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The impact of oil price changes on selected macroeconomic indicators in Azerbaijan*

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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, growth in the gross domestic product (GDP) decreases after oil price innovations in the oil and gas sector and in the remainder of the economy. Downturns (upscores) in the oil and gas sector also prompt downturns (upscores) in the non-oil sector as fluctuations in oil revenues affect the government’s capacity to subsidize the rest of the 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 seen after oil price increases, whereas the interest rate and the exchange rate mainly react to decreases. Inflation increases after both types of shocks, due to either the accommodative monetary policy stance in the case of oil price decreases or the shock itself in the case of increases.

1. Introduction

Historically low prices in April 2020 illustrated once more that oil price fluctuations can have substantial economic consequences. These effects differ largely across countries, depending 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. The worldwide collapse in the demand for oil due to the COVID-19 pandemic put economic pressure on oil-exporting countries, whereas the excess demand for oil during the first and second oil crises in 1973 and 1979 had a detrimental impact on oil-importing countries.

Consequently, 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 Burbidge and Harrison (1984), Darby (1982), Davis and Haltiwanger (2001), Gisser and Goodwin (1986), Hamilton (1983), Hooker (1996, 2002), and Rasche and Tatom (1977, 1981). More recent papers reiterate this adverse effect on the gross domestic product (GDP), consumer prices, and unemployment (Katircioglu et al., 2015) and find a detrimental effect of oil price volatility (van Eyden et al., 2019). Sotoudeh and Worthington (2017) document the influence on net oil-consuming countries and net oil-producing countries.

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Beginning in 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 beginning in the mid-1980s had smaller positive impacts on real economic activity than foreseen by the previous linear models. Consequently, many studies (e.g., Bernanke et al., 1997; Davis and Haltiwanger, 2001; Ferderer, 1996; Hamilton, 1996, 2003; Hamilton and Herrera, 2004; Jimenez-Rodriguez and Sanchez, 2005; Lee et al., 1995, 2001; Mork, 1989, 1994; Mork et al., 1994; Mory, 1993) find an asymmetric relationship between oil prices and macroeconomic variables. Herrera et al. (2011, 2015), Kilian (2009), and Kilian and Vigfusson (2011) provide contradictory results and question the robustness of the earlier studies. Nevertheless, more recent studies (An et al., 2014; Bergmann, 2019; Donayre and Wilmot, 2016; Du et al., 2010; Hamilton, 2011; Kilian and Vigfusson, 2013; Rahman and Serletis, 2010; Serletis and Istaik, 2013) confirm the asymmetry or nonlinearity in the relationship between oil prices and the macroeconomy. The consensus in these studies is that in advanced economies, the substantial adverse effect on economic activity of oil price increases exceeds the positive influence of oil price decreases.

The vast literature focuses mostly on the US and other advanced economies, whereas relatively few studies have examined the effects of oil price fluctuations on developing oil-exporting countries (e.g., Berument et al., 2010; Emami and Adibpour, 2012; Farzanegan and Markwardt, 2009; Gummi et al., 2017; Koh, 2017; Lorde et al., 2009; Mehrara and Oskoui, 2007; Olomola and Adejumo, 2006; Rautava, 2004). The general theme in these papers is that, in small oil-exporting economies, oil price decreases hinder economic growth, whereas positive shocks stimulate real economic activity. We contribute to this scarce literature and analyze the effects of oil price innovations on macroeconomic variables in Azerbaijan. Section 2 provides some background information on Azerbaijan and illustrates why an in-depth analysis of Azerbaijan is particularly interesting.

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

Our key results are as follows. First, after oil price innovations, GDP growth decreases in the oil and gas sector and in the rest of the economy. Downturns (upsprings) in the oil and gas sector also prompt downturns (upsprings) in the non-oil sector as fluctuations in oil revenues affect the government’s capacity to subsidize the rest of the economy. Second, oil price innovations also lead to higher inflation in Azerbaijan. In response to the required tightening of monetary policy, the manat (1 manat = 0.59 US dollars as of August 2020) appreciates against the US dollar. Finally, GDP effects are documented primarily after oil price increases, whereas the interest rate and the exchange rate mainly react to decreases. Inflation increases after both types of shocks, due to either an accommodative monetary policy stance in the case of oil price decreases or the shock itself in the case of increases.

The remainder of this paper is organized as follows. Section 2 provides some background information on the economy of Azerbaijan. Section 3 introduces the dataset and the econometric methodology. Section 4 shows the empirical results. Section 5 concludes.

2. Background on Azerbaijan

Azerbaijan’s development is tightly related to its oil deposits, with the energy sector under government control. Fig. 1 plots total GDP in Azerbaijan (red line, left axis), the shares of oil and gas in GDP (orange bar, right axis) and non-oil GDP (green bar, right axis), and oil prices (black line, right axis) over the period 2001–2018.

Azerbaijan’s total GDP increased substantially during this period, with a sizable correlation to the oil price indicator ($\rho = 0.55$). The relative importance of the two different sectors alternated several times over that period because energy exports were a substantial component of total GDP and large oil price windfalls. To exploit these windfalls, oil production was sharply increased between 2005 and 2011, with a tendency to decrease slowly at the end of the sample period. The importance of the oil and gas sector peaked in 2007, with a share of 62.7% of total GDP.

Fig. 2 plots the volume of oil and gas GDP (orange bar, left axis) and non-oil GDP (green bar, left axis) as well as transfers from the State Oil Fund of Azerbaijan (SOFAZ) 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 the oil and gas sector and in the rest of the economy, with average annual growth rates of 48% and 25%, respectively. As a by-product, Azerbaijan’s currency reserves expanded to twice the volume of its foreign debt at the end of 2008. In 2009, output declined as a result of slacking world oil prices but resumed its steady 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 contraction in foreign reserves as the Central Bank of Azerbaijan (CBA) injected USD 8.28 billion into the economy during this period. Despite these interventions, the manat (AZN) was devalued twice by a total of roughly 50% in 2015. After the second devaluation, the CBA adopted a managed float (see also Bayramov and Abbas, 2017).

Fig. 2 also shows that the non-oil sector depends heavily on government expenditures that are primarily transfers from SOFAZ, which was established in 1999 to manage currency and revenue flows from oil and gas activities. SOFAZ transfers are indirect oil revenues, and tax receipts from the oil sector are direct revenues; together they supply around 60% of overall state revenues. Hence, it

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1 The correlation increases to $\rho = 0.67$ when the deterministic trends from both series are removed.
is evident that the government budget is highly dependent on energy resource revenues.

The question of whether this oil abundance is a “curse” or a “blessing” has been examined by Hasanov (2010), who emphasizes that oil revenues mainly go to the nontradable sector. Further studies (e.g., Aliyev and Mikayilov, 2016; Aliyev and Nadirov, 2016; Aliyev et al., 2016; Dehning et al., 2016; Gurbanov et al., 2017; Hasanov, 2013b; Hasanov and Alirzayev, 2016; Hasanov et al., 2016, 2018) confirm that (oil revenue-financed) government expenditures have a positive impact on economic growth in the non-oil sector in Azerbaijan. Huseynov and Ahmadov (2013) provide a theoretical framework for this effect in an oil-exporting country and show that the procyclicality of fiscal policy is the major transmission channel of oil price shocks to the rest of the economy. Consequently, in times of falling oil prices, the non-oil sector has downside risks (in addition to the direct negative effect on the oil and gas sector). Finally, Hasanov (2013a) finds that foreign direct investment in the oil sector increased oil dependence and harmed non-oil exports.

The literature had reached a consensus on the fiscal dominance in Azerbaijan. The central bank does not appear to have much independence in affecting the country’s economy. Hasanov (2011) confirms this fiscal dominance with the inability of the CBA to suppress high inflation generated by the oil boom in the early 2000s.

In sum, Azerbaijan achieved substantial economic growth due to its abundant energy resources at the beginning of the twenty-first century. However, it also became highly dependent on resource revenues because of poor diversification. The non-oil sector is driven...
mainly 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.

The extant literature (e.g., Dikkaya and Doyar, 2017; Hasanov, 2010; Hasanov et al., 2017; Mukhtarov et al., 2020) documents the positive effects of oil price increases on GDP growth in Azerbaijan. In addition, these increases led to an appreciation of the manat, and some evidence indicates that the Dutch disease is prevalent in Azerbaijan (Hasanov, 2010, 2013a). Czech (2018) demonstrates that the ratio of public debt to GDP is negatively correlated with oil prices and that the economy of Azerbaijan suffers from a natural resource curse (see also Humbatova et al., 2019). Karimli et al. (2016) hold that inflation responds significantly to oil price shocks and that fiscal policy is a major transmission channel of oil price shocks to inflation. Another branch of the literature examines the differences across oil-exporting countries (including Azerbaijan) in terms of exposure to oil price fluctuations (Huseynov and Ahmadov, 2014; Koh, 2017) and the passthrough of oil prices to domestic inflation (Ahmadov et al., 2018). In this way, flexible exchange rates and oil funds are found to be particularly effective as buffers for the fiscal budget in shielding these countries from negative oil price shocks.

Our paper sheds further light on the exposure of the economy of Azerbaijan to oil price fluctuations. It contributes to the existing literature as we investigate the asymmetric effects of oil price changes for a longer time window than in previous research (2002Q1–2018Q4), thereby also considering the aftermath of the oil price slump in 2014 as well as the huge devaluation of the manat in 2015. We analyze the response of standard macroeconomic variables such as real GDP growth, the inflation rate, the central bank interest rate, and the exchange rate. In addition, we provide an in-depth analysis of two production components of GDP and four GDP expenditure categories.

3. 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: real GDP growth (RGDP), the consumer price index inflation rate (INFL), the central bank interest rate (CBRATE), the depreciation in the exchange rate against the US dollar (AZN/USD, FX), and the growth rate in 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:

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

(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 $B_j$ 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 the first step, we estimate a baseline four-variable model with RGDP, INFL, CBRATE, and FX in vector $X_t$ and OP in vector $Z_t$. In the second step, we split the indicator for real GDP into two production components and estimate a five-variable model with real GDP growth in the oil and gas sector, real GDP growth in the rest of the economy, INFL, CBRATE, and FX in vector $X_t$ and OP in vector $Z_t$. In the third step, we split the indicator for real GDP into four expenditure categories and estimate a seven-variable model with real growth in consumption, real growth in government expenditure, real growth in investment, real growth in net exports, INFL, CBRATE, and FX in vector $X_t$ and OP in vector $Z_t$.4

To analyze potentially asymmetric reactions to oil price increases and decreases, we build on the approaches by Hamilton (1996) and Mork (1989). Mork (1989) defines increases and decreases in oil prices as separate variables and allows an asymmetric response to oil price changes. His transformation can be described as follows:

$$\text{AOPD}_t = \begin{cases} \text{OP}_t & \text{if } \text{OP}_t < 0 \\ 0 & \text{otherwise} \end{cases}$$

(2)

$$\text{AOPI}_t = \begin{cases} \text{OP}_t & \text{if } \text{OP}_t > 0 \\ 0 & \text{otherwise} \end{cases}$$

(3)

$\text{OP}_t$ 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) defines net increases in oil prices by comparing the price of oil in each quarter with the highest value observed

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2 Note that the relatively short sample period as well as the Global Financial Crisis and the subsequent Great Recession make it impossible to reasonably estimate a stable long-run cointegrating relationship and a vector error correction model.

3 Data sources are the Federal Reserve Bank of St. Louis for oil prices, the State Statistical Committee of Azerbaijan for GDP data, and the International Monetary Fund for the other series. Nominal GDP data is transformed to real GDP data with the help of the consumer price index. All series, with the exception of the central bank rate, are growth rates compared to the previous year.

4 An augmented Dickey-Fuller (ADF; 1979) test including a constant term and four lags rejects the null of non-stationarity for all series at the 5% significance level. Test statistics: RGDP: −1.868; RGDP (oil&gas): −2.122; RGDP (non-oil): −2.118; consumption: −2.939; government expenditures: −2.220; investment: −2.466; net exports: −2.462; INFL: −2.386; CBRATE: −2.707; FX: −3.155; OP: −2.206. Critical value (5%): −1.672.
during the previous four quarters. If the value in the present quarter is larger than the previous year’s maximum, the percentage change over the preceding year’s maximum is used. If the price of oil in quarter t is below the maximum of the previous four quarters, the series is set at zero for t. Du et al. (2010) extend Hamilton (1996) approach and also analyze the effect of net oil price decreases. Hence, we describe net oil price increases and decreases as follows:

\[
\text{NOPD}_t = \min(0, O_t - \min(O_{t-1}, O_{t-2}, O_{t-3}, O_{t-4}))
\]

\[
\text{NOPI}_t = \max(0, O_t - \max(O_{t-1}, O_{t-2}, O_{t-3}, O_{t-4}))
\]

\(O_t\) is the oil price (in logs), and NOPD and NOPI are the corresponding net oil price decreases and increases.

Our fourth and fifth specifications extend the baseline four-variable VAR and include the following variables: RGDP, INFL, CBRATE, and FX in vector \(X_t\) and AOPD (NOPD) and AOPI (NOPI) in vector \(Z_t\).\(^5\)

We set \(p = 3\), as a VAR(3) sufficiently captures the dynamics in the model and is stable, as all eigenvalues in the five specifications are within the unit circle, and, 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 kind of identification 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 4, however, are robust to the estimation of VAR models with only endogenous variables and the imposition of a recursive scheme.\(^6\)

4. Empirical results

4.1. Linear specifications

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

GDP growth is found to increase immediately, two quarters, and four to fourteen 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 3.7 basis points (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 of 1.23 pp, in inflation of 0.90 pp, and in the central bank rate of 0.90 pp and triggers appreciation in the manat of 2.84 pp.

Fig. 4 shows the dynamic multipliers after a one-pp innovation in the oil price indicator for the baseline four-variable VAR,\(^7\)

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 being roughly eight times larger in the oil and gas sector than in the rest of the economy. Indeed, the maximum positive effects are 6.7 bps (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.

Fig. 5 shows the dynamic multipliers after a one-pp innovation in the oil price indicator for the seven-variable VAR in which the expenditure categories of real GDP (consumption, government expenditures, investment, and net exports) are entered into the system as four separate variables.\(^8\)

The growth rate of private consumption decreases two periods after the oil price shock, with a peak effect of −10.1 bps. However, Fig. 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 the shock, with a maximum change in the growth rate of 16.7 bps. Finally, growth in net exports 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 private consumption.

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\(^5\) An ADF test including a constant term and four lags rejects the null of non-stationarity for all series at the 5% significance level. Test statistics: AOPD: −2.828; AOPI: −2.365; NOPD: −2.998; NOPI: −3.136. Critical value (5%): −1.672.

\(^6\) In this system, we order the oil price indicators first. Hence, we allow a contemporaneous reaction of all other macroeconomic variables to oil price shocks but preclude the opposite, that is, the oil price reacts—if at all—only to lagged macroeconomic shocks.

\(^7\) 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 by this extension.

\(^8\) 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 by this extension.
Fig. 3. Dynamic multipliers of baseline VAR. Notes: Fig. 3 shows the dynamic multipliers (solid lines, in pp) to a one-pp innovation in the oil price indicator and corresponding 68% confidence bands (dashed lines).

Fig. 4. Dynamic multipliers in five-variable VAR (production). Notes: Fig. 4 shows the dynamic multipliers (solid lines, in pp) to a one-pp innovation in the oil price indicator and corresponding 68% confidence bands (dashed lines).
Taken together, the three sets of results provide further evidence that Azerbaijan is a “subsidized economy” or supply-driven economy (see, e.g., 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 in oil revenues due to a decrease in the demand for oil on the world market. The corresponding decline in GDP growth in the rest of the economy can be explained by its composition, as it is driven by government expenditures subsidized by oil income and taxes. The sharp reduction in oil revenues limits the government’s capacity for transfers to the rest of the 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 appreciation in the exchange rate, which also limits the external competitiveness of the economy. Tightening of monetary policy in response to an 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 recovery in the rest of the economy. The appreciation of the manat against the US dollar after oil price shocks, together with the increase in inflation, provide evidence that the Dutch disease occurs in Azerbaijan (cf. Hasanov, 2010, 2013a).

4.2. Nonlinear specifications

Fig. 6 shows the results for the specification in the 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).9

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 fourteen quarters after the shock). One reason for the very small recessionary effects of negative oil price shocks is the monetary policy stance. In fact, the CBA responds mainly to oil price decreases with an easing

9 The standard deviations of the asymmetric indicators are 21.34 pp (decreases) and 17.67 pp (increases), respectively.
Fig. 6. Dynamic multipliers of asymmetric oil price indicators. Notes: Fig. 6 shows the dynamic multipliers (solid lines, in pp) to a one-pp innovation in the asymmetric oil price indicators and the corresponding 68% confidence bands (dashed lines). AOPD (AOPI) is the indicator for oil price decreases (increases).
Fig. 7. Dynamic multipliers of net oil price indicators. Notes: Fig. 7 shows the dynamic multipliers (solid lines, in pp) to a one-pp innovation in the net oil price indicators and the corresponding 68% confidence bands (dashed lines). NOPD (NOPI) is the indicator for net oil price decreases (increases).
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 loose 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 tightening is only marginally significant. Consequently, the exchange rate barely reacts to oil price increases either.

Fig. 7 shows the results for the specification in the spirit of Du et al. (2010) and Hamilton (1996). 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).

Fig. 7 shows the results for the specification in the spirit of Du et al. (2010) and Hamilton (1996). 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).10

Her growth fluctuations appear to be symmetrically dampened by monetary policy (as much as this is possible in a system of mainly fixed exchange rates with fiscal dominance). The reduction after a net oil price decrease is only significant one and two quarters after the shock because the CBA immediately cuts its interest rate. 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.

As in Fig. 6, inflation is found to increase due to the loose monetary policy stance in the event of net decreases or due to the shock after net increases. The exchange rate exhibits strong depreciation after net oil price decreases (also due to loose monetary policy) but only marginally significant appreciation after net oil price increases. 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 nonlinear extensions, growth effects are mainly documented after (net) oil price increases. The lack of response by GDP after (net) oil price decreases is driven by the 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 strong depreciation. Inflation increases after both types of shocks, due to either the accommodative monetary policy stance in the case of decreases or the shock in the case of increases.

5. Conclusions

Thanks to high resource windfalls over the past two decades, Azerbaijan has achieved high economic growth. However, the oil price slumps in 2009 and 2014 demonstrated that Azerbaijan’s economy is heavily dependent on energy exports and operates based on large government expenditures subsidized by SOFAZ. 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 VAR models for the period 2002Q1–2018Q4.

Our key results are as follows. GDP growth decreases after oil price shocks in the oil and gas sector and in the rest of the economy. The decline in the oil and gas sector can be explained by a reduction in oil revenues due to a decrease in demand for oil on the world market. The corresponding decline in GDP growth in the rest of the economy can be explained by its composition, as it is driven by government expenditures subsidized by oil income and taxes. The sharp reduction in oil revenues limits the government’s ability to fund the rest of the economy. Hence, downturns (upsweeps) in the oil and gas sector also prompt corresponding downturns (upsweeps) in the non-oil sector. 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 rest of the economy. Oil price shocks also trigger appreciation of the manat against the US dollar. This also limits the external competitiveness of the economy, and, together with the increase in inflation, our results provide evidence that the Dutch disease occurs in Azerbaijan.

When we analyze potential asymmetries, growth effects are mainly documented after (net) oil price increases. The absence of a response in GDP after (net) oil price decreases is driven by the 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 strong depreciation. Inflation increases after both types of shocks, due to either the loose monetary policy stance in the case of decreases or the shock in the case of increases.

Our results further illustrate that dependence on natural resources can be harmful for an oil-exporting economy. This holds in particular in times of falling oil prices. Our sample does not include the most recent slump in oil prices triggered by the worldwide collapse in demand for oil due to the COVID-19 pandemic. It remains to be seen how Azerbaijan (and other oil-exporting countries) will cope with this economic slump. In this context, a more diversified economy that is less dependent on natural resources would indeed be more resilient in the event of negative oil price shocks.

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

Fig. 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. Nominal GDP data has been transformed to real GDP data with the help of the consumer price index. All series, with the exception of the central bank rate, are growth rates compared to the previous year’s quarter.
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