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The role of oil and gas industry in Azerbaijan's economic development: investment trends and global context

Abstract: Investments in the energy sector are the primary driver of its growth. Thus, trends in capital inflows in developing countries are a relevant research area. The purpose of the study is to assess investment opportunities in Azerbaijan's oil industry while considering its role in the national economy and current state. The research examines how oil export revenues correlate with GDP growth in Azerbaijan, highlighting the industry's significance for economic development while acknowledging the challenges of dependency on oil exports. In particular, the relationship between the level of exports in Azerbaijan and the gross domestic product (GDP) was assessed, and the elasticity of these metrics was found. This study examined the current situation both in the world in general and in Azerbaijan in particular. The study demonstrated that the investment landscape, particularly in the energy sector, has undergone a marked change, driven by economic growth and government support, particularly in regions such as Europe, the United States, and China. This surge in investment is also determined by the urgent need for the world to switch to renewable

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energy. The study noted that SOCAR has become the country's leading oil supplier, accounting for most of Azerbaijan's total crude oil exports. Developing its operations in international markets and establishing productive economic relations is one of the company's strategic priorities. Given that oil and gas resources play an important role in Azerbaijan's economy, the regression method revealed a close relationship between oil exports and GDP.

Keywords: sustainable development, international relations, financial strategies, government initiatives

Nomenclature and abbreviation

IEA	–	International Energy Agency
GDP	–	gross domestic product
CO_2	–	carbon dioxide
OPEC	–	Organization of the Petroleum Exporting Countries
OLS	–	ordinary least squares
REC	–	Renewable energy consumption
NREC	–	non-renewable energy consumption
EKC	–	Environmental Kuznets Curve
FDI	–	foreign direct investment

Introduction

The oil industry is central to the global economy and geopolitics, having a significant impact on the development of various industries, transport, and energy. Many scientists have assessed the potential of the oil industry in Azerbaijan. Gasimov and Hajiyev (2021) studied the evolution of Azerbaijan's oil industry, focusing on SOCAR's journey and its enhanced presence in the global financial market with new financial tools. The years since independence have seen the discovery of new oil and gas fields, technological advances, and new partnerships with international oil companies. The study also assessed financial reporting and risk management in the sector, highlighting the benefits of strong international financial reporting standards for oil and gas firms in navigating a favorable investment climate and ensuring efficient, competitive production. Aliyeva investigated changes in the national oil industry due to structural changes in the sector (2022). The scientist concluded that structural changes in the sector have had a significant impact on the economic development of the Republic of Azerbaijan. It was noted that the increase in the added value of oil production, although it allowed companies to make additional profits, reduced

the export of technological products from the country, which could lead to negative long-term consequences. In this regard, the creation of conditions for the diversification of the national economy is crucial to ensure that it is less dependent on oil and gas exports.

Mohubbat (2023) assessed the impact of the oil industry development on the economic situation in Azerbaijan. The scientist noted that the industry has a significant positive impact on the national economy. Nevertheless, Azerbaijan is highly dependent on exports of these products, which can lead to negative consequences in the event of a crisis in the country or the world (Mehdiyev 2024). The peculiarities of creating an investment climate in Azerbaijan in the oil industry were discussed by Gasimov and Hajiyev (2022). Particular attention was devoted to the role of creating appropriate conditions for attracting investment to the country, and methods of improving the investment climate, especially in the oil sector, were described. The positive impact of the development of the oil sector in Azerbaijan on the national economic development was also written by Humbatova et al. (2023). The researchers concluded that the role of industry in the country's future development is enormous, and the strategy for the development of the sector was crucial for the economic independence, stability, development, and diversification of Azerbaijan's non-oil sector. In the future, it should lead to an even deeper integration of the country into the global energy economy.

Thus, in the sources analyzed above, little attention was paid to the study of the investment component of the energy sector and subsequent trends in its development. In this regard, the study aimed to assess the possibilities of attracting investment in the industry, considering its role in the Azerbaijani economy and its current state.

1. Materials and methods

The study utilized comprehensive statistical data from the International Energy Agency's World Energy Investment 2022 Report and the State Statistics Committee of the Republic of Azerbaijan to examine global energy sector investments and Azerbaijan's energy production trends. Statistical methods, including correlation and regression analyses, were applied to evaluate the relationship between oil export revenues per capita and GDP per capita in Azerbaijan, resulting in linear equations that quantified how changes in energy exports influenced the country's economic performance. Statistical information was used in the study to describe the situation with investments in the energy sector globally. This was based on data from the International Energy Agency's (IEA) World Energy Investment 2022 (2022) Report, which describes all the main trends in investment in this area over the year. The IEA is an autonomous intergovernmental organization headquartered in Paris. It was founded in 1974 as part of the Organisation for Economic Co-operation and Development following the 1973 oil crisis, and its goal is to ensure global energy security. In particular, the data from this source was used to assess information on energy investments by sector and sector (broken down by different categories). In

addition, data was used from the State Statistics Committee of the Republic of Azerbaijan (n.d.), the leading website providing statistical data on various sectors in the country. Information was used on the dynamics of oil production in the Republic of Azerbaijan, the dynamics of gas production in the Republic of Azerbaijan, the dynamics of oil exports, and the level of gross domestic product (GDP) in the country.

Specific statistical analysis methods were used to formulate the main conclusions of the study. Correlation analysis was used to analyze how strongly oil export revenues per capita and GDP per capita in Azerbaijan are related. Regression analysis most often results in a linear relationship with the corresponding coefficients following each of the independent values. Since only two variables were used for the estimation in this study, the results obtained form a straight line. The general form of the formula between the dependent and independent variables resulting from the regression analysis can be seen in Equations (1, 2):

$$y = C + ax \tag{1}$$

$$y = a_0 + a_1x_1 + a_2x_2 \ldots + a_nx_n \tag{2}$$

where:

- y – dependent variable,
- x_n – independent variable,
- a_n – index next to the variable,
- C – the value without the variable.

As already noted, the equation obtained in this study is based on Equation 1, although its general form is given in Equation 2. The value a_n indicates how much the value of the dependent variable changes when the independent variable x_n changes by 1 unit; at the same time, $C(a_0)$ shows what the value of the dependent variable will be if all independent variables are equal to zero. The study also determined the value of the elasticity (the level of GDP in terms of exports). The general form of this Equation is as follows (3):

$$\varepsilon = a_1 \cdot \frac{\overline{x}}{\overline{y}} \tag{3}$$

where:

- ε – elasticity,
- a_1 – value of the index near the independent variable x_1 (Equation 1),
- $\overline{x}$ – the average value of the independent variable for the selected period,
- $\overline{y}$ – the average value of the dependent variable for the selected period.

This metric is also significant in determining the role of energy exports for a country, as it can be used to assess how GDP changes depending on changes in the country's exports.

2. Results

Azerbaijan's strategic positioning in the global energy market is directly impacted by the improving investment outlook and growth in the petroleum industry, providing significant opportunities for national economic development despite the conflicting global pressures for cleaner energy alternatives. The country's explicit focus on research and development in oil and gas exploration represents a deliberate national strategy to capitalize on its natural resources while the sector remains profitable. This government-led approach to fostering innovation and collaboration between industry stakeholders aims to enhance Azerbaijan's competitive advantage in the global energy market while simultaneously strengthening its economic resilience. Although many power companies remain financially fragile, developers are expected to take advantage of the opportunities provided by supportive monetary policy and government support to plan infrastructure improvements and invest in new projects (Fang 2023; Ye et al. 2022). Global carbon dioxide (CO_2) emissions are rising again despite the urgent need for a transition to sustainable energy (Ritchie and Roser 2024). The petroleum industry, primarily oil and natural gas, is currently the most significant sector contributing to global energy needs. While pressure to find cheaper and cleaner energy alternatives is growing, the oil and gas sector is experiencing growth and investing more in production (Deryaev 2024b; Prokopov et al. 1989). The Government of the Republic of Azerbaijan recognizes the importance of research and development in oil and gas exploration and production. By focusing on innovation and collaboration between industry, academia, and government, the country aims to unlock new resources and improve production efficiency (Martinez et al. 2023). Some data on the volume of investment in the oil sector by destination globally can be seen in Figure 1.

As can be seen from Figure 1, investment in energy is gradually increasing in all three areas shown in the chart. Figure 1 presents a bar chart illustrating global energy investments across different sectors from 2016 to 2023 (with 2023 being an estimate, as indicated by "2023e"). The investment values are expressed in billion USD (2022) and are categorized into three sectors: Buildings (represented in green), Transport (in orange), and Industry (in yellow). The chart indicates a general upward trend in total energy investments over the years, with notable increases after 2020. Investments in the building sector consistently constitute the largest share, followed by transport and the industry. From 2021 onward, a significant rise in total investments is evident, with 2022 and 2023e displaying the highest levels. The increase is driven primarily by higher investments in the Transport and Industry sectors. This is especially true in the field of electricity transmission. Data by sector can be seen in Figure 2, and energy efficiency in Figure 3.

Figure 2 presents a bar chart illustrating global energy investment trends across different sectors from 2018 to 2023. The investments are measured in billion dollars (2022) and are categorized into three main groups: fuel supply, electricity, and end-use investments. In the fuel supply sector, investments in oil and gas production (represented in red) have remained consistently high, exceeding $400 billion per year, with a slight fluctuation over time. Oil and gas refining (in purple) shows lower investment levels but follows a similar pattern. Investments in

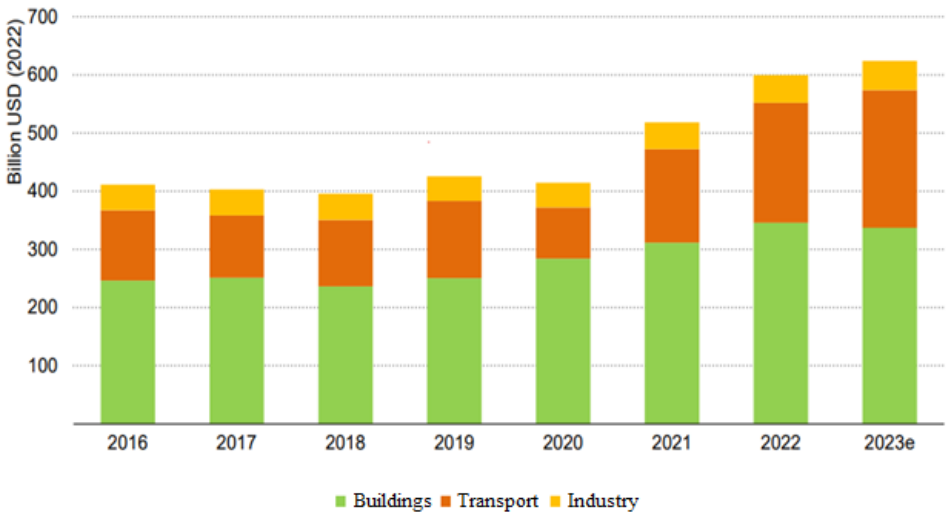

Fig. 1. Global Energy Investments by sphere
Source: compiled by the authors based on World Energy Investment 2022 (2022); World Energy Outlook 2023 (2023)

Rys. 1. Globalne inwestycje energetyczne według sfer

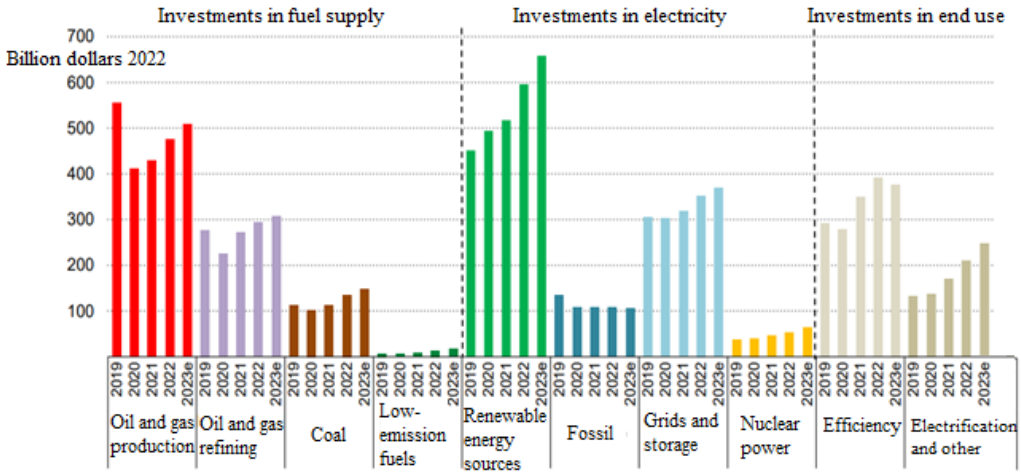

Fig. 2. Global energy investment by sector
Source: compiled by the authors based on World Energy Investment 2022 (2022), World Energy Outlook 2023 (2023)

Rys. 2. Globalne inwestycje w energię według sektorów

coal (in brown) are significantly lower compared to oil and gas. Meanwhile, low-emission fuels display moderate and relatively stable investment levels. The electricity sector exhibits a strong growth trend in renewable energy sources (in green), surpassing all other categories within this

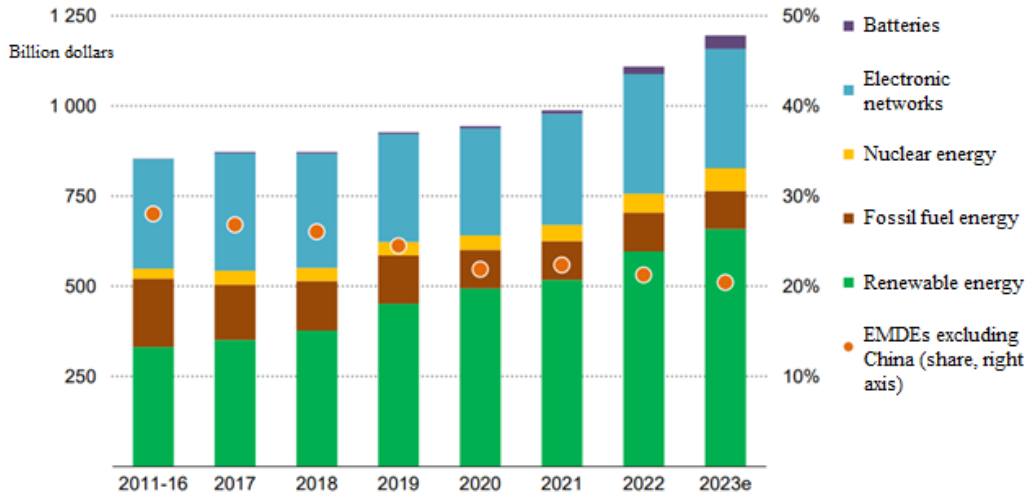

Fig. 3. Clean energy and global investments in energy efficiency, 2011–2023
Source: compiled by the authors based on World Energy Outlook 2023 (2023)

Rys. 3. Czysta energia i globalne inwestycje w efektywność energetyczną w latach 2011–2023

sector. Fossil fuel-based electricity investments (in dark blue) remain relatively lower, while investments in grids and storage (light blue) show a steady increase. Nuclear power investments (in yellow) are the smallest in this category but show a stable trend. The end-use sector focuses on energy efficiency and electrification. Investment in efficiency (in beige) has gradually increased, while electrification and other energy uses have also seen a steady rise.

Figure 3 illustrates global investments in clean energy and energy efficiency from 2011 to 2023, measured in billion dollars. The investments are categorized into different energy sectors, including renewable energy, fossil fuel energy, nuclear energy, electronic networks, and batteries. Additionally, the figure includes an overlay of the share of Emerging Market and Developing Economies (EMDEs) excluding China (shown as orange dots) on the right vertical axis. The stacked bars show a steady increase in total investments over time, with a notable acceleration after 2020. Renewable energy (represented in green) consistently makes up the most significant portion of investments, followed by fossil fuel energy (brown), which remains relatively stable. Nuclear energy (yellow) contributes a small but stable share of investment, while electronic networks (blue) and batteries (purple) exhibit increasing investment trends, particularly in the later years. The share of EMDEs, excluding China, fluctuates between approximately 15% and 30% over the years, as represented by the orange dots. The overall trend suggests a significant global shift towards renewable energy and energy storage solutions, with increasing investments in battery technology and electrical networks.

In 2020, a significant portion of flexible spending was concentrated in key markets such as the US, Europe, and China, particularly in wind energy investments. Capital spending in the power sector outpaced oil and gas supply for the fifth consecutive year. Consumer investment

was mainly driven by electrification, with increasing sales of electric vehicles due to automakers introducing new models aligned with fuel economy targets and zero-emission vehicle mandates. Political factors continue to influence energy investments, especially as recovery plans take shape in various countries. Governments with more fiscal leeway and access to low borrowing rates are seizing the opportunity to boost investments in infrastructure, efficiency improvements, and clean energy technologies (Ciula et al. 2024; Deryaev 2024a).

Investment growth in clean energy is primarily seen in markets and sectors with supportive public policies, such as Europe's building sector. Policies and incentives are encouraging projects in areas like low-carbon hydrogen storage and carbon capture systems (Yang et al. 2022; Zahoor et al. 2021). However, there is a gap between current spending on clean energy incentives and what is needed for a sustainable recovery. Many developing countries lack the resources for comprehensive recovery strategies, and inflation concerns in some areas raise questions about the longevity of low interest rates. Despite commitments to net-zero emissions and sustainable finance, actual spending on clean energy projects has not seen a significant boost. Financial institutions are increasingly focusing on sustainable finance, but there is still a shortage of quality clean energy projects and effective channels to direct available funds appropriately. Clean energy investment is growing, but it falls short of what is required to mitigate climate change impacts (Komilova and Latipov 2022). Policies must drive a substantial increase in clean energy investment in this decade to align with net-zero goals.

Governments must provide clear policy signals to reduce uncertainty and prevent risks in clean energy investments. Slow investment in electricity grids could create obstacles for renewables or lead to issues if oil and gas suppliers transition faster than consumers. State-owned companies are increasing investment in oil and gas exploration, although overall spending remains below pre-crisis levels (Deryaev 2023). Cost control remains important, but major national oil companies are strategically investing to gain market share, like Qatar's significant liquified natural gas expansion with carbon capture. Private oil companies face pressure to manage portfolios despite higher prices, prioritizing debt reduction and shareholder returns over production expansion. The industry is also gradually investing more in clean energy technologies to align with clean energy transitions, focusing on emissions reduction and clean electricity and fuels (Orazbayev et al. 2023).

Transporting goods and people is crucial. Oil and natural gas, particularly gasoline, diesel, and liquefied petroleum gas, are favored as vehicle fuels due to their high energy density and ease of transport, leaving no practical alternatives (Chernyakova et al. 2016; Orazbayev et al. 2019). While hydrogen and other fuels are expected to replace oil and natural gas in the future, hydrogen's lower volumetric energy density (about four times less than oil/natural gas fuels) presents storage challenges. Despite being cleaner, hydrogen is an energy carrier like electricity, not a primary energy source. Hydrogen is currently not a feasible alternative to oil and natural gas due to its substantial storage requirements (Khan et al. 2017; Metaksa et al. 2018). Although oil and natural gas have a limited role in electricity generation, natural gas has become more popular recently due to its cost-effectiveness and reduced environmental impact, with its usage expected to rise slightly (World Energy Investment 2022, 2022). As environmental awareness

increases, there is a move towards using fuels with lower carbon emissions. The use of natural gas is growing significantly due to its economic and energy efficiency (Ismayilov et al. 2020; 2021). Recent hikes in oil and natural gas prices have ignited debates about the depletion of these resources.

"The Contract of the Century" marked a significant turning point for Azerbaijan's economy, leading to substantial growth and the establishment of crucial export pipelines (Gasimov and Hajiyev 2022). Heydar Aliyev's leadership was instrumental in advocating for the Baku-Tbilisi-Ceyhan route, bolstering Azerbaijan's reputation as a major player in the oil and gas sector. Presently, Azerbaijan's oil and gas production stands at an average of 2.7 million tons of oil and 1.5 billion m^3 of associated gas per month from the Azerai, Chirag, and Gunashli (ACG) fields. Since the late 1990s, oil exports have surged more than tenfold, with SOCAR emerging as the primary oil exporter, responsible for 70% of exports. The hydrocarbon reserves of the ACG jacket doubled during the Contract of the Century, with current estimates indicating 1 billion tons of oil and 350 billion cubic meters of gas. Substantial amounts of oil and gas have been extracted since development began, and future oil production is projected to reach 34–35 million tons annually.

Additionally, SOCAR holds a majority stake in DESFA, which manages Greece's gas transmission system. DESFA's operations encompass gas transportation, storage, and system upkeep, with plans to expand pipelines to Italy, Turkey, and other European nations through the TAP project. Azerbaijan's success in significant ventures like the Contract of the Century has positioned it as an appealing destination for foreign investment, elevating its status as a promising investment hub.

SOCAR strategically entered foreign markets, opening offices in 13 countries and launching a Swiss trading company, which marked its entry into the global energy market. SOCAR Trading SA, based in Switzerland, focuses on supplying petroleum products directly to consumers to optimize revenues and streamline operations. The company has a strong presence in Europe, Eastern and Southwest Europe, North and West Africa, Southeast Asia, and the Mediterranean, with offices in key locations such as Geneva, Singapore, Turkey, UAE, Nigeria, and Vietnam. SOCAR Trading SA engages in global sales of oil and oil products and offers intermediary services (World Energy Investment 2022, 2022). Under the SOCAR brand, gas stations in Switzerland, Romania, and Ukraine contribute to the company's global goals by providing exceptional customer service. In addition to the economic benefits, SOCAR's retail success in the field of petroleum products significantly promotes the company and Azerbaijan on the international stage.

The oil and gas industry in Azerbaijan saw notable growth between 2012 and 2022, making substantial contributions to the nation's GDP and dominating its industrial sector. This dominance highlights the necessity of diversifying industrial strategies to bolster non-oil sectors. Azerbaijan's oil and gas reservoirs are vital for the country's economic and cultural progress, leading to improved socio-cultural standards. This sector, a cornerstone of the nation's natural resources, remains pivotal for economic expansion, with significant proceeds channeled to the State Petroleum Fund from oil and gas sales. The strategic objective of broadening revenue

Table 1. Dynamics of oil production in the Republic of Azerbaijan for 2012–2022 [thousand tons]

Tabela 1. Dynamika produkcji ropy naftowej w Republice Azerbejdżanu w latach 2012–2022 [tys. ton]

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2022
Total	43.4	43.5	42	41.6	41	38.7	38.8	37.5	34.5	32.6
Including: SOCAR	8.3	8.3	8.3	8.2	7.5	7.4	7.5	7.7	7.4	6.9
Together with foreign companies	35.1	35.2	33.7	33.4	33.5	31.3	31.3	29.8	27.1	25.7

Source: compiled by the authors based on data State Statistics Committee of the Republic of Azerbaijan (n.d.).

Table 2. Dynamics of gas production in the Republic of Azerbaijan for 2012–2022 [billion m^3]

Tabela 2. Dynamika produkcji gazu w Republice Azerbejdżanu w latach 2012–2022 [mld m^3]

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2022
Total	26.9	29.5	29.5	29	29.4	28.6	30.5	35.6	37.1	46.7
Including: SOCAR	6.9	7.2	7.2	6.9	6.3	6.1	6.6	6.8	7.3	8.5
Together with foreign companies	20	22.3	22.4	22.1	23.1	22.5	23.9	28.8	29.8	38.2

Source: compiled by the authors based on data State Statistics Committee of the Republic of Azerbaijan (n.d.).

sources through natural gas, petrochemicals, and petroleum products is supported by modern sustainable production technologies. Azerbaijan's substantial oil and gas reserves underscore its significance in the TRACECA region. Key initiatives like the International North-South Transport Corridor and the Baku-Tbilisi-Kars railway are instrumental in positioning Azerbaijan as a global transport and logistics hub, facilitating trade diversification beyond oil-related sectors.

Table 3. Dynamics of oil exports and GDP in the Republic of Azerbaijan for 2012–2022

Tabela 3. Dynamika eksportu ropy naftowej i PKB w Republice Azerbejdżanu w latach 2012–2022

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2022
Oil exports per capita [US dollars]	2,410.3	2,375.9	2,129	1,166.2	819.7	1,413.6	1,805.9	1,783.3	1,190.1	1,948.3
GDP per capita [US dollars]	7,594.3	7,977.4	7,990.8	5,561.5	3,928.6	4,198.5	4,797.8	4,864	4,280.8	7,872.1
Share of oil exports in total exports in the country [%]	93.1	92.7	92.4	87.8	87	90.5	91.9	90.6	87.2	88.4

Source: compiled by the authors based on data State Statistics Committee of the Republic of Azerbaijan (n.d.).

Using the regression equation parameters a_0, a_1 were found:

$$\bar{y}_x = 1488.07 + 2.45x \tag{4}$$

where:

$\bar{y}_x$ – GDP per capita,
x – oil export per capita.

Therefore, a rise in annual oil exports per person by thousands of US dollars will lead to an average growth in GDP per person by 2.45 thousand USD. In this scenario, the elasticity coefficient will be as follows:

$$\varepsilon = a_1 \cdot \frac{\bar{x}}{\bar{y}} = 2.45 \cdot \frac{1703.4}{5664.62} = 0.7367 \tag{5}$$

where:

a_1 – index next to the value “oil exports per capita”,
$\bar{x}$ – average oil exports per capita,
$\bar{y}$ – average GDP per capita.

This implies that a 1% increase in exports corresponds to a 0.74% rise in GDP, indicating a strong correlation between these metrics. Referring to the table, the proportion of oil and petroleum product exports peaked at 93.1%. Despite a subsequent decline of 5.9% in 2020, by 2022, this share rebounded by 1.2%, comprising 88.4% of the nation’s overall exports.

4. Discussion

A recent study noted that a high dependence on oil exports can have unexpected long-term consequences for the country’s development. Bohemian and Maxén (2015) examine how oil price shocks influence the economic growth of net oil exporters, explicitly comparing the sensitivity of economic growth in Organization of the Petroleum Exporting Countries (OPEC) countries to that in other oil-exporting countries. The study utilizes annual real GDP and deflated world oil prices for 19 countries (11 OPEC and eight non-OPEC). To ensure data stability, the augmented Dickey-Fuller test, and the Im, Pesaran, and Shin tests were conducted to check for unit roots. The countries were categorized into two groups – OPEC and non-OPEC – and two separate unrestricted bivariate vector autoregression models were created to assess how each group’s economic growth rates respond to oil price increases. The analysis was carried out using EViews software. Thus, the OPEC countries have become entirely dependent on changes in the

situation on external markets, which indicates additional risks to the long-term development of such countries. A recent study has shown that in the coming years, investments in renewable energy sources will take up the bulk of investments in the energy sector, which will only worsen the situation in the future as oil demand declines.

The impact of high oil prices on economic growth was examined by Uğur and Khalid (2015). The model variables included GDP, oil prices, government spending, foreign direct investment, inflation, exports, and imports. To ensure the data's standardization, the Augmented Dickey-Fuller and Phillips-Perron tests were utilized. The study employed ordinary least squares (OLS), fixed effects model, and random effects model to analyze the influence of oil prices on GDP. The results of the Hausman test indicated that the random effects model is the most suitable for this analysis. Empirical findings show that rising oil prices have a positive and significant impact on economic growth (GDP) in six OPEC countries. While this is a positive sign for oil exporters, it also indicates that this could cause many difficulties if oil prices decline rather than rise. In this regard, the country significantly increases its risks by becoming overly dependent on exports of certain products. The way out of this situation is an investment in innovative development of the industry, which is something Azerbaijan should focus on.

The current study focused on the interaction between the oil sector and the achievement of sustainable development goals. The conclusion was made that CO_2 emissions are currently rising globally, which is also causing an increasingly rapid transition to renewable energy sources. This also raises challenges for the national future development as energy demand declines in the long term. Turedi and Turedi (2021) examined the effects of energy sources, economic growth, and CO_2 emissions in 53 developing countries using a two-stage generalized method of moments. They found an inverted U-shaped relationship between economic growth and CO_2 emissions, supporting the Kuznets curve hypothesis. Renewable energy consumption (REC) reduces CO_2 emissions, while non-renewable energy consumption (NREC) increases them. Both REC and NREC positively impact economic growth. To reduce CO_2 emissions, developing countries should decrease NREC's share in total energy consumption and increase REC's share (Borisov et al. 1987). Improving NREC efficiency is also crucial for sustaining economic growth. Hanif et al. (2019) analyzed the long- and short-term impacts of fossil fuel consumption, foreign direct investment, and economic growth on carbon emissions in 15 developing Asian countries using panel data and an autoregressive distributed lag model. The results indicate that economic growth efforts and fossil fuel consumption increase CO_2 emissions. Foreign direct investment also leads to environmental degradation and higher CO_2 emissions, supporting the pollution haven hypothesis. The study suggests that reducing fossil fuel consumption and adopting green growth strategies will improve welfare in these countries. The current study looked at sustainability issues from a different perspective; nevertheless, it is worth noting that the situation in the context of global warming may worsen with the further use of such technologies. In this regard, these issues should be addressed, including by the oil exporting countries themselves.

Even more, scholars analyzed the correlation between the development of the oil industry and sustainable development. As such, Ashraf et al. (2020) studied the impact of foreign direct investment, urbanization, economic growth, and fossil fuel consumption on CO_2 emissions in

11 developing Asian countries. Their findings confirmed the Environmental Kuznets Curve (EKC) hypothesis. The study suggests that reducing fossil fuel consumption and adopting green growth policies will benefit both the welfare of these countries and the global environment. An analysis of carbon dioxide emissions, economic growth, energy use, and FDI in Asian countries by Gunarto (2020) showed a clear link between energy consumption and carbon emissions, but no significant association was found between FDI and carbon emissions. These findings emphasize the need to address energy use to mitigate carbon emissions and environmental damage in Asia. The study also provides valuable support for policymakers as they develop effective environmental strategies. Azerbaijan is experiencing increasing temperatures, erratic rainfall, and natural disasters such as droughts and floods. These changes threaten agricultural productivity, food security, and overall economic stability. A World Bank report indicates that the agriculture sector is particularly vulnerable to climate impacts, which could lead to severe economic consequences. Decades of industrial activity, particularly in the oil and gas sectors, have resulted in significant environmental degradation. Issues such as air pollution, water scarcity, and deforestation are prevalent, affecting public health and quality of life (O'g'li and Karshiboevna 2024). For instance, illegal logging and poor land management practices have led to substantial loss of forest cover, exacerbating environmental challenges (US Agency for International Development 2024).

Naz et al. (2019) studied the link between REC, foreign direct investment (FDI), economic growth, and CO_2 emissions. They found that economic growth and FDI inflows raise CO_2 emissions, whereas REC lowers them significantly. Surprisingly, the results did not align with the inverted U-shaped EKC hypothesis regarding per capita income and CO_2 emissions. Instead, they support the "pollution hypothesis", indicating that FDI inflows can harm a country's natural environment. Thus, scientists once again confirm the existence of a correlation between investment in the oil industry and CO_2 emissions, which suggests that additional attention should be devoted to achieving sustainable development, including among such companies. The current study emphasised that renewable energy is the most popular area for investment and is likely to remain so in the coming years; despite this, investment in the oil industry also remains significant. In this regard, the government should create more favorable conditions for investment in renewable energy than in traditional sectors. Laureti et al. (2022) carried out research on the significance of REC within the circular economy, examining World Bank data spanning from 2011 to 2020 across 193 countries. They employed diverse econometric techniques such as fixed effects panel data, random effects panel data, pooled OLS, and WLS. The findings demonstrated a favorable connection between REC, cooling days, and adjusted savings. Furthermore, utilizing the k-means algorithm for cluster analysis, optimized with silhouette coefficients, validated the existence of two distinct clusters.

Thus, scientists noted that the further development of the energy sector is related to renewable energy sources; this area is also highly attractive for investment, as shown in the current study. The Azerbaijani government should address this when formulating future policies for the development of the industry.

Conclusions

The study concluded that the outlook for investment has improved due to economic growth and government support policies. Traditional energy companies, especially oil and gas companies, face financial instability but are employing new opportunities thanks to technological advances and favorable monetary policies in many countries. The study also concluded that despite all attempts to move towards renewable energy sources, the oil industry, led by oil and natural gas, remains dominant in meeting energy needs. Investment in renewable energy, particularly wind and solar, is growing due to technological advances and declining costs; however, there remains a significant gap between current clean energy spending and the levels required for sustainable recovery, particularly in developing countries. In this regard, governments are conducting research and development to improve the efficiency of exploration and production. Azerbaijani's strategic cooperation between industry, academia, and government should be aimed at developing new resources and strengthening its position in the global energy market.

Political factors influence energy investments: governments use fiscal policy to increase investment in infrastructure and clean energy technologies. Despite commitments to achieve zero emissions, the actual cost of clean energy is set to increase, requiring more precise policy signals to reduce uncertainty and encourage investment. In turn, insufficient investment in power grids can hinder the integration of renewable energy sources. SOCAR, the Azerbaijani state oil company, has expanded its operations globally, participating in international trade and infrastructure projects. The emphasis on sustainable production technologies and diversification of income sources underscores Azerbaijan's desire to ensure both economic growth and a better environment. A regression equation between oil exports and GDP growth in Azerbaijan was also constructed: it showed a significant correlation between the metrics, which underlines the economic importance of the energy sector in the country. A more detailed analysis of the possibilities of economic diversification in Azerbaijan is relevant for further research. Analysis of the national foreign trade activities in the oil sector remains important.

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References

Aliyeva, A. 2022. Post-oil period in Azerbaijan: Economic transformations, anti-inflation policy and innovations management. *Marketing and Management of Innovations* 13(2), pp. 268–283, DOI: 10.21272/mmi.2022.2-24.

Ashraf et al. 2020 – Ashraf, M.W., Rehman, H. and Chaudhary, I.S. 2020. The impact of economic growth, foreign direct investment, urbanization, fossils fuel consumption on environmental degradation in emerging Asian economies. *Journal of Business and Social Review in Emerging Economies* 6(4), pp. 1479–1495, DOI: 10.26710/jbsee.v6i4.1480.

Bohemian, H. and Maxén, J. 2015. *Oil price shocks effect on economic growth*. Lund: Lund University.

Borisov et al. 1987 – Borisov, Y.S., Oliker, V.E., Astakhov, E.A., Korzhik, V.N. and Kunitskii, Y.A. 1987. Structure and properties of gas-thermal coatings of Fe-B-C and Fe-Ti-B-C alloys. *Soviet Powder Metallurgy and Metal Ceramics* 26(4), pp. 313–318, DOI: 10.1007/BF01184439.

Chernyakova et al. 2016 – Chernyakova, E.S., Ivanchina, E.D., Yakupova, I.V., Vinidiktova, M.V. and Seytenova, G.Z. 2016. Coke formation reduction in the cataltic reforming reactors at the optimal catalyst activity. *Petroleum and Coal* 58(7), pp. 746–752.

Ciula et al. 2024 – Ciula, J., Sobiecka, E., Zaclona, T., Rydwanska, P., Oleksy-Gebczyk, A., Olejnik, T.P. and Jurkowski, S. 2024. Management of the Municipal Waste Stream: Waste into Energy in the Context of a Circular Economy-Economic and Technological Aspects for a Selected Region in Poland. *Sustainability* 16(15), DOI: 10.3390/su16156493.

Deryaev, A.R. 2023. Analysis of the opening of zones with abnormally high reservoir pressures in the oil and gas fields of the Western part of Turkmenistan. *SOCAR Proceedings* 1, pp. 20–25, DOI: 10.5510/OGP2023SI200871.

Deryaev, A. 2024a. Integration of advanced technologies to improve the efficiency of gas condensate field developme. *Machinery and Energetics* 15(1), pp. 33–42, DOI: 10.31548/machinery/1.2024.33.

Deryaev, A.R. 2024b. Drilling fluids for drilling wells in complex geological conditions in oil and gas fields of Turkmenistan. *Neftyanoe Khozyaystvo - Oil Industry* 2024(4), pp. 32–36. DOI: 10.24887/0028-2448-2024-4-32-36.

Fang, Z. 2023. Assessing the impact of renewable energy investment, green technology innovation, and industrialization on sustainable development: A case study of China. *Renewable Energy* 205, pp. 772––782, DOI: 10.1016/j.renene.2023.01.014.

Gasimov, A.A. and Hajiyev, G.B. 2021. On management evaluation of oil-gas industry enteprises in modern economic condition. *SOCAR Proceedings* 3, pp. 100–105, DOI: 10.5510/OGP20210300535.

Gasimov, A.A. and Hajiyev, G.B. 2022. Formation of the investment climate in the oil and gas industry of Azerbaijan and its impact on the development of the non-oil sector. *SOCAR Proceedings* 2, pp. 33–42, DOI: 10.5510/OGP2022SI200750.

Gunarto, T. 2020. Effect of economic growth and foreign direct investment on carbon emission in the Asian states. *International Journal of Energy Economics and Policy* 10(5), pp. 563–569, DOI: 10.32479/ijeep.10218.

Hanif et al. 2019 – Hanif, I., Raza, S.M., Gago-de-Santos, P. and Abbas, Q. 2019. Fossil fuels, foreign direct investment, and economic growth have triggered CO_2 emissions in emerging Asian economies: Some empirical evidence. *Energy* 171, pp. 493–501, DOI: 10.1016/j.energy.2019.01.011.

Humbatova et al. 2023 – Humbatova, S.P., Panahova, G.M., Mahmudova, I.M. and Hajiyev, N. 2023. The impact of Azerbaijan's oil strategy on economic growth: analysis and diagnosis. *International Journal of Energy Economics and Policy* 13(2), pp. 181–193, DOI: 10.32479/ijeep.13991.

Ismayilov et al. 2020 – Ismayilov, G.G., Iskenderov, É.K., Ismayilova, F.B., and Zeinalova, G.A. 2020. Controlled Methods to Suppress Pressure Pulsations in Multiphase Pipelines. *Journal of Engineering Physics and Thermophysics* 93(1), pp. 216–222, DOI: 10.1007/s10891-020-02111-w.

Ismayilov et al. 2021 – Ismayilov, G.G., Iskandarov, E.K., Ismayilova, F.B. and Hacizade, S.G. 2021. Analysis of the Gas Pipelines Operation Based on Neural Networks. *Advances in Intelligent Systems and Computing* 1306, pp. 403–408, DOI: 10.1007/978-3-030-64058-3_50.

Khan et al. 2017 – Khan, Z., Khalid, S., Ali, K., Ali, S. and Kiran, A. 2017. Crude oil prices and its effect on economic growth; analyzing pre and post oil price shocks: A case study of Pakistan economy. *Journal of Energy Technologies and Policy* 7(3), pp. 10–15.

Komilova, N.K. and Latipov, N.F. 2022. Classification of settlements on the basis of the ecological situation in the Navoi region and the factors affecting the health of the population. *Visnyk of V N Karazin Kharkiv*

National University-Series Geology Geography Ecology 56, pp. 209–213, DOI: 10.26565/2410-7360-2022-56-15.

Laureti et al. 2024 – Laureti, L., Costantiello, A., Massaro, A. and Leogrande, A. 2024. The role of renewable energy consumption in promoting sustainability and circular economy: A data-driven analysis. [In:] S. Singh, S. Rajest, S. Hadoussa, A. and Obaid, R. Regin (Eds.), *Data-Driven Intelligent Business Sustainability*, pp. 360–386. Hershey: IGI Global, DOI: 10.4018/979-8-3693-0049-7.ch024.

Martinez et al. 2023 – Martinez, L., Dincer, H. and Yuksel, S. 2023. A hybrid decision making approach for new service development process of renewable energy investment. *Applied Soft Computing* 133, DOI: 10.1016/j.asoc.2022.109897.

Mehdiyev, V. 2024. Harmonization of capital accounting in Azerbaijan commercial enterprises in accordance with IFRS requirements. *Scientific Bulletin of Mukachevo State University. Series "Economics"* 11(1), pp. 40–49, DOI: 10.52566/msu-econ1.2024.40.

Metaksa et al. 2018 – Metaksa, G., Moldabaeva, G. and Alisheva, Z. 2018. Obtaining preset properties in the hydrogenation process by controlling the state of phase boundary. *E3S Web of Conferences* 56, DOI: 10.1051/e3sconf/20185603028.

Mohubbat, H. 2023. Effects of oil and natural gas industry on Azerbaijan economy. In *Proceedings of the 1st International Scientific and Practical Conference "Modern Knowledge: Research and Discoveries"*, pp. 8–15. Vancouver: InterConf., DOI: 10.51582/interconf.19-20.05.2023.001.

Naz et al. 2019 – Naz, S., Sultan, R., Zaman, K., Aldakhil, A.M., Nassani, A.A. and Abro, M.M. 2019. Moderating and mediating role of renewable energy consumption, FDI inflows, and economic growth on carbon dioxide emissions: Evidence from robust least square estimator. *Environmental Science and Pollution Research* 26(3), pp. 2806–2819, DOI: 10.1007/s11356-018-3837-6.

O'g'li, L.N.F. and Karshiboevna, K.N. 2024. The Importance of Anthropogenic Influence in Assessing the Ecological Condition of Cities in Uzbekistan (in the Case of Navoi). *Baghdad Science Journal* 21(4), pp. 1214–1219, DOI: 10.21123/bsj.2023.8892.

Orazbayev et al. 2019 – Orazbayev, B.B., Kozhakhmetova, D.O., Berikkhanova, G.Y. and Orazbayeva, K.N. 2019. Development of System of Model Columns K-1, K-2 and K-3 for Fluid Catalytic Cracking Unit based on Varying Information. *ACM International Conference Proceeding Series* 1, pp. 122–125, DOI: 10.1145/3312714.3312727.

Orazbayev et al. 2023 – Orazbayev, B., Zhumadillayeva, A., Kabibullin, M., Crabbe, M.J.C., Orazbayeva, K. and Yue, X. 2023. A Systematic Approach to the Model Development of Reactors and Reforming Furnaces With Fuzziness and Optimization of Operating Modes. *IEEE Access* 11, pp. 74980–74996, DOI: 10.1109/ACCESS.2023.3294701.

Prokopov et al. 1989 – Prokopov, V.G., Shvets, Y.I., Fialko, N.M., Meranova, N.O., Korzhik, V.N. and Borisov, Y.S. 1989. Mathematical-modeling of the convective heat-transfer processes during formation of the gas-thermal coating layer. *Dopovidi Akademii Nauk Ukrainskoi RSR, Seriya A-Fiziko-Matematichni ta Technichni Nauki* 6, pp. 71–76.

Ritchie, H. and Roser, M. 2024. CO_2 Emissions. *Journal of Geoscience and Environment Protection* 12, p. 10.

State Statistics Committee of the Republic of Azerbaijan. n.d. Energy. [Online] https://www.stat.gov.az/source/balance_fuel/?lang=en m [Accessed: 2025-03-14].

Turedi, S. and Turedi, N. 2021. The effects of renewable and non-renewable energy consumption and economic growth on CO_2 emissions: Empirical evidence from developing countries. *Business and Economics Research Journal* 12(4), pp. 751–765, DOI: 10.20409/berj.2021.350.

Uğur, A.A. and Khalid, K.R. 2015.The impact of oil price shocks on economic growth (A case study; selected six OPEC countries) during the period (1995–2014) panel-data models. *International Journal of Latest Research in Humanities and Social Science* 1(4), pp. 17–27.

US Agency for International Development 2024. Azerbaijan: Climate Country Profile (November 2024). [Online] https://reliefweb.int/report/azerbaijan/azerbaijan-climate-country-profile-november-2024 [Accessed: 2025-02-23].
World Energy Investment 2022. 2022. [Online] https://www.iea.org/reports/world-energy-investment-2022 [Accessed: 2025-02-23].
World Energy Outlook 2023. 2023. [Online] https://iea.blob.core.windows.net/assets/86ede39e-4436-42d7-ba2a-edf61467e070/WorldEnergyOutlook2023.pdf [Accessed: 2025-02-23].
Yang et al. 2022 – Yang, Z., Zhang, M., Liu, L. and Zhou, D. 2022. Can renewable energy investment reduce carbon dioxide emissions? Evidence from scale and structure. *Energy Economics* 112, DOI: 10.1016/j.eneco.2022.106181.
Ye et al. 2022 – Ye, J., Al-Fadly, A., Huy, P.Q., Ngo, T.Q., Hung, D.D. and Tien, N.H. 2022. The nexus among green financial development and renewable energy: Investment in the wake of the Covid-19 pandemic. *Economic Research* 35(1), pp. 5650–5675, DOI: 10.1080/1331677X.2022.2035241.
Zahoor et al. 2021 – Zahoor, Z., Khan, I. and Hou, F. 2021. Clean energy investment and financial development as determinants of environment and sustainable economic growth: Evidence from China. *Environmental Science and Pollution Research* 29, pp. 16006–16016, DOI: 10.1007/s11356-021-16832-9.

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Rola przemysłu naftowego i gazowego w rozwoju gospodarczym Azerbejdżanu: trendy inwestycyjne i kontekst globalny

Streszczenie

Inwestycje w sektorze energetycznym są głównym motorem jego wzrostu. Dlatego też trendy w napływie kapitału w krajach rozwijających się są istotnym obszarem badawczym. Celem niniejszego opracowania jest ocena możliwości inwestycyjnych w przemyśle naftowym Azerbejdżanu, przy jednoczesnym uwzględnieniu jego roli w gospodarce narodowej i obecnego stanu. Przeprowadzone badanie analizuje, w jaki sposób przychody z eksportu ropy naftowej korelują ze wzrostem PKB w Azerbejdżanie, podkreślając znaczenie branży dla rozwoju gospodarczego, jednocześnie uznając wyzwania związane z zależnością od eksportu ropy naftowej. W szczególności oceniono związek między poziomem eksportu w Azerbejdżanie a produktem krajowym brutto (PKB) oraz ustalono elastyczność tych wskaźników. W badaniu przeanalizowano obecną sytuację zarówno na świecie, jak i w Azerbejdżanie. Studium wykazało, że krajobraz inwestycyjny, szczególnie w sektorze energetycznym, uległ wyraźnej zmianie, napędzanej wzrostem gospodarczym i wsparciem rządowym, szczególnie w regionach takich jak Europa, Stany Zjednoczone i Chiny. Ten wzrost inwestycji jest również zdeterminowany pilną potrzebą przejścia świata na energię odnawialną. W opracowaniu zauważono, że SOCAR stał się wiodącym dostawcą ropy naftowej w kraju, odpowiadając za większość całkowitego eksportu ropy naftowej Azerbejdżanu. Rozwijanie działalności na rynkach

międzynarodowych i nawiązywanie produktywnych relacji gospodarczych jest jednym ze strategicznych priorytetów firmy. Biorąc pod uwagę, że zasoby ropy naftowej i gazu odgrywają ważną rolę w gospodarce Azerbejdżanu, metoda regresji ujawniła ścisły związek między eksportem ropy naftowej a PKB.

Słowa kluczowe: zrównoważony rozwój, stosunki międzynarodowe, strategie finansowe, inicjatywy rządowe