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# Crimea and Punishment: The Impact of Sanctions on Russian and European Economies

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# Crimea and punishment:

## The impact of sanctions on Russian and European economies

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### Abstract

The conflict between Russia and Ukraine that started in March 2014 resulted in bilateral economic sanctions imposed by Russia and Western countries, including the members of the euro area (EA). The paper investigates the impact of sanctions on the real side of the economy of Russia and the EA. Using an index that measures intensity of sanctions the effects of sanctions shocks are analyzed by the means of structural vector autoregression. The direct effect on GDP growth is documented for Russia but not for the EA. While, on average, 1.97% of the GDP quarter-on-quarter growth is estimated to be lost due to sanctions by Russia, the corresponding estimate for the aggregate EA is very small. On the contrary, the indirect effect through depreciation of the currency is shown to be more important for the EA.

**Keywords:** Political conflict; sanctions; economic growth; Russia; euro area; structural vector autoregression.

**JEL classification:** C32, F51.

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# 1 Introduction

The conflict between Russia and Ukraine that started in March 2014 led to economic sanctions imposed by the Western countries, including the members of the European Union. As a reaction, Russia imposed counter-sanctions. The paper investigates the impact of sanctions for Russian and the euro area (EA) economies at the aggregate level. The study contributes to the debate whether sanctions are effective, or put differently, whether one can attribute some adverse effects in terms of GDP growth losses to the sanctions.

European businessmen, especially those exporting to Russia, fear about negative consequences of sanctions and pledge for their removal, see [Deutsch-Russische Auslandshandelskammer \(2016\)](#). Their fears are perfectly grounded. Indeed, according to the UN Comtrade data, in 2014, the exports of EU countries to Russia declined on average by 14% compared to 2013. Out of 28 member states 25 suffered export decreases. Especially strong exports deterioration could be observed in Malta (-78%), Cyprus (-42%), and Belgium (-27%). Large EU economies also had substantial exports losses: Germany and UK each experienced a 18% decline, while in France and Italy it was about -12%. In 2015, the exports decline intensified even more. At the time of writing the paper no data were available for all EU countries. However, for example, between 2013 and 2015, the UK exports to the Russian Federation declined by 51%. In 2015, German exports to Russia went down by further 30% compared to 2014.<sup>1</sup>

Given recent decisions to prolongate sanctions made both by European Union ([Council of the European Union 2015](#)), Russian Federation ([President of Russia 2015](#)), and the USA ([Obama 2016](#)), it becomes increasingly more important to understand the price that is paid for the political decisions of that sort. We study influence of sanctions on real GDP growth both in Russia and in the EA. The group of European countries includes 19 euro area economies that are to a large extent behind the aggregate growth of the European Union and share the same currency and monetary policy. As discussed above, international trade and financial ties between these countries and Russia were tight prior to the escalation of conflict. We distinguish two effects of the sanctions: Direct and indirect ones. We think about the former as of likely losses in terms of GDP growth. We refer to the latter as a potentially harmful influence of sanctions on the economy through deteriorated terms of trade, distorted export and/or import commodity prices that are not directly seen in the GDP growth rates.

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<sup>1</sup>According to Volker Treier from DIHK (German Chamber of Commerce and Industry), <http://www.dihk.de/themenfelder/international/news?m=2016-02-18-treier-russland>.

To the best of our knowledge, this is the first paper that evaluates the economic growth effects of anti-Russian sanctions for Russia and selected European countries. The lack of studies on the topic is related to the fact that sanctions were introduced relatively recently, so that the number of observations within sanctions' period is small. We take advantage of the most recent data that allow us to quantify current effects without claims on the long term perspective.

Following [Dreger et al. \(2016\)](#) we construct an aggregate index to measure the intensity of economic sanctions between Russia and the rest of the world. The index accounts for the intensity in economic sanctions, that encompass the measures targeting individuals, businesses, and entire industries. This paper is the first to set up structural vector autoregression (SVAR) in the spirit of [Sims \(1980\)](#) to evaluate consequences of sanctions. The method is very useful to analyze the effect of interest as under suitable conditions it allows to (i) assess the responsiveness of economies to sanctions dynamically; (ii) understand contribution of sanctions shocks to the variability of key macroeconomic variables; (iii) obtain a counterfactual data series—in our case GDP growth rates— under the assumption of the absence of sanctions. In our model, we account for GDP growth, oil prices, and real effective exchange rates (REER) of Russia and the EA. We identify the sanctions shock as the only shock having contemporaneous impact on all variables. The exogenous sanctions shock may be interpreted as a deviation from expected intensity of sanctions. The interpretation is appealing from our point of view as the index of sanctions is a composite of different bans and restrictions. Even though we use most recent data, the sample size is too short to estimate models with time varying parameters. For that reason shifts in the (structural) parameters that might have occurred, unfortunately, cannot be taken into account.

Our results may be summarized as follows. First, sanctions directly affect Russian GDP, but not aggregate GDP of euro zone. The indirect effect of the sanctions is seen in the adjustment of the real effective exchange rates for both regions. Second, much larger variations in the GDP growth of Russia than of the EA are due to sanctions. In contrast, a large fraction of fluctuations in the REER of the euro area countries are due to sanctions. Third, using counterfactual analysis we estimate quarter-on-quarter GDP growth loss for Russia to be on average slightly less than 2%. The corresponding number for EA countries is negligibly small. Thus, we obtain evidence on direct and indirect effect of sanctions on the Russian economy, while only indirect effects matter for the EA. Given rather tight trade connections between the European countries and Russia, not only

direct but also indirect effect plays an important role for the propagation of sanctions shocks. Depreciation of the real effective exchange rate of currencies may be seen as one of the mechanisms to combat trade loss due to sanctions.

The rest of the paper is organized as follows. Section 2 discusses the literature on economic impact of sanctions. Section 3 describes the data used in the study. Econometric model, main results and discussion of robustness are presented in Section 4. Finally, Section 5 concludes.

## 2 Economic impact of sanctions

The empirical evidence on the effects of economic sanctions is mixed. Trade restrictions, for instance, can raise the costs for the target country, but may also harm the sanctioning country. Countries with strong economic ties are especially hit through lower growth perspectives. Using a gravity regression approach, [Caruso \(2003\)](#) reported negative effects of economic sanctions on trade. Sanctions may cause higher damage, if they are implemented multilaterally. In case of unilateral sanctions, the target might be able to sell or buy goods and raw materials from third, non-sanctioning countries.

[Neuenkirch and Neumeier \(2015\)](#) assess the impact of economic sanctions imposed by the UN and USA. They use panel data estimation techniques and sample that includes 68 countries and covers the period 1976–2012. They find that the UN sanctions have a relatively large and statistically significant effect decreasing the target state’s real per capita GDP growth rate by 2.3–3.5 percentage points, while the effect of the US sanctions is much smaller accounting for a 0.5–0.9 decrease in the GDP growth.

[Hoffmann and Neuenkirch \(2015\)](#) investigate the impact of sanctions on the Russian stock returns. It is found that intensification of the conflict reduces Russian stock returns. In particular, the (de-)escalation of the conflict in Ukraine accounts for a total variation of 6.5 percentage points in the Russian stock market. [Dreger et al. \(2016\)](#) examine the effects of Russia/Ukraine-related sanctions and oil price decline on the daily exchange rate of ruble. They find that the exchange rate is mostly affected by the oil price than by economic sanctions.



### 3 Data

We use the following data for our analysis. All variables are seasonally adjusted. The data are quarterly and run from 1997Q1 through 2015Q4.

- $s_t$  is the index of intensity of the sanctions imposed by the rest of the world on Russia. The index is developed and thoroughly described in Dreger et al. (2016). For the purposes of the present study it was updated and covers the period between March 2014 and December 2015. In other times the index takes value zero.
- $y_t^{RU}$  first difference of the log of Russian GDP obtained from the Federal State Statistics Service, Russia.<sup>2</sup>
- $y_t^{EA}$  first difference of the log of euro area GDP (based on 19 EA countries) obtained from Eurostat.
- $p_t^{oil}$  log of price of oil obtained from the Datastream. The variable accounts for a dramatic decline of the oil prices that began in summer 2014, given the heavy dependence of Russian economy on the oil and gas exports.
- $e_t^{RU}$  log of real effective exchange rate of Russian ruble obtained from Bank for International Settlements.
- $e_t^{EA}$  log of real effective exchange rate of euro obtained from Bank for International Settlements.

All variables are shown in Figure 1. The corresponding descriptive statistics are reported in Table 1.

Table 1: Descriptive statistics of variables under inspection

Statistic	N	Mean	St. Dev.	Min	Max
$s_t$	84	0.643	2.242	0.000	9.403
$y_t^{RU}$	83	0.007	0.018	-0.060	0.040
$y_t^{EA}$	83	0.004	0.007	-0.029	0.023
Oil price in levels	84	54.547	35.318	11.210	121.200
$e_t^{RU}$	84	4.376	0.238	3.828	4.695
$e_t^{EA}$	84	4.603	0.070	4.435	4.709

Note:  $N$  stands for a number of observations, while "St.Dev." denotes standard deviation.

The sanctions index,  $s_t$ , varies between 0 and 9.4. The mean log real GDP of Russia is 0.007 (which corresponds to 0.7% quarter-on-quarter growth rate) and is substantially higher than that of the EA 0.004

<sup>2</sup>Due to a switch from the GDP deflator with 2008 basis to that with 2011 basis carried out by the Russian Federal State Statistics Office in April 2016 we had to link the two real GDP time series (1995Q1–2015Q3 and 2011Q1–2015Q4) through their growth rates. Through 2010Q4, the growth rates of the former time series; while since 2011Q1, the growth rates of the latter time series are used.

(0.4%). This is corroborated by Figure 1, which shows much more dynamic growth of Russian economy between 1999 and 2009. However, the growth rates of Russian GDP vary much stronger than those of the euro area: standard deviation of 0.018 vs. 0.007. Between 1995Q1 and 2015Q4, oil price fluctuated wildly between 11 and 121 US dollars per barrel. Finally, Russia’s real effective exchange rate shows much stronger variation than its EA counterpart.

## 4 Econometric analysis

### 4.1 The model

The ultimate goal of our analysis is to identify the sanctions shock and trace the reaction of the Russian and European economies to the shock. As briefly discussed in the introduction, the structural VAR model suits our purposes well, but plausible identification scheme is needed. To analyze the effects of sanction we set up a VAR of order  $p$ :

$$y_t = \nu + A_1 y_{t-1} + \dots + A_p y_{t-p} + u_t \quad , \quad (1)$$

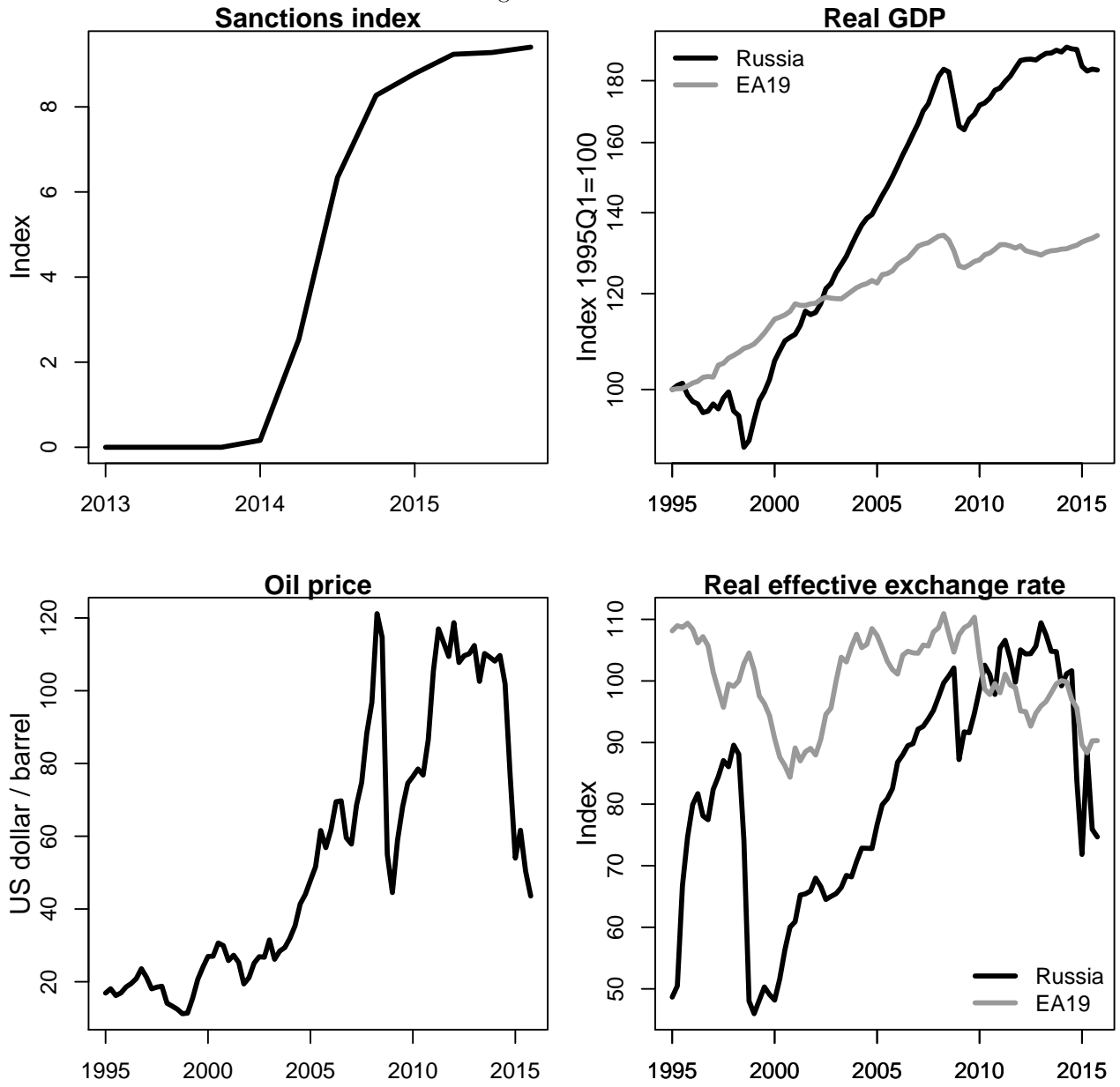
where  $y_t = (y_{1t}, \dots, y_{Kt})'$  is a vector of observable variables; the  $A_i$ 's are  $(K \times K)$  coefficient matrices;  $\nu$  is a  $(K \times 1)$  constant term; and the  $u_t$ 's are  $K$ -dimensional serially uncorrelated vector of residuals with mean zero and non-singular covariance matrix  $\Sigma_u$ .

Since the reduced-form residuals  $u_t$  in equation (1) are contemporaneously correlated, they do not allow for an economic interpretation. The structural shocks  $\varepsilon_t$ , which do have economic meaning, are obtained from the reduced form residuals by a linear transformation:

$$\varepsilon_t = B^{-1} u_t \quad \text{or} \quad u_t = B \varepsilon_t \quad . \quad (2)$$

The matrix  $B$  contains the instantaneous effects of the structural shocks on the observed variables and is the object to be identified in some way. In principle, there are several types of identifying restrictions prevalent in the empirical literature, these are short-run (Sims 1980), long-run (Blanchard and Quah 1989), and sign restrictions (Canova and De Nicoló 2002). The long-run restrictions are not applicable in our analysis as they

Figure 1: Variables



require non-stationary series. Even though some problems with sign restrictions outlined by [Fry and Pagan \(2011\)](#) are partly solved by [Inoue and Kilian \(2016\)](#) and [Arias et al. \(2014\)](#), it may not be easy to come up with sign patterns for the sanctions shock. Data-driven identification based on non-normality of the residuals (see [Lanne et al. 2015](#) for a review) is out of consideration for our analysis due to a short data sample.

For these reasons, we employ identification based on short-run impact of shocks on the variables. The variable capturing the effects of sanctions is ordered first in the structural VAR and the matrix  $B$  takes lower triangular form. Consequently, the sanctions shock is ordered first and it is the only shock that may influence all of the variables on impact. The other shocks are identified but are not interpreted. Allowing for contemporaneous effects is reasonable as the sanctions are deployed very rapidly, in general, and in our specific example of Russian-Western sanctions, in particular. The ban of trade and financial transactions between Russia and the EU affected the private sector quickly. To be precise, on 6 August 2014, Russian President Vladimir Putin signed Decree no. 560 to announce economic counter-sanctions against the EU and other Western partners. The details of the sanctions were made public and simultaneously entered into force on 7 August 2014 ([The Russian Government 2014](#)). Thus, a quick implementation of sanctions makes adjustments in the GDP and real exchange rates within a quarter very intuitive.

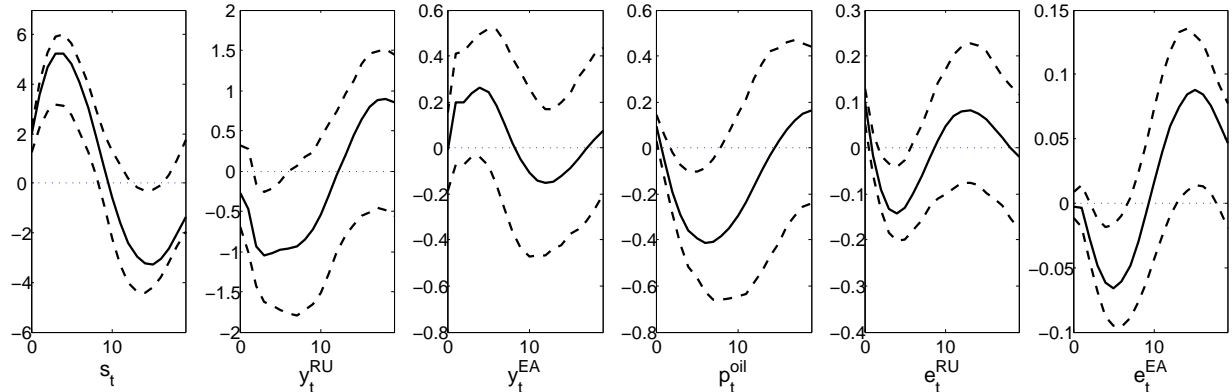
The SVAR model set up as in equations (1) and (2) ensures that  $\Sigma_u = BB'$  and structural shocks are normalized to have unit variance. Note that different structural models lead to the same reduced form. In general, it can be shown that the identification of the structural shocks requires  $\frac{K(K-1)}{2}$  restrictions. Even though we are interested in the effect of single sanctions shock, we aim at a full identification of the model. This means that we need 15 restrictions to identify all shocks of SVAR ( $K = 6$ ). We discuss robustness of the identification scheme later.

## 4.2 Empirical analysis

We base our choice of augmentation lag  $p$  on the information criteria. Akaike information criterion selects lag order to be 5, Hannan-Quinn information criterion to be 2, and Schwarz information criterion to be 1 when maximum number of lags is five. Recalling that Akaike information criterion always favors larger models and single-lag model may not capture the dynamics well, we proceed with the VAR(2) as Hannan-Quinn criterion

indicates. No severe problems in terms of autocorrelation of residuals are observed for VAR(2).

Figure 2: Impulse-responses of variables to sanctions shock



Notes: The impulse-responses are based on the SVAR(2) model. The solid lines represent the point estimates, while the dashed lines are 68% confidence intervals constructed from 1000 bootstrap replications.

The impulse-responses to sanctions shock are shown in Figure 2. The sanctions shock is scaled to have an impact of two units. It is close to the change in the intensity of sanctions from 2014Q1 to 2014Q2. After a shock the growth rate of the Russian GDP starts declining and has its minimum at around 100 basis points after a year. After second quarter of response the drop is significant for the duration of about a year. On the contrary, the reaction of the EA aggregate GDP growth lies within the confidence intervals that include zero for the whole response horizon. Note that the magnitude of the reaction to shock is much higher for the Russian GDP growth than for EA variable. Thus, we observe direct effect of sanctions for Russia but not for the aggregate EA.

The reaction of other variables in the system is significant from approximately third up to eighth quarter after the shock. This shows that sanctions and counter-sanctions of two big trading regions may have adverse effect on the global economy through the reduced demand and, hence, prices of raw materials, above all oil. In an attempt to compensate the potential negative effect of sanctions or try out new markets for international trade the REERs of both analyzed regions depreciate. This may be an indication of the trade diversion towards remote and perhaps less developed partners. The effect of sanctions through the adjustment of exchange rate is observed for both regions.

Another important indicator to consider is whether the sanctions shock is an important driver of the variation in the GDP growth rates and other variables. The forecast error variance decomposition for several horizons is

Table 2: Contribution of sanctions shock to forecast error variances

Variable	Horizon			
	4	8	12	100
$y_t^{RU}$	0.038	0.0718	0.077	0.126
$y_t^{EA}$	0.018	0.026	0.030	0.041
$p_t^{oil}$	0.041	0.130	0.140	0.119
$e_t^{RU}$	0.102	0.102	0.096	0.089
$e_t^{EA}$	0.089	0.143	0.161	0.341

shown in Table 2. The influence of the sanctions shock is rather strong for the Russian economy: The shock contributes up to 12.6% of the variation in the GDP growth. For the EA, the sanctions appear to have indirect effect through the influence on the REER. Nearly a one-third of the variation in the real effective exchange rate is due to the sanctions shock. The variance decomposition conveys the importance of direct effects of sanctions for Russia and indirect ones for the EA.

The impulse-responses and variance decomposition show that sanctions have had a non-negligible effect on Russia and the EA. However, from the policy perspective it may be more interesting to quantify the impact of sanctions on GDP directly. For that purpose we deploy our SVAR to perform a counterfactual analysis in the following way. Suppose that all sanctions shocks would have been zero for the whole time span of our data. The moving average representation of the SVAR allows to calculate values of the time series assuming one (or more) shocks are set to zero. With the artificial data in hand, the difference between the true and counterfactual data shows the effect of sanctions shocks. The result of setting the sanctions shocks to zero is shown in Table 3. The shocks are eliminated for the whole duration of the sample but for convenience we report only the last six months. In the preceding period, counterfactual GDP growth rate series are not much different from the true ones, only the last observations do differ.

Table 3: Actual and counterfactual GDP growth rates

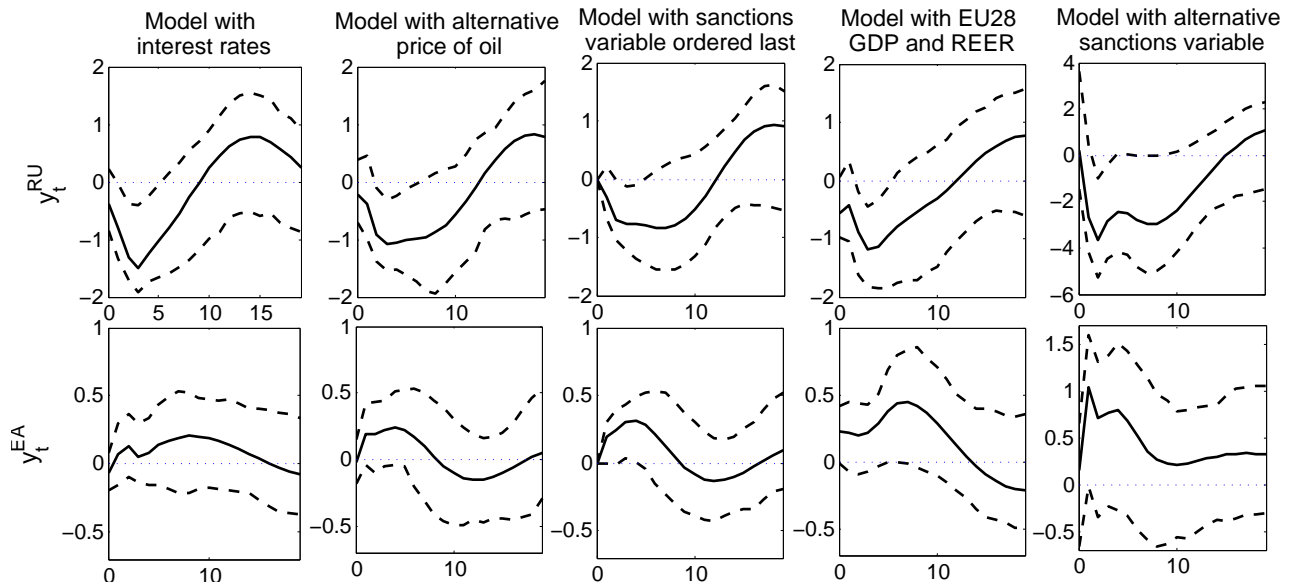
Date	Actual data		Counterfactual		Difference	
	$y_t^{RU}$	$y_t^{EA}$	$y_t^{RU}$	$y_t^{EA}$	$y_t^{RU}$	$y_t^{EA}$
2014Q2	0,458	0,096	1,440	0,394	-0,982	-0,298
2014Q3	0,169	0,301	1,661	0,393	-1,492	-0,092
2014Q4	0,055	0,469	2,138	0,372	-2,084	0,097
2015Q1	-2,756	0,726	-0,243	0,682	-2,513	0,044
2015Q2	-2,204	0,424	0,245	0,372	-2,449	0,052
2015Q3	0,588	0,314	2,922	0,217	-2,333	0,096
Average					-1,976	-0,017

The counterfactual analysis suggests that the direct effect of sanctions is much more pronounced for Russian economy than for the aggregate EA. On average, Russia lost about 2 percentage points of the GDP quarter-on-quarter growth due to restrictions on international trade and financial transactions. If one translates that into the growth over the last two years of the sanctions war, the economic effect is very pronounced. On the contrary, we observe rather negligible effects of sanctions for the EA.

One possible reason for this rather negligible effect of sanctions on the real GDP of the euro area is a change in its net exports. In 2014, the EA18 exports to Russia declined by 17.9 billion US dollars, while imports went down by 21.5 billion US dollars. Thus, the negative trade balance of the EA with Russia shrank by 3.6 billion US dollars. This represents a slight increase in the GDP of euro area, given that net exports to the Russian Federation make up about 16.1% of overall net exports and 0.6% of the GDP of EA18 countries. By contrast, between 2013 and 2014, Russian net exports to all its trade partners decreased from 212.3 to 211.2 billion US dollars. To some extent, this is due to a fall in price for oil that represents a large part of Russia's exports.

### 4.3 Robustness check

Figure 3: Impulse-responses of GDP growth rates to sanctions shocks in different models



Notes: The impulse-responses are based on the SVAR(2) models. The solid lines represent the point estimates while the dashed lines are 68% confidence intervals constructed from 1000 bootstrap replications.

In order to validate our modeling approach and results we perform a number of robustness checks. To

extend the information and capture monetary policy we augmented the model with interest rate time series for both Russia and the EA. Additional variables did not influence our conclusions on the effects of sanctions. To some extent it is not surprising as the European Central Bank is not combating economic consequences of sanctions. While targeting strategy of the Bank of Russia is less clear, its monetary policy tended to combat high inflation in the recent past. Further, we investigated the robustness of our results with respect to the oil price measure. We reran the analysis taking the oil price as the refiners' acquisition cost (imports) as suggested by [Kilian \(2009\)](#). Our conclusions hold. Furthermore, with no major changes to our findings one may consider an alternative identification scheme with the sanctions variable ordered last. This, of course, has an impact on contemporaneous effects of the sanctions shock that are all zero now. Even though conclusions hold, sanctions shocks feeding into the economy with a lag of a quarter may be difficult to defend from our point of view. Apart from that we experimented with alternative set of European countries. The analysis is tricky as the extended set of 28 EU countries share neither common currency nor monetary policy. Using partner countries trade shares we produced an aggregate REER series for 28 European Union countries and re-estimated the SVAR. The major conclusion on direct and indirect effects of sanctions holds. Finally, the variable measuring the intensity of sanctions applied in our model represent the sanctions of the rest of the world with respect to Russia. We constructed similar index measuring the intensity of the Russian sanctions with respect to the rest of the world. The conclusions are similar, when this alternative index is taken to structural VAR. Impulse-responses for GDP growth rates for five alternative models described in this section are shown in [Figure 3](#).

## 5 Conclusions

In this paper, we propose to use structural VARs to assess the effects of economic sanctions for Russian and European economies. We model interactions between these two regions using a measure of the intensiveness of sanctions introduced in [Dreger et al. \(2016\)](#), price of oil, real GDP growth as well as real effective exchange rates of Russia and 19 euro area countries.

The sanctions shock is identified as the solely shock that may influence all of the variables on impact. The identification is motivated by a quick implementation of sanctions. On the one hand, there is a strong evidence in favor of adverse effect of sanctions on the growth rate of Russian GDP, but not on the growth rate of euro



area's GDP. On the other hand, the real effective exchange rate of both Russia and the EA gets exposed to depreciation pressure after a sanctions shock. The impact of sanctions on the exchange rate is to some extent expected as in the specific case economic restrictions constitute mostly trade bans. Our findings are robust to a number of modeling assumptions. The results suggest that the sanctions implemented by Russia and Western countries against each other do exert an impact on the aggregate economic activity in both regions.

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