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PERMANENT AND TEMPORARY OIL PRICE SHOCKS, MACROECONOMIC POLICY, AND TRADABLE NON-OIL SECTOR: CASE OF AZERBAIJAN, KAZAKHSTAN, AND RUSSIA

Ramiz Rahmanov

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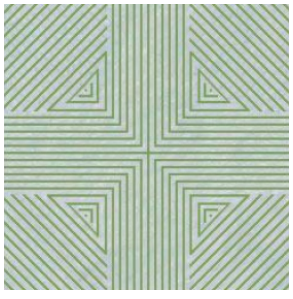

Permanent and Temporary Oil Price Shocks, Macroeconomic Policy, and Tradable Non-oil Sector: Case of Azerbaijan, Kazakhstan, and Russia[1]

Ramiz Rahmanov

Central Bank of the Republic of Azerbaijan

E-mail: ramiz_rahmanov@cbar.az

Abstract

This paper examines the economic effects of permanent and temporary oil price shocks in three oil-exporting countries (Azerbaijan, Kazakhstan, and Russia) using the five variable (real short term interest rate, real effective exchange rate, real budget expenditure, real imports, and real tradable non-oil production) VARX model with two exogenous variables which represent the corresponding shocks. The impulse response analysis conducted over the quarterly data from 2003:I to 2015:IV shows that in Azerbaijan, a permanent oil price shock produces a significantly positive effect on all variables but interest rate, while a temporary oil price shock has a significant and positive effect only on imports and exchange rate. For Kazakhstan, the impulse response functions show that a permanent oil price shock significantly and positively affects interest rate, imports, and budget expenditure; a temporary oil price shock has a significantly positive influence on all variables except budget expenditure. In Russia, a permanent oil price shock produces a significantly positive effect on all variables; a temporary oil price shock exerts a significantly positive effect on all variables but interest rate. Contrary to the permanent income hypothesis, the budget expenditure in Russia responds both to the permanent and temporary oil price shocks. Such divergence from the hypothesis can be explained by the specifics of the policy on the oil revenue spending. As regards the presence of the symptoms of the Dutch disease, the results indicate only on one symptom. Thus oil price shocks ultimately lead to appreciation of national currencies but not to a decline in tradable non-oil production.

Keywords: permanent oil price shock, temporary oil price shock, macroeconomic policy, non-oil economy, VARX

JEL classification: C54, E32, E37, E63, Q32

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Introduction

In the recent two years, the oil market experienced a series of negative developments. Brent crude oil prices had declined from the peak of USD 111.6 in June 2014 to the bottom of USD 30.7 in January 2016. The fall in oil prices observed this time fundamentally differs from the drop occurred in the last financial crisis. At that time, the decline resulted from a temporary liquidity problem provoked by the insolvency of Lehman Brothers, while the current fall was rather engendered by structural changes in demand and supply. The changes on the demand side include weak global economic growth, especially in the emerging market economies, wider introduction of energy-saving technologies, development of alternative energy, and gradual appreciation of the US currency. The changes on the supply side include an increase in production of shale oil, decision of OPEC maintain its oil production level, increase in oil production in Iran, Iraq, and Libya whose participation in the international oil market was previously limited due to either serious security problems or sanctions. Since the current negative oil price shock has fundamental reasons, the oil prices can remain low for a long period and this can create serious challenges for governments in oil exporting countries where oil constitutes the main share of exports, and budgets are mostly financed by oil revenues.

In the former Soviet Union space, there are three major oil exporting countries: Azerbaijan, Kazakhstan, and Russia. These countries are characterized by high dependence on oil in trade and fiscal accounts. The share of oil in exports in Azerbaijan exceeds 90%, in Kazakhstan and Russia, the share varies between 60% and 80%. When oil prices were high, these countries experienced a huge inflow of petrodollars which led to the significant appreciation of their national currencies and accumulation of considerable foreign exchange reserves. However, as the negative oil price shock hit the oil market, the inflow of petrodollars narrowed and this provoked a pressure on the national currencies. At first, the central banks expressed willingness to maintain their currencies through spending their reserves. To prevent foreign exchange reserves from falling to critical levels, the central banks in these countries had to devalue their currencies and change exchange rate regimes.

During the periods of high oil prices, the governments of these countries were receiving a large volume of oil revenues, one part of which was accumulated in the wealth funds and the other part was directed to the budget and spent on raising pensions and wages of the public employees and infrastructure development. In 2013, the contribution of oil revenues to the budgets in Azerbaijan and Kazakhstan exceeded 50% and in Russia, the contribution to the budget was around 50%. After the oil market started declining, the governments of these countries started optimizing their spending and suspending the projects of the relatively low priority.

High dependence on oil revenues and high volatility of oil prices call for effective economic policy and management in Azerbaijan, Kazakhstan, and Russia. The probability of designing successful economic policy and making good governance depends on understanding the manner oil price shocks hit the economy and interact with other economic variables. There is a vast body of studies which contribute to the analysis of the relationship between changes in oil

prices and macroeconomic variables in oil-exporting countries. One strand of the literature analyzing the impact of oil price shock assumes that economies respond symmetrically to negative and positive shock (Rautava, 2004; Ito, 2008). Another strand instead argues that economies respond differently to negative and positive oil price shocks and therefore distinguishes shocks (Farzanegan and Markwardt, 2009; Rahmanov, 2009; Koh, 2016). The other strand of the literature along with estimating the impact of either symmetric or asymmetric oil price shocks aims to determine the nature of the shocks using the SVAR models (Ahmed and Wadud, 2011; Kand and Ratti, 2013; Kose and Baimaganbetov, 2012; Karimli et al, 2016). Despite the diversity of the approaches to the analysis of the effects of oil price shocks, there exist a consensus among these studies about the existence of the significant positive relationship between positive oil price shocks on the one side and output and fiscal spending on the other side in oil exporting countries.

This paper sets a new strand in the literature as it suggests a new approach to differentiation of oil price shocks. Following the seminal work of Friedman (1957) which proposes that consumption responds to permanent changes in income rather than temporary changes, I argue that fiscal spending in oil exporting countries have to respond to permanent oil price shocks rather than temporary ones. To test the proposition, I estimate the five variable VARX models with two exogenous variables representing correspondingly permanent and temporary oil price shocks for Azerbaijan, Kazakhstan, and Russia using the quarterly samples over the period 2003-2015.The separation of nominal oil price shocks into permanent and temporary components was made solving the unobserved components model by the Kalman filter. The impulse responses show that that in Azerbaijan, a positive permanent oil price shock produces a significant and positive effect on real effective exchange rate, real budget expenditure, real imports, and real tradable production, while a positive temporary oil price shock has a significant and positive effect only on real effective exchange rate and real imports. For Kazakhstan, the impulse response functions show that a positive permanent oil price shock positively and significantly affects real short-term interest rate, real imports, and real budget expenditure; a positive temporary oil price shock has a significantly positive influence on real short-term interest rate, real effective exchange rate, real imports and real tradable non-oil production. In Russia, a positive permanent oil price shock has a significantly positive effect on all variables; a positive temporary oil price shock has a significantly positive effect on all variables but real short term interest rate. The results of Azerbaijan and Kazakhstan support the Permanent income hypothesis that agents have to respond only to permanent changes in income. However, the finding that real budget expenditure responds to a temporary oil price shock in Russia contradicts the Permanent income hypothesis which states than only a permanent shocks matter. Such a counterintuitive reaction of the fiscal spending in Russia can be explained by the rule used to manage oil revenues. As regards, the presence of the symptoms of the Dutch disease, the results indicate only on one symptom – appreciation of the national currency. The other symptom of the Dutch disease - a decline in non-oil tradable production was not detected. Another interesting finding is that in Azerbaijan, a short-term interest responds neither to a

permanent nor a temporary oil price shock, this result shows that the banking sector in Azerbaijan to a large extent is isolated from the developments occurring in the main sector of the economy. The other finding catching attention is that despite among three countries Azerbaijan is the most oil dependent country, the magnitudes of its responses are smaller than those of Kazakhstan and Russia. This fact indicate that the way economies respond to oil price shocks is determined not just by the degree of oil dependence but also the economic structure and policies implemented by the governments. The other observation arousing curiosity is that most of the shocks are short-lived; Esfahani et al. (2013) explain such a quick adjustment to the shocks by the low development of the financial markets.

The rest of the paper is organized as follows. The following section introduces the methodology of the empirical analysis. The third section describes the data, explains the procedure used to compute permanent and temporary oil price shocks, and analyzes the time series properties of the variables. The fourth and fifth sections present and discuss the results. Finally, the last section concludes the paper with the highlights of the main results and their policy implications.

Methodology

In this paper to investigate the impact of permanent and temporary oil price shocks on the real economy in three oil-exporting countries, I use a quarterly VARX with five endogenous of order p and two exogenous variables of order q (VARX(p,q)) for each country under study (Ocampo and Rodriguez, 2012):

$$y_t = c + A(L)y_t + B(L)x_t + \varepsilon_t$$

where y_t is a (5 × 1) vector of endogenous variables, c is the (5 × 1) intercept vector of the VARX, x_t is a (2 × 1) vector of exogenous variables, $A(L)$ and $B(L)$ arematrices of polynomials in the lag operator L and ε_t is the (5 × 1) vector of innovations. Each matrix in $A(L)$ has a size of 5×5 and each matrix in $B(L)$ has a size of 5×2. Innovations are uncorrelated with their own lagged values and the right-hand side variables, but they may be contemporaneously correlated.

The endogenous variables considered in this model are the following: real short term interest rate, real effective exchange rate, real budget expenditure, real imports, and real tradable non-oil GDP. The set of exogenous variables includes nominal permanent oil price shock and nominal temporary oil price shock. Here I use the assumption that an oil price is an exogenous factor for these economies because neither of these countries has a large enough share in the world oil production or consumption to influence the oil price setting. For example, according the statistics reported by the US Energy Information Administration, in 2014, Azerbaijan produced 0.9%, Kazakhstan – 1.8%, and Russia- 11.6 % of total oil supply. Regards the oil consumption, according the US Energy Information Administration, in 2013, Azerbaijan consumed 0.1%, Kazakhstan – 0.3%, and Russia – 3.8% of total oil consumption.

The composition of the endogenous variable set is motivated by both the propagation mechanism of the oil price shocks and the interest of the paper to examine the impact of the oil price shocks on the macroeconomic policy and tradable non-oil sector. Changes in oil prices affect budget revenues and therefore the spending capacity of the government. Budget expenditure in turn has a significant effect on the demand which can be met either through higher imports or domestic production. Fluctuations in the inflow of petrodollars also affect the supply of the foreign currency into the country and therefore affect the value of the national currency. Changes in the value of national currency affect its purchasing power and can influence country imports. The variable set also includes a real short term interest rate to capture the reaction of the monetary sector to inflationary pressures coming from the greater demand.

The VAR model contains real permanent and temporary oil price shocks to test the Permanent income hypothesis developed by Friedman (1957), which states that only changes in permanent income have an influence on consumption. Following the logic of this hypothesis, one can suggest that the fiscal spending in oil-exporting countries have to react only to permanent oil price shocks because only permanent changes in oil prices will cause permanent changes in oil revenues. Additionally, the analysis of the VAR model will allow us to test whether Azerbaijan, Kazakhstan, and Russia have the symptoms of the Dutch disease. The Dutch disease theory predicts that large inflow of petrodollars into the economy has to lead to the appreciation of the domestic countries, decline in manufacturing, increase in wages, and fast growth of the non-tradable sector (Oomes and Kalcheva, 2007; Esfahani et al., 2013; Mohaddes and Pesaran, 2013). In the framework of this VAR specification, it will be possible only to test the impact of oil price shocks only on the real exchange rate and tradable non-oil sector.

For the analysis of the reactions of the economic variables to permanent and temporary oil price shocks, impulse responses functions will be estimated. If the VARX model is stable, the reduced form can be rewritten as a moving average representation:

$$y_t = \bar{y} + C(L)u_t + D(L)x_t \quad (3)$$

where $\bar{y}$ is the5×1 vector of means of the system, $C(L)$ and $D(L)$ are infinite polynomials in the lag operator L, and $u_t$isthe (5×1) vector of structural innovations. When y_t is equal to its mean, an injection of one shock to the system would cause it to move from the equilibrium. The path along which the variables return to the equilibrium is called the impulse response of the VAR (Ocampo and Rodriguez, 2012).

As this paper aims to estimate the separate effects of permanent and temporary oil price shocks which are exogenous in the model and does not have an objective to identify the other shocks, the correlations in the VAR residuals are ignored and therefore no transformation is made. Instead, I just separately set the impulse of one unit to each exogenous variable and compute the responses of the endogenous variables.

Data

The sample period used is almost the same for all countries under study; it runs from 2003:I to 2015:IV for Azerbaijan, from 2003:I to 2015:IV for Kazakhstan, and from 2003:IV to 2015:IV for Russia. The oil price is defined as the spot price of an internationally traded Brent brand of crude oil in the US dollar. The statistics on oil prices was taken from the database of the US Energy Information Administration. The real short term interest rate is the nominal short term lending rate adjusted for inflation. For Azerbaijan and Kazakhstan, the short term lending rate is an average rate charged by banks on credits up to one month from individuals and firms; for Russia, it is an average rate charged by banks on credits up to one year from firms. The interest rate and real effective exchange rate statistics is taken from the databases of the central banks of the corresponding countries. The real budget expenditure represents the expenditure of the consolidated budget in the national currency deflated by the national Consumer Price Indices. The data on the consolidated budgets come from the databases of the Ministries of Finance. The real non-oil tradable GDP stands for the total real value of production in agriculture and manufacturing expressed in the national currency. The data for this variable come from the national accounts statistics compiled by the statistical offices of the respective countries. All variables except real interest rates are expressed in logs.

As the purpose of the analysis is to determine the impact of permanent and temporary oil price shocks and not the general oil price shocks on the economy, one needs to extract permanent and temporary components from the oil price series. A permanent oil price shock series is defined as a growth rate of the permanent component of the oil price series, and a temporary oil price shock series is defined as a growth rate of the temporary component of the oil price series. To decompose the oil price series into permanent and temporary components, I use an unobserved components model in the following set up which resembles that of Clark (1987):

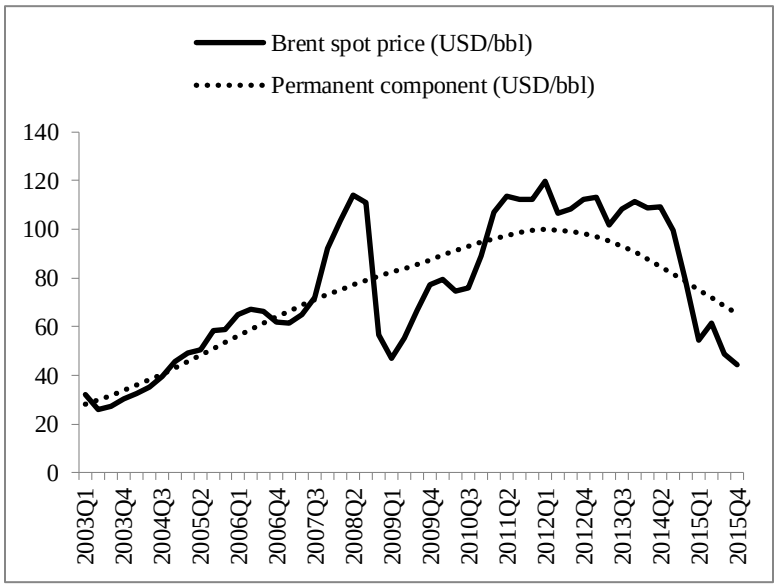
$$OP_t = PC_t + TC_t$$
$$PC_t = PC_{t-1} + \Delta PC_t + u_t$$
$$\Delta PC_t = \Delta PC_{t-1} + v_t$$
$$F(L)TC_t = w_t$$

where OP_t is an oil price series, PC_t is a permanent (trend) component, TC_t is a temporary (cyclical) component, $F(L)$ is a finite polynomial in the lag operator, and u_t, v_t, and w_t are independent white noise processes.

The construction of the model implies that the permanent and temporary oil price components are independent series, in other words, they are driven by different processes. The unobserved components model is solved using the Kalman filter which is a powerful recursive algorithm. This filter allows for sequentially updating one-step ahead estimate of the state mean and variance upon receiving new information. Appling the Kalman filter to the state space model, I obtain the permanent and temporary components of the oil price series. The oil price series together with the permanent component series is plotted in Figure 1. It is seen in the graph that although a spectacular increase in the oil prices during 2007:III-2008:II period was driven by

both permanent and temporary positive shocks, the contribution of the temporary shocks was larger. During 2008:III-2010:III period, the oil prices experienced positive permanent shocks; however, the negative temporary shocks prevailed and the oil prices declined. The recent negative developments in the oil markets are brought by both negative permanent and temporary oil price shocks.

Figure 1. Brent Spot Price: Actual vs. Permanent Component



Source: US Energy Information Administration, author's estimations

The time series properties of the variables were assessed by the Augmented Dickey Fuller (ADF) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests. The null hypothesis of the ADF test is that the series is non-stationary against the alternative that the series is stationary. The null hypothesis of the KPSS test states that the series is stationary against the alternative that the series is non-stationary. The ADF test regression requires the specification of the lag order. For the lag-order selection, I will use a general-to-specific sequential t test rule because the simulations performed by Ng and Perron (1995) show that the sequential t test rule has smaller size distortions comparable to the traditional information criterion rules. According to the t test rule, one first has to set an upper bound for the lag length, which is six in this application, and estimate the ADF test for this lag order. If the coefficient of the last lagged difference is statistically significant at the 10% level, then the result of the test is accepted; otherwise the lag length is reduced by one, and the procedure is repeated. If no lags are significant, the lag order is set to zero. For the KPSS test, I choose the Bartlett kernel spectral estimation method and use the Newey-West selection procedure to determine the optimal bandwidth. The results of the tests are reported in Table 1.

Table 1. Unit root tests

	ADF test			KPSS test		
	Level	1st difference	2nd difference	Level	1st difference	2nd difference
			Azerbaijan			
Real short term interest rate	-0.670	-9.901*	-6.635*	0.685	0.139*	0.014*
REER	-1.066	-4.200*	-6.611*	0.752	0.250*	0.248*
Real budget expenditure	-1.358	-6.913*	-6.174*	0.879	0.121*	0.060*
Real imports	-2.178	-9.653*	-5.882*	0.866	0.247*	0.146*
Real tradable non-oil production	-2.035	-7.773*	-5.639*	0.932	0.160*	0.316*
			Kazakhstan			
Real short term interest rate	-3.739*	-7.648*	-3.999*	0.073*	0.138*	0.155*
REER	-2.150	-6.969*	-6.308	0.757	0.390*	0.310*
Real budget expenditure	-2.465	-5.533*	-6.295	0.911	0.363*	0.500
Real imports	-2.950*	-2.596	-5.311*	0.704	0.551	0.064*
Real tradable non-oil production	-0.759	-5.254*	-5.720*	0.935	0.125*	0.118*
			Russia			
Real short term interest rate	-3.843*	-4.411*	-5.632*	0.216*	0.045*	0.036*
REER	-1.918	-3.187*	-5.326*	0.620	0.501	0.044*
Real budget expenditure	-2.129	-10.404*	-6.870*	0.802	0.051*	0.017*
Real imports	-2.333	-3.513*	-6.333*	0.649	0.448*	0.314*
Real tradable non-oil production	-2.238	-5.999*	-5.536*	0.716	0.135*	0.410*

Note: A constant is included into the test regressions. Critical values for the KPSS test: 1% level - 0.739, 5% level - 0.463, and 10% level - 0.347. Critical values for the ADF test: 1% level --3.606, 5% level - -2.937, and 10% level --2.607. *Stationary at least at 5% level.

Since I use two tests to analyze the time series properties of the variable, it can happen that two tests produce conflicting results; if it is the case, I look at the plot of the series against time to determine whether the series is growing or not. In case the series is growing, the stationary hypothesis is rejected and vice versa. Under this testing strategy, for Azerbaijan, all variables are found to be first-difference stationary series. For Kazakhstan and Russia, real short term interest rate is determined to be a stationary process and the other series are determined to be first-difference stationary processes.

Empirical results

In the VAR estimation the lag order selection is an important issue. There are many criteria

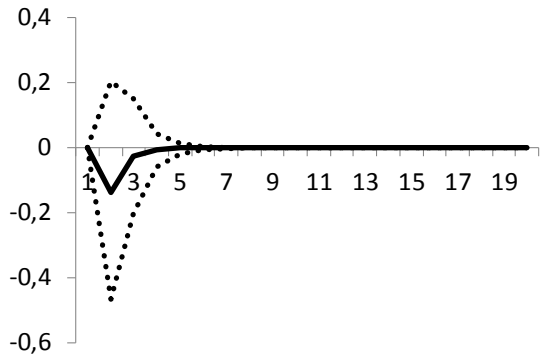
which can be used in determination of the autoregressive order, among the most popular are Akaike Information Criteria (AIC), Schwarz Information Criterion (SC), and Hannan-Quinn information criterion (HQ). As the sample sizes are relatively, to select the lag order, this paper uses a SC because of its parsimony setting the maximum lag order to five. The SC indicates that for all country VARX models, the optimal lag order is one.

Azerbaijan

Figure 2 reports impulse response functions of real short term interest rate, real effective exchange rate, real budget expenditure, real imports, and real tradable non-oil production to one unit permanent and temporary oil price shocks for 20 quarters together with their 68% error bands. The figure shows that both temporary and permanent oil price shocks have no statistically significant effects on real short term interest rates. A permanent shock to oil prices produces a significantly positive effect on real effective exchange rate only in the second quarter, but then the effect falls and dies out by the fifth quarter. The response of real effective exchange rate to a temporary oil price shock exhibits the similar pattern but has larger magnitudes. Quantitatively, a 10% positive permanent oil price shock increases real effective exchange rate by 2.1 % in the second quarter, while a 10% positive temporary oil price shock raises real effective exchange rate by 1.6% in the second period. A permanent oil price shock raises real budget expenditure only in the second quarter and the effect deteriorates by the fifth quarter, while a temporary oil price shock does cause a significant effect on fiscal spending. In numerical terms, a 10% positive permanent oil price shock leads to an increase in real budget expenditure by 8% in the second quarter. Real imports significantly positively react to both permanent and temporary oil price shocks only in one period but by different magnitudes. Thus a 10% positive permanent oil price shock raises imports by 7.5% in the second quarter, and a 10% positive temporary oil price shock increases imports by 1.6% in the second. Real tradable non-oil sector demonstrates a positive and significant response only to a permanent price shock and only in the second quarter. Numerically, a 10% positive permanent oil price shock results in an increase in tradable non-oil production by 3.8% in the second period.

Figure 2. Responses to positive one unit innovations with 68% bootstrapped confidence bounds: the Azerbaijani case

Response of *real short term interest rate* to a permanent oil price shock



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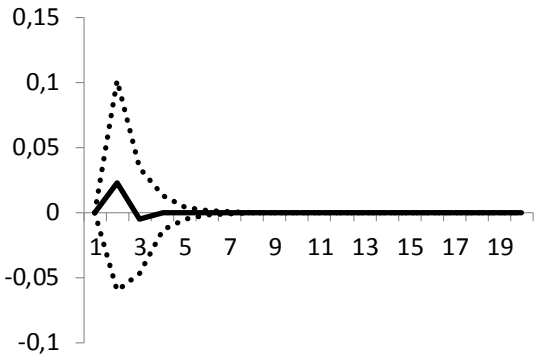
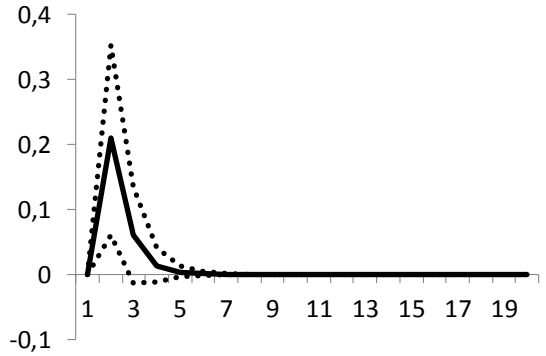
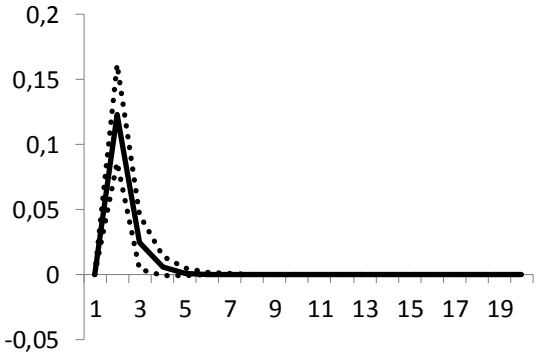


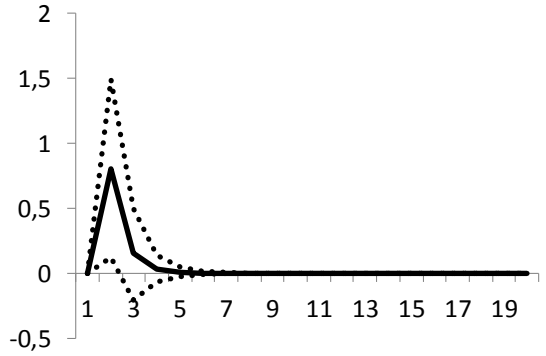
Response of *REER* to a permanent oil price shock



Response of *REER* to a temporary oil price shock



Response of *real budget expenditure* to a permanent oil price shock



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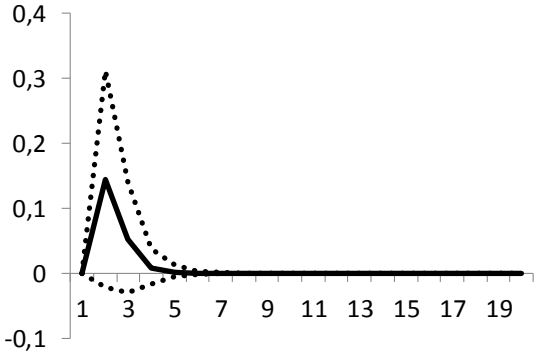
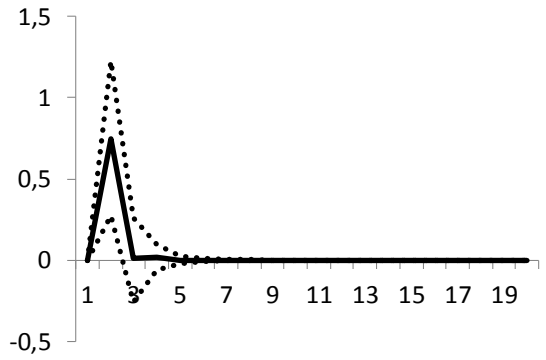
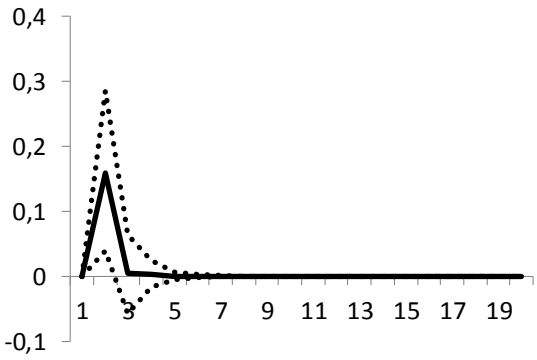


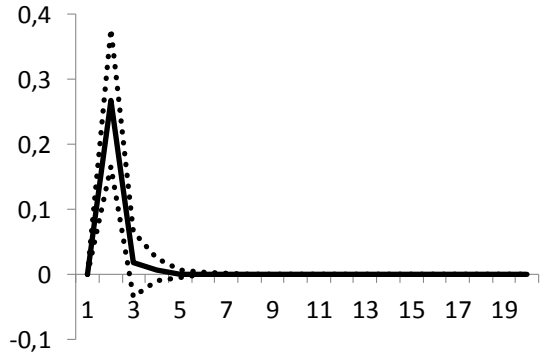
Response of *real imports* to a permanent oil price shock



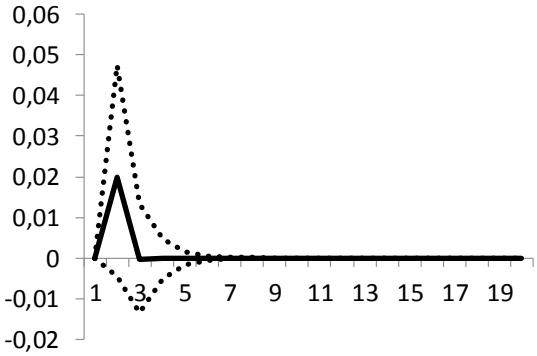
Response of *real imports* to a temporary oil price shock



Response of *real tradable non-oil production* to a permanent oil price shock



Response of *real tradable non-oil production* to a temporary oil price shock



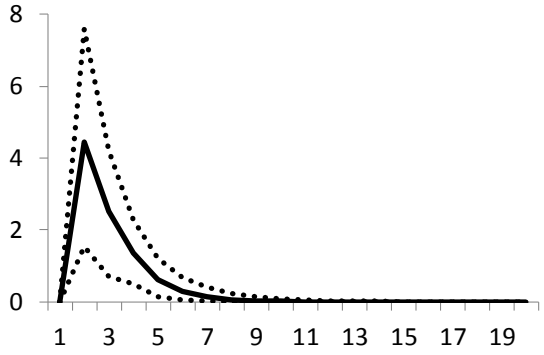
Kazakhstan

Figure 3 shows the responses of real short term interest, real effective exchange rate, real budget expenditure, real imports, and real tradable non-oil production to temporary and permanent positive oil price shocks for 20 quarters together with their 68% error bands. In contrast to Azerbaijan, both permanent and temporary oil price shocks produce significantly positive effects on real short term interest rate although of different magnitudes. In quantitative terms, a 10% permanent and temporary positive oil price shocks increases real interest rate by 0.4% and 0.2% after one period respectively. The effects completely decay by the seventh quarter. Another result which distinguishes the Kazakh economy from that of Azerbaijan is that in Kazakhstan, real effective exchange rate responds only to temporary oil price shocks. Thus a 10% temporary positive oil price shock leads to 0.9% appreciation in the second quarter; the effect dies out by the sixth period. The patterns of the responses of real budget expenditure to permanent and temporary oil price shocks resemble those of the Azerbaijani case. Fiscal spending also in a positive manner reacts only to a permanent oil price shock albeit the effect is larger in the magnitude but short lived. Numerically, a 10% permanent positive oil price shock leads to a

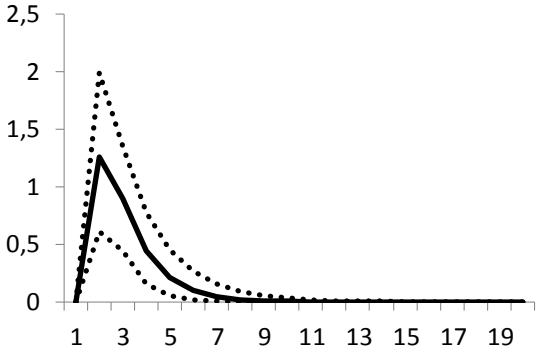
10.3% increase in the budget spending in the second quarter. Real imports show a positive response of short duration to both permanent and temporary oil price shocks although the sizes of responses differ. A 10% permanent oil price shock causes imports to grow by 15.1% by the second quarter, while a 10% temporary oil price shock leads to an increase in imports only by 2%. Real tradable non-oil production responds significantly only to permanent oil price shocks. The effect is positive and significant only in the second quarter and dissipates by the third quarter. Quantitatively, a 10% temporary oil price shock results in 0.6% increase in tradable non-oil sector in the second period.

Figure 3. Responses to positive one unit innovations with 68% bootstrapped confidence bounds: the Kazakh case

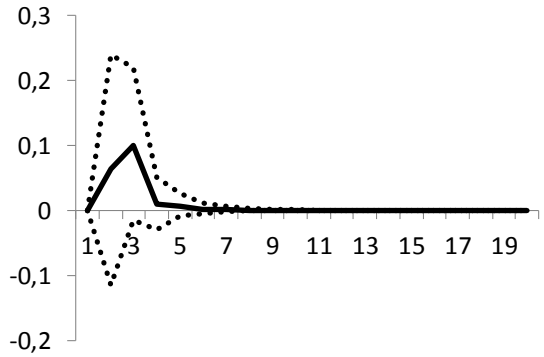
Response of *real short term interest rate* to a permanent oil price shock



Response of *real short term interest rate* to a temporary oil price shock



Response of *REER* to a permanent oil price shock



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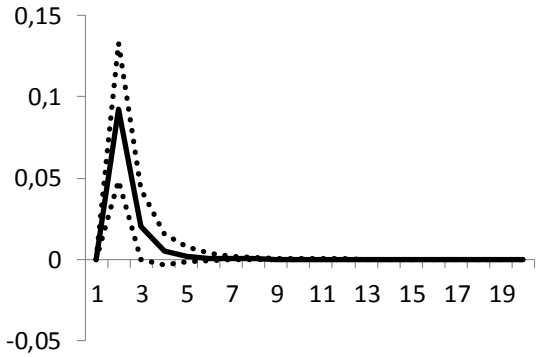
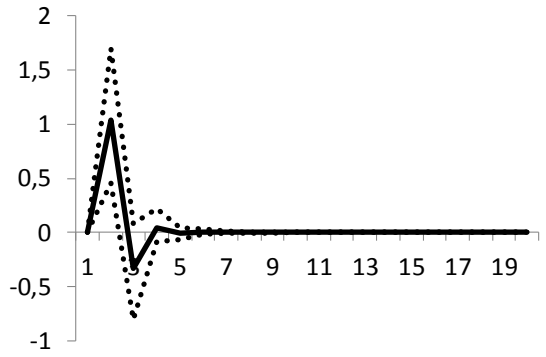
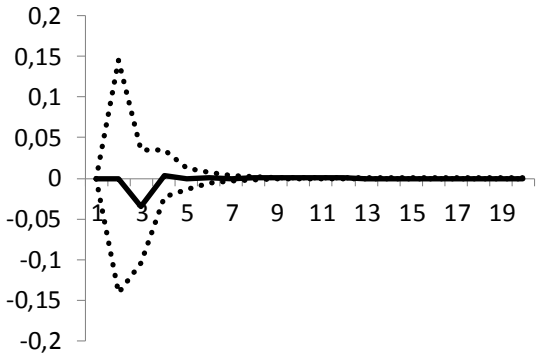


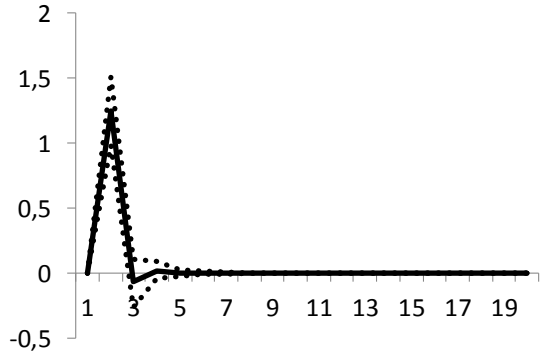
Response of *real budget expenditure* to a permanent oil price shock



Response of *real budget expenditure* to a temporary oil price shock



Response of *real imports* to a permanent oil price shock



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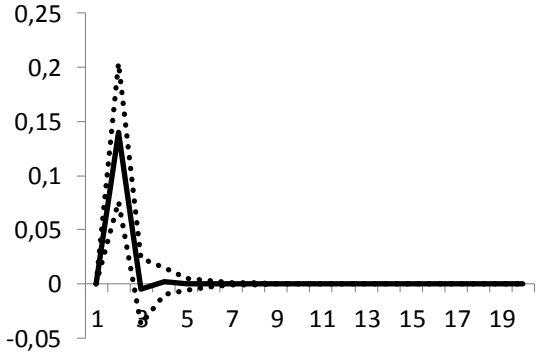
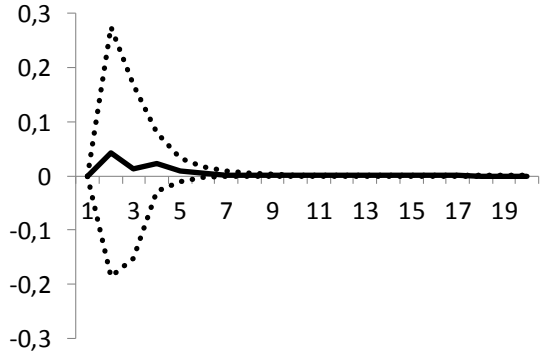
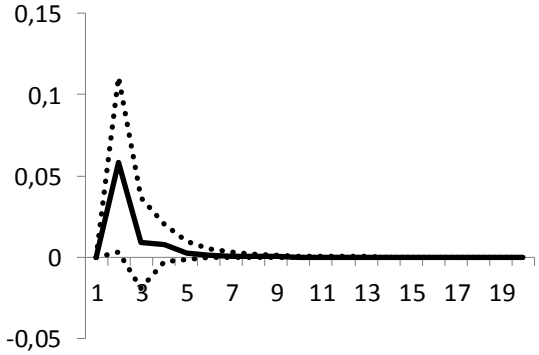


Response of *real tradable non-oil production* to a permanent oil price shock



Response of *real tradable non-oil production* to a temporary oil price shock



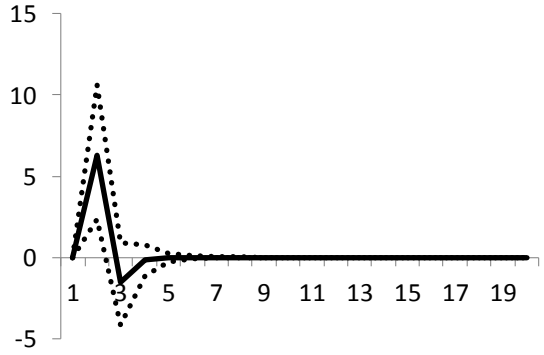
Russia

Figure 4 shows the responses of real short term interest, real effective exchange rate, real budget expenditure, real imports, and real tradable non-oil production to temporary and permanent

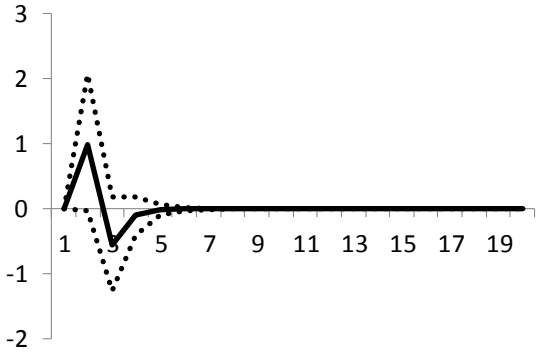
positive oil price shocks for 20 quarters together with their 68% error bands. The figure shows that in Russia, contrary to Kazakhstan, only permanent oil price shocks have a significantly positive effect on real interest rate. The effect becomes significant only in the second quarter and decays shortly. Thus a 10% permanent oil price shock leads to a 0.63% increase in real interest rate in the second period. Similar to Azerbaijani and Russian cases, real effective exchange rate responds positively both to permanent and temporary oil price shocks. The effects become significant only in the second period and die out by the third quarter. Quantitatively, 10% permanent and temporary oil price shock result in 6.9% and 1.1% appreciation of real effective exchange rate respectively in the second period. Furthermore, unlike Azerbaijan and Kazakhstan, real budget spending responds significantly not only to permanent oil price shocks but also to temporary oil price shocks. Numerically, a 10% permanent and temporary oil price shocks increase fiscal spending by 12.3% and 3.2% respectively in the second period. As in the other two oil exporters, in Russia, both permanent and temporary oil price shocks have significantly positive effects on real imports. A 10% permanent and temporary oil price shocks raise real imports by 9.5% and 3% respectively, but the effect are short lived. Finally, in contrast to Azerbaijan and Kazakhstan, real tradable non-oil production demonstrates significant and positive responses both to permanent and temporary oil price shocks in the second period, but the effects decays by the third period. Quantitatively, 10% permanent and temporary oil price shocks lead to 2.2% and 1.1% expansion of the tradable non-oil production in the second period.

Figure 4. Responses to positive one unit innovations with 68% bootstrapped confidence bounds: the Russian case

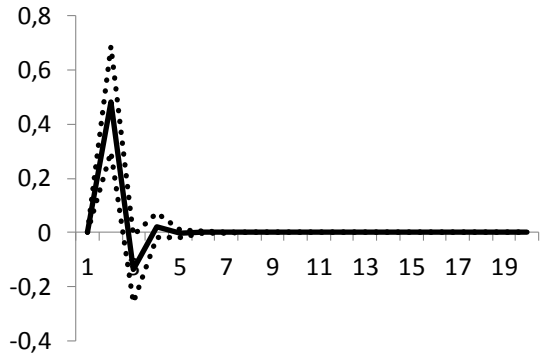
Response of *real short term interest rate* to a permanent oil price shock



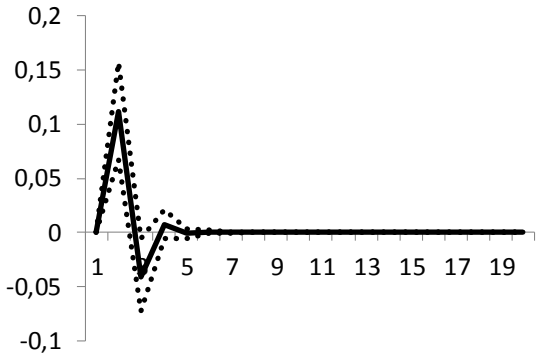
Response of *real short term interest rate* to a temporary oil price shock



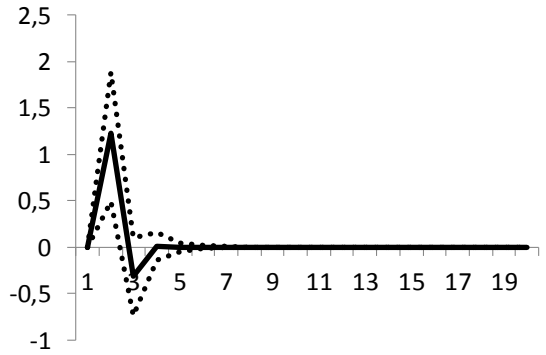
Response of *REER* to a permanent oil price shock



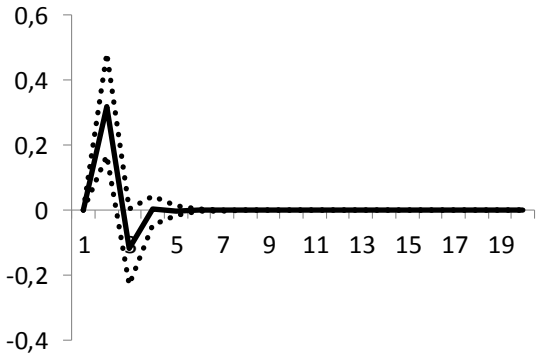
Response of *REER* to a temporary oil price shock



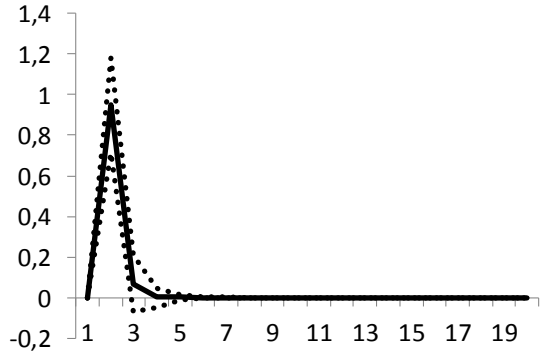
Response of *real budget expenditure* to a permanent oil price shock



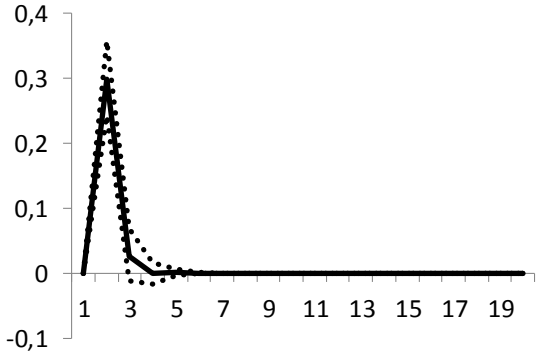
Response of *real budget expenditure* to a temporary oil price shock



Response of *real imports* to a permanent oil price shock

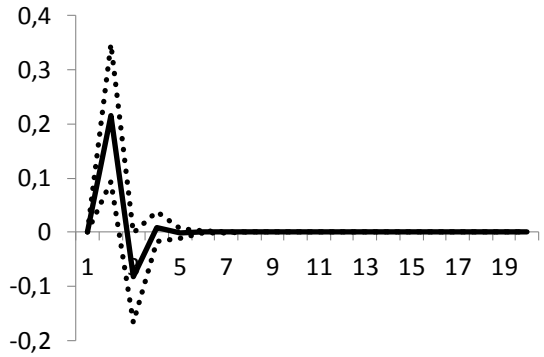


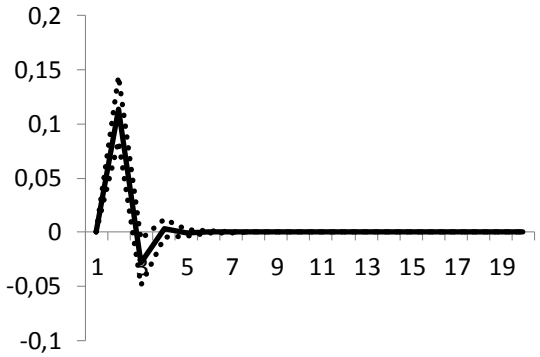
Response of *real imports* to a temporary oil price shock



Response of *real tradable non-oil production* to a permanent oil price shock

Response of *real tradable non-oil production* to a temporary oil price shock





Discussion of the results

The permanent income hypothesis implies that government budget expenditure has to respond only to permanent oil price shocks. However, the impulse response analysis shows that the permanent income hypothesis holds for Azerbaijan and Kazakhstan but not for Russia. The reason why the hypothesis does not hold for Russia is that the way how oil revenues enter the budget in Russia differs from that in Azerbaijan and Kazakhstan. In Russia, every year the Parliament determines amount of transfers to be made to the budget for the next fiscal year from oil revenues which are formed by hydrocarbon production taxes and hydrocarbon export duties. In normal times, the amount cannot exceed 3.7% of the forecasted GDP of that year. After the oil transfer to the budget is made, the remaining part of the oil revenues goes to the stabilization fund whose objective is to help maintain spending of a social character in downturn. The amount of the transfers the stabilization fund does not have to exceed 10% of the forecasted GDP of that year. Any amount above 10% of the forecasted GDP goes to the National Welfare Fund whose objective is to co-finance the deficit of the Pension Fund. However, from 2010 these quantitative rules have not be applied and all oil revenues go to the federal budget. The description of the Russian oil revenue usage policy shows that even periods when the quantitative rules were applied, the government did not distinguish between permanent and temporary fluctuations in oil revenues, it just considers the current situation. In such circumstances, it is not surprising to observe that budget spending in Russia responds both to permanent and temporary oil price shocks. In Azerbaijan and Kazakhstan, the procedure of the management of oil revenues is different. There all oil revenues are directly accumulated in the National Wealth Fund, then for each fiscal year, the government together with the parliament decides on the amount of transfers to be made from the stocks of the funds. Additionally, the government and parliament have the right to revise the budget in the middle of the fiscal year if necessary. Such a discretionary policy in contrast to the strict rules allows policymakers and lawmakers to consider their expectations on developments in the oil market before they make a decision on the amount of the transfers and thereby to some extent secures the oil revenue transfers from the effects of the short-term price fluctuations.

In all three countries, real imports respond positively to both types of oil price shocks. In fact, one expects that imports do not respond to temporary oil price shocks because imports is a part of consumption and therefore according to the well-known hypothesis, imports need to respond only permanent shocks. Although finding a positive and significant response to temporary oil price shocks for Russia is not surprising (since a temporary oil price shock significantly affects budget spending), it is an unexpected result for Azerbaijan and Kazakhstan. In fact, imports usually grow if either income increase or exchange rate appreciates or both. Therefore, it is likely that in Azerbaijan and Kazakhstan, temporary oil price shocks affect imports through real exchange rate appreciation.

The impulse responses functions show that real effective exchange rates in Azerbaijan and Russia appreciate when either temporary or permanent oil price shock, while, in Kazakhstan, real effective exchange rate responds only to temporary oil price shocks. Any positive oil price shock for oil exporting countries implies an increase in export revenues and thereby should lead to the appreciation of domestic currencies. However, the way oil price shocks affect exchange rate is largely predetermined by the exchange rate regimes the country uses. During the 2003-2015, Azerbaijan and Kazakhstan used the monetary policy framework where an exchange rate was an anchor. Until recently the Russian monetary policy framework was also based on the exchange rate anchor to USD; however, now they are gradually moving to the inflation targeting framework. This implies that generally during the study period Azerbaijan, Kazakhstan, Russia (for almost all period) stuck to the peg-like exchange rate regimes; therefore, variation in real effective exchange rates in these countries is explained by the variation in exchange rates of USD vis-à-vis the currencies of the trading partners and the variation in relative prices. A positive oil price shock leads to depreciation of the currencies of the trading partners which are in majority are oil importers and increases the domestic price levels. These two factors in combination lead the appreciation of the real effective exchange rates in these countries. As exchange rate appreciation is one of the symptoms of the Dutch Disease, this result implies that this disease also affected Azerbaijan, Kazakhstan, and Russia.

Along with the appreciation of the national currency, the Dutch Disease is supposed to lead to a decline in the tradable non-resource sector. However, the impulse response function analysis show that in fact, in Azerbaijan permanent oil price shocks, in Kazakhstan temporary oil price shocks, and in Russia both kinds of shocks have a positive effect on tradable non-oil output. Thus, the inflow of oil revenues does not hamper the other tradable sectors but instead promotes its development. Such an outcome is indebted to the policy of the governments which set an aim to develop the non-oil sector to avoid the Dutch disease.

The impulse responses also show that the effects of the oil price shocks last a short time. Esfahani et al. (2013) suggest that the quick adjustment to shocks can be explained by the low development of the financial sectors which a limited set of opportunities to smooth expenditure and therefore economic actors are forced to respond quickly as the circumstances change.

The other interesting finding is that real interest rate in Azerbaijan does not respond either to permanent or temporary oil price shocks while in Kazakhstan real interest rate reacts to

both kinds of shocks and in Russia real interest rate responds only to permanent oil price shocks. This result shows that in fact the banking sector in Azerbaijan is isolated from the effects of the developments in the main sector of the economy; in other words, neither supply nor demand for financial resources is affected by oil price shocks, so it is a structural issue.

Conclusions and policy implications

This paper presents an empirical analysis of the impact of permanent and temporary oil price shocks on the economies of three oil exporting countries – Azerbaijan, Kazakhstan, and Russia. The analysis is conducted over the quarterly data covering the 2003:I – 2015:IV period using the five variable VARX model with two exogenous variables where exogenous variables are permanent and temporary oil price shocks. The impulse response analysis shows that in Azerbaijan, a permanent oil price shock leads to an increase in exchange rate, budget spending, imports, and non-oil production; a temporary oil price shock provokes an increase only in exchange rate and imports. In Kazakhstan, a permanent oil price shocks has a positive effect on interest rate, budget expenditure, and imports; a temporary oil price shock stimulates growth of interest rate, exchange rate, imports and tradable non-oil output. In Russia, a permanent oil price shock causes an increase in interest rate, exchange rate, budget expenditure, imports, and tradable non-oil production; a temporary oil price shock positively affects exchange rate, budget spending, imports, and tradable non-oil output.

Finding that a temporary oil price shock stimulates growth in budget expenditure of Russia is a surprising result because the Permanent income hypothesis dictates that spending has to react only to permanent changes in income. Such a response of budget expenditure is the consequence of the fiscal rule which does not adjusts the amount of the oil transfer to the budget for temporary fluctuations in oil prices. In Azerbaijan and Kazakhstan, there is no specific rule which determines the amount of the oil transfers to the budget; the amount is determined discretionary. As the budget expenditure in Azerbaijan and Kazakhstan does not respond to temporary oil price shocks, it seems that when the government and the parliament decide the amount of transfers they take into consideration the nature of changes in oil prices. In practice, the failure to distinguish between permanent and temporary changes can lead to the undesirable consequences. If there is a temporary positive oil price shock and the government decides to increase social spending which is irreversible, then after the positive shocks quickly decays, the government can find it problematic to find new sources to fulfill increased social obligations. To avoid the development of this scenario, the fiscal authorities in oil exporting countries need to design fiscal rules which accounts for the nature of changes in oil prices.

The impulse responses show that these countries have only one symptom of the Dutch disease – real exchange rate appreciation. No evidence was found that that the increase in oil prices leads to a decline in the tradable non-oil sector; instead, a positive oil price shock stimulates growth in the tradable non-oil sector. Such a counter intuitive outcome is the result of the efforts of the governments of these countries to develop the non-oil sector in order to avoid the Dutch disease. Now when the oil prices experience a negative shock, the scale of the

financial support of the government to the non-oil sector and domestic demand on the goods of the tradable non-oil sector will get narrow and this in turn will lead to downturn in the sector. To minimize the negative effect of the fall in oil prices on the tradable non-oil sector, the authorities should assist firms in finding new markets to compensate the decline in the domestic demand.

As the reason of the short-lived effects of oil price shocks, the literature mentions the low development of the financial sector. The further development of the financial sector in these countries will result in the more long-lived effects of oil price shocks. The long lasting effects of shocks will bring benefits as well as challenges to these economies. Because if the long-lived positive shocks stimulate the economic growth for a great while, then the negative shocks will also depress the economy for a long period. In such circumstances, it is necessary to design an effective toolkit which will help to shorten the length of the effects of negative oil price shocks.

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