, diversification and modernization of the economy from an export-commodity model to an innovation-oriented one are essential for sustainable development. The

high dependence of the economy on the commodity sector and its vulnerability to external shocks fundamentally destabilize the national currency. Nurmakhanova (2020) notes Kazakhstan possesses significant reserves of oil and natural gas and heavily relies on revenues from their exports. The researcher studied the relationship between real gross domestic product (GDP), budget revenues, real exchange rates, domestic price levels, and oil prices. The findings indicate oil price changes exert pressure on domestic price levels or influence the application of the country's tax policy. These factors impact changes in the real exchange rate. From the perspective of Kazakhstan's economic policy, efforts should continue to reduce dependence on the energy sector through reforms. The anti-inflationary monetary policy of the National Bank of Kazakhstan could constrain the real exchange rate and support real GDP growth.

Gill and Kose (2024) identified that oil price changes affect all countries regardless of their income level through shifts in the supply curve, exchange rates, and demand shifts. Hence, countries dependent on oil exports or imports will always be vulnerable to the consequences of oil price fluctuations.

The aforementioned studies primarily focus on examining the relationship between oil prices, currency conversion, stock indices, and macroeconomic indicators. This study, however, centers on analyzing the macroeconomic landscape through the lens of Kazakhstan's economic structure, and export potential, and considers the economic performance that meets the population's needs. Given Kazakhstan's status as one of the oldest oil exporters in the Caspian region, its economy is particularly sensitive to fluctuations in oil prices. Additionally, its proximity to China, a major consumer of commodities, and its location bridging Asia and Europe impart unique characteristics to its economy. These factors underscore the relevance of studying Kazakhstan's economy to analyze the impact of oil prices on macroeconomic stability, thereby offering practical utility in developing strategies to manage economic risks amid oil market instability.

Fluctuations in oil prices can have a varied impact on the economies of different countries. In Kazakhstan, for example, shocks may lead to currency depreciation and an increase in inflationary pressures through mechanisms such as import price changes—a phenomenon known as the exchange rate-related inflation spread (Nanovsky, 2022). In monetary unions, such as the EU, monetary policy measures alter the scope of the imbalance created by oil prices, influencing real economic adjustments and wage-setting behavior (Baas and Belke, 2023). The J-curve hypothesis, which suggests that trade balances initially worsen after a currency depreciation but then improve, appears to be of limited relevance in oil-dependent economies. The worsening of trading conditions tends to exacerbate the external deficit rather than being corrected over time (Nanovsky, 2022).

The volatility of global oil prices has asymmetric macroeconomic implications. In countries that export oil, such as Kazakhstan, fluctuations in revenue from hydrocarbon sales determine fiscal stability. In the European Union, policy flexibility mitigates these external shocks by diversifying the energy structure. The EU's Energy Efficiency First (EEF) principle provides a legal basis for prioritizing energy efficiency over supply-oriented models. Accordingly, the EEF creates an adaptive economic structure that gradually reduces dependence on fossil fuels. However, its implementation varies among member states, posing a challenge to the coherence of EU energy transition strategies (Casanova and Pinto, 2024). The budget structure of Kazakhstan, on the contrary, exhibits cyclical vulnerability: oil revenues constitute a dominant proportion of government revenue, exacerbating pro-cyclical fiscal imbalances that increase volatility during periods of economic decline. The REPowerEU initiative of the EU is an example of a strategic departure. Thus, Kazakhstan's economic structure remains structurally vulnerable to commodity cycles, while the EU incorporates a legally binding framework to harmonize energy security measures with environmental sustainability, mitigating economic imbalances through regulatory mechanisms (da Silva, 2024). These structural differences illustrate a fundamental dichotomy. EU legislation encourages energy democracy through the institutionalization of decentralized energy models. In contrast, Kazakhstan's economic management is rooted in hydrocarbon dependency, lacking the stabilizing mechanisms required for long-term macroeconomic isolation (Jaria-Manzano, 2024).

The goal of this study was to investigate the impact of global oil prices on macroeconomic policy formation in Kazakhstan and the European Union, identify structural differences between the regions, analyze fiscal sustainability, and determine the level of resilience of each economic system through a comprehensive comparative analysis. In order to achieve the said goal, the study set the following research objectives:

- Analyze the structure of Kazakhstan's economy (the study aimed to assess the degree of diversification, quantify the contribution of different sectors to GDP, and determine the indicators of economic resilience to fluctuations in oil prices by comparing the data obtained with the EU's heterogeneous economic model; in this model, energy diversification policies mitigate external shocks and stabilize key macroeconomic indicators such as inflation, investment flows, and trade balances).
- Investigate the dynamics of Kazakhstan's export potential over the past two decades and the structure of exports.
- Correlate the relationship between global crude oil prices and key macroeconomic indicators of Kazakhstan, taking into account the time effects of panel data.

Structure of the article:

- Introduction - provides an overview of the issue.
- Literature Review - identifies theoretical gaps.
- Materials and Methods - describes the methods and data used in the study, and defines the subject, object, and methodological limitations.
- Results - presents empirical findings that address the identified theoretical gaps.
- Discussion - compares the obtained results with findings from other studies.
- Conclusion - concludes the article, describes the practical implications of the results, and outlines directions for future research.

3. MATERIALS AND METHODS

In this section of the study, the methodology is presented, encompassing the conceptual framework, step-by-step research design, data collection methods, tools utilized, and limitations.

3.1. Conceptual Foundation of the Study

This study is grounded in conceptual postulates that employ a comprehensive approach to examining the impact of an external economic factor, namely the dynamics of global crude oil prices, on the macroeconomic indicators of a country's development. The methodological framework of the study is built on the principles of synergy between theoretical and empirical postulates, particularly drawing from the theory of resource dependence (Li et al., 2024). This theory elucidates the dilemmas and regularities concerning the influence of seemingly positive factors, such as a country's wealth in natural resources, specifically oil, on the formation of economic vulnerability over the long term. Economic dependence is explained by the volatility in global oil price dynamics (Chen et al., 2020; Du et al., 2024) and the high reliance of a country's income on its exports, thereby impacting the stability of the national currency and potentially exerting negative effects on the development of other sectors such as industry, agriculture, the banking sector, and high-tech services (Zhang et al., 2024). Given the pronounced asymmetry in the economic resilience of Kazakhstan and the EU, a "differentiated sustainability system" was employed. This approach enabled the examination of policy flexibility, fiscal stability, and investment trends influenced by fluctuations in crude oil markets.

3.2. Methodological Design and Stages of Work

The methodological design of this study is based on the sequential implementation of three stages. The first stage involves analyzing the structure of Kazakhstan's economy in the context of its resilience to fluctuations in oil prices. The results of the first stage, within the overall research objective, allow for an assessment of the progressive nature of the country's economic structure in terms of each sector's contribution to GDP formation. Comparing these sectors enables conclusions to be drawn regarding the diversification of Kazakhstan's economy as a whole and its ability to develop autonomously, minimizing the negative impact of fluctuations in global oil prices.

The second stage of the study conducts a dynamic analysis of export capacity (exports as a capacity to import), utilizing methods of mathematical statistics to identify trends in the dynamics of the examined indicator. The choice of this indicator for analysis can be explained by its importance in reflecting the country's ability to finance its imports with export earnings. This indicator shows to what extent export earnings cover import expenditures. Therefore, higher values of this indicator indicate a more stable external economic position for the country, as they signify that the country can cover more of its import needs through exports.

Identification of trends in a dynamic series of data allows for determining the primary direction of data changes over time. Several methods exist for detecting trends, with the most common being the use of linear approximation:

$$Y_t = \alpha + \beta_{1t} + \epsilon_t \quad (1)$$

Where:
Y_t – represents the value of the dependent variable at time t;
t – is the time variable;
α – is the intercept of the equation, reflecting the influence of factors not included in the model;
β_1 – is the regression coefficient indicating the change in the dependent variable per unit of time;
ϵ_t – denotes the random error of the model.

At this stage, an additional review is planned of Kazakhstan's current export structure, providing analytics on the distribution of export goods and the country's dependence on various sectors, particularly the oil sector. Empirical assessment involved collecting and structuring quantitative data on oil prices, GDP growth, fiscal revenues, inflation rates, and export structures for Kazakhstan and the European Union.

The third stage of the research involves conducting a correlation analysis to determine the impact of global oil prices on key macroeconomic indicators in Kazakhstan. At this stage, a consolidated correlation table is constructed, incorporating correlation coefficients between all pairs of variables in the dataset that characterize the influence of oil prices on Kazakhstan's key macroeconomic indicators. The degree of linear dependence between the two variables under study is assessed using the Pearson correlation coefficient, which ranges from −1 to 1. Extreme scenarios may include (Kong and Ni, 2024):

1: Complete positive linear dependence;
0: Absence of linear dependence;
−1: Complete negative linear dependence.

The formula for the Pearson correlation coefficient (r) is defined as follows:

$$r = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{\sum(x-\bar{x})^2\sum(y-\bar{y})^2}} \quad (2)$$

Where: x and y denote AVERAGE (array1) and AVERAGE (array2).

Array1: Mandatory argument. Set of independent values, in this study representing crude oil prices

Array2: Mandatory argument. Set of dependent values, in this study representing GDP, exports, and inflation.

3.3. Research Materials and Data

The study utilized data from statistical databases of international organizations including the World Bank, Statista, and the National Statistical Office of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan. The research sample included key indicators characterizing the structure of the country's economy, its state, stability, export potential, and ability to withstand external challenges, including fluctuations in oil prices in global markets.

3.4. Methodological Framework and Interpretation

The criteria for analysis include the market of Kazakhstan, which is an oil-exporting country and derives a significant portion of its budgetary revenues from oil. Additionally, mathematical analysis indicators were employed to identify and describe the nature of the phenomenon under study. From the perspective of employing an event-driven approach, the article formed a dynamic series of indicators covering the period from 2000 to 2023, during which a series of globally significant macroeconomic events occurred, including the global financial-economic crisis and the COVID pandemic, which impacted the country's economic development trends.

The study utilized methods of comparative analysis, correlation, and trend characterization identification through approximation. Calculations were conducted using Excel and the SPSS software package.

3.5. Methodological Limitations

There are several methodological limitations that must be considered for interpreting the results and formulating conclusions. Some limitations are related to the availability of publicly accessible statistical data and the timeliness of data updates at both national and global levels. Other limitations stem from the fact that economic processes in reality are often non-linear and may require more complex models that correspondingly necessitate a larger volume of statistical information. Moreover, the economy of Kazakhstan may be susceptible to the influence of short-term external shocks, such as abrupt changes in global oil prices, political crises, and other factors, which can distort long-term trends and complicate analysis.

4. RESULTS

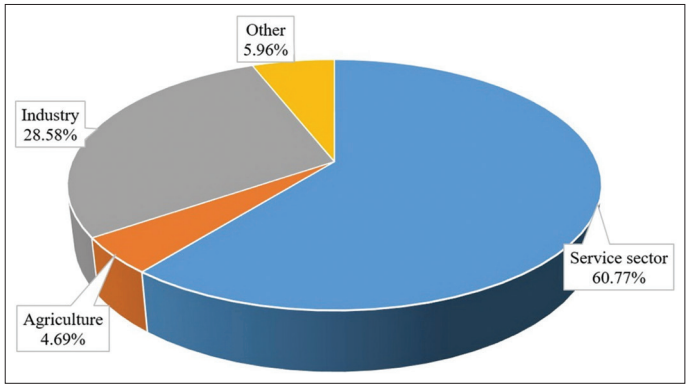
In this section, three tasks are addressed aimed at studying the impact of oil prices on key macroeconomic indicators reflecting the development of the Kazakhstani economy. Specific results were obtained for each task:

Solution to Task 1: Understanding the structure of Kazakhstan's economy in the context of its resilience to fluctuations in oil prices.

The synthesis of theoretical data revealed that the dependence of the economy on volatile oil prices in global markets negatively impacts the country's macroeconomic indicators. Consequently, factors of resource dependency and resilience necessitate a shift towards diversifying the economic structure. This approach aims to establish a more resilient and balanced economy, less reliant on a single sector and better prepared to meet the challenges of the global economy (Figure 1).

The analysis of the sectoral structure of Kazakhstan's economy reveals that the dominant sector currently is services. A high share of the service sector typically indicates a certain level of economic development for a country, as developed economies generally allocate a significant portion of their GDP to services. This trend also signifies economic diversification, making it less dependent on the extraction and export of natural resources such as oil and gas,

Figure 1: Structure of the Kazakhstan Economy, 2023



Source: Developed by the authors based on data from the National Statistics Bureau (2024a)

which historically played a crucial role in Kazakhstan's economy. Accordingly, the 60.77% of GDP (amounting to 116,207.0 million USD at the 2024 exchange rate) attributed to the services sector underscores its substantial contribution to the country's economic development and underscores the importance of various service activities in daily life and economic activity in Kazakhstan.

The industrial sector's share of 28.58% in Kazakhstan's economic structure indicates that approximately a quarter of the country's gross domestic product is generated through industrial activities, particularly in the production of various goods. The agricultural sector's 4.69% share highlights its significance, albeit smaller compared to the service and industrial sectors, in Kazakhstan's economy.

Overall, the structure of Kazakhstan's economy can be deemed optimal based on criteria of diversification. The diversification of the economy is substantiated by the following factors:

- Services sector (60.77%): A significant share of services is characteristic of more developed economies and indicates diversification, which positively impacts economic stability
- Industry (25.58%): A substantial share of the industrial sector is also a positive factor as the industry fosters technological development and innovation
- Agriculture (4.69%): Despite its small share, agriculture plays a crucial role in ensuring food security and employment in rural areas.

Thus, despite Kazakhstan's substantial reserves of oil, gas, and minerals, an economy heavily reliant on resource exports may be vulnerable to fluctuations in global commodity prices. However, the high shares of services and industry indicate a commitment to diversification.

Result to Task 2: Dynamic analysis of export capacity (Exports as a capacity to import) and Kazakhstan's export structure. Data are presented in constant local currency units (LCU).

Overall, over the study period, there has been stable growth in the export capacity indicator (Exports as a capacity to import). In 2000, its value stood at 3.23 trillion (constant LCU), whereas by 2023, it had increased to 9.6 trillion (constant LCU). This indicates

a significant enhancement in the country's export capabilities over the past two decades (Figure 2), reflecting a linear trend in export capacity dynamics with an R-squared value of 0.7775 and an absence of model residual error.

Event-driven analysis of export capacity dynamics allows the identification of key periods:

Two stages of accelerated growth:
(1) 2000-2008: Substantial increase from 3.23 to 6.54 trillion constant LCU. This period is characterized by high growth rates of export capabilities, driven by rising global prices of oil and other commodities, which constitute a significant portion of Kazakhstan's exports.
(2) 2010-2014: Indicators also show growth, likely associated with continued development in the oil industry and increased exports of oil and gas.

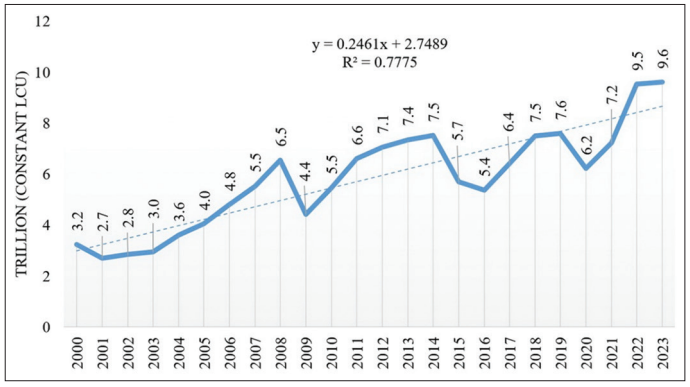
Stages of decline and stagnation:
(1) 2008-2009: Observed a decline from 6.54 to 4.42 trillion constant LCU, coinciding with the global financial crisis that affected commodity prices and global demand.
(2) 2014-2016: After peaking in 2014 (7.52), the value decreased by 2016. This could be attributed to falling oil prices and economic instability in the region.

Stages of recovery and stable growth:
(1) Starting from 2017, there has been recovery and gradual growth, possibly linked to rising oil prices and successful economic reforms aimed at diversifying exports.
(2) In 2022 and 2023, the export capacity indicator reaches record levels, indicating global economic recovery and high commodity prices.
(3) The decline in export capacity in 2020 can be explained by the impact of the COVID-19 pandemic, which led to reduced global demand and disrupted supply chains.

The analysis of Kazakhstan's export structure (Figure 3) indicates that predominantly exported are crude oil and raw petroleum products derived from bituminous minerals (53.8%), radioactive chemical elements and radioactive isotopes (4.4%), refined copper and unwrought copper alloys (4.1%), copper ores and concentrates (3.9%), ferroalloys (3%), and petroleum gases and other gaseous hydrocarbons (2.6%).

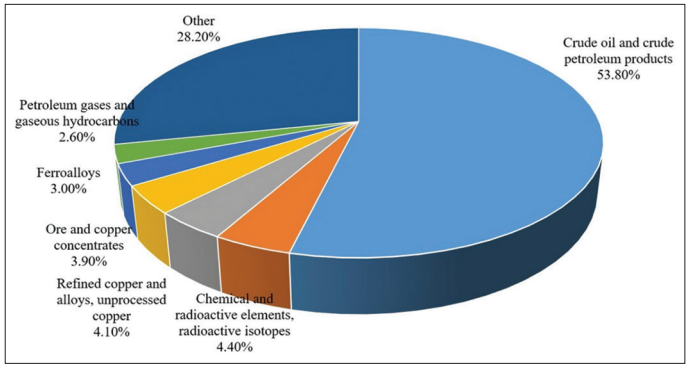
Thus, Kazakhstan's export orientation reveals a dependency on oil exports, making its economy vulnerable to negative fluctuations in oil prices. While a high share of oil exports contributes significantly to foreign currency inflows, it concurrently increases the economy's reliance on a single commodity group. This underscores the necessity for further economic diversification. For instance, Kazakhstan is one of the world's largest producers of uranium, and its export constitutes a significant portion of the export structure. This critical sector of the economy, influencing the global nuclear energy market, should be further developed. The substantial share of exports in copper ores, concentrates, refined copper, and ferroalloys highlights the importance of the mining and metallurgical sectors to the economy. Therefore, increasing

Figure 2: Dynamics of Kazakhstan's export capacity, 2000-2023



Source: Developed by the authors according to data from The World Bank (2024a; 2024b)

Figure 3: Structure of Kazakhstan's Exports, 2023



Source: Developed by the authors according to data from the National Statistics Bureau (2024b)

the proportion of processed goods (such as metal processing and production of final products) could enhance the value-added of exports and create new job opportunities.

Results of Task 3: Analysis of the strength of the association between global crude oil prices and key macroeconomic indicators of Kazakhstan.

Pairwise Pearson correlation matrices (Table 1) between crude oil prices and key macroeconomic indicators of Kazakhstan indicated that the country's economy is significantly dependent on the oil sector and global fluctuations in its market dynamics.

The Pearson correlation coefficient between global crude oil prices and Kazakhstan's GDP, which stands at 0.783, signifies a high degree of positive association between the two variables. Practically, this strong positive correlation implies that increases in oil prices typically coincide with increases in Kazakhstan's GDP, and vice versa. The vulnerability of Kazakhstan's economy to fluctuations in global oil prices suggests that a decline in oil prices could substantially reduce the country's GDP, potentially undermining economic stability.

Moreover, the Pearson correlation coefficient between global crude oil prices and consumer price inflation in Kazakhstan (0.151) indicates a weak positive relationship between oil prices and

Table 1: Results of correlation analysis of the impact of global oil prices on key macroeconomic indicators of Kazakhstan based on panel data for 2000-2023

Indicator of pairwise comparison	Strength of association indicators	Pearson correlation values and significance levels	
Prices	Pearson correlation	1	0.783
	Significance level	-	0.01
GDP	Pearson correlation	0.783	1
	Significance level	0.01	-
Prices	Pearson correlation	1	0.151
	Significance level	-	0.481
Inflation	Pearson correlation	0.151	1
	Significance level	0.481	-
Prices	Pearson correlation	1	0.777
	Significance level	-	0.01
Export	Pearson correlation	0.777	1
	Significance level	0.01	-

Source: Calculations by the authors based on data from The World Bank (2024a; 2024c) and Statista (2024)

inflation in the country. This suggests a slight tendency for oil price increases to be accompanied by inflationary pressures, although this association is not significant. Therefore, consumer price inflation is influenced by numerous factors including domestic economic policies, monetary policies, agricultural conditions, and consumption levels. While oil is an important commodity for Kazakhstan's economy, it is not the sole determinant of inflation. Understanding this weak correlation aids in assessing and managing economic risks. In the event of significant fluctuations in global oil prices, the impact on inflation in Kazakhstan would be limited, thereby mitigating macroeconomic risks associated with oil.

The Pearson correlation coefficient between global crude oil prices and Kazakhstan's export capacity, which stands at 0.777, indicates a strong positive linear relationship between these variables. In practice, this implies that an increase in oil prices is typically accompanied by a significant rise in Kazakhstan's export capacity, and vice versa. The high correlation coefficient underscores the significant dependency of Kazakhstan's export capacity on the oil sector. This indicates that the oil sector plays a crucial role in the country's economy, and its dynamics substantially influence the overall export potential.

While a strong positive correlation can be beneficial during periods of high oil prices, it also points to the vulnerability of export capacity to fluctuations in oil prices. During periods of declining oil prices, export capacity may significantly decrease, which could adversely affect the country's economy.

Thus, the analysis demonstrates that Kazakhstan's economy is heavily reliant on global oil prices. This is evidenced by the high correlation between GDP and export capacity. The oil sector plays a key role in economic growth and the country's export capabilities. Meanwhile, there is also relative independence of inflation from oil prices, suggesting that domestic economic factors, such as monetary policy and price regulation, play a more significant role in shaping inflation. This may indicate that the social component of the economy has the potential for resilience.

The European Union's resilience to oil price fluctuations is underpinned by its energy diversification strategy. The fundamental principle of this strategy rests on the ability of the EU to mitigate external shocks and reduce economic volatility through a multi-vector energy portfolio. Unlike Kazakhstan, which relies heavily on hydrocarbons for both exports (56% in 2023) and government revenue (39%), the EU supports a heterogeneous energy mix that includes renewable energy, nuclear power, and natural gas sourced from various suppliers. This contrast in energy sources leads to a sharp difference in the adaptability of oil prices to GDP. While Kazakhstan demonstrates a correlation of 0.783, the EU exhibits a lower level of dependence, with a correlation of −0.218 between fluctuations in Brent crude oil prices and GDP growth among its 27 member states (2010-2022). This numerical evidence confirms the presence of structural isolation.

These discrepancies arise from the macroeconomic framework of energy dependency. In Kazakhstan, the volatility of oil revenue determines fiscal stability, whereas in the EU, state-controlled energy transition policies mitigate external price shocks. The European Green Deal, implemented as part of the "Fit for 55" program, aims to reduce emissions by 55% by 2030. This requires a phase-out of reliance on fossil fuels. Between 2010 and 2023, the EU's renewable energy production increased from 12.5 to 23.1% of its total primary energy consumption. This shift has displaced traditional hydrocarbon sources, as evidenced by investments in renewable infrastructure in 2022, which amounted to 358 billion euros (European Commission). The strategic redirection of capital reduces exposure to oil market volatility. In contrast, in Kazakhstan, investment in renewable energy remains at <1.4% of its GDP, increasing the country's vulnerability.

The mechanisms of price transmission illustrate this asymmetry: Oil price shocks impact the EU through a cross-sectional inflationary effect on consumer energy prices. In Kazakhstan, these shocks directly impact exchange rate stability. The euro, operating under differentiated trade conditions, shields oil-importing countries from short-term fluctuations in oil prices. An empirical analysis of energy price hikes in 2022 has shown that despite a 31% increase in crude oil costs, final electricity prices for EU consumers rose by only 12.5%, owing to the stabilization policy. Kazakhstan, conversely, faced a 23.4% devaluation of the tenge in 2020, reflecting external price fluctuations without monetary insulation mechanisms. This is indicative of the economic volatility associated with oil-linked exchange rates.

Investment dynamics reinforce this structural contrast. The EU's financial architecture prioritizes energy security through capital market interventions. Kazakhstan, in turn, remains dependent on direct contributions from oil revenues. The European Investment Bank (EIB) financed 18.2 billion euros worth of renewable energy projects between 2018 and 2022, creating a sustainable transition trajectory. The Kazakhstan National Fund, which relies on oil exports, experiences cyclical capital inflows. Between 2014 and 2016, the fund's capital decreased by 20 billion dollars due to oil price reductions, demonstrating a fundamental vulnerability. While the EU's energy investments are stable regardless of oil cycle fluctuations, Kazakhstan's financing of energy remains

cyclically linked to the crude oil market, which undermines long-term sustainability.

An analysis of macroeconomic risk management strategies has revealed a discrepancy in the level of policy response. The EU regulatory framework incorporates proactive stabilization measures, whereas the budgetary structure of Kazakhstan remains responsive to fluctuations in external prices. The EU's energy security strategy implemented after 2014 resulted in a 35% decrease in Russian energy imports by 2022, indicating an active shift towards diversification. In contrast, Kazakhstan remains structurally reliant on China (17.4% of total exports) and the EU (49.2%) for demand for hydrocarbons, lacking alternative income buffers.

Sectoral restructuring highlights the differences in these macroeconomic trends. The EU aims to reduce its dependence on fossil fuels for its industrial sector, as demonstrated by the 5.1% annual decline in oil consumption (2015-2022) in the processing and transportation industries. On the other hand, Kazakhstan exhibits a strong commitment to hydrocarbon-intensive industrial growth. Oil and gas account for 18.7% of its GDP—a statistic that has remained unchanged for two decades. This inertia is also evident in the labor market. In the EU, only 2.4 million workers are employed in fossil fuel-related sectors (2023) compared to 6.7 million in 2000. Meanwhile, in Kazakhstan, oil and gas still employ 11.3% of the formal workforce.

The European Central Bank (ECB) takes energy shocks into account in its monetary policy formulation, using interest rate modulations to manage inflationary pressures. This contrasts with the approach of the National Bank of Kazakhstan, which tends to adopt a more passive monetary policy and adjust rates in response to events rather than proactively managing them. This difference is reflected in inflation rates. European inflation peaked at 10.9% in 2022 and returned to a normal 4.3% by the end of 2023 due to interest rate adjustments and fiscal measures. Inflation in Kazakhstan reached 20.3% in the same year and remained above 18% through mid-2023, indicating a weak mechanism of monetary transmission. This lack of flexibility further indicates the country's macroeconomic instability linked to oil prices.

Tax structures also confirm this dichotomy. The EU's carbon pricing mechanisms, particularly the Emissions Trading System (ETS), create countercyclical revenue streams that stabilize the fiscal balance even during energy price shocks. Kazakhstan's tax system is directly linked to oil revenues: in 2023, oil-related taxes accounted for 45.7% of all budget revenues, leaving public finances vulnerable to a direct decline in revenues during a downturn in crude oil prices. The European CO_2 tax model generated 31.5 billion euros in 2022. This model acts as a non-cyclical fiscal tool, contrasting with Kazakhstan's reliance on Brent oil price fluctuations.

From a geopolitical perspective, the EU's strategy for supply diversification ensures long-term macroeconomic stability. On the other hand, Kazakhstan's position as an exporter of oil creates structural challenges. The REPowerEU initiative, which was launched in 2022, aims to phase out the import of Russian fossil fuels by 2027 and strengthen the country's strategic energy independence. Kazakhstan also faces the risk of market concentration, as 67% of its crude oil exports rely on a limited number of trading partners, such as China, the EU, and Russia. This situation is exacerbated by geopolitical instability and the country's dependence on transit routes through Russian pipelines (Caspian Pipeline Consortium).

The main difference between the European Union and Kazakhstan lies in their respective approaches to economic sustainability in relation to energy resources. The EU tends to actively reduce its dependence on fossil fuels, seeking to minimize the impact of fluctuations in oil prices and integrate diversified fiscal instruments. In contrast, Kazakhstan remains focused on the dynamics of oil revenue, lacking monetary insulation mechanisms and diverse non-energy revenues. This economic reliance underscores the need for strategic restructuring in Kazakhstan. There is an urgent need to transition from reliance on hydrocarbon exports towards a diversified economy that reflects the EU's diversified energy strategy. Such a shift would allow Kazakhstan to stabilize its macroeconomic performance in the face of oil market volatility.

5. DISCUSSION

The study dedicated to analyzing and evaluating the impact of global oil price changes on Kazakhstan's economic dynamics revealed significant structural characteristics of the national economy. Initially, a macro-level structural investigation of the economy was conducted, segmenting it into sectors and determining the shares of the industrial sector, agriculture, services, and other sectors. It was established that the dominant sector is the service sector. This finding has significant implications for understanding the impact of oil prices on Kazakhstan's economy and for identifying diversification criteria.

As noted by Luciani (2020), oil-dependent economies are generally considered unstable. However, economic life is a process of continuous creative destruction, and no economy will remain stable without constantly adapting to changing external circumstances, including global oil prices, which significantly influence a country's economic activity (Shahin et al., 2021). Researchers Luciani (2020) and Shahin et al. (2021) have identified a measurable and significant diversification of oil-rich economies in recent times, and this process continues.

In this context, the government must identify new and sustainable growth foundations based on risks arising from oil prices, improve economic policy, and accelerate the transition to innovative high-tech economic development models. Yousef et al. (2023) found that process technologies applied in the country's oil industry positively impact economic, environmental, and sustainable activities. The findings of this study indicated that, firstly, the dominance of the service sector points to the development of infrastructure, which is usually associated with maturity and optimal economic conditions. Secondly, the predominance of the service sector suggests that changes in oil prices can indirectly affect this sector through changes in income and consumer demand.

Furthermore, the analysis of the economic structure shows that significant efforts are needed to develop other sectors, such as agriculture and industry, to reduce dependency on oil revenues. This requires strategic planning and investments in infrastructure, education, and innovation.

In the second phase, a dynamic research method was applied to analyze Kazakhstan's export capacity from 2000 to 2023 to identify its potential in the global market and determine the main industries influencing the country's economy. Changes in global oil prices directly affect the country's export revenues and, consequently, macroeconomic stability (Patyk and Bodziony, 2024). The analysis conducted by Shahbaz et al. (2023) underscores the importance of striving for economic diversification, particularly within the context of export-oriented strategies. After analyzing Kazakhstan's export capacity and reviewing its current export structure, the study draws the following conclusions: (1) over the past two decades, there has been growth in export opportunities, marked by periods of expansion and contraction, as evidenced by the approximation of a linear trend; (2) despite the significant influence of the service sector, the oil industry continues to play a critically important role in Kazakhstan's economy. This highlights Kazakhstan's high dependence on oil exports and its vulnerability to external economic shocks, including fluctuations in oil prices. These findings emphasize the necessity of further economic diversification and the search for sustainable sources of growth.

Sha (2022) asserts that crude oil plays a key role in supporting global economic activity, and its varying prices significantly impact global GDP, as confirmed by empirical data. This aligns with the authors' conclusion regarding the critical role of the oil industry in Kazakhstan's economy and its substantial dependence on oil prices, making the economy susceptible to external economic shocks. Additionally, an analysis based on quantile regression (Sha, 2022) demonstrated the asymmetric impact of oil prices on macroeconomic indicators, corroborating the authors' findings of periodic fluctuations in Kazakhstan's export capacity and the asymmetric effect of oil prices on the economy.

Researchers Song et al. (2022) also note that changes in oil prices in various economic or political contexts are reflected through channels of oil demand and macroeconomic control measures, depending on market conditions. This underscores the need for Kazakhstan to diversify its economy to reduce reliance on the oil industry and strengthen resilience against external economic impacts. Thus, correlating the conclusions presented in this article with the results of other studies helps to deepen the understanding of the influence of oil prices on Kazakhstan's macroeconomic stability and highlights the importance of diversifying sources of economic growth to ensure the country's resilience and development.

In the concluding phase of the current study, a high degree of positive correlation was identified between oil prices and key macroeconomic indicators such as GDP and export capacity through correlation analysis, consistent with previous findings (Antwi, 2021). This emphasizes the significance of the oil industry as a major revenue source for export-oriented countries, as confirmed by the results of Alfalih (2023). Simultaneously, our correlation analysis showed that the impact of oil prices on inflation is weak, indicating the presence of other significant factors, including domestic economic and social factors, influencing the inflation rate in the country. Social and economic policies aimed at ensuring stability and maintaining the standard of living may play an important role in this. This underscores the need to continue and strengthen such policies to enhance the overall resilience of the country's economy, including continuing to diversify the economic structure to reduce dependence on the oil industry.

The findings of Sarmah and Bal (2021) and Kumar et al. (2019) support the necessity to focus on reducing dependence on crude oil consumption and transitioning to the use of renewable energy sources to stimulate economic growth. This strategic direction aligns with the conclusions of the current study on the importance of economic diversification and the search for sustainable growth sources, which will help mitigate the impact of global oil price fluctuations on the domestic economy and achieve environmental goals.

Kazakhstan's response to fluctuations in oil prices is constrained by several structural weaknesses. These include a fiscal system that is highly susceptible to revenue shocks, a currency regime that is vulnerable to oil-related capital flows, and a lack of countercyclical economic mechanisms. As a result, the country faces procyclical budgetary distortions and periodic financial instability (Ybrayev et al., 2022). The European Union operates within the framework of a differentiated energy paradigm, which involves investments in alternative energy sources, regulatory measures, and diversified import channels. This strategy aims to protect macroeconomic indicators from the direct impact of oil market volatility, thereby ensuring stability in exchange rates, predictability in budgets, and insulation from inflation (Paceskoski and Taskovski, 2024).

The model of Kazakhstan, shaped by its historical reliance on oil exports, makes the monetary system vulnerable to fluctuations in exchange rates and inflationary pressure. The real effective exchange rate of the tenge is clearly correlated with changes in oil prices, confirming systemic exposure to commodity price cycles (Abubakirova et al., 2021). The European institutional mechanisms provide the EU's monetary policy with sufficient flexibility to absorb external shocks. In contrast, Kazakhstan's monetary policies are more reactive than proactive, resulting in exchange rate distortions that exacerbate trade imbalances (Nanovsky, 2022).

Fiscal sustainability in the EU is supported by the establishment of structural fiscal buffers. Targeted allocations for investments in renewable energy infrastructure, technologies that reduce emissions, and diversification of energy sources contribute to the long-term reduction of dependence on fossil fuels. In 2023, the EU's investments in non-fossil fuel energy sectors exceeded 380 billion euros, reflecting its strategic commitment to economic stability (Gibba and Khan, 2023). The budgetary system of Kazakhstan is heavily reliant on hydrocarbon revenues, which can lead to policy volatility during periods of oil market downturns. This phenomenon was evident during the oil price crashes in 2008,

2014, and 2020, which each resulted in budgetary reductions, urgent policy adjustments, and accelerated inflation (Moldabekova et al., 2022).

The EU's energy transition policy, which aims to reduce its reliance on fossil fuels, represents a structural shift away from the resource-dependent paradigm of Kazakhstan. European macroeconomic policies prioritize risk mitigation through diversification of energy supply sources. Kazakhstan, in turn, is bound by an export-driven model, where exogenous changes in oil prices determine its fiscal and monetary policies (Paceskoski and Taskovski, 2024). Policy asymmetry is evident in the European Union's macroeconomic reaction to the energy price surge. The EU introduces inflation management measures and monetary interventions to stabilize economic activity. Kazakhstan's economy fluctuates in response to crude oil price cycles, confirming the lack of structural hedging mechanisms (Kelesbayev et al., 2022a)

Empirical analysis has highlighted the vulnerability of Kazakhstan's financial system. Lower oil prices have led to a worsening of the trade balance, contrary to the theoretical predictions of the Marshall-Lerner condition and the J-curve effect. This phenomenon can be explained by the limited diversity of Kazakhstan's export products and the high sensitivity of imports to currency devaluation (Nanovsky, 2022). The EU maintains the stability of its trade balance through a diversified energy portfolio. This includes reliance on Norwegian natural gas and crude oil from the Middle East and North Africa, which reduces the volatility of imports. The economic dependence of Kazakhstan on revenue streams derived from a single resource intensifies macroeconomic imbalances (Paceskoski and Taskovski, 2024).

The fundamental discrepancy between the EU's approach and Kazakhstan's current economic model is their structural capacity for macroeconomic stabilization. European institutions use countercyclical fiscal and monetary policies, while Kazakhstan's policies tend to maintain cyclical economic vulnerability. This finding highlights the need for a strategic adjustment in policy, with a focus on diversification and energy transition.

6. CONCLUSION

The study reveals that the macroeconomic stability of Kazakhstan is highly dependent on fluctuations in oil prices. This is evident from the Pearson coefficient of correlation between world oil prices and GDP growth (0.783). The European Union demonstrates a structurally insulated economic structure. The European energy diversification policy reduces susceptibility to external shocks, as confirmed by the coefficient of correlation (−0.218) between Brent crude oil prices and the GDP of EC-27 countries. An analysis of the export potential dynamics shows a steady upward trajectory. Between 2000 and 2023, the export capacity (exports as a capacity to import) of Kazakhstan increased from 3.23 trillion (constant LCU) to 9.6 trillion (constant LCU), representing a 197.2% increase. This trend was interrupted by periods of decline associated with oil price fluctuations (2008-2009: −32.4%; 2014-2016: −21.1%). The structural assessment highlights the predominance of the service sector (60.77% of GDP, 116.2 billion USD at the 2024 exchange rate). This indicates an ongoing, albeit incomplete, transition towards economic diversification. The industrial sector (28.58%) and agriculture (4.69%) continue to play a secondary role.

According to the results of the structural analysis, Kazakhstan's economy at the macroeconomic level has the potential to achieve relative independence from global oil price fluctuations. However, the country's wealth in mineral resources significantly influences its export activities. The dilemma outlined in the article highlights the necessity of diversifying the economy to align its structure more closely with those of developed countries, while simultaneously addressing the high dependency of exports on crude oil through national economic policy measures. It is determined that the relative independence of inflation from oil prices could serve as a driver for further enhancing macroeconomic stability in the long term.

The practical value of the study lies in its contribution to the development of macroeconomic policy. Fiscal stabilization mechanisms, such as national welfare buffer funds and countercyclical taxation schemes, are essential for Kazakhstan to manage revenue volatility caused by fluctuations in oil prices. The experience of EU policy provides valuable insights: carbon taxation and diversified investment portfolios can serve as stabilizing factors. The empirical evidence from the study underscores the need for strategic redistribution of Kazakhstan's exports, shifting its trade dependence from hydrocarbon exports to industries with higher added value (processed metals and technology-intensive industries).

Future research should focus on examining the underlying mechanisms of interaction between oil price changes and macroeconomic indicators. Studying the experiences of countries with developed and resilient economies that possess mineral resources will be beneficial for understanding their approaches to economic diversification and establishing long-term competitive advantages in industrial and service markets. Further analysis of the potential application of economic mechanisms to promote structural diversification will help formulate specific measures and recommendations for government bodies to strengthen Kazakhstan's macroeconomic stability.

When interpreting the results of this study, it is important to consider methodological limitations, some of which are due to the availability of statistical data in the public domain and the timeliness of data updates at national and international levels. Moreover, economic processes are often nonlinear and require more complex models for accurate description, which in turn necessitates a large volume of statistical information. Another implementation limitation is that Kazakhstan's economy may be subject to short-term external shocks, such as fluctuations in global oil prices and political crises, which can distort long-term trends and complicate analysis.

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