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THE EFFECTS OF OIL PRICES ON TURKEY'S FOREIGN TRADE RELATIONS TO AZERBAIJAN*

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Abstract

Turkey is one of the most important trade partners of Azerbaijan. Also, Azerbaijan's national income is highly depended on oil revenues. Hence, this study aims to investigate the effects of oil prices on Azerbaijan's imports from Turkey. For this purpose, a vector autoregression (VAR) model is estimated using quarterly data on imports, GDP, exchange rate and oil prices covering 2001-2016. Among other results, we find that a shock to oil prices positively affects Azerbaijan's imports from Turkey. Furthermore, changes in Azerbaijan's imports from Turkey are explained by oil prices about 11%.

Keywords**:** Oil prices, foreign trade, Azerbaijan, VAR model

JEL Classification**:** C22, F10, Q43

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1. Introduction

Because of having heavy investments in its oil fields, Azerbaijan has emerged as an energy-rich country since the mid 1990's. After independence, the country needed urgent financial funds and entrepreneurs to reestablish its ex-socialistic economy. Due to its market economy experiences and stronger relations with the global economy, Turkey became important country for Azerbaijan. Furthermore, Turkey's trade relations with Azerbaijan have been relatively more important than other Turkish Republics emerged post-Soviet space, because Azerbaijan is the closest country to Turkey and very similar features at social and cultural level.

Foreign trade between Turkey and Azerbaijan is considerably based on energy (especially oil and natural gas) production and exports. These countries are connected to each other with two oil and gas pipelines, named Baku-Tbilisi-Ceyhan and Baku-Tbilisi-Erzurum. When the Baku-Tbilisi-Erzurum pipeline became operational in 2007, it not only allowed Turkey to have access to cheaper gas, but also equipped Ankara with a hedge against Moscow and Tehran.

While oil prices declined from the mid-2014 to today, trade relations between these countries also tended to decrease. Falling in trade figures demonstrate that Turkey's trade connections towards Azerbaijan is depended on the fluctuations in oil prices. Therefore, this paper aims to investigate the relationship between oil prices and Turkey's trade relations to Azerbaijan.

To the best of our knowledge, no work examines the effects of oil prices specifically on Azerbaijan's imports from Turkey. Therefore, our aim is to show the impact of oil prices on Azerbaijan's imports from Turkey. Quarterly dataset covering 2001-2016, which includes imports, GDP, exchange rate and oil prices, is employed to estimate a VAR model. According to impulse-response results, Azerbaijan's imports from Turkey positively affected by a shock on oil prices. Also, oil prices can explain about 11% of total changes in Azerbaijan's imports from Turkey.

Remainder of the paper is organized as follows: Section 2 summarizes the related literature. Section 3 explains data, model and methodology. Section 4 presents empirical results. Section 5 concludes.

2. Literature Review

Even the most of the papers in the literature investigate the effects of oil prices on economic growth, there are some works on the relationship between exports and oil prices. Among them, Altıntaş (2013) uses autoregressive distributed lag (ARDL) and 1987-2010 data for Turkey. Results show that 1% increases in oil prices and foreign income increase exports of Turkey by 0.22% and 5.61% when 1% increase in exchange rate decreases exports of Turkey by 0.61%. Çulha, Özmen and Yılmaz (2015) use fixed-effects and generalized method of moments (GMM) on 2003-2013 data for Turkey. They also consider 67 countries which are main export destinations for Turkey. They find when a 1% increase in oil prices expands Turkish exports to oil exporting countries by 0.08%-0.11%, it also decreases Turkey's exports to oil importing developed countries by 0.06%-0.11%. Wei and Guo (2016) use VAR model and 1996-2014 quarterly data for China. According to the results, a shock to oil prices increase exports. Alagöz, Alacahan and Akarsu (2017) estimate current account function of Turkey, China, Kazakhstan, Mexico, Indonesia, Costa Rica, Colombia and South Africa using generalized method of moments (GMM), random-effects, fixed-effects and pooled ordinary least squares. Their data covers 1980-2016 and results show that a one unit increase in oil prices decreases current account by 30 million USD. Göçer and Bulut (2015) use Maki cointegration and Hacker and Hatemi-J causality tests on 1992-2014 quarterly data for Russia. They find that variables have long-run relationship. In addition, 1% increase in oil prices increase exports by 1.01%. Chen and Hsu (2012) use generalized autoregressive conditional heteroskedasticity (GARCH) on 1984-2008 data for 84 countries. Their main result is that oil price fluctuations decrease international trade. Özlale and Pekkurnaz (2010) examine the relationship between current account ratio and oil prices for Turkey. Their monthly data spans 1999-2008. They find that a shock to change in oil prices declines the change in current account ratio.

Among works on the relationship between oil prices and output, Sarwar, Chen and Waheed (2017) use 1960-2014 data for 210 countries. Taking into consideration electricity consumption, they find their variables are cointegrated. According to the results of fully modified OLS, a 1% increase in oil prices increase GDP by 0.112% for the whole panel. Gökmenoğlu, Azin and Taşpınar (2015) use 1961-2012 data for Turkey and show oil prices Granger cause industrial production. Using Toda-Yamamoto causality test, Dikkaya and Doyar (2017) find unidirectional causalities from oil prices to GDP, from exchange rate to oil prices and from GDP to exchange rate for Azerbaijan. They also show that there are unidirectional causalities from oil prices to GDP, from exchange rate to GDP and from GDP to exchange rate for Kazakhstan. Alpdoğan and Tok (2018) use various cointegration tests, and fully modified OLS and dynamic OLS on 1995-2016 data for OECD countries. They find that a 1% increase in oil prices increase gross national product (GNP) about 0.3%.

3. Data, Model and Methodology

We use quarterly data on imports of Azerbaijan from Turkey (current US$), nominal GDP of Azerbaijan in domestic currency, and domestic currency of Azerbaijan per dollar, and Brent oil prices per barrel (current US$). The data cover 2001Q01-2016Q04. Import series is obtained from TUIK (2018) (Turkish Statistical Institute) when oil price series is obtained from EIA (2018) (U.S. Energy Information Administration). GDP and exchange rate series are sourced from International Financial Statistics of IMF (2018).
For oil prices, we choose values in the last month of each quarter. We also transform GDP from domestic currency to US$ using exchange rate data mentioned above. Quarterly data are seasonally adjusted using moving averages. Seasonally adjusted variables are used in their natural logs and abbreviated as $\log IMP$ for natural log of imports, $\log GDP$ for natural log of GDP, $\log EXC$ for natural log of exchange rate and $\log OIL$ for natural log of oil prices. Our model in vector autoregression (VAR) form can be demonstrated as follows:

$$A_t = c + \alpha_1 A_{t-1} + \cdots + \alpha_p A_{t-p} + \varepsilon_t$$

Here, t stands for times. A_t is 4×1 $\log IMP$, $\log GDP$, $\log EXC$ and $\log OIL$ vector, c is 4×1 constant term vector, α_r is 4×4 coefficient matrix for lag $r = 1,2, \dots, p$, and ε_t is 4×1 vector of errors.

Our econometric analysis begins with unit root tests. We implement Augmented Dickey and Fuller (1981) (ADF) and Phillips and Perron (1988) (PP) unit root tests. Then VAR(p) model is estimated. Each variable in the model is employed in their stationary levels. Optimum lag order p is chosen as the lag order recommended by the majority of the information criteria. Then, impulse-response is conducted to show how a shock to oil prices affects the imports. Finally, variance decomposition is utilized to see the source of changes in imports.

4. Empirical Results

ADF and PP unit root tests are implemented to see the stationarity orders of the variables. According to Table 1, each variable is stationary in their first differences both with equations with constant and equations with constant and trend.

Table 1. Unit root tests

	ADF				PP			
	Constant		Constant + Trend		Constant		Constant + Trend	
	Level	1st Dif.	Level	1st Dif.	Level	1st Dif.	Level	1st Dif.
$\log IMP$	-1.6119	-7.7845***	0.1962	-8.5354***	-1.5888	-7.7993***	0.1962	-8.5354***
$\log GDP$	-2.0899	-7.1314***	0.5910	-7.9291***	-1.9237	-7.3174***	0.7213	-7.9308***
$\log EXC$	-1.1306	-4.0681***	0.7004	-4.4791***	0.5192	-8.1253***	1.3156	-8.5545***
$\log OIL$	-1.8959	-6.8144***	-1.4923	-6.8549***	-1.9125	-6.7366***	-1.5442	-6.7866***

*** shows significance at 1% level. Lag length for ADF test is chosen by Schwarz Information Criterion. Barlett Kernel is used as the spectral estimation method and the bandwidth is determined using the Newey–West method for PP test.

Since the variables are stationary in their first differences, VAR model is estimated using first differenced variables. According to majority of information criteria, optimum lag order is 4 (see Table A1). Estimated VAR(4) model (see Table A2) is found to be stable (see Figure A1). Also, residuals of VAR(4) are serially uncorrelated (see Table A3) and homoscedastic (see Table A4).

Since the impulse-response functions are highly sensitive to ordering of the variables, generalized impulses are chosen. Responses of oil prices is not indicated purposely, since it does not make sense in the context of economics. Responses of the variables to generalized one standard error shock to a variable for 10 periods are shown on Figures 1-12.

Imports give high and positive response to a shock in itself (see Figure 1). The response is mostly positive. It is negative only in fourth, eighth and tenth periods. Imports give largely positive response to a shock in GDP (see Figure 2). In tenth period, the effect turns to be negative. It is negative only in fourth, eighth and tenth periods. Response of imports to a shock in exchange rate is found mostly negative (see Figure 3). It is positive in sixth and tenth periods.

A shock to imports creates mostly positive effect on GDP (see Figure 4). The response is found to be negative in third, fourth, seventh and tenth periods. GDP gives high and positive response to a shock to itself (see Figure 5). The response is mostly positive. It is negative in sixth and tenth periods. Response of GDP to a shock in exchange rate is found mostly negative (see Figure 6). The response is positive in around second, sixth and ninth periods.

Response of exchange rate to a shock in imports is also found mostly negative (see Figure 7) The response is positive only in third, seventh and tenth periods. Exchange rate also gives negative response to a shock in GDP (see Figure 8). The response is slightly positive in around seventh and ninth periods. Response of exchange rate to a shock in itself is mostly positive (see Figure 9). The response is negative in second, fifth, sixth and ninth periods.

Figure 1. $\Delta \log IMP$ to $\Delta \log IMP$

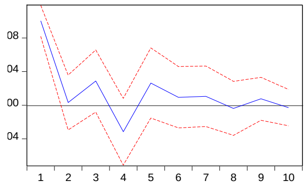


Figure 2. Response of $\Delta \log IMP$ to $\Delta \log GDP$

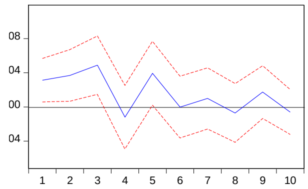


Figure 3. Response of $\Delta \log IMP$ to $\Delta \log EXC$

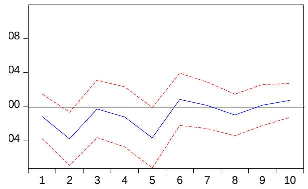


Figure 4. Response of $\Delta \log GDP$ to $\Delta \log IMP$

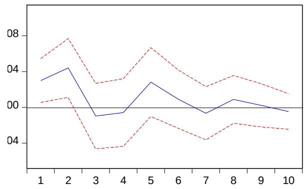


Figure 5. Response of $\Delta \log GDP$ to $\Delta \log GDP$

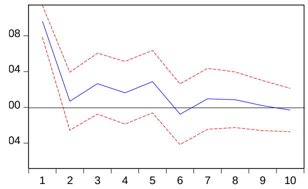


Figure 6. Response of $\Delta \log GDP$ to $\Delta \log EXC$

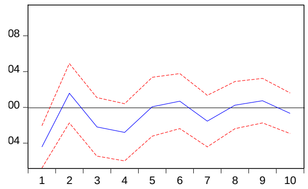


Figure 7. Response of $\Delta \log EXC$ to $\Delta \log IMP$

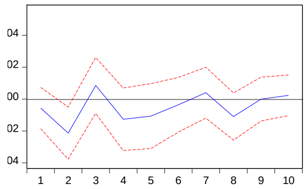


Figure 8. Response of $\Delta \log EXC$ to $\Delta \log GDP$

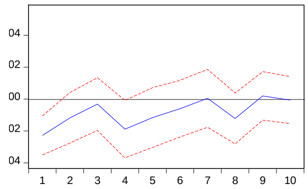


Figure 9. Response of $\Delta \log EXC$ to $\Delta \log EXC$

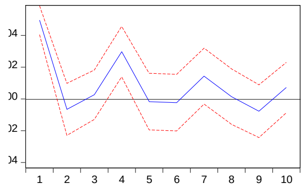


Figure 10. Response of $\Delta \log IMP$ to $\Delta \log OIL$

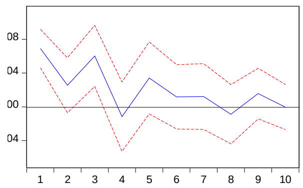


Figure 11. Response of $\Delta \log GDP$ to $\Delta \log OIL$

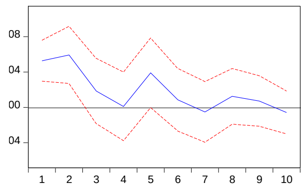
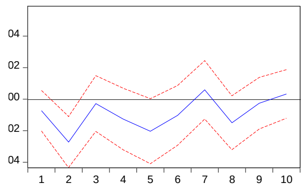


Figure 12. Response of $\Delta \log EXC$ to $\Delta \log OIL$



Imports give generally positive response to a shock in oil prices (see Figure 10). Also this response is high in the first periods. The response turns to be negative only in fourth and eighth periods. GDP also gives mostly positive response to a shock in oil prices (see Figure 11). The response is negative only in seventh and tenth periods. Unlike imports and GDP, exchange rate gives generally negative response to a shock in oil prices (see Figure 12). The response is positive in seventh and tenth periods.

Variance decompositions of imports, GDP and exchange rate are shown in Tables 2-4. However, variance decomposition of oil prices is not given for the same reason as in the impulse-response functions stated above.

Table 2. Variance decomposition of $\Delta \log IMP$

Period	S.E.	$\Delta \log IMP$	$\Delta \log GDP$	$\Delta \log EXC$	$\Delta \log OIL$
1	0.1003	100.0000	0.0000	0.0000	0.0000
2	0.1115	81.0883	11.4770	4.2734	3.1613
3	0.1300	64.4790	18.8764	5.9476	10.6970
4	0.1367	63.7185	17.1222	7.2549	11.9045
5	0.1449	59.9538	20.3497	8.5871	11.1094
6	0.1458	59.6280	20.1494	8.8788	11.3438
7	0.1466	59.5585	20.1783	8.9929	11.2704
8	0.1475	58.8484	20.0922	9.8568	11.2026
9	0.1491	57.8761	20.7966	10.1902	11.1371
10	0.1494	57.6834	20.8438	10.2710	11.2019

Table 2 shows variance decomposition of imports. In the first period, changes in imports are totally self-explained. The share of imports decreases gradually to 58% when others increase. Oil prices can explain changes in imports about 3% in the first period. Then it increases up to 12% in fourth period. In the last period shares of GDP, exchange rate and oil prices are 21%, 10% and 11%, respectively.

Table 3. Variance decomposition of $\Delta \log GDP$

Period	S.E.	$\Delta \log IMP$	$\Delta \log GDP$	$\Delta \log EXC$	$\Delta \log OIL$
1	0.0964	9.7217	90.2783	0.0000	0.0000
2	0.1179	20.4836	60.6982	2.8368	15.9815
3	0.1252	18.7793	60.0625	3.1784	17.9798
4	0.1288	17.9470	58.9619	6.0932	16.9978
5	0.1354	20.5811	55.7094	6.7276	16.9820
6	0.1365	20.6853	55.4581	6.6852	17.1713
7	0.1379	20.5065	55.1519	7.3212	17.0204
8	0.1386	20.7092	54.7752	7.5012	17.0144
9	0.1391	20.5886	54.3875	7.9031	17.1209
10	0.1395	20.5880	54.1021	8.2660	17.0440

Table 3 indicates variance decomposition of GDP. Imports and GDP explain total changes in GDP in the first period by 10% and 90%, respectively. In the following periods, the shares of imports and GDP decrease when the shares of exchange rate and oil prices increase up to 8% and 17%, respectively. In the explanation of the changes in GDP, it can be said that growth speed of exchange rate is higher than that of oil prices.

Table 4 shows variance decomposition of exchange rate. In the first period, GDP is an important variable that explains the changes in exchange rate. Accordingly, exchange rate itself and GDP explain total changes in exchange rate by 79% and 20%, respectively. In the following periods, the share of imports increases up to 17% when it was only 1% in the first period. In the end of the period, the share of exchange rate decreases to 54% when the shares of GDP and oil prices are 17% and 12%, respectively.

Table 4. Variance decomposition of $\Delta \log EXC$

Period	S.E.	$\Delta \log IMP$	$\Delta \log GDP$	$\Delta \log EXC$	$\Delta \log OIL$
1	0.0496	1.2845	19.8320	78.8836	0.0000
2	0.0577	14.5930	15.5274	63.2231	6.6566
3	0.0597	15.7329	15.6038	59.2627	9.4006
4	0.0674	15.8428	17.6529	59.1141	7.3901
5	0.0708	16.6660	17.5379	54.8233	10.9727
6	0.0718	16.4319	17.5511	53.8818	12.1352
7	0.0738	15.8460	16.6248	55.8747	11.6546
8	0.0755	17.2364	17.3556	53.6710	11.7370
9	0.0760	17.0003	17.1941	53.9421	11.8636
10	0.0765	16.8836	17.0171	54.2884	11.8109

When we take into consider overall results, we can say that oil price shocks have positive effects on Azerbaijan’s imports from Turkey. Also, 11% of changes in Azerbaijan’s imports from Turkey due to oil prices.

5. Conclusions

Azerbaijan is an important country for Turkey referring foreign trade, foreign direct investments and socio-economic interactions. Turkey’s energy needs and Azerbaijan's current necessities established dependency among these countries to some extent. Infrastructural investments (via construction companies) and industrial expansion of Turkish businesspeople towards ex-Soviet sphere more influenced Azerbaijan.

Current paper use quarterly data on Azerbaijan’s imports from Turkey, GDP, exchange rate and oil prices and estimate a VAR model. Within the framework of estimated VAR model, we show impulse-response functions and variance decompositions. It is seen that, among other results, Azerbaijan’s imports from Turkey give generally positive response to a positive shock to oil prices. Also, according to variance decompositions, oil price (after imports and GDP) is an important variable which explains the changes in imports about 11%.

Our results confirm the sensitivity of Azerbaijan’s imports from Turkey to oil prices. When we consider Azerbaijan’s high dependency to oil revenues, increases in oil prices provide higher GDP, and increasing GDP leads to higher imports from Turkey. Since we limit the imports only with Turkey, effects of oil prices on total imports may be higher than that of from Turkey.

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Appendices

Table A1. Lag order selection

	Lag 0	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5
Log Likelihood	202.1672	232.0027	251.1741	266.3523	286.3103	300.9652
LR	NA	54.5269	32.3930	23.5523	28.2166*	18.6976
Final Prediction Error	1.27e-08	7.87e-09	7.11e-09	7.47e-09	6.78e-09*	7.60e-09
Akaike Information Criterion	-6.8334	-7.3104	-7.4198	-7.3915	-7.5279*	-7.4816
Schwarz Information Criterion	-6.6913*	-6.5999	-6.1409	-5.5442	-5.1123	-4.4975
Hannan-Quinn Inf. Criterion	-6.7780	-7.0337*	-6.9216	-6.6719	-6.5870	-6.3192

* indicates the lag order selected by related criterion.

Table A2. VAR(4) estimation

	$\Delta \log IMP$	$\Delta \log GDP$	$\Delta \log EXC$	$\Delta \log OIL$
$\Delta \log IMP\ (-1)$	-0.2629 (0.1904)	0.0286 (0.1830)	-0.0553 (0.0942)	-0.7116** (0.3595)
$\Delta \log IMP\ (-2)$	-0.1866 (0.1823)	-0.1016 (0.1751)	0.0850 (0.0902)	-0.3086 (0.3441)
$\Delta \log IMP\ (-3)$	-0.2326 (0.1727)	-0.0297 (0.1660)	-0.1122 (0.0855)	0.2660 (0.3261)
$\Delta \log IMP\ (-4)$	-0.0629 (0.1480)	-0.0568 (0.1423)	0.0613 (0.0733)	-0.0430 (0.2795)
$\Delta \log GDP\ (-1)$	0.1484 (0.1915)	-0.2968 (0.1840)	-0.0253 (0.0948)	0.2501 (0.3616)
$\Delta \log GDP\ (-2)$	0.3430* (0.2048)	-0.0696 (0.1968)	0.0385 (0.1013)	-0.2647 (0.3866)
$\Delta \log GDP\ (-3)$	-0.0469 (0.2150)	0.1783 (0.2066)	-0.0411 (0.1064)	0.0910 (0.4059)
$\Delta \log GDP\ (-4)$	0.1882 (0.1823)	0.4645*** (0.1751)	-0.1082 (0.0902)	0.0359 (0.3441)
$\Delta \log EXC\ (-1)$	-0.5930* (0.3431)	0.2832 (0.3297)	-0.2376 (0.1698)	-0.4724 (0.6477)
$\Delta \log EXC\ (-2)$	0.1008 (0.3314)	0.0385 (0.3184)	-0.0801 (0.1640)	-0.9067 (0.6256)

$\Delta \log EXC\ (-3)$	-0.3438 (0.3359)	-0.3829 (0.3228)	0.5111*** (0.1662)	-0.3385 (0.6342)
$\Delta \log EXC\ (-4)$	-0.1163 (0.3516)	0.1499 (0.3379)	-0.0762 (0.1740)	0.8420 (0.6634)
$\Delta \log OIL\ (-1)$	0.1668 (0.1107)	0.3968*** (0.1064)	-0.1254** (0.0548)	0.3208 (0.2091)
$\Delta \log OIL\ (-2)$	0.1739 (0.1168)	0.2265** (0.1122)	-0.0596 (0.0578)	-0.0649 (0.2205)
$\Delta \log OIL\ (-3)$	0.0100 (0.1072)	0.0305 (0.1030)	-0.0188 (0.0530)	0.1120 (0.2024)
$\Delta \log OIL\ (-4)$	0.1317 (0.1045)	0.0768 (0.1004)	-0.0551 (0.0517)	-0.0980 (0.1973)
C	0.0341 (0.0227)	0.0174 (0.0218)	0.01710 (0.0112)	0.0389 (0.0428)
$\square^2$	0.5343	0.5158	0.5661	0.2048

*, ** and *** show respectively significance at 10%, 5% and 1% levels. Standard errors are in parentheses.

Figure A1. Inverse roots of AR characteristic polynomial

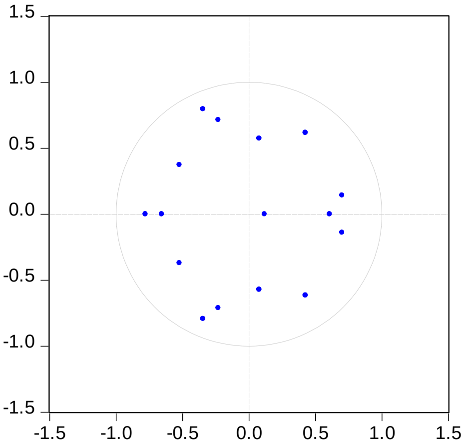

Table A3. VAR residual serial correlation LM test

Lag	LRE* stat	Prob.
1	11.30068	0.7906
2	18.66334	0.2865
3	17.91206	0.3291
4	13.72333	0.6193
5	24.60653	0.0771

*Edgeworth expansion corrected likelihood ratio statistic

Table A4. VAR residual heteroskedasticity test

Chi-sq	Prob.
317.2908	0.5323