Universität Trier

# Azerbaijan and its Oil Resources: Curse or Blessing?

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Research Papers in Economics
No. 11/19

# Azerbaijan and its Oil Resources: Curse or Blessing?

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First Draft: May 21, 2019

**Abstract**

We examine the relationship between oil price fluctuations and economic activity in Azerbaijan using vector autoregressive models for the period 2002Q1–2018Q4. Our key results are as follows. First, quarterly GDP growth decreases after oil price innovations in both, the oil and gas sector and in the remaining economy. Downturns (upswings) in the oil and gas sector also prompt downturns (upswings) in the non-oil sector as fluctuations in oil revenues affect the government's capacity to subsidize the remaining economy. Second, oil price innovations also lead to higher inflation in Azerbaijan. In response to the required tightening of monetary policy, the manat appreciates against the US dollar. Finally, GDP effects are primarily documented after oil price increases, whereas the interest rate and the exchange rate mainly react to decreases. Inflation increases after both types of shocks, either due to the accommodative monetary policy stance in the case of oil price decreases or due to the shock itself in the case of increases.

**JEL Codes**: E32, Q43.
**Keywords**: Azerbaijan, Dutch disease, natural resources, oil prices, vector autoregression.

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# 1 Introduction

Crude oil is essential for economic development, even in the 21$^{st}$ century. The effects of oil price fluctuations differ largely across countries, depending, inter alia, on the countries' size and their position in the supply chain. Naturally, developing oil-exporting countries are more vulnerable to oil price shocks than advanced oil-importing countries. Ever since the first and second oil crises of 1973 and 1979, researchers have focused on the nexus of oil price fluctuations and macroeconomic activity.

Pioneering studies that mostly establish a negative relationship between oil prices and real economic activity include, inter alia, Rasche and Tatom (1977), Darby (1982), Hamilton (1983), Burbidge and Harrison (1984), and Gisser and Goodwin (1986). Starting from the second half of the 1980s, studies on a linear relationship between oil price shocks and real economic activity lost their significance. The substantial decreases in oil prices from the mid-1980s had smaller positive impacts on real economic activity than foreseen by the previous linear models. Consequently, Mork (1989), Lee et al (1995), and Hamilton (1996) presented non-linear approaches to analyze the relation between oil price increases/decreases and economic recessions/booms.

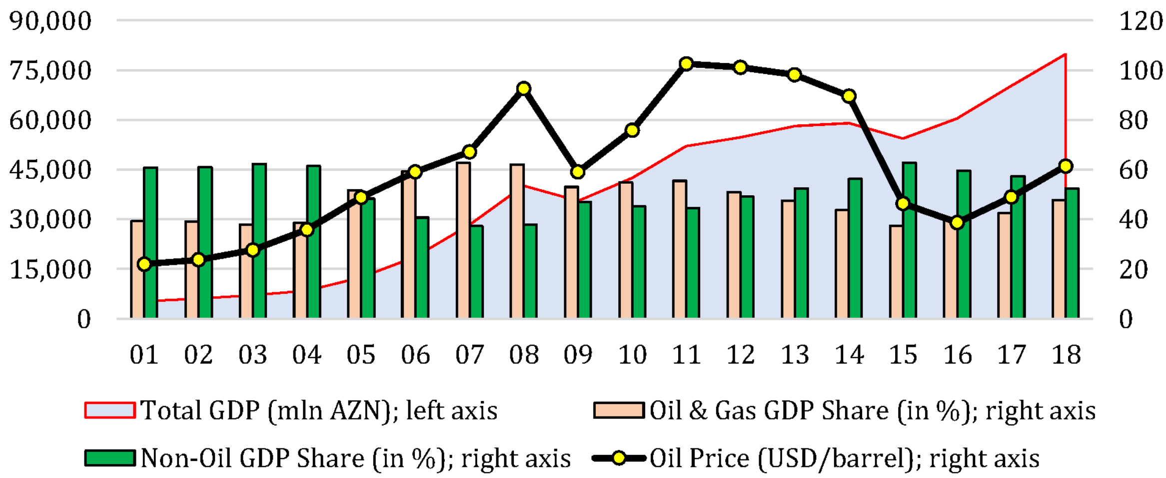
The vast literature mostly focuses on the US and other advanced economies,[1] while relatively few studies have examined the effects of oil price fluctuations on developing oil-exporting countries (Rautava, 2004; Mehrara and Oskoui, 2007; Farzanegan and Markwardt, 2009; Berument et al, 2010; Emami and Adibpour, 2012). The general theme of these papers is that oil price decreases hinder economic growth, whereas positive shocks stimulate real economic activity in small oil-exporting economies. In this paper, we contribute to this scarce literature and provide—to the best of our knowledge—the first analysis of the effects of oil price innovations on macroeconomic variables in Azerbaijan.

Azerbaijan's development is tightly related to its oil deposits with the energy sector being under control of the government. Figure 1 plots total GDP in Azerbaijan

[1] There are many further seminal papers on the relationship between oil prices and macroeconomic variables. See, inter alia, Rasche and Tatom (1981), Hooker (1996, 2002), Bernanke et al (1997), Davis and Haltiwanger (2001), Hamilton (2003), Hamilton and Herrera (2004), and Kilian (2009).

(red line, left axis), the shares of oil and gas GDP (orange bar, right axis) and non-oil GDP (green bar, right axis), and the oil price (black line, right axis) over the period 2001–2018. Azerbaijan's total GDP increased substantially during this period and the correlation with the oil price indicator is quite sizeable ($\rho = 0.55$).[2] The relative importance of the two different sectors alternated several times during that period due to energy exports being a substantial component of total GDP and large oil price windfalls. The importance of the oil and gas sector peaked in 2007 with a share of 62.7% of total GDP.

Figure 1: Oil Price, Total GDP in Azerbaijan, and Sectoral GDP Shares



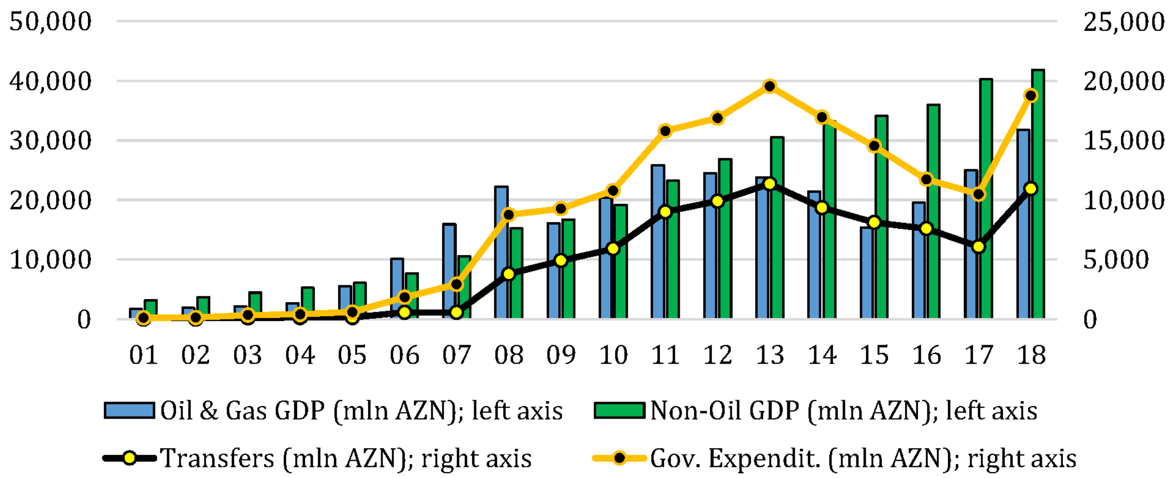

*Sources*: State Statistics Committee of Azerbaijan, US Energy Information Administration, and own calculations.

Figure 2 plots the volumes of oil and gas GDP (orange bar, left axis) and non-oil GDP (green bar, left axis) alongside transfers from the State Oil Fund of Azerbaijan to the government's budget (black line, right axis) and total government expenditures (yellow line, right axis). Until 2008, rising oil prices contributed to extraordinary growth rates in both, the oil and gas sector and the remaining economy, with average annual growth rates of 48% and 25%, respectively. As a by-product, Azerbaijan's currency reserves reached twice the volume of its foreign debt at the end of 2008. In 2009, output declined as a result of slackening world oil prices but resumed its steady

[2]Note that the correlation increases to $\rho = 0.67$ when removing the deterministic trends from both series.

growth thereafter until the next oil price slump in 2014. The recession in 2014 and 2015 was driven by the oil and gas sector and accompanied by a shrinkage of foreign reserves as the Central Bank of Azerbaijan (CBA) injected 4 billion USD to the economy in this period. Despite these interventions, the manat (AZN) devalued twice by a total of more than 50%. Following the second devaluation, the CBA adopted a managed float (see also Bayramov and Abbas, 2017).

Figure 2: Oil and Gas GDP, Non-Oil GDP, Government Expenditures, and SOFAZ Transfers




*Sources*: State Statistics Committee of Azerbaijan Republic, SOFAZ Annual Report 2017, and SOFAZ Revenue and Expenditure Statement for January–December 2018.

Figure 2 also shows that the non-oil sector depends heavily on government expenditures that are primarily transfers from the State Oil Fund of Azerbaijan (SOFAZ), which was established in 1999 to manage currency and revenue flow from oil and gas activities. SOFAZ transfers, along with the share of direct and indirect oil revenues, generated around 60% of the overall state budget revenues. Hence, it is also evident that the government budget is highly dependent on resource revenues.

To summarize, Azerbaijan achieved substantial economic growth due to its abundant energy resources since the beginning of the 21$^{st}$ century. However, it also became highly dependent on resource revenues due to poor diversification. The non-oil sector is mainly driven by transfers from the oil and gas sector. The exposure of Azerbaijan's economy to oil price innovations makes the subject of this paper worthy of investigation.

To quantify the dependence of Azerbaijan on oil price fluctuations we employ vector autoregressive models for the period 2002Q1–2018Q4. As a first step, we establish a baseline VAR to obtain dynamic multiplies for (i) real GDP growth, (ii) the inflation rate, (iii) the central bank rate, and (iv) the exchange rate after innovations in the growth rate of world oil prices. In a second step, we split the overall GDP indicator into (i) two production components and (ii) four expenditure categories. Finally, we explore potential asymmetries with respect to oil price decreases and increases based on two different approaches (Mork, 1989; Hamilton, 1996).

Our key results are as follows. First, quarterly GDP growth decreases in both, the oil and gas sector and the remaining economy, after oil price innovations. Downturns (upswings) in the oil and gas sector also prompt downturns (upswings) in the non-oil sector as fluctuations in oil revenues affect the government's capacity to subsidize the remaining economy. Second, oil price innovations also lead to higher inflation in Azerbaijan. In response to the required tightening of monetary policy, the manat appreciates against the US dollar. Finally, GDP effects are primarily documented after oil price increases, whereas the interest rate and the exchange rate mainly react to decreases. Inflation increases after both types of shocks, either due to the accommodative monetary policy stance in the case of oil price decreases or due to the shock itself in the case of increases.

The remainder of this paper is organized as follows. Section 2 introduces the dataset and the econometric methodology. Section 3 provides the empirical results. Section 4 concludes.

# 2 Data and Econometric Methodology

Our dataset covers the period 2002Q1–2018Q4. The starting point is restricted by the publication of quarterly GDP data (since 2001) and the calculation of growth rates to the previous year's quarter. It consists of the following variables: (i) real GDP growth

(RGDP), (ii) the consumer price index inflation rate (INFL), (iii) the central bank rate (CBRATE), (iv) the depreciation of the exchange rate against the US dollar (AZN/USD, FX), and (v) the growth rate of Brent crude oil prices (OP).[3]

Our empirical strategy is based on a linear VAR model (Sims, 1980), which can be written in its reduced form as follows:

$$X_t = \delta + \sum_{i=1}^{p} A_i X_{t-i} + \sum_{i=0}^{p} B_i Z_{t-i} + U_t \tag{1}$$

$X_t$ is the vector of endogenous variables, $Z_t$ is the vector of exogenous variables, $\delta$ is the vector of intercepts, $U_t$ is the vector of error terms, and $A_i$ and $B_i$ are parameter matrices.

We estimate five different versions of Eq. 1 where we vary the elements in the vectors $X_t$ and $Z_t$. In a first step, we estimate a baseline four-variable model with (i) RGDP, (ii) INFL, (iii) CBRATE, and (iv) FX in vector $X_t$ and OP in vector $Z_t$. In a second step, we split the indicator for real GDP into two production components and estimate a five-variable model with (i) real GDP growth in the oil and gas sector, (ii) real GDP growth in the remaining economy, (iii) INFL, (iv) CBRATE, and (v) FX in vector $X_t$ and OP in vector $Z_t$. In a third step, we split the indicator for real GDP into four expenditure categories and estimate a seven-variable model with (i) real consumption growth, (ii) real government expenditure growth, (iii) real investment growth, (iv) real net export growth, (v) INFL, (vi) CBRATE, and (vii) FX in vector $X_t$ and OP in vector $Z_t$.

To analyze potentially asymmetric reactions to oil price decreases and oil price increases we build on the approaches by Mork (1989) and Hamilton (1996). Mork (1989) defined decreases and increases in oil prices as separate exogenous variables by allowing for an asymmetric response to oil price changes. His transformation can be

[3] Figure A1 in the Appendix shows time series plots of all the series. *Sources*: Federal Reserve Bank of St. Louis for oil prices, State Statistical Committee of Azerbaijan for GDP data, and International Monetary Fund for the remaining series. All series, with the exception of the central bank rate, are growth rates to the previous year's quarter.

described more technically as follows:

$$AOPD_t = \begin{cases} |OP_t| & \text{if } OP_t < 0 \\ 0 & \text{otherwise} \end{cases} \tag{2}$$

$$AOPI_t = \begin{cases} OP_t & \text{if } OP_t > 0 \\ 0 & \text{otherwise} \end{cases} \tag{3}$$

$OP_t$ is the growth rate of oil prices over the previous year's quarter and $AOPD_t$ and $AOPI_t$ are the corresponding negative and positive growth rates of oil prices.

Hamilton (1996) defined net increases in oil prices by comparing the price of oil in each quarter with the highest value observed during the previous four quarters. If the value for the present quarter is larger than the previous year's maximum, the percentage change over the preceding year's maximum is utilized. If the price of oil in quarter $t$ is below the maximum of the previous four quarters, the series is set to be zero for $t$. Du et al (2010) extend Hamilton's (1996) approach and also analyze the effect of net oil price decreases. Hence, we can describe net oil price decreases and increases as follows:

$$NOPD_t = min(0, O_t - min(O_{t-1}, O_{t-2}, O_{t-3}, O_{t-4})) \tag{4}$$

$$NOPI_t = max(0, O_t - max(O_{t-1}, O_{t-2}, O_{t-3}, O_{t-4})) \tag{5}$$

$O_t$ is the oil price (in logs) and $NOPD_t$ and $NOPI_t$ are the corresponding net oil price decreases and increases.

Our fourth and fifth specifications thus extend the baseline four-variable VAR and contain the following variables: (i) RGDP, (ii) INFL, (iii) CBRATE, and (iv) FX in vector $X_t$ and (i) AOPD (NOPD) and (ii) AOPI (NOPI) in vector $Z_t$.

We set $p = 3$ as a VAR(3) sufficiently captures the dynamics in the model and is stable as all eigenvalues lie inside the unit circle, while at the same time the lag structure is as parsimonious as possible. We identify dynamic multipliers after innovations in the oil price indicators in the vector $Z_t$. Hence, we assume that Azerbaijan, as a relatively small country, does not have economic or political power to influence global oil prices, which are treated as exogenous. One advantage of this identification scheme is that we do not have to rely on (potentially arbitrary) recursive identification or sign restrictions to obtain oil price shocks in a system of endogenous variables. Our results presented in Section 3, however, are robust to the estimation of VAR models with endogenous variables only and the imposition of a recursive scheme.[4]

# 3 Empirical Results

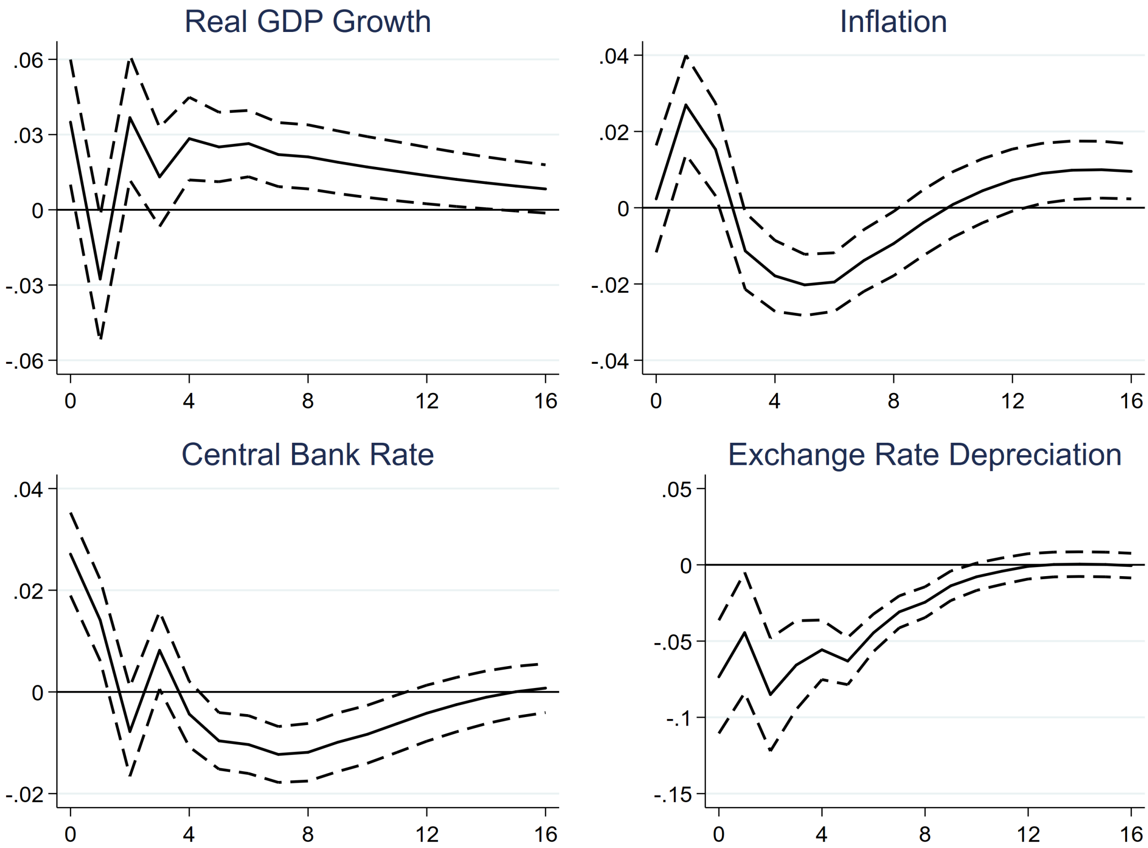
## 3.1 Linear Specifications

Figure 3 shows the dynamic multipliers after a one percentage point (pp) innovation in the oil price indicator for the baseline four-variable VAR.

Quarterly GDP growth is found to increase immediately, two quarters and four to 14 quarters after a one pp innovation in oil prices. The peak effect is 3.7 basis points (bps) after two quarters. Inflation increases one and two periods after the oil price shock with a peak effect of 2.7 bps. The CBA raises the interest rate immediately (by 2.7 bps) as well as one and three quarters after the shock to suppress inflation, which leads to a negative response of inflation three to eight quarters after the oil price innovation. The decline in inflation then leads to a more accommodative monetary policy stance five to eleven quarters after the shock. The manat appreciates right away until nine quarters after the shock with a peak effect of –8.5 bps after two quarters. All these responses are of economic relevance when considering the large standard deviation of the oil price indicator (33.35 pp). A one standard deviation innovation leads to peak increases in real GDP growth by 1.23 pp, in inflation by 0.90 pp, and in the central bank rate by 0.90 pp and triggers an appreciation of the manat by 2.84 pp.

[4]In this scheme, we order the oil price indicators first. Hence, we allow (i) a contemporaneous reaction of all other macroeconomic variables to oil price shocks but (ii) preclude the opposite, that is, the oil price reacts—if at all—only to lagged macroeconomic shocks in Azerbaijan.

Figure 3: Dynamic Multipliers of Baseline VAR




*Notes*: Figure 3 shows the dynamic multipliers (solid lines, in pp) to a one pp innovation in the oil price indicator alongside the corresponding 68% confidence bands (dashed lines).

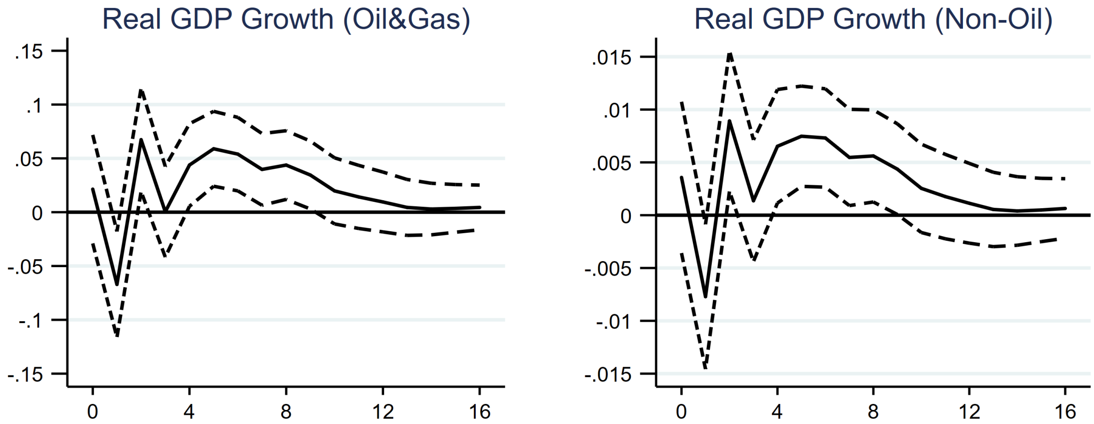
Figure 4 shows the dynamic multipliers after a one pp innovation in the oil price indicator for the five-variable VAR where quarterly real GDP growth in the oil and gas sector and quarterly real GDP growth in the remaining economy enter the system as separate variables.[5]

In general, quarterly GDP growth in both sectors responds in a similar fashion. After one quarter, we observe a significant decrease in both sectors and after two and four to nine quarters real GDP growth increases as a response to the oil price shock. It is noteworthy, however, that the magnitude of the responses varies considerably across sectors with the response of the oil and gas sector being roughly eight times larger than the one in the remaining economy. Indeed, the maximum positive effects are 6.7 bps

[5]To conserve space, we only report the results of the production indicators as the responses of the remaining variables (available on request) are virtually unaffected from this extension.

(oil and gas sector) and 0.9 bps (non-oil sector), indicating that the total effect on real GDP growth is driven by the oil and gas sector.

Figure 4: Dynamic Multipliers of Five-Variable VAR (Production)



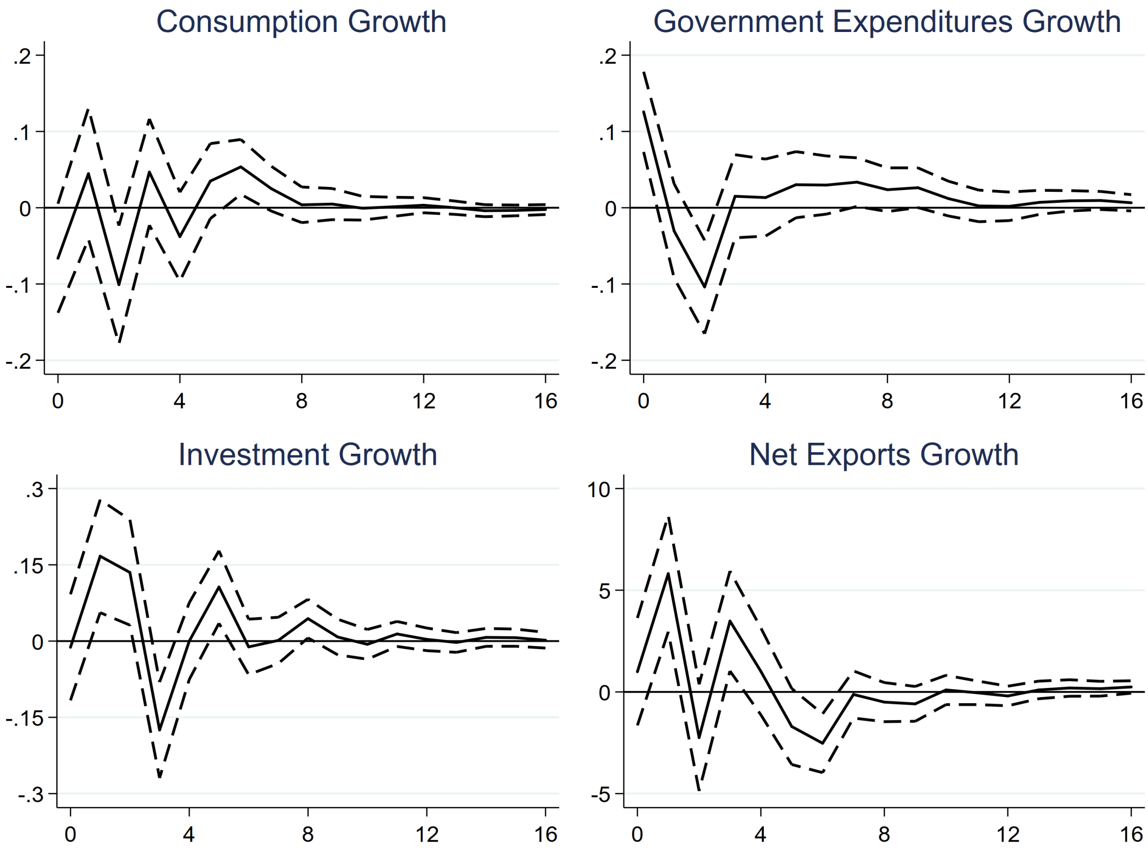

*Notes*: Figure 4 shows the dynamic multipliers (solid lines, in pp) to a one pp innovation in the oil price indicator alongside the corresponding 68% confidence bands (dashed lines).

Figure 5 shows the dynamic multipliers after a one pp innovation in the oil price indicator for the seven-variable VAR where the expenditure categories of real GDP (consumption, government expenditures, investments, and net exports) enter the system as four separate variables.[6]

The growth rate of private consumption decreases two periods after the oil price shock with a peak effect of –10.1 bps. However, Figure 5 also indicates a marginally significant rebound of consumption six quarters after the shock. Government expenditures increase immediately by 12.6 pp. However, two periods after the shock there is a significant negative response as well (–10.4 pp). Investment significantly increases one, two, five, and seven quarters after shock with a maximum change in the growth rate of 16.7 bps. Finally, net exports growth increases by 5.82 pp one period after the shock with some delayed positive (negative) responses after three (six) quarters. Hence, it is apparent that the overall effect on GDP growth is driven by net exports, government expenditures, and investment, but not by private consumption.

[6]To conserve space, we only report the results of the expenditure categories as the responses of the remaining variables (available on request) are virtually unaffected from this extension.

Figure 5: Dynamic Multipliers of Seven-Variable VAR (Expenditures)




*Notes*: Figure 5 shows the dynamic multipliers (solid lines, in pp) to a one pp innovation in the oil price indicator alongside the corresponding 68% confidence bands (dashed lines).

Taken together, the three sets of results provide further evidence for Azerbaijan as a "subsidized economy" or "supply based economy" (see, for instance, Bayramov and Abbas, 2017). The decline in GDP growth in the oil and gas sector one period after the shock can be explained by a reduction of oil revenues due to a decrease in the demand for oil on the world market. The corresponding decline in GDP growth in the remaining economy can be explained by its composition as it is driven by government expenditures subsidized from oil income and taxes. The sharp reduction in oil revenues limits the government's capacity for transfers to the remaining economy. Hence, downturns (upswings) in the oil and gas sector also prompt downturns (upswings) in the non-oil sector. Non-oil GDP growth is directly hampered by a reduction in oil revenue-driven government spending and indirectly by an appreciation of the exchange rate, which also limits the external competitiveness of the economy. A tightening of monetary policy in response to the increase in inflation additionally harms the non-oil sector. After a couple of quarters, oil revenues increase in the wake of higher oil prices and GDP growth recovers in both sectors with the oil and gas sector driving the recovery in the remaining economy. The appreciation of the manat against the US dollar after oil price shocks, taken together with the increase in inflation, provide evidence that the Dutch Disease might apply to Azerbaijan.

### 3.2 Non-Linear Specifications

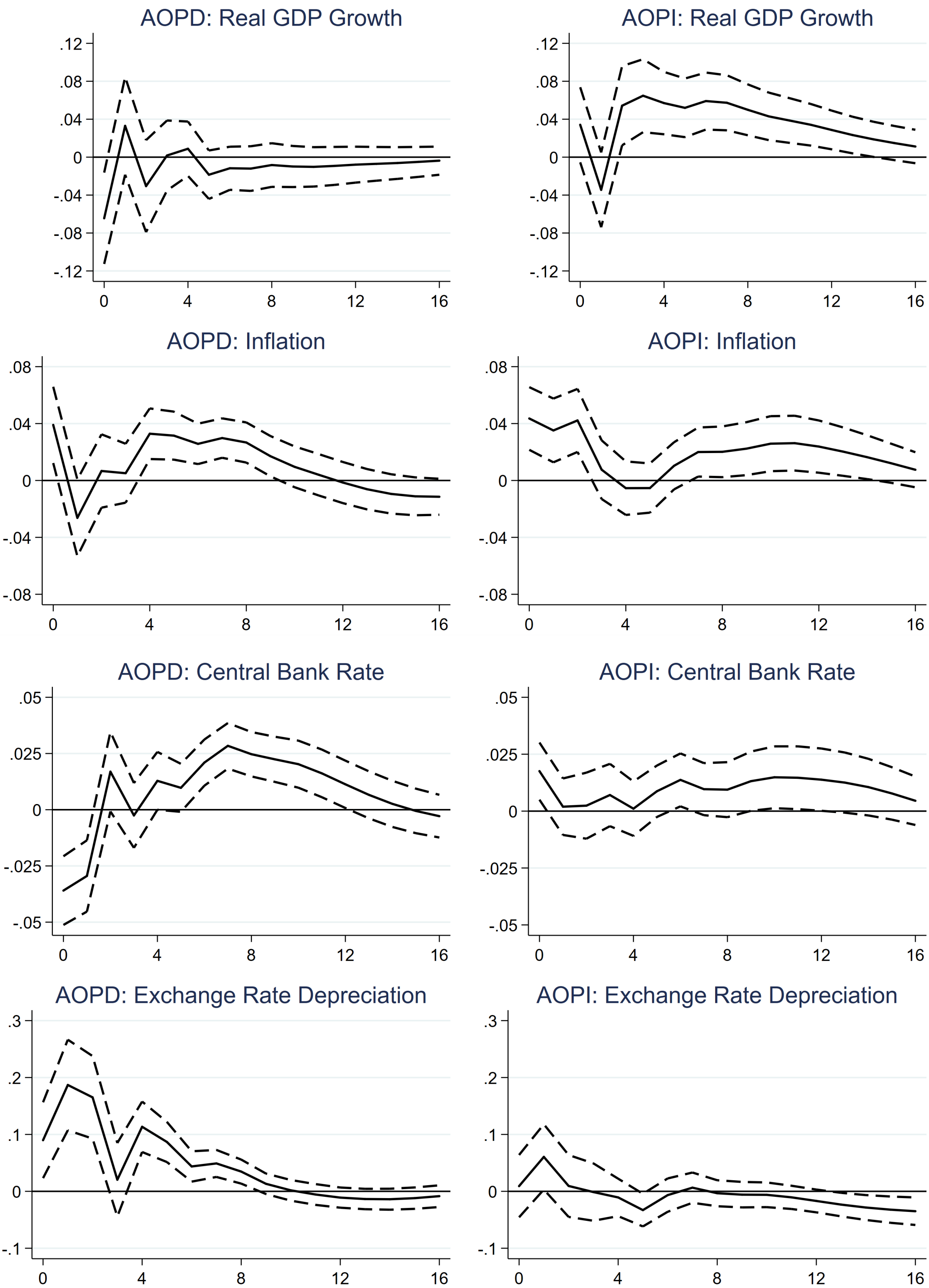
Figure 6 shows the results for the specification in spirit of Mork (1989). The left (right) panel shows the dynamic multipliers after a one pp oil price decrease (increase) in line with the definition in Eq. 2 (3).[7]

Growth fluctuations are driven by oil price increases rather than by decreases. We only observe a significant reduction in GDP growth for one quarter after negative innovations (immediately after the shock), whereas positive responses after an increase in oil prices are documented for a prolonged horizon (two to 14 quarters after the shock). One reason for the very small recessionary effects of negative oil price shocks is the accommodative monetary policy stance. In fact, the CBA mainly responds to oil price decreases with an easing of monetary policy immediately and after one quarter. Inflation increases right away and four to nine quarters after the decrease in oil prices. Hence, the accommodative monetary policy stance outweighs the reduction in inflation due to the decrease in oil prices. As a direct consequence, the exchange rate depreciates for a prolonged horizon, which together with the initial rise in inflation leads to a more restrictive monetary policy stance six to twelve quarters after the shock.

Inflation also rises after positive oil price shocks. In this situation, however, the response of monetary policy in the form of a tightening is only marginally significant. Consequently, the exchange rate barely reacts to oil price increases, too.

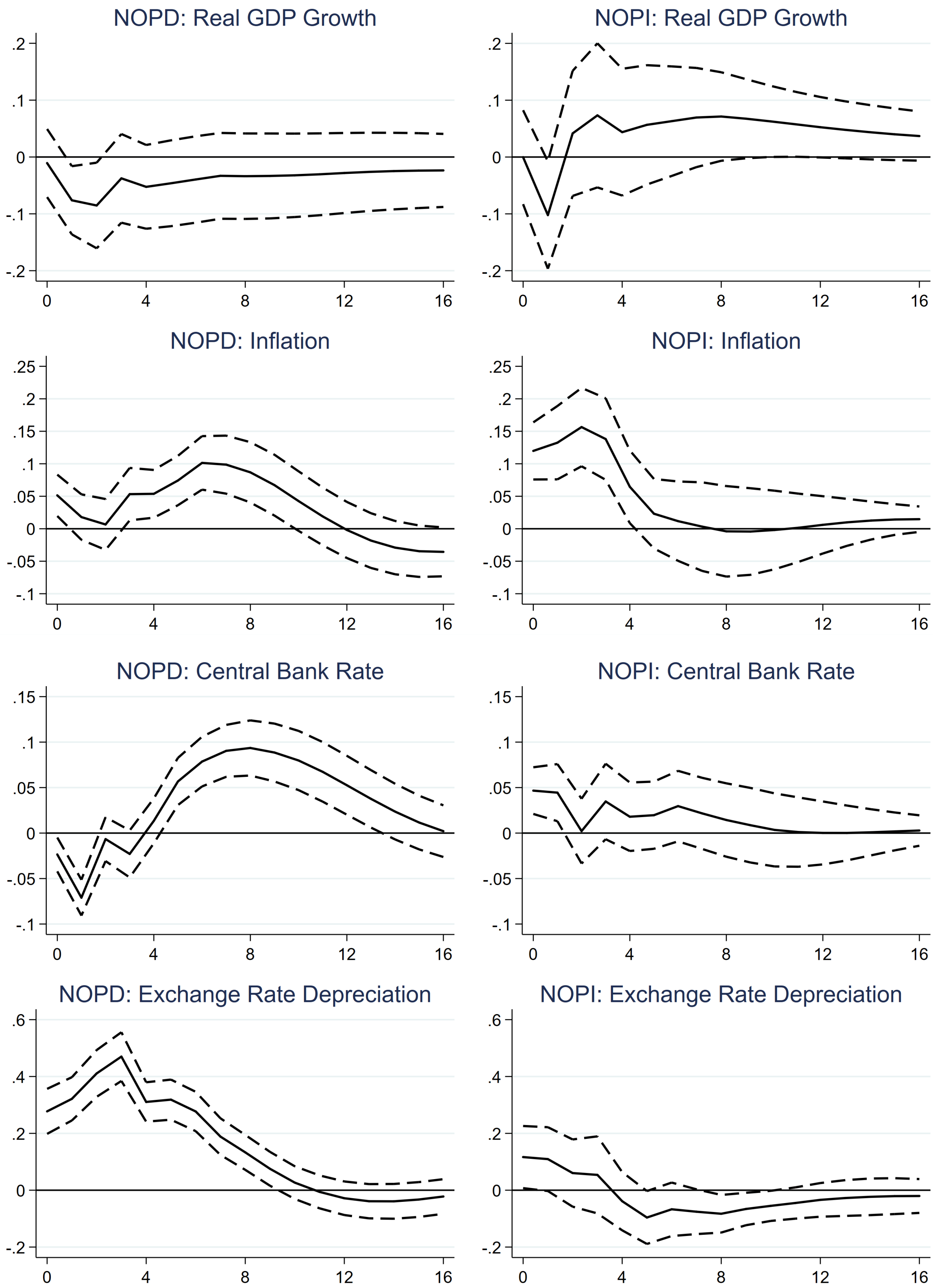
[7] The standard deviations of the asymmetric indicators are 21.34 pp (decreases) and 17.67 pp (increases), respectively.

Figure 6: Dynamic Multipliers of Asymmetric Oil Price Indicators




*Notes*: Figure 6 shows the dynamic multipliers (solid lines, in pp) to a one pp innovation in the asymmetric oil price indicators alongside the corresponding 68% confidence bands (dashed lines).

Figure 7: Dynamic Multipliers of Net Oil Price Indicators




*Notes*: Figure 7 shows the dynamic multipliers (solid lines, in pp) to a one pp innovation in the net oil price indicators alongside the corresponding 68% confidence bands (dashed lines).

Figure 7 shows the results for the specification in spirit of Hamilton (1989) and Du et al (2010). The left (right) panel shows the dynamic multipliers after a one pp net oil price decrease (increase) in line with the definition in Eq. 3 (4).[8]

Here, growth fluctuations are symmetrically dampened by monetary policy. The reduction after a net oil price decrease is only significant one and two quarters after the shock since the CBA immediately cuts its interest rate to stabilize growth. Similarly, an increase in real GDP growth is only documented ten and eleven quarters after the shock, mainly due to the immediate tightening in response to the net oil price increase. Similar to Figure 6, inflation is found to increase due to accommodative monetary policy in the case of net decreases or due to the shock itself after net increases. The exchange rate exhibits a strong depreciation after net oil price decreases (also due to the accommodative monetary policy stance) but only a marginally significant appreciation after net oil price increase. The strong depreciation and the increase in inflation prompts delayed interest rate hikes by the CBA after net oil price decreases.

Summarizing the results of both non-linear extensions, growth effects are mainly documented after (net) oil price increases. The non-response of GDP after (net) oil price decreases is driven by the accommodative monetary policy stance as the CBA asymmetrically counteracts the consequences of negative oil price shocks. Consequently, the exchange rate also reacts mainly to decreases with a strong depreciation. Inflation increases after both types of shocks, either due to the accommodative monetary policy stance in the case of decreases or due to the shock itself in the case of increases.

## 4 Conclusions

Thanks to high resource windfalls over the past two decades, Azerbaijan was able to achieve high economic growth. However, the oil price slumps of 2009 and 2014 demonstrated that Azerbaijan's economy is heavily dependent on energy exports and

[8] The standard deviations of the net change indicators are 8.76 pp (net decreases) and 5.92 pp (net increases), respectively.

operates based on large government expenditures subsidized by the State Oil Fund. In this paper, we shed more light on Azerbaijan's exposure to oil price fluctuations. We analyze the effects of oil price shocks on macroeconomic variables using vector autoregressive models for the period 2002Q1–2018Q4.

Our key results are as follows. Quarterly GDP growth decreases after oil price shocks in both, the oil and gas sector and in the remaining economy. The decline in the oil and gas sector can be explained by a reduction of oil revenues due to a decrease in the demand for oil on the world market. The corresponding decline in GDP growth in the remaining economy can be explained by its composition as it is driven by government expenditures subsidized from oil income and taxes. The sharp reduction in oil revenues limits the government's capacity to subsidize the remaining economy. Hence, downturns (upswings) in the oil and gas sector also prompt corresponding downturns (upswings) in the non-oil sector. A tightening of monetary policy in response to the increase in inflation additionally harms the non-oil sector. After a couple of quarters, oil revenues increase in the wake of higher oil prices and GDP growth recovers in both sectors with the oil and gas sector driving the recovery in the remaining economy. Oil price shocks also trigger an appreciation of the manat against the US dollar. This also limits the external competitiveness of the economy and taken together with the increase in inflation our results provide evidence that the Dutch Disease might apply to Azerbaijan.

When analyzing potential asymmetries, growth effects are mainly documented after (net) oil price increases. The non-response of GDP after (net) oil price decreases is driven by the accommodative monetary policy stance as the CBA asymmetrically counteracts the consequences of negative oil price shocks. Consequently, the exchange rate also reacts mainly to decreases with a strong depreciation. Inflation increases after both types of shocks, either due to the accommodative monetary policy stance in the case of decreases or due to the shock itself in the case of increases.

# References


Bayramov, V. and Abbas, G. (2017): "Oil Shock in the Caspian Basin: Diversification Policy and Subsidized Economies," *Resources Policy* 54, 149–156.

Bernanke, B. S., Gertler, M., and Watson, M. (1997): "Systematic Monetary Policy and the Effects of Oil Price Shocks," *Brookings Papers on Economic Activity* 1997 (1), 91–157.

Berument, H., Ceylan, N. B., and Dogan, N. (2010): "The Impact of Oil Price Shocks on the Economic Growth of Selected MENA Countries," *Energy Journal* 31 (1), 149–176.

Burbidge, J. and Harrison, A. (1984): "Testing for the Effects of Oil-Price Rises Using Vector Autoregressions," *International Economic Review* 25 (2), 459–484.

Darby, M. R. (1982): "The Price of Oil and World Inflation and Recession," *American Economic Review* 72 (4), 738–751.

Davis, S. J. and Haltiwanger, J. (2001): "Sectoral Job Creation and Destruction Responses to Oil Price Changes," *Journal of Monetary Economics* 48 (3), 465–512.

Du, L., Yanan, H., and Wei, C. (2010): "The Relationship Between Oil Price Shocks and China's Macroeconomy: An Empirical Analysis," *Energy Policy* 38 (8), 4142–4151.

Emami, K. and Adibpour, M. (2012): "Oil Income Shocks and Economic Growth in Iran," *Economic Modelling* 29 (5), 1774–1779.

Farzanegan, M. R. and Markwardt, G. (2009): "The Effects of Oil Price Shocks on the Iranian Economy," *Energy Economics* 31 (1), 134–151.

Gisser, M. and Goodwin, T. H. (1986): "Crude Oil and The Macroeconomy: Tests of Some Popular Notions," *Journal of Money, Credit and Banking* 18 (1), 95–103.

Hamilton, J. D. (1983): "Oil and the Macroeconomy since World War II," *Journal of Political Economy* 91 (2), 228–248.

Hamilton, J. D. (1996): "This is What Happened to the Oil Price-Macroeconomy Relationship," *Journal of Monetary Economics* 38 (2), 215–220.

Hamilton, J. D. (2003): "What is An Oil Shock?" *Journal of Econometrics* 113 (2), 363–398.

Hamilton, J.D. and Herrera, A.M. (2004): "Comment: Oil Shocks and Aggregate Macroeconomic Behavior: The Role of Monetary Policy," *Journal of Money, Credit and Banking* 36 (2), 265–286.

Hooker, M. A. (1996): "What Happened to the Oil Price-Macroeconomy Relationship?" *Journal of Monetary Economics* 38 (2), 195–213.

Hooker, M. A. (2002): "Are Oil Shocks Inflationary? Asymmetric and Nonlinear Specifications Versus Changes in Regime," *Journal of Money, Credit and Banking* 34 (2), 540–561.

Kilian, L., (2009). "Not all Oil Price Shocks are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market," *American Economic Review* 99 (3), 1053–1069.

Lee, K., Ni, S., and Ratti, R. A. (1995): "Oil Shocks and the Macroeconomy: The Role of Price Variability," *Energy Journal* 16 (4), 39–56.

Mehrara, M. and Oskoui, K. N. (2007): "The Sources of Macroeconomic Fluctuations in Oil Exporting Countries: A Comparative Study," *Economic Modelling* 24 (3), 365–379.

Mork, K. A. (1989): "Oil and the Macroeconomy When Prices Go Up and Down: An Extension of Hamilton's Results," *Journal of Political Economy* 97 (3), 740–744.

Rasche, R. H. and Tatom, J. A. (1977): "The Effects of the New Energy Regime on Economic Capacity, Production, and Prices," *Federal Reserve Bank of St. Louis Review* 59 (4), 2–12.

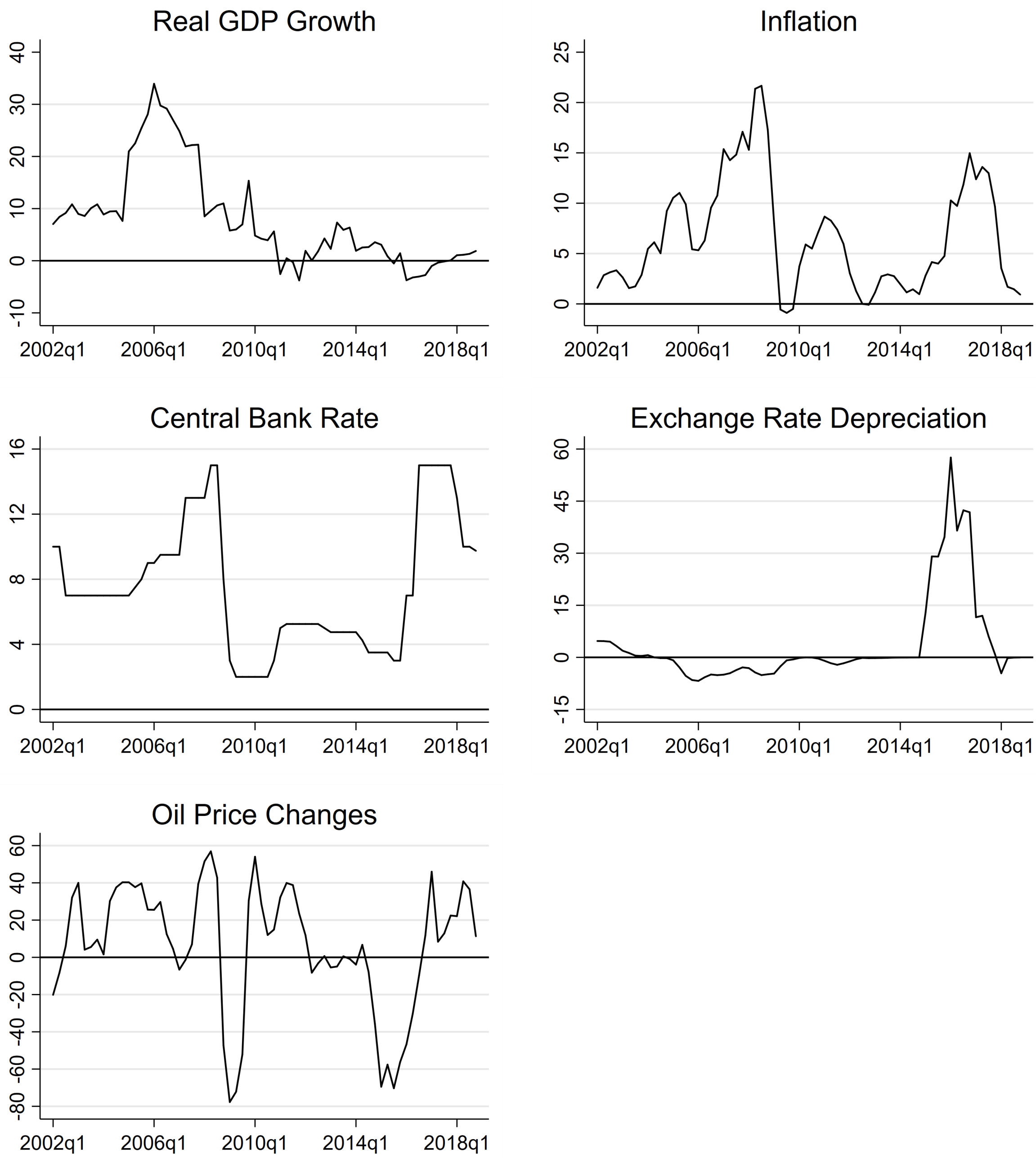
Rasche, R. H. and Tatom, J. A. (1981): "Energy Price Shocks, Aggregate Supply and Monetary Policy: The Theory and International Evidence," *Carnegie-Rochester Conference Series on Public Policy* 14 (1), 9–93.

Rautava, J. (2004): "The Role of Oil Prices and the Real Exchange Rate in Russia's Economy—A Cointegration Approach," *Journal of Comparative Economics* 32 (2), 315–327.

Sims, C. A. (1980): "Macroeconomics and Reality," *Econometrica* 48 (1), 1–48.

# Appendix

Figure A1: Macroeconomic Variables in Azerbaijan and World Oil Prices




*Sources*: Federal Reserve Bank of St. Louis for oil prices, State Statistical Committee of Azerbaijan for GDP data, and International Monetary Fund for the remaining series. All series, with the exception of the central bank rate, are growth rates to the previous year's quarter.