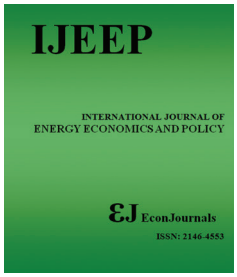

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The Impact of Oil Prices on the Import of Capital Goods in Azerbaijan

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ABSTRACT

The article studies theoretical and practical aspects of the oil prices impact on the import of capital goods in an oil-exporting country. Based on the two-step Engel-Granger procedure for cointegration analysis, the relationship between the real volume of imported capital goods per capita and the real price of Azeri light oil is examined. It has been determined that the real volume of imported capital goods per capita is highly dependent on the oil price, and the volatility of the oil price also affects the volatility of imports of capital goods. This also shows that investment activity in the country depends on oil prices. Therefore, it is necessary to spend oil revenues, regardless of oil prices, depending on the economic development goals and to pursue policies to transform oil revenues into stable growth factors.

Keywords: Oil Price, Capital Goods, Import, ECM
JEL Classifications: E22, O13, Q31, Q32

1. INTRODUCTION

Changes in oil prices affect many parameters of the national economy (Hamilton, 1983; Hamilton, 1996; Edelstein and Kilian, 2009; Kilian et al., 2009). This impact differs in the economies of oil exporting countries and oil importing countries. The rise in oil prices is considered as the cause of recessions, periods of excessive inflation, declining productivity, and slowing economic growth in oil-importing countries (Barsky and Kilian, 2004). But high oil prices generate more income to oil-exporting countries (Bjørnland, 2009). Because the price elasticity of demand and supply in the oil market is low in the short term (Kilian, 2020; Ahmadov, 2023). Therefore, the change in the oil prices cause a significant change in the volume of oil revenues in oil-exporting countries.

In oil-exporting countries, oil revenues were mainly used to accumulate currency reserves, import goods and services, and also reduce public debt (Beck and Kamps, 2009). Oil revenues in these countries can also be spent in the national economy. However, the economy of oil-exporting countries cannot absorb all oil revenues. Due to the volatility of oil prices, the ability of the national economy to adapt to changing demand in the short term is limited (Beck and Kamps, 2009). Moreover, the spending of oil income obtained in foreign currency in the country can lead an appreciation of the national currency and the appearance of symptoms of "Dutch disease" (Ahmadov, 2022).

The oil and gas sector play an important role in the economy of Azerbaijan. Thus, the share of the oil and gas sector in GDP fluctuated from 29.5% to 59.8%, and the share of oil revenues in state budget revenues - from 36.5% to 73.8% in 2002-2022. The significant increase in oil production in Azerbaijan occurred simultaneously with the rise in oil prices on the world market, and oil income played an important role in the development of the national economy. According to Mukhtarov et al. (2020), oil price increases have a positive effect on economic growth, consumer price index and export while a negative effect on exchange rate in Azerbaijan.

Investments in the non-oil sector, financed by oil income, increase the country's non-oil wealth, thereby complying with the principles of sustainable development. Imports of capital goods have a significant impact on the economic development of developing countries, which lag behind developed countries in terms of technology (Carrasco and Tovar-García, 2021; Herrerias and Orts, 2013; Habanabakize and Dickason-Koekemoer, 2022; Tala and Hlongwane; 2023). According to de Long and Summers (1993), in countries with high rates of economic growth, the volume of investment in machinery and equipment was large, and as the number of technological innovations reflected in equipment imported from developed countries increased, the efficiency of resource use increased. It should be noted that 86.1% of the machinery and equipment used in Azerbaijan in 2021 were imported.

The increase in oil revenues at Azerbaijan's disposal has created opportunities for financing the national economy (Figure 1). Thus, in 2022, the total volume of investment in fixed assets in the country's non-mining industry increased by 3.8 times compared to 2005. In 2005-2022, the ratios of oil revenues and total state budget expenditures spent in Azerbaijan through the state budget to non-oil GDP were equal to 33.6% and 55.0%.

As a result of the increase in oil revenues in Azerbaijan, investments in fixed assets increased by 5.0 times in 2021 and 5.4 times in 2022 compared to 2002. This growth led to an increase in the volume of imports of capital goods. In addition, the share of imported capital goods in fixed capital investment increased from 22.5% in 2002 to 36.3% in 2021 (Figure 2).

Therefore, increasing the import of capital goods from oil revenues is important from the point of view of economic growth and exchange policy. In this regard, it is important to study the pattern of connection between the price of oil and the import of capital goods in Azerbaijan.

2. LITERATURE REVIEW

Trade stimulates economic growth through increased domestic output (Awokuse, 2007). In particular, there is an interdependence between the level of development and the volume of foreign trade in small economies. Senhadji (1998) found that the income elasticity of import demand is on average <0.5, while the long-run income elasticities are close to 1.5. Zhou and Dube (2011) adopt the bounds testing approach to examine the validity of the co-integration restrictions embodied in import demand model specifications for the period of 1970-2007 in China, India, Brazil, and South Africa and found that the long-run income elasticity exceeds the short-run.

High oil prices represent a transfer of wealth from oil importers to oil exporters and generate a higher level of activity in oil-exporting economy (Bjørnland, 2009). Thus, the change in the price of oil in oil-exporting countries affects the change in income, which affects the volume of imports. The dependence on capital goods imports is systematically related to a country's level of income (Mutreja et al., 2018).

Algaeed (2018) examined empirically the impacts of oil price shock on the import demand function for the period of 1975-2015 in Saudi Arabia, using Robust OLS and unrestricted VAR model and found that 10% change in real oil price affect real import by 6%, on the other hand, 10% increase in real GDP leads to an increase in real import by 13%.

Capital goods are central elements for the generation and diffusion of technology, augmenting productivity, and technological capability in the developing countries (Baark, 1991). Greenwood et al. (1997) also confirm that investment in capital goods is a key determinant of productivity and economic growth (Greenwood et al. 1997).

According to Mutreja et al. (2018), international trade in capital goods affects economic development through two channels: capital formation and total factor productivity. They found that unimpeded trade in capital goods reduces the income gap between rich and poor countries by 40%.

The bulk of world export of capital goods concentrates in a few advanced countries, and for a majority of developing countries, the foreign sources of technology have been the major (90% or more) determinant of productivity growth (Keller, 2004).

Eaton and Kortum (2001) study imports of capital goods in 34 countries in 1985 and find that developing countries import most of their equipment. Mazumdar (2001) examined the relationship between imports of capital goods and economic growth in some selected developing countries using panel cointegration technique and found that imports of machinery and equipment positively and significantly stimulate economic growth.

Lee (1995) using two stage LS and Ordinary LS methods examined the role of imported capital goods on economic growth for 1960-1988 in 89 OECD countries and found that imported capital goods had a much higher productivity than domestically produced capital goods. Thus, lower-income countries can increase their efficiency in capital accumulation and productive process through importing relatively cheaper but technologically superior capital goods from the advanced countries (Lee, 1995).

Damilola (2014), using the ARDL method, showed that capital goods imports had a positive and significant impact on economic growth in both the short and long term in the West African currency area during the period 1970 to 2012.

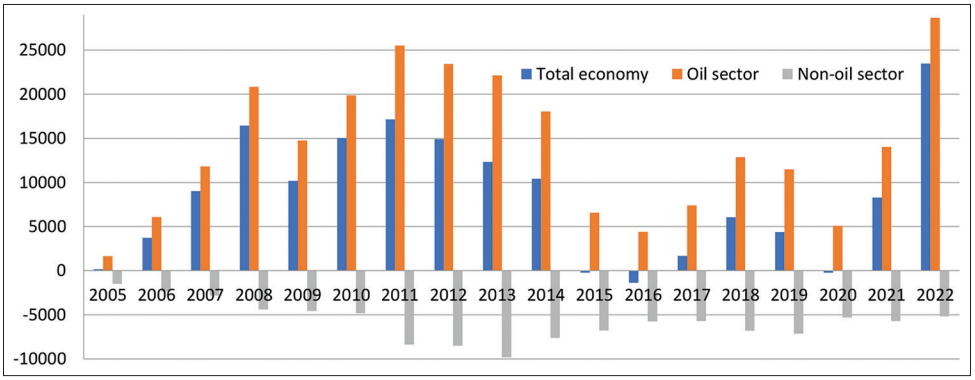
This paper examines the impact of oil prices on capital goods imports in Azerbaijan.

3. DATA AND METHODOLOGY

3.1. Data Descriptions

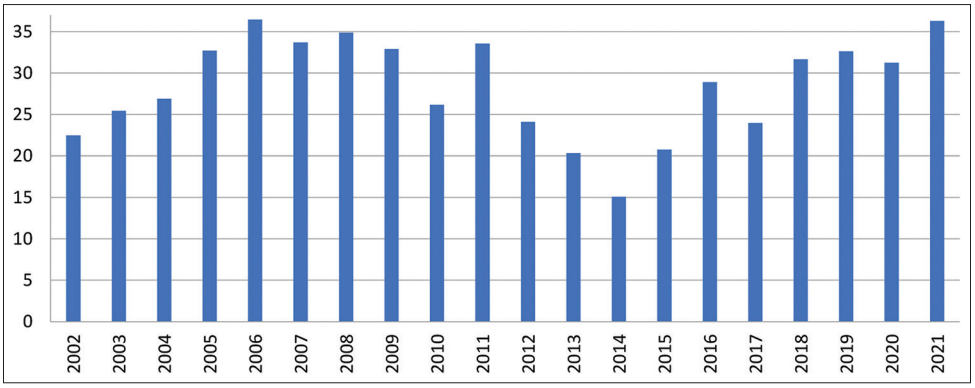
The nominal volume of added value in the oil and gas sector directly depends on the oil price. So, since the production and transportation costs of 1 ton of crude oil are relatively stable, the change in the oil price affects the change in income. An increase in oil revenues has a positive effect on the growth of

Figure 1: Current account balance in Azerbaijan (million US dollars)



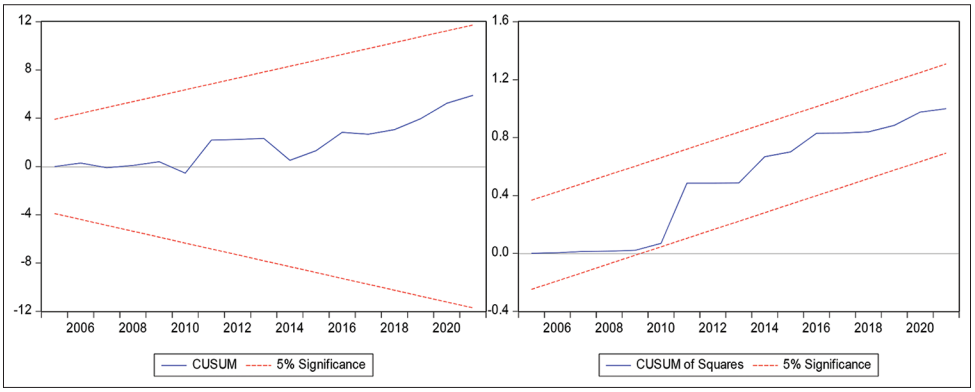
Source: cbar.az

Figure 2: Share of imported capital goods in the formation of fixed capital of Azerbaijan (%)



Source: stat.gov.az, https://wits.worldbank.org

Figure 3: CUSUM and CUSUM of squares test results



investment. This factor can also cause an increase in imports of capital goods. Thus, the study examines the relationship between the real volume of imported capital goods per capita (ig) and the real price of Azeri light oil (p). The nominal price of Azerbaijani light oil was obtained from state budget documents, the cost of capital goods in Azerbaijan was obtained from the World Bank database (www.stat.gov.az, www.maliyye.gov.az, www.stat.gov.az, www. maliyye.gov.az, www.data.worldbank.org, https://wits.worldbank.org). The per capita cost of capital goods is expressed in US dollars adjusted for US inflation and covers the years of 2002-2021. Nominal prices of Azeri light oil are expressed in real terms based on a price index calculated from World Bank data on annual nominal and real Brent oil prices (data.worldbank.org).

Descriptive statistics of ig and p time series and correlation between them are given in Tables 1 and 2.

Descriptive statistics show that the hypothesis that the time series ig and p are normally distributed is true.

The correlation coefficient between the ig and p time series was equal to 0.85, the t-statistic was equal to 6.87, and the probability (t-statistic) was equal to 0 (Table 2). These

indicators show that there is a high positive correlation between ig and p variables.

3.2. Methodology

The research used Engel-Granger two-step procedure for cointegration analysis to investigate the link between the real volume of the imported investment goods per capita (ig) and the of Azeri light oil real price (p) (Engle, and Granger, 1987).

In the first step, the time series is pre-tested for their order of integration. If the first differences (I(1)) are stationary, then the following regression equation for non-stationary variables is estimated, reflecting the long-run relationship between variables that are themselves non-stationary:

$$ig_t = c + \beta p_t + u_t \quad (1)$$

Here, c and β are the regression coefficients, ig and p are the dependent and independent variables, u is the white noise error, and t is time. If $\hat{u}_t \sim I(0)$, then there is cointegration between ig_t and p_t time series and it is not spurious. In the second step the relationship between the variables is examined by the following regression equation based on the error correction model (ECM):

$$\Delta ig_t = \alpha + b\Delta p_t + \gamma \hat{u}_{t-1} + \varepsilon_t \quad (2)$$

Table 1: Descriptive statistics of the variables

	ig	p-value
Mean	227.9446	53.12537
Median	232.3398	50.02192
Maximum	389.2057	83.16471
Minimum	58.08285	25.10000
SD	73.01677	19.45099
Skewness	−0.123127	0.264865
Kurtosis	3.653757	1.801264
Jarque-Bera	0.406699	1.431318
Probability	0.815993	0.488870
Sum	4558.892	1062.507
Sum Sq. Dev.	101297.5	7188.479
Observations	20	20

Table 2: Correlation between ig and p

Correlation	0.8507
t-Statistic	6.8666
Probability	0

Table 3: Critical values for the residual based ADF tests (t-Statistics) for cointegration (20 observation)

	1% level*	5% level*	10% level*
With Intercept only	−4.50188	−3.6585	−3.26398
With intercept and trend	−5.18823	−4.2896	−3.86608
No Intercept and No Trend	−2.6889	−1.9592	−1.62465

*MacKinnon (1991)

Here, $\hat{u}_{t-1}$ −error correction term, b–reflects the short-term effect of real oil price changes on ig, γ is the error-correction coefficient, which reflects the effect of long-term disequilibrium in the previous period. If the cointegration relationship between ig and p is stable, γ should be statistically significant and between −1 and 0.

3.2.1. The unit root test

At the first stage, the unit root of ig and p variables is estimated using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) criteria (Table 2) (Dickey and Fuller, 1981; Phillips and Perron, 1988). As a result of these tests, if ig and p variables are non-stationary and have the I(1) order of integration, and u_t from the equation (1) also are stationary with the constant, then there are co-integration relations between them (Engle and Granger, 1987). t-Statistics in the ADF test of u_t are compared with the critical values for cointegration (Table 3).

3.2.2. Engel-Granger and Phillips-Ouliaris co-integration tests

Engle-Granger and Phillips-Qualiris cointegration tests were performed to determine cointegration between ig and p variables.

3.2.3. Diagnostics

This study checks the (2) model through Breusch-Godfrey LM test, Breusch-Pagan-Godfrey Heteroskedasticity test, Ramsey RESET test and The CUSUM and CUSUMSQ tests. The normal distribution of white noise error is checked by the Jarque-Bera test and other tests (Tables 4 and 5).

4. EMPIRICAL RESULTS

ADF and PP tests show that time series ig and p are non-stationary, and their first differences (I(1)) are stationary (Table 6).

According to the calculations made using the ordinary least squares (OLS) method, the coefficients in the regression equation (1) were as follows.

$$ig_t = 58.28964 + 3.193483 * p_t \quad (3)$$

Here, R^2=0.723715, adjusted R^2=0.708366, t-statistic for iq is equal 6.866591 and probability is equal 0, t-statistic for constant is equal 2.22196 and probability is equal 0.0393. The residuals of the regression equation (3) are stationary (Tables 2 and 6). So, the critical value of the t-Statistic in the ADF test for the null hypothesis of no cointegration and no lags is approximately −3.37 at a significance level of 5% (Asterio and Hall, 2011).

Engle-Granger and Phillips-Qualiris cointegration tests show that there is a cointegration relationship between k and lpo variables (Tables 7 and 8).

Table 4: Diagnostic test results

	Ramsey RESET Test (t-statistic)	Jarque-Bera normality test	Breusch-Pagan-Godfrey Heteroskedasticity test		Breusch-Godfrey Serial Correlation LM Test		R^2
			F-statistic	Obs*R-squared	F-statistic	Obs*R-squared	
Value	1.743585	3.024448	0.342195	0.779377	0.460239	0.531253	0.688492
Prob.	0.1004	0.220419	0.7153	0.6773	0.5072	0.4661	

Table 5: Normality tests for ut (Null hypothesis: u_t has a normal distribution)

Method	Value	Adj. Value	Probability
Kolmogorov (D+)	0.159235	0.735143	0.3393
Kolmogorov (D-)	0.092368	0.426437	0.6951
Kolmogorov (D)	0.159235	0.735143	0.6522
Kuiper (V)	0.251602	1.177700	0.5684
Cramer-von Mises (W2)	0.065063	0.048891	0.7878
Watson (U2)	0.064689	0.062336	0.5508
Anderson-Darling (A2)	0.369012	0.369012	0.8788

Table 6: Result of ADF and PP unit root test (At Level Form)

Model	Variable	ADF	PP	Stationarity	I
With Intercept only	ig	−2.861347	−2.861347	N/S	I (1)
	p	−2.077632	−2.109241	N/S	I (1)
	Δig	−5.16968*	−5.16968*	S	I (0)
	Δp	−3.956244*	−3.933111*	S	I (0)
With Intercept and Trend	ig	−2.397598	−2.372445	N/S	I (1)
	p	−2.023455	−1.891291	N/S	I (1)
	Δig	−5.672969*	−5.940203*	S	I (0)
	Δp	−4.080409**	−4.18562**	S	I (0)
No Intercept and No Trend	ig	−0.11624	−0.11624	N/S	I (1)
	p	−0.329484	−0.281483	N/S	I (1)
	Δig	−5.251796*	−5.251796*	S	I (0)
	Δp	−4.060449*	−4.046232*	S	I (0)
With Intercept only	u_t	−4.656992*$_{s_0}$	−4.727959*$_{s_0}$	S	
With Intercept and Trend		−4.570238**$_{s_1}$	−13.87534*$_{s_0}$	S	
No Intercept and No Trend		−4.756438*$_{s_0}$	−4.7566438*$_{s_0}$	S	

* and ** - indicate rejection a unit root at the 1% and 5% significance levels respectively (MacKinnon (1996). s_0, s_1 - indicate confirmation of stationarity at the 1% and 5% significance levels respectively critical values of t-Statistics for cointegration (MacKinnon (1991))

Table 7: Engel-Granger and Phillips-Ouliaris co-integration tests

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
Engel-Granger co-integration test				
ig	−4.756438	0.0065	−18.6826	0.0135
Phillips-Ouliaris co-integration test				
ig	−4.965687	0.0043	−17.79731	0.0196

*MacKinnon (1996) P-values

Table 8: Granger causality tests (Lags: 1)

Null hypothesis	Obs	F-statistic	Prob.
p does not Granger Cause ig	19	3.9832	0.0633
ig does not Granger Cause p		0.23132	0.6371

Granger Causality Tests show p does Granger cause ig at a significance level of 10%.

Table 6 shows that Δig_t, Δp_t and $\hat{u}_t$ (ECT) are stationary. So, using OLS method the error correction model (ECM) specification in this case can be expressed as follows:

$$\Delta ig_t = 2.129293 * \Delta p_t - 0.940515 * ECT_{t-1} \quad (4)$$

The following tests also show that a random variable is normally distributed:

The tests performed that regression equation (4) is significant (Table 4 and Figure 3). As can be seen from regression equations (3) and (4), in the long run, a change in the real price of oil by 1 dollar will lead to a change in imports of capital goods by 3.2 dollars. This effect is significant. Thus, an increase in the price of oil by one dollar led to an increase in the average annual oil income per capita in Azerbaijan by approximately $14 in 2002-2021. At the same time, approximately 23% of the per capita income received as a result of an increase in the price of 1 barrel of oil by 1 dollar was spent on importing capital goods. At the same time, the change in p in the short term is significantly influenced by the deviation from the equilibrium trajectory in the previous year. Because a $1 increase in the change in the real oil price resulted in a $2.13 change in real capital goods imports per capita, the impact of a $1 deviation from the previous year's equilibrium path on the current year's change was $0.94. At the same time, regression equation (4) shows that approximately 94.1% of deviations from the long-term trajectory in the previous year are corrected in the current year. It can be concluded that the return of ig to the path of balance in Azerbaijan is happening quickly. This is due to the fact that capital expenditures of the state budget, which are carried out mainly from oil revenues in Azerbaijan, have a large share of investments (Ahmadov, 2022). Since the import of capital products is directly related to the volume of investment. Thus, the tests conducted show that the price of oil is one of the main factors determining the import of capital products, along with other parameters, in countries where revenues from oil exports have a significant share in financing the economy.

5. CONCLUSION

The study shows a positive dependence of imports of capital goods on the real price of oil in Azerbaijan. Both the price of oil and the volume of imports of capital goods have undergone significant fluctuations. Thus, the ratio of the standard deviation of the price of oil to its average price was equal to 0.37, and the ratio of the standard deviation of imports of capital products to its average annual volume was 0.32. In general, although investment is a variable component of total expenditure, the high dependence of the volume of imports of capital goods on the price of oil is a negative situation from the point of view of the sustainability of economic growth. Thus, it is appropriate that policies implemented to transform oil revenues into sustainable development factors should be less dependent on oil prices.

In Azerbaijan, with the exception of 2015 and 2016, the assets of the State Oil Fund grew steadily in 2002-2022 and in 2022 exceeded non-oil GDP by 1.2 times. Also, in 2005-2022, the average annual share of state ownership in investments in fixed capital of the non-oil sector was 66.7%, and the share of foreign investment was 6.4%. In this case, it is necessary to increase the financial capacity of the local private sector, using oil revenues. It is also advisable to spend oil revenues in the country for the

purpose of developing the national economy, regardless of oil prices, as well as to implement political measures towards turning oil revenues into factors of stable growth.

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