

Assessing the impact of oil prices on economic development: Empirical insights from Azerbaijan

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Abstract

The article highlights one of the pressing challenges facing humanity: issues related to the fuel and energy sector. It underscores that the fuel and energy dilemma is a catalyst for numerous other problems, including environmental damage, air pollution, and the deterioration of soil quality, among others. The importance of addressing these concerns is emphasized. The article also identifies three key factors influencing the economic structure of most countries: natural and economic advantages, historically established specialization, and the level of scientific, technological, and technical progress. Oil plays a pivotal role in Azerbaijan's economy, primarily due to the country's natural and economic advantages in this sector. As a result, the oil industry is significantly developed within Azerbaijan's economy. In this context, the article calculates the oil multiplier and elasticity coefficient, offering scientifically substantiated results.

Keywords: Green Economy, GDP, oil and gas production, multiplier, elasticity coefficient, nominal and real exchange rate.

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Introduction

As the world economy becomes global, the socio-economic problems and concerns of humankind are also global in nature. It is no coincidence that, since the 1960s, many issues that pose serious challenges to humanity have been the subject of widespread discussion. Solutions to global socio-economic problems have been discussed at the United Nations (UN) and similar international organizations. Since then, humanity's problems have been consistently mentioned as a key issue on the agenda of reports and meetings of international organizations. As a result of broad discussions, it has become clear that many complex and contradictory processes create unpleasant problems in world society and disrupt dynamic development.

One of the socio-economic problems facing humanity at the end of the XX century and the first half of the XXI century are issues related to fuel and energy.

In the area of fuel and energy, there is deterioration of soil quality, environmental damage, atmospheric pollution, etc. Issues such as the trend of world population growth, limited or sustainable arable land, soil erosion, etc., make it relevant to discuss issues related to human nutrition.

However, it should be noted that in most countries, three factors have a particular influence on shaping the structure of the economy.

The first is the country's natural and economic advantages, which play an important role in shaping the structural sectors of its economy, and this can still be observed today.

- The second important factor is historically established specializations, which play an important role in shaping the structure of the economy. This can include historical national traditions of Azerbaijan such as carpet weaving, hat making, etc.
- Thirdly, as an example, it is possible to attract investments for the creation of new industries related to the development of scientific technological and technical progress and, as a consequence, the creation of new types of products using new equipment. For example, robotization in the automotive industry, creation of nuclear power plants, development of unmanned aerial vehicles became possible precisely in the sphere of technical progress.

If we approach the above from the point of view of the economy of Azerbaijan, it becomes clear that for many years the oil factor as a natural economic potential has played an important role in the formation of the structure of the country's economy, and this process continues to this day. It is interesting to assess the predominance of the oil factor in the economy of

Azerbaijan compared to other resources and how it affects the economy of the country.

Theoretical and methodological approach and literature review

Until the 1970s, many researchers around the world clearly supported the ideas of A. Smith and D. Ricardo about the positive role of natural resources in the process of economic development. However, this idea was challenged by the discovery of large natural gas deposits in the Netherlands in 1959, and years after their development in 1977, it became clear for the first time that natural gas exports did not contribute to the development of other sectors of the economy. In 1976, the Dutch economy earned 2 billion dollars from natural gas exports. The high level of profitability of gas production also created conditions for the concentration of investment resources in this area. In other words, although Dutch natural gas exports generated revenue for the state budget and contributed to economic growth, this growth came to be considered “growth leading to impoverishment.” Since the 1980s, many academic articles have been published on the negative impact of natural resources on the economy. The negative impact of oil on the national economy was described as the “Dutch syndrome”, and in 1982 Max Corden and Peter Nieri proposed a classical economic model describing the Dutch syndrome Huseynov et al. (2005).

In addition, Corden in 1982 studied the impact of the increase in oil exports in Indonesia on its economy, Edward in 1985 investigated the effects of the price increase of coffee, the main export product of Colombia, on the world market, Ojesid in 1993 confirmed the structural changes that occurred in Nigeria and the processes observed during the oil boom of 1974, and Valdes in 1994 confirmed that the reforms implemented in Chile and New Zealand led to the “Dutch disease”. Gl. Wiplosch, C. Grafe, L. Halpern in 1997 assessed the growth of real exchange rates in transition economies as a natural process, Montes M.F., Popov V.V. He named the causes of the currency crisis of the 2000s and considered the causes of currency crises in different countries Khasanli et al. (2002)

In general, there are many works by both Western and Russian economists (Chuku, Effiong, Sam, Gaidar E.T., Guriev S., Sonin K., etc.) on the negative impact of natural resources on economic growth. Many of the above-mentioned economists have stated in various articles that specialization in natural resources does not bring significant benefits to the national economy. Here: “resource curse”, “Dutch disease”, “oil curse”, etc. The use of terminology is particularly striking.

In the 21st century, the first condition for giving more importance to the mixed and diverse development of the economy or its diversification is to ensure its stable development. This also shows that the economic security of a country, the protection of national interests and the potential for effective economic structure formation are its integral parts. In this regard, one of the topics discussed over the past 40 years has been how to spend the income earned from exporting these products to countries rich in natural resources. A group of people receives income from natural resources, which goes to the state budget: economic development, competitiveness, solution of socio-economic problems.

The second group, on the contrary, states the importance of spending to eliminate inequality in society, lower living standards and a number of other unpleasant situations.

This situation can certainly be defined according to the degree or level to which the state stimulates the economy. From this point of view, countries rich in natural resources can be divided into two groups. The first group includes countries that stimulate the economy properly by effectively utilizing the funds from natural resources, and the second group includes countries that do not effectively utilize the revenues from natural resources and do not choose the right methods to stimulate the economy.

Experience shows that in some countries, the abundance of natural resources and the efficient use of revenues from their exports are the main source of high growth, competitiveness and human capital development. Examples of such countries are Norway, the United States, Canada and the United Kingdom. However, in some other countries, the abundance of natural resources and the inefficient use of revenues from their exploitation ultimately lead to a deterioration in living standards and lopsided economic development. Examples of such countries include Iraq, Angola, Syria, Sudan, Colombia, Algeria, Nigeria, etc.

Observations confirm that the state budget of many countries exporting natural resources in the form of crude oil tends to become dependent on the world market prices of these natural resources, high inflation, frequent fluctuations of the national currency, corruption, etc. lead to negative situations such as: Therefore, to cope with this difficult task, countries that mainly export crude oil usually create an oil fund and countries that export other natural resources create a “stabilization fund”. The creation of such funds is primarily aimed at better utilizing the proceeds of a country's natural resource exports and preserving them for future generations. From this point of view, determining the value of revenues from the export of natural resources is one of the most relevant issues. The following issues were discussed:

1. Which non-oil industries should be developed and how?
2. How should oil revenues be used for social protection of the population?
3. How to avoid the “oil curse” or “natural resource curse”.

Within the framework of the article it would be interesting to consider the experience of Norway in this respect. Norway has no problems with the export of raw materials. The main reason for Norway's success is the efficient and transparent management of the country's oil and gas industry and the revenues derived from it, as well as its effective support from the structural parts of the economy. Other economic fundamentals include:

- The state budget should not be bloated by oil and gas revenues;
- the diversification of the industrial structure is underway;
- Macroeconomic stability has been maintained.

Experience shows that a prerequisite for freeing the economy from oil dependence is to achieve economic diversification. In this regard, in 1970-1975, a special plan for energy independence was developed in the USA. In addition, in the 1980s, the US, Japan and Germany had special programs for the development of knowledge-intensive economy. In other words, the economic development of countries that achieved a certain level of success in the modern era was not accidental, but was made possible on the basis of a systematic and logical approach and plan Ganbarov (2021).

Analyzing the impact of oil prices on Azerbaijan's economic development

Historically, the richness of Azerbaijan's territory in oil and oil products has further strengthened its fame. Historical sources testify that already in VI-VII centuries B.C. there was accurate information about the presence of oil reserves in this geographical region. Later, we find information about Azerbaijani oil beyond its borders in the works of various famous researchers. Some time later, approximately in XVII-XVIII centuries, in Baku and its vicinity there was a serious interest in exploration, study and production of oil. From ancient times to the present day, the oil sector has played a significant role in the development of Azerbaijan's economy. The geography of foreign oil companies participating in numerous signed international oil contracts and representing their countries is expanding every year, and eventually the interests of the USA, Great Britain, Norway, Russia, Turkey, Iran, China, Japan, France, Spain, Belgium, Canada and other influential countries in Azerbaijan have increased. This ensured large investments in the oil industry within the framework of oil agreements concluded by the Republic with foreign companies. As a logical consequence of this, Azerbaijan achieved a sharp increase in oil and gas production, which, in turn, created the basis for fully ensuring the country's energy security and exporting large volumes of hydrocarbon resources. The signing of the "Contract of the Century" on

September 20, 1994 opened new prospects for Azerbaijan, allowed the implementation of the Baku-Tbilisi-Ceyhan, Baku-Novorossiysk, Baku-Supsa oil export pipelines, the Baku-Tbilisi-Erzurum Southern Gas Corridor (TAP), the TANAP gas export pipeline and other important projects (Mikhailov, 2014). Since 2005, with the emergence of a new mining boom, revenues from oil sales have become a vital source of funding for Azerbaijan's economic and social development (Khalilov and Huseyn, 2021). The implementation of measures envisaged in the "State Program for the Development of the Fuel and Energy Complex of the Republic of Azerbaijan (2005-2015)" ensured the inflow of large financial resources into the country, which was of great importance in the development of other sectors of the country's economy. In general, it can be said that the State Programs ensuring the development of priority directions of all sectors of the country's economy have been prepared, their successful implementation has been ensured, and now the purposeful work in this direction continues (Mikhailov, 2014).

Additionally, it is important to highlight that Azerbaijan, renowned for its considerable oil and gas reserves, is proactively advancing the integration of renewable energy into its energy portfolio (Gasimli et al., 2024a). Moreover, the country is establishing green energy corridors, including "Caspian-Black Sea-Europe" and "Azerbaijan-Central Asia-Europe," to facilitate and support this transition (Gasimli et al., 2024b). But oil revenues also play an important role in Azerbaijan's investment in green energy projects.

Data and methodology

Although hybrid vehicle production has increased annually in recent years, we believe that among the various raw materials and fuel products circulating in global trade, petroleum, petroleum products, natural gas and coal products will continue to play a leading role for a long time to come. At the very least, it will take time to transition to hybrid technology. On the other hand, although the geopolitical and geo-economic tensions that have emerged in the global world in recent years have had some impact on Azerbaijan's economy, overall macroeconomic stability has been maintained and GDP growth rates have continued. Of course, the oil industry also plays a major role in the continuation of this growth.

To study the statistical impact of oil prices on the volume of GDP of a country, we construct a linear regression equation and present it as follows:

$$y = a_0 + a_1x \quad (1)$$

where y - gross domestic product (million US dollars), x - world oil prices (barrel of US dollars), a_0 and a_1 - parameters.

It is interesting to calculate the average elasticity coefficient characterizing the influence of oil price in the world market and time factor on the volume of GDP in Azerbaijan. The following approach is used in statistics to calculate the elasticity coefficient:

$$\bar{E}_{yx} = a_1 \frac{\bar{x}}{\bar{y}};$$

At the same time, if all costs are held constant and only oil consumption is changed, then the change in GDP due to oil consumption can be characterized by the above emphasis:

$$\mu_{oil} = \frac{1}{1 - b}$$

Here μ_{oil} is the oil multiplier and b is the marginal propensity to consume oil.

Table 1 - GDP production by economic activity, mln AZN. Source: SSC, 2025c

Years	Oil industry	GDP	Share in GDP (%)
2005	5 283.9	12 522.5	42.2
2006	9 534.0	18 746.2	50.9
2007	15 219.2	28 360.5	53.7
2008	21 164.5	40 137.2	52.7
2009	15 090.4	35 601.5	42.4
2010	19 482.2	42 465.0	45.9
2011	24 980.0	52 082.0	48.0
2012	23 570.1	54 743.7	43.1
2013	22 790.2	58 182.0	39.2
2014	20 222.3	59 014.1	34.3
2015	14 370.2	54 380.0	26.4
2016	18 557.0	60 425.2	30.7
2017	24 039.4	70 337.8	34.2
2018	31 041.4	80 092.0	38.8
2019	28 846.8	81 896.2	35.2
2020	19 248.2	72 578.1	26.5
2021	32 649.9	93 203.2	35.0
2022	60 143.1	133 972.7	44.9
2023	41 082.2	123 005.5	33.4

In this regard, it is important to determine the share of the oil industry in the formation of GDP by economic activity. For this purpose, let's take a look at the Table 1.

Results

One of the approaches used to determine how oil prices affect a country's GDP volume is to build an econometric model between GDP and oil prices. If we estimate this regression equation using the E-views (econometric views) system, the estimation result is as follows.

Method: Least Squares
Date: 10/10/24 Time: 16:12
Sample: 1997 2023
Included observations: 27
 $GDP = C(1) + C(2)*PRICE$

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-8242.416	4836.966	-1.704047	0.1008
C(2)	779.8806	73.20511	10.65336	0.0000
R-squared	0.819487	Mean dependent var		37786.14
Adjusted R-squared	0.812266	S.D. dependent var		26079.13
S.E. of regression	11299.63	Akaike info criterion		21.57411
Sum squared resid	3.19E+09	Schwarz criterion		21.67010
Log likelihood	-289.2505	Hannan-Quinn criter.		21.60266
F-statistic	113.4941	Durbin-Watson stat		0.510952
Prob(F-statistic)	0.000000			

The values of t-statistics for the corresponding parameters in the table indicate that the parameter values are significant. The coefficient of determination is approximately 0.82 ($R^2 = 0.82$), which indicates that 82.0% of the change in the price of gross domestic product in Azerbaijan in the period 1997-2023 is explained by changes in world oil prices and time trends in these years. To characterize the impact of oil price in the world market and time factor on the volume of GDP of Azerbaijan, let us calculate the average elasticity coefficient:

$$\bar{E}_{yx} = a_1 \frac{\bar{x}}{\bar{y}} ;$$

$$\bar{E}_{yx} = \frac{779.9 \cdot 59}{37786,1} = 1,2\%$$

The \bar{E}_{yx} equal to 1.2% indicates that a 1% increase in the average price of oil on the world market can lead to a 0.2% increase in the average price of GDP in Azerbaijan.

At the same time, if all costs are considered constant and only oil consumption is changed, then the change in GDP due to oil consumption can be characterized by the above emphasis:

$$\mu_{oil} = \frac{1}{1 - b}$$

Here is the oil multiplier and b is the marginal propensity coefficient of oil consumption. In 2023, Azerbaijan's GDP amounted to \$72,356.2 million. About 25.2 billion USD worth of oil was consumed domestically in the reporting year. Thus, the average oil consumption propensity score is $25.2/78 = 0.3$. Then the multiplier of oil consumption is:

$$\mu_{oil} = \frac{1}{1 - 0.3} = \frac{1}{0.7} = 1.4$$

In other words, a \$1 increase in oil consumption adds \$0.4 to GDP.

Discussion

It can be seen that the oil and gas sector accounts for the largest share in the nominal growth of the country's GDP indicator. Thus, in 2005-2023, the oil and gas sector ranked first with a cumulative share in GDP of 39.9%.

The Government of Azerbaijan, while playing a useful role in ensuring global energy security, is also constantly increasing measures to improve the business environment in the country, create and develop healthy competition and fight against monopolies. In addition to the above, it should be noted that high oil prices recorded in the world markets during the analyzed period, although having a positive impact on economic growth, also affect the strengthening of the manat exchange rate, which can also be assessed as a negative phenomenon.

The presence of rich natural oil and gas reserves in Azerbaijan also contributes to the state budget revenues. Thus, on average up to 50% of the

budget revenues in one form or another fall on the oil sector. At the same time, the share of the oil sector in total industrial production amounted to 10.1% in 1991, 46.2% in 1995, 71.8% in 2000, this figure was maintained in subsequent years, and in 2023 this figure was at the level of 63%.

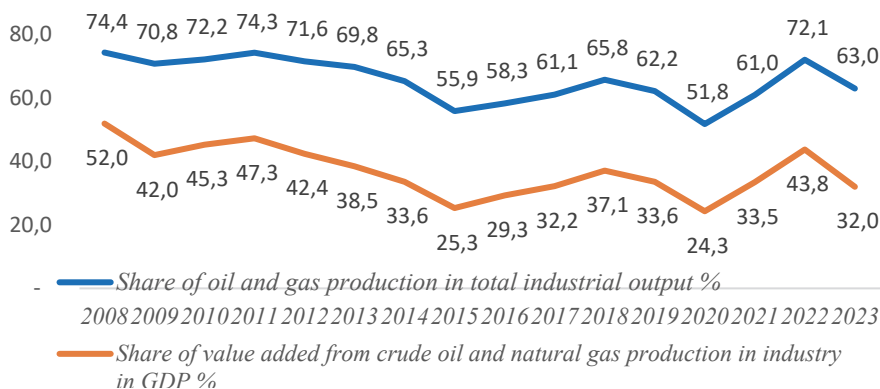


Figure 1 - Share of oil and gas production in industry (%)

The high share of GDP in the value created by the industry's crude oil and natural gas production indicates that the oil and gas industry is a key sector that can have a significant impact on the country's economic development.

The Government of Azerbaijan established the State Oil Fund of Azerbaijan in 1999 by decree of the President of Azerbaijan to reduce the negative effects of dollars flowing into the country's economy after the signing of the "Contract of the Century" in Azerbaijan in 1994 and decided to collect these funds in this Fund.

In 1998, four years after the signing of the "Contract of the Century" in 1994, Azerbaijan reached the 1991 level of oil production. After 1999, oil production continued with increasing dynamics, and only in 2004 oil production exceeded the volume of oil production in 1941. In 2010, oil production in Azerbaijan (including gas condensate) amounted to 50.8 million tons, which was the peak of the country's oil industry development. From this point of view, it is interesting to consider the dynamics of oil production by year.

The data in Table 2 show that since 2011, our country has been experiencing a downward trend in oil production every year. This decrease will amount to an average of 1.6 million tons for the period 2011-2023.

Table 2 - Oil production (including gas condensate) in Azerbaijan, thousand tons. Source: SSC2025a

<i>Years</i>	<i>Oil production (including gas condensate)</i>	<i>Growth rate %</i>	<i>1 barrel</i>
1997	9071	2.6	19.9
1998	11424	25.9	13.5
1999	13807	20.9	17.4
2000	14017	1.5	27.6
2001	14909	6.4	23.1
2002	15334	2.9	24.4
2003	15381	0.3	28.1
2004	15549	1.1	36.1
2005	22214	42.9	50.6
2006	32268	45.3	61
2007	42598	32.0	69.04
2008	44514	4.5	94.1
2009	50416	13.3	60.9
2010	50838	0.8	77.4
2011	45626	-10.3	107.5
2012	43375	-4.9	109.6
2013	43457	0.2	105.9
2014	42076	-3.2	96.3
2015	41628	-1.1	49.5
2016	41050	-1.4	40.8
2017	38688	-5.8	52.5
2018	38814	0.3	69.8
2019	37501	-3.4	64.1
2020	34532	-7.9	41.5
2021	34580	0.1	69.9
2022	32646	-5.6	100.1
2023	30147	-7.7	82.9

Observations confirm that a significant part of oil and gas production is exported for sale. In this regard, it is also interesting to determine the specific weight of oil, gas and mineral products in the export structure for 2000-2023. In this regard, let us look at Figure 2.

Observations confirm that the high share of gas and mineral products in the export structure indicates that oil and gas resources dominate the economy and that the economy needs diversification.

Figure 2 - Specific weight of oil, gas and mineral products in the structure of exports (%).
Source: SSC, 2025b

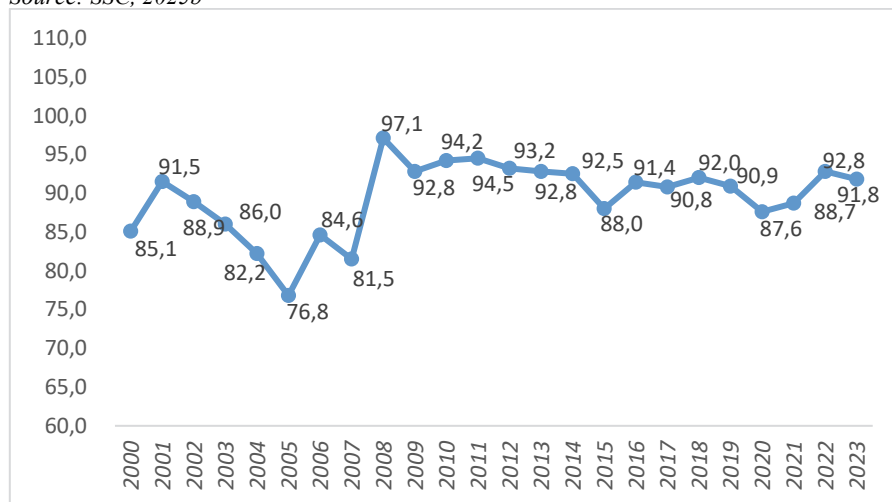


Table 3 - Real and nominal effective exchange rate. Source: (CBAR, 2025)

Years	Nominal effective rate	Real effective rate
2001	105,3	97,2
2002	97,3	86,9
2003	85,5	75,2
2004	80,2	74,2
2005	92,1	85,8
2006	90,0	89,0
2007	85,4	95,1
2008	100,1	121,8
2009	98,3	115,5
2010	104,2	127,7
2011	108,1	134,2
2012	108,3	130,3
2013	108,1	131,5
2014	124,5	146,6
2015	89,7	110,0
2016	66,3	91,3
2017	65,9	94,2
2018	72,6	99,6
2019	73,4	99,0
2020	75,6	100,3
2021	85,4	113,6
2022	95,2	122,3
2023	102,0	121,4

The increase in the share of oil products in exports has naturally led to the inflow of more foreign currency, or more precisely, dollars, into the country's economy. In this regard, it would be useful to consider the dynamics of nominal and real effective exchange rates.

The impact of oil revenues on the national economy in Azerbaijan began to be felt after 2001. This was manifested in the strengthening of the national currency – manat. The world crisis and financial turmoil in the international markets in 2007-2008 seriously affected the country's economy, especially the manat exchange rate, in connection with which the Central Bank in most years taken for analysis tried to keep the manat exchange rate more stable by conducting foreign currency purchase operations.

In general, we note that while in 2008 the manat appreciated by 22%, in 2023 this figure is 19%.

Conclusion

The conducted analyses show that the impact of oil and gas exports on the country's economy is significant. In general, there is a serious need to diversify exports. Thus, the volume of oil production has been decreasing year by year in recent years. This also indicates the need to develop the non-oil sector. The decrease in oil production naturally also has a significant impact on the state budget revenues.

In this regard, the development of non-oil sectors is necessary. In addition, we believe that the trend of decreasing oil production will also reduce its exports, which will have a less significant impact on the exchange rate of the national currency. It is also important to maintain the exchange rate of the national currency at an optimal level. The exchange rate of the manat should be maintained at such a level that it does not hinder the stimulation and development of exports. The share of the oil factor, that is, oil revenues, in the strengthening of the exchange rate of the manat is large. As oil revenues decrease, it will naturally affect not only the exchange rate of the national currency, but also other economic indicators. In this regard, it is important to create a revival in other sectors of the economy in the prospective period. Studies have shown that an increase of \$1 in domestic oil consumption adds \$0.4 to GDP. This will play a significant role in increasing the competitiveness of the country's economy and developing other sectors.

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