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IMPACT OF OIL PRICE ON AZERBAIJAN ECONOMY: RELATIONSHIP BETWEEN OIL PRICES, REAL EFFECTIVE EXCHANGE RATES AND REAL GDP[1].

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ABSTRACT

This paper analyzes the relationship between oil prices, real effective exchange rate, and real GDP in case of Azerbaijan economy. By using quarterly data from 2001Q1 to 2020Q1, we apply Vector Auto Regression (VAR) model. Our main findings indicate the existence of Granger causality between oil prices and GDP. In addition, by showing that shock to oil price causes 72% variations of fluctuations in real effective exchange rates, we also confirm that the Azerbaijan economy can be considered as experiencing Dutch Diseases. Even though our results illustrate the positive impact of a shock to the oil prices on GDP in the short run, in prolonged time it turns out to be negative.

Keywords: Oil price, Dutch Disease, non-oil GDP, Azerbaijan economy.

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INTRODUCTION

There is plenty of literature suggesting that oil prices and real exchange rate fluctuations affect significantly economic activity. The consequences of oil price fluctuations are distinct in oil-exporting and oil-importing countries. In this research our main focus is to reveal the relationship between Oil Price, GDP, and Real effective exchange rate in the case of Azerbaijan since Azerbaijan had been one of the biggest oil producers in the early twentieth century. After getting independence from the Union of Soviet Socialist Republic in 1991, Azerbaijan faced serious economic recession, as Azerbaijan's economy is forced to implement the economic transmission process from Centrally Planned Economy towards Market Economy. The third president of the Republic of Azerbaijan, Heydar Aliyev signed "The Contract of the Century" on September 20, 1994, in which this contract was turning point of Azerbaijan Economy. Signing this contract has resulted in the transportation of crude oil to the world market through Baku Tbilisi Ceyhan pipeline.

Azerbaijan's economy achieved significant economic development since the beginning of the 21st century. As we mentioned above, this economic development mainly relies on the oil sector of the economy.

Although, Azerbaijan tries to lessen its dependence on oil and oil revenues through the development of a non-oil sector and diversification of the economy, so far it achieved some success, but still, oil revenues comprise a significant part of real GDP. After starting the transportation of crude oil to the world market and substantially increase in the price of oil led to the inflow of revenue to Azerbaijan. Of course the rapid increase in oil revenues affects economic performance in Azerbaijan. For instance, in 2006, Azerbaijan was a leader country in the world as GDP growth rate was 34. 5% and also the money supply rose 2 times before financial depression in the world economy (Hasanov, 2010).

In order to draw a framework of the independency of the economy from the oil and oil products, we need to highlight some economic indicators. For example, table 1 indicates the share of oil products in Azerbaijan's export over the different years. In addition, the study by Aliyev and Nadirov (2016), which Autoregressive Distributed Lag Bounds Testing (ARDLBT) Approach to cointegration is employed for data covering 2000Q1-2015Q2, provides the evidence that 1% increase in oil prices result in nearly 0.29% rise in non-oil GDP while holding remaining variables fixed. On the other hand, 1% rise of average daily oil production leads to increasing of non-oil GDP by 0.17%.

Table 1: Azerbaijan Export Structure (%)

Products Exported	2003	2005	2006	2007	2008	2010
Crude petrol	70,07	51,04	60,40	53,05	92,49	86,53
Oil products	15,35	25,07	23,63	27,55	4,30	6,02

Source: *Data of Azerbaijan State Institute of Statistics,2011*

The empirical findings of this study show that that shock to oil price accounts for 72% variations of fluctuations in Real Effective Exchange Rates. Besides, we expected to find a negative relationship between oil price and GDP in the long-run. Even though our results show a positive impact of a shock to the oil prices on GDP in the short run, in prolonged time it turns out to be negative.

We are motivated to investigate this topic for the main reasons. First of all, numerous empirical studies explore how oil price changes affect different macroeconomic indicators such as real exchange rate, GDP, money supply. For example, Korhonen and Juurikkala (2009) studied this topic for nine OPEC countries, Koranchelian (2005) for Algeria context; M. Nagy Eltony and Mohammad Al-Awadi (2001) for Kuwaiti context and so on. Secondly, oil prices started to drop after 2014 and continue to wave at the end of the second decade of the 21st century. Due to these fluctuations, Azerbaijan national currency lost its value significantly against the USA dollar and GDP growth rate had been negative in 2017. Afore-mention reasons triggered us to study this topic in the case of Azerbaijan by using quarterly data from 2000 to 2020 which never applied this time frame before.

Remainder of the paper is organized as follow. In the next section we are going to conduct brief literature survey to determine our final hypotheses and to review similar papers for other countries. Then, we will point out our main hypotheses which we attempt to verify in our paper. In the section of data and methodology we will explain which methodology we will apply by referencing again literature and we will show the source of our dataset. The last section concludes the paper.

1. LITERATURE SURVEY

There is a large body of literature that explores empirical and theoretical aspects of relationship amongst oil price, Gross Domestic Product (GDP) and real effective exchange rate (REER) for both developing and developed countries. For the sake of saving space and avoiding replication we are going to represent a brief literature review of some studies which demonstrate how oil price fluctuations affect GDP and Real effective exchange rate in case of oil exporters and importers, since oil prices impact on various economies different ways.

The empirical paper by Hasanov (2010) investigates the impact of crude oil prices on the real exchange rate of Azerbaijan national currency, the Manat. Hasanov (2010) applies quarterly data from 2000-2007 and employ the Error Correction Model and Johansen integration approaches to estimate this relationship. The study found that there is a statistically significant and positive relationship between oil price and Azerbaijan's real exchange rate, a 1 % increase in oil prices causes a 0.7% rise in the real effective exchange rate. Besides, according to paper relative prices positively impact the real effective exchange rate of Azerbaijan manat which mostly related to fiscal expansion.

The main difference paper by Hasanov (2010) and our paper is that while Hasanov (2010) investigates how oil price fluctuations affect the exchange rate, we also pay attention to linkages between GDP and oil prices. Secondly, Hasanov (2010) applies data in the short-run (2000-2007) we expanded timeframe from 2000 to 2020 as well as we applied different methodology.

Mukhtarov, Aliyev and Zeynalov (2020) attempt to find how the change in oil prices affect inflation, exchange rate, economic growth and export in Azerbaijan. By using data from 2005 to 2019 and applying Johansen cointegration and VECM methods authors revealed that there is statistically significant and positive relationship between oil price and economic growth, inflation and export while oil prices impact negatively on exchange rate. In the similar study Mukhtarov, Mammadov and Ahmadov (2019) again verified relationship between oil price and inflation since 1 % increase in oil price leads to raise inflation by 0.58 % in Azerbaijan.

Another notable paper by Dikkaya and Doyar (2017) examines how quarterly oil prices affect GDP and the exchange rate for both Azerbaijan and Kazakhstan. Since both countries regained independence from the Soviet Union and their economy was vulnerable to oil prices. Mehmet and Bayram (2017) used the VAR model and Toda-Yamamoto casualty test to estimate ties between GDP, oil prices, and exchange rate. Results demonstrate that there is one-way causality between oil prices and GDP for Azerbaijan and Kazakhstan, this finding associated with results of other similar papers by Pradhan et al. (2015), Oksuzler (2011) by proving that any decrease in oil prices negatively affects economic growth in oil exporter countries which also suffer from Dutch Disease.

Eltony and Al-Awadi (2001) explore the impact of oil price fluctuations on macroeconomic variables, namely, Oil revenue, Government Development Expenditure, Government Current expenditure, CPI, Money Demand and value of imports of Goods and Services for Kuwaiti economy. We reference a study by Elton and Al-Awadi (2001) for three main reasons. First of all, the Kuwaiti economy significantly relies on oil income as Azerbaijan does, that's why we have expected a similar pattern. Secondly, variables, government development expenditure, and government current expenditure comprise the main parts of GDP which we expect a positive relationship between them. Finally, we will follow the similar methodology which Eltony and Al-Awadi (2001) addressed in their paper. The main outcomes of this study revealed that there is strong causality running from oil prices to oil revenues and government expenditures.

In one existing paper, by using the VECM model and annual data from 1970 to 2003 Koranchelian (2005) explored the long-run real exchange rate path and how oil prices affect the real exchange rate of Algeria Dinar. Koranchelian (2005) found that the actual oil price combined with relative productivity impacts on the real effective exchange rate statistically substantially and positively.

Farzanegan and Markwardt (2009) investigates the effects of oil price shocks on the Iranian Economy as Iran is another main oil exporter which its economy is considerably vulnerable to Oil price fluctuations. By applying the VAR model, authors proved that the rise in oil prices raise real effective exchange rate and appreciate Iran Rial in mid-run, this trend is considered one of the main syndromes of Dutch Disease. Besides, the empirical findings of the paper show that economic growth is significantly affected by Oil price changes. In a similar paper, Raguindin and Reyes (2005) attempt to find a relationship between Oil price changes and real GDP of the Philippines. The author used data on the Philippine economy from 1981 to 2003 and employed asymmetric VAR model and main findings of this paper showed that positive oil prices shock causes prolonged decreasing in real GDP.

One interesting study by Olomola and Adejume (2006) is devoted to impacts of oil price fluctuations on the real exchange rate, output, inflation, and money supply for Nigeria context by applying quarterly data from 1970 through 2003. By using VAR estimations, unexpectedly, authors revealed that oil price shocks do not affect substantially inflation and output. In the meantime, oil price fluctuations considerably affect the real exchange rate and determine the money supply in the long-run. To find the relationship between oil prices, GDP, and governmental revenues in the case of Venezuala El-Anashay (2005) applied data from 1950 to 2001 and used specific VAR and VECM. In the long run, they found economic growth consistent with fiscal balance which is also non-ignorable for short term fluctuation.

The empirical study by Aliyev, Ismayilov and Gasimov (2019) tries to examine relatively less explored but crucial relationship between Oil prices changes and non-oil tax revenues for Azerbaijan context. In order to draw reliable results authors apply Fully Modified Ordinary Lease Squares (FMOLS), Dynamic Ordinary Least Squares (DOLS), and Canonical Cointegration Regression (CCR) and data from 2000Q1 to 2015Q4. They found that as far as oil prices increase domestic production become less profitable and trigger companies to implement policy "to import and sell" rather "to produce and sell".

Until now, our focus is to review papers investigating relationship oil prices and various macroeconomic variables for oil exporters. Turning to oil importer countries and developed countries we see different patterns. For example, Jimenes-Rodriguez and Snaches (2005) shed light on the effects of oil price changes on economic activities for seven OECD countries. Authors conduct a multivariate model and applied symmetric and asymmetric models to estimate econometric equations. They conclude that an increase in oil prices leads to a larger impact on GDP that dropping in oil price does. They also highlighted that increases in oil price cause a significant negative effect on economic performance in oil importer countries, however amongst exporter countries this effect is questionable.

As we look at literature most of the works which estimate the relationship between oil prices and various macroeconomic variables used Vector Auto Regression model and elasticity estimation. Using this model allows the researcher to obtain reliable and exact results of how different macroeconomic variables respond to oil price changes. For example, Rautava (2004) employed the Johansen co-integration test and showed that a 10 % increase in oil price leads to rises in GDP by 2.2 %. Guneş (2013) by applying the structural VAR estimation model revealed that oil prices shock cause to fall in the real exchange rate in Turkey. When we summarize all of these studies, we conclude that various economies respond to oil price fluctuations, in particular in oil exporter countries, oil price shocks are significantly correlated with the real exchange rate and GDP.

2. HYPOTHESIS

Based on the vast literature, we proposed the following hypothesis:

As an oil-exporting country, the Azerbaijan economy experiences vulnerability to the fluctuations in oil prices. Thus, we propose that there is a positive relationship between oil prices and real exchange rates in Azerbaijan.

Secondly, by considering the literature which says that rising exchange rates (appreciation of the national currency) due to the sensitivity to oil prices is considered as one of the main indicators of Dutch Disease, we expect to confirm this result for Azerbaijan.

The next hypothesis is that there is a one-way causality between Oil prices and GDP.

Our final hypothesis suggests that as an oil-exporting country which consists of a large share of the country's foreign trade, the Azerbaijan economy experiences a negative relationship between oil price and Real GDP in the long-run.

3. DATA AND METHODOLOGY

We use quarterly data throughout 2001Q1 and 2020Q1 (72 sample observations). GDP data is taken from The State Statistics Committee of Azerbaijan Republic, and real effective exchange rates data are obtained from the Central Bank of Azerbaijan. We use the Federal Reserve Bank of St. Louis web site to conduct oil prices which are represented by Brent oil prices in the US dollar. To follow the literature, each variable is used in their nominal values (Yavuz (2006) and Tugcu (2014)). Real Effective Exchange Rate (REER) – it is calculated as a multilateral consumer price index based on the real effective exchange rate of the currency of domestic economy relative to its main trading partners which are defined in terms of foreign currency per unit of the domestic currency. Thus, the increase of REER means that domestic currency appreciates. (REER is calculated by Central Bank of Azerbaijan). So, our variables are Real Effective Exchange Rates (REER), Gross Domestic Product (GDP), and Brent oil price (Oil Price). To verify the aforementioned hypothesis, we use the Vector Auto-regression Model and apply a time series analysis. In order to test whether our data is stationary, the Unit Root Test is applied.

4. ESTIMATION RESULTS

First of all, to check the stationarity of our time-series, we run the Unit Root Test. Table 2 indicates that the p-value of the Augmented Dickey-Fuller test is 0.0058 which is less than a 5% significance level, thus we reject the Null which means that our time-series is stationary at 1st difference. (Initially, the p-value was higher than 5% in level, so we use 1st difference). The same test results are 0.00 for both Oil Price and REER in 1st difference. (The results table for Oil Price and REER is given in appendix A2). Therefore, all three variables have no unit roots and all of them are stationary time-series. Besides, we also run the Kwiatkowski-Phillips-Schmidt-Shin test which shows that all variables are stationary in 1st difference. (Complete results of KPSS test is given in appendix A1).

Table 2: Augmented Dickey-Fuller test statistic

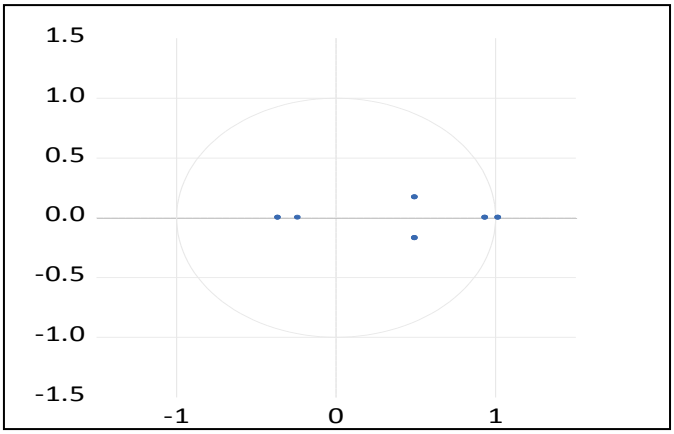
Variable name	P-value at level	P-value at 1st difference
GDP	0.9061	0.0058
REER	0.5123	0
Oil_price	0.1542	0

Source: *Authors' own completion*

Figure 1 elucidates the inverse roots of the characteristic AR polynomial. As we see from the chart, all roots have absolute values which are lower than one and locate inside the unit circle (except one value).

To show causality between variables, we apply the Granger Causality test and the results are given by table 3. Starting from the top of the table, where the Oil price is dependent while GDP and REER are the independent variables. P values are 0.9536 for GDP and 0.4095 for REER which both are higher than the 5% significance level. It reveals that neither GDP nor REER can jointly cause oil prices, due to the p-value is higher than the alfa level. However, from the middle part of the table, we see that the p-value is 0.0052 for Oil price and 0.1781 for REER, respectively. It means that Oil Price can Granger cause GDP due to p-value is less than 5% significance level, while the real effective exchange rate does not cause for GDP.

Figure 1: Inverse roots of AR characteristics polynomial



Source: *Authors' own completion*

Table 3: VAR Granger Causality/Block Exogeneity Wald Tests

Sample: 2001Q2 2020Q1			
Included observations: 74			
Dependent variable: OIL_PRICE			
Excluded	Chi-sq	Df	Prob.
GDP	0.09507	2	0.9536
REER	1.785473	2	0.4095
All	2.012977	4	0.7334
Dependent variable: GDP			
Excluded	Chi-sq	Df	Prob.
OIL_PRICE	10.52453	2	0.0052
REER	3.450989	2	0.1781
All	12.22862	4	0.0157
Dependent variable: REER			
Excluded	Chi-sq	Df	Prob.
OIL_PRICE	40.08628	2	0
GDP	2.395241	2	0.3019
All	41.9431	4	0

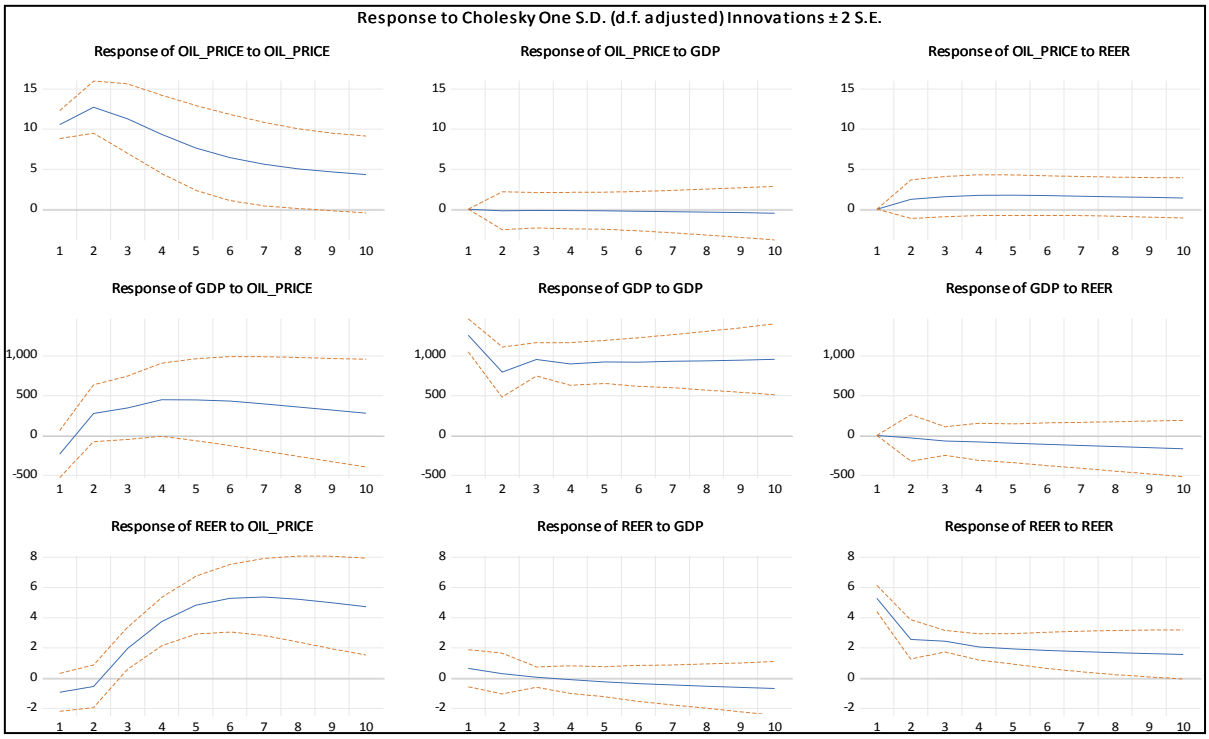
Source: *Authors' own completion*

The final part of the table (where REER is the dependent variable) shows that the p-value is 0 for the Oil price. Therefore, we may claim that null-hypothesis for the Oil price is rejected, thus Oil price does Granger cause REER. However, we fail to reject the null due to the p-value for GDP is 0.3019 which is higher than 5%, thus GDP does not cause real effective exchange rates. In this part, we will explain how these variables react to each other in the next 8 year period. Figure 4 represents how these variables respond to each other as a result of one standard deviation to variable.

GDP - GDP starts to increase rapidly in the first year, keeps increasing slowly till the 4th period, remains stable till 6th years, but then starts to decrease all the next periods in response one SD shock to the Oil price. However, one SD shock to real effective exchange rate reduces the GDP through all the periods which is always below zero lines starting from zero in the 1st period. REER - Real effective exchange rate starts to rise from the negative value in the first year, hits the zero in the second period, and keeps constant for the next periods in response to one SD shock to the Oil price. Unlikely, a shock to the GDP makes REER smaller till the 3rd year then reach zero and keeps diminishing for the next periods.

Oil Price – from figure 4, it seems that one standard deviation shock to GDP diminishes the Oil price through all the periods which is always below zero levels. On the other hand, Oil price climbs swiftly in the 2nd period, keeps growing slowly till 4th years, then becomes slightly smaller for further years in response to a shock to REER.

Figure 2: Impulse response analyses



Source: *Authors' own completion*

In figure 5, variance decompositions of the variables are represented. For instance, as we see from the top of the table, a shock to the real effective exchange rates accounts 3 percent variation of fluctuation in Oil price in the long-run while this figure for GDP is just over 1 percent. The middle part of the table indicates that shock to the Oil price can cause a 12 % variation in fluctuation in GDP in the long run; however, for REER, this number is just slightly over 1 % at the end of the period. Interestingly, the final part of the chart illuminates that shock to the Oil price accounts 3% variation of fluctuation in REER in the initial year, while 72% at the final stage of the period. This figure for GDP is decreasing till the ending period which is 0.86 percent in the long-run.

Figure 3: Variance decomposition analyses

Variance Decomposition of OIL_PRICE:				
Period	S.E.	OIL_PRICE	GDP	REER
1	10.56495	100.0000	0.000000	0.000000
2	16.60325	99.42809	0.015214	0.556695
3	20.14155	99.00465	0.015714	0.979640
4	22.26931	98.56941	0.019503	1.411085
5	23.61118	98.17337	0.024633	1.801993
6	24.53334	97.81846	0.033333	2.148205
7	25.22194	97.50586	0.046415	2.447724
8	25.77265	97.22942	0.065134	2.705442
9	26.23411	96.98206	0.090279	2.927666
10	26.63211	96.75673	0.122519	3.120752
Variance Decomposition of GDP:				
Period	S.E.	OIL_PRICE	GDP	REER
1	1283.479	3.300804	96.69920	0.000000
2	1537.191	5.591511	94.36649	0.041999
3	1845.779	7.454194	92.37439	0.171412
4	2104.019	10.31301	89.40961	0.277378
5	2344.076	11.97178	87.62922	0.399001
6	2558.935	12.91026	86.56680	0.522938
7	2755.592	13.21180	86.13071	0.657492
8	2936.942	13.12277	86.07559	0.801634
9	3106.717	12.78228	86.26172	0.956005
10	3267.455	12.29581	86.58460	1.119584
Variance Decomposition of REER:				
Period	S.E.	OIL_PRICE	GDP	REER
1	5.399497	3.060992	1.411869	95.52714
2	6.007228	3.319610	1.374744	95.30565
3	6.778331	11.10223	1.086416	87.81136
4	8.011050	29.72603	0.796673	69.47729
5	9.554178	46.43353	0.632664	52.93380
6	11.07750	57.32479	0.579202	42.09601
7	12.44104	64.04663	0.595739	35.35763
8	13.61051	68.27123	0.656164	31.07261
9	14.60106	71.02157	0.749234	28.22920
10	15.44087	72.87189	0.869372	26.25873

Note: Cholesky Ordering: OIL_PRICE GDP REER

Source: *Authors' own completion*

CONCLUSION

All in all, based on extensive literature review, we come up with some hypotheses about the Azerbaijan economy. By using quarterly data covering from 2000 to 2020, we apply Vector Autoregression (VAR) model to test our hypothesis. For example, in respect to our first hypothesis we expected to find a positive relationship between oil price and exchange rate. Our findings show that shock to oil price accounts for 72% variations of fluctuations in Real Effective Exchange Rates. Therefore, our finding is consistent with the current studies by Hasanov (2010) who found that there is a statistically significant and positive relationship between oil price and Azerbaijan's real exchange rate, and the research by Farzanegan and Markwardt (2009), who also proved that the rise in oil prices raise real effective exchange rate and appreciate Iran Rial in mid-run. This result also can be considered as one of the indicators of "Dutch Disease" in the Azerbaijan economy.

Our statistics results also verify our second hypothesis, so we obtained the similar results with the research by Mehmet and Bayram (2017) which is the existence of one-way causality between Oil price and GDP where the findings indicated the existence of Granger Causality. The results of this research, almost verify our final hypothesis which expected to find a negative relationship between oil price and GDP in the long-run. Even though our results show a positive impact of a shock to the oil prices on GDP in the short run, in prolonged time it turns out to be negative. Despite the lack of data and possible limitations of the methodology, these results may have important implications for government authorities. By highlighting the sensitivity, and vulnerability of the Azerbaijan economy which significantly depends on oil prices, the government institutions need to make some policies to expand economic diversification of the non-oil sector to build up a sustainable economy.

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