



Measuring Smartness: Understanding the Economic Impact of Targeted Sanctions

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Measuring Smartness:

Understanding the Economic Impact of Targeted Sanctions

by

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Abstract

While broad economic sanctions and trade embargoes have long been used as instruments of foreign policy, targeted sanctions focusing on specific individuals, entities, and transactions are relatively new and less understood. Using detailed firm-level data, this paper provides empirical estimates of the impact of targeted sanctions, focusing on the case of sanctions deployed by the United States and the European Union against Russia after its intervention in Ukraine in 2014 as a natural experiment. Our main finding is the average sanctioned company or associated company loses about one-third of its operating revenue, over one-half of its asset value, and about one-third of its employees relative to their non-sanctioned peers. We also survey the literature which suggests that sanctions have had a relatively smaller impact on Russia's macroeconomy compared to oil prices. Together, these results indicate that the sanctions are quite "smart," in the sense of hitting the intended targets with relatively minimal collateral damage.

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I. **Introduction**

While broad economic sanctions and trade embargoes have long been used as instruments of foreign policy, targeted sanctions focusing on specific individuals, entities, and transactions are relatively new. A prominent example of this new approach to sanctions policy is the targeted sanctions program of the United States and the European Union (EU), imposed in response to Russia's annexation of Crimea and its alleged use of force in eastern Ukraine. The U.S. and EU targeted a select list of Russian individuals and companies starting in March 2014. Over the next two years, the list of targets grew in scope and was met by Russian counter-sanctions on agricultural imports.

Understanding the impact of these targeted sanctions is essential to assessing their efficacy. Clouding the picture, however, is the fact that the conflict in 2014 roughly coincided with a series of powerful macroeconomic shocks, especially a dramatic decline in the price of oil (Russia's main export), which jolted both the Russian and world economies.

The difficulty inherent in attributing Russia's poor economic performance following sanctions to a single cause has allowed for a wide range of conflicting claims regarding the economic costs of the sanctions to Russia and to neighboring economies (principally members of the EU). Opponents of sanctions, in particular, claim that sanctions have caused little pain to the specific targets, while inflicting untold economic damage on the Russian people and on neighboring countries. Such assertions pose a challenge for the sanctions policy, which was intended to be

“smart,” in the sense of hitting those responsible for the offending policy with minimal collateral damage.

The purpose of this paper is to fill this information gap with empirical evidence. While several credible institutions provided model-based estimates of the *potential* impact of sanctions in the months after they went into effect, and others have chronicled the collapse of the Russian economy and its trade with the rest of the world, this paper uses pre- and post-sanctions data to measure the actual effect of sanctions and counter-sanctions from the surrounding macroeconomic shocks.

To measure the “smartness” of the sanctions’ impact, we proceed in two steps. First, we examine whether the sanctions hit in the intended targets. We do this using data on individual firms from Bureau Van Dijk’s ORBIS database. To our knowledge, this paper represents the only paper that uses detailed firm-level data to understand the economic impact on the targets themselves. Our main finding is that sanctioned companies or those associated with sanctioned individuals are indeed harmed by sanctions relative to non-sanctioned peer companies. On average, a sanctioned or associated company loses an estimated one-third of its operating revenue, over one-half of its asset value and about one-third of its employees after being targeted compared to non-sanctioned companies or those not associated with sanctioned companies. These estimates, which are large and appear highly statistically robust, suggest targeted sanctions do have a powerful impact on the targets themselves.

Second, we examine the collateral damage. In particular, we consider impact the sanctions on Russian GDP and on its imports from the EU. In contrast to the

firm-level approach, which fully controls for macroeconomic shocks with time varying fixed effects, it is not possible to control for all conceivable confounders in the aggregate analysis. Instead, we dial back our ambition and consider only how much of the post-sanction performance of the Russian economy can be explained either directly or indirectly by falling oil prices, with the residual capturing the combined effect of sanctions and any other exogenous factors. We find that oil price volatility explains the vast majority of the decline in Russia's GDP and import demand, with very little left to be explained by sanctions or other factors. Thus either sanctions had only a small negative effect on these variables or other positive factors largely cancelled out the effect of sanctions. The most plausible candidate factor would be the Russian policy response, which is probably not exogenous to sanctions.

Finally, we find that sanctions and countersanctions have had a small effect on the economies of most EU countries. Adding together the impacts of sanctions and countersanctions on exports – the main vulnerability – gives a median impact across EU countries of just -0.13 percent of GDP. The reasons for this are: (1) Russia generally accounts for a small share of total EU countries' exports; and (2) most of the decline in Russian imports is explained by lower oil prices and trend factors.

Economic sanctions are meant to signal international disapproval, deter further aggression, and create leverage in negotiations with the targeted country aimed at reversing the offending policies. Whether sanctions will ultimately

accomplish these goals is a key question but is beyond the scope of this paper.¹ If success depends on the sanctions delivering focused impact with minimal collateral damage, our results suggest the targeted sanctions are acting as advertised.

The remainder of the paper is as follows. Section II reviews the literature on the economic impact of sanctions against Russia. Section III provides a description of the targeted sanctions program. Section IV presents the empirical methodology and analysis and results of the firm-level approach, along with various robustness checks. Section VI considers the collateral damage to the broader economic performance of the Russian and EU economies. Section V concludes.

¹ See Harrell (2015) for further discussion on the policy implications drawn from the Russian sanctions experience.

II. Literature Review

The literature, both theoretical and empirical, on economic sanctions is vast. However, most empirical studies cover the period when policymakers invoked comprehensive sanctions involving broad country-wide trade embargoes rather than selective sanctions against specific targets.

The academic literature on these comprehensive sanctions, such as those against Iraq after the 1990-91 Gulf War, has tended to give only mixed support for the effectiveness of sanctions. Many studies have focused on the secondary effects of sanctions on corruption and humanitarian consequences without matching political dividends. Recent surveys are provided in Hufbauer et al. (2007) and Drezner (2011).

Empirical studies of targeted sanctions are much fewer, partially due to the relatively short history of targeted sanctions programs and the related paucity of examples involving purely targeted sanctions programs instead of becoming part of a broader comprehensive sanctions program. Indeed, U.S.-EU targeted sanctions against Russia in the wake the Ukraine crisis represents a fairly rare example of purely targeted sanctions against a middle-income economy fairly well integrated into the global economic and financial system.

Economists attempting to empirically estimate the impact of sanctions on Russia face the challenge of disentangling the impact of sanctions from the confounding effects of the broader political uncertainty stemming from the Ukraine crisis and the dramatic drop in oil prices discussed above. However, most studies

conclude that oil prices were far more important in explaining Russia's post-2014 macroeconomic weakness, with a relatively small effect ascribed to sanctions.

An IMF (2015) report, using a generic macroeconomic model, forecasted that sanctions could reduce Russia's real output by about 1 to 1.5 percent of GDP, via weaker investment and consumption. A World Bank (2015) study similarly argues that sanctions against Russia and counter-sanctions may have affected investment and consumption but does not provide any specific numbers. Neither of these studies attempts to directly measure the economic impact of sanctions.

Dreger et al. (2015) used a VAR model featuring oil prices, the ruble exchange rate, and a sanctions news index to argue that the oil price drop was the primary driver of the ruble depreciation but that sanctions news surprises may have had some impact on the ruble's conditional volatility. The study does not consider the effect on GDP growth or imports.

Tuzova and Qayub (2016) presents another reduced-form VAR model featuring a variety of Russian macroeconomic variables including GDP, the real exchange rate, inflation, fiscal and consumption expenditures, and external trade to argue that oil prices were the main cause of Russia's poor macroeconomic outlook.

Moret et al. (2016) also looked at country-level trade data and compared trading volumes between Russia and the EU pre- and post-crisis to conclude that the Baltic states suffered the greatest relative losses, similar to what we find Section V of this paper.²

² In another chapter of this volume, Crozet and Hinz (2016) use detailed monthly trade data at both the country level and firm level for France to estimate the impact of sanctions on trading activity. They find large impacts on trade (as much as \$60

Lacking from all of this literature is the use of firm-level data to estimate empirically the impact on the economic performance of the targets themselves. The closest our paper is Stone (2016), which uses an event study methodology to study the impact of sanctions news events on the asset prices of sanctioned sectors and the 11 largest energy firms and banks. The paper finds a negative impact on the asset prices of targeted sectors compared to non-targeted sectors but no significant difference between targeted and non-targeted firms within a sector.

Compared to the literature, our paper is unique in several respects. First, ours is the first to use detailed firm-level data to estimate empirically the impact on the real performance, such as operating revenue and employment, of targeted firms themselves. Second, we consider a comprehensive sample of firms, including all of targeted private firms (not only publically traded financial and energy firms) as well as firms associated with sanctioned individuals. Third, we find strong evidence that sanctioned firms are indeed harmed by sanctions relative to their non-sanctioned peers.

billion collectively) between Russia and many EU economies. The authors recognize that most of this effect is due to oil prices, Russian economic underperformance, and political uncertainty. The effect from targeted sanctions appears to be at most \$3 billion.

III. Description of Targeted Sanctions

III.a. Overview of U.S. and EU Targeted Sanctions Policy against Russia

On March 6, 2014, President Obama declared a national emergency and issued the first of four Executive Orders to deal with the threat posed by the situation in Ukraine, including the actions of the government of the Russian Federation. Issued in March and December of 2014, these Executive Orders provided the authority for various agencies of the U.S. Government, including Treasury, State, Commerce, and others, to impose targeted sanctions on primarily Russian entities.³ The U.S. Department of Treasury's Office of Foreign Asset Control is the primary entity responsible for implementing targeted sanctions. The targets are determined by the Secretary of the Treasury, in consultation with the Secretary of State, after a careful investigation and vetting process.

U.S. targeted sanctions with respect to the Ukraine/Russia crisis broadly fall into two categories:

- **SDN Sanctions:** Blocking sanctions against individuals and entities on the List of Specially Designated Nationals and Blocked Persons (SDN) List
- **SSI Sanctions:** Sectoral sanctions against entities operating in the financial, energy, and defense sectors of the Russian economy listed on the Sectoral Sanctions Identification (SSI) List

Designated SDN entities and individuals face asset freezes and travel bans in the United States. And unless otherwise authorized or exempt, *all* trade and financial

³ These are E.O. 13660 (March 6, 2014), E.O. 13661 (March 16, 2014), E.O. 13662 (March 20, 2014), and E.O. 13685 (December 19, 2014).

transactions and other activities by U.S. persons (individuals or entities) with these designated SDN individuals and entities are prohibited.⁴

Meanwhile, the SSI entities represent those entities for which U.S. persons are prohibited from engaging in certain transactions. Notably, U.S. persons cannot transact in or issue debt of longer than 30 days maturity or acquire new equity with targeted companies in the Russian financial sector or the Russian defense sector. Similar restrictions also apply to debt of longer than 90 days maturity with targeted companies in the Russian energy sector. Furthermore, U.S. persons are prohibited from transacting in certain technology and services related to deep-water, Arctic offshore, or shale oil activity with the Russian energy sector.

The EU also developed a targeted sanctions policy in the form of EU Council Regulations starting in March 2014.⁵ From these EU Council Regulations, the European Union maintains a categorization of targeted sanctions similar to that of the United States in response to the events in Ukraine/Russia in 2014:

- **Restricted Measures List:** Asset freezes and visa bans apply to entities and individuals designated on the EU Restricted Measures List.
- **Sectoral Sanctions List:** The EU also prohibits EU nationals and companies from transacting in equity or debt instruments with a maturity exceeding 30 days with entities on the EU Sectoral Sanctions List.

Similar to that of the U.S. sectoral sanctions, the EU imposed an embargo on trade in arms and dual-use goods/technology with Russia, covering all items on the

⁴ 50% Rule: Transactions with an entity that is 50 percent or more owned, whether individually or in the aggregate, directly or indirectly, by an SDN designated entity or individual, is also blocked, regardless of whether the entity itself is listed.

⁵ EU Council Regulations No. 269/2014, 284/2014, 433, 2014, 833/2014, and No 960/2014.

EU common military and dual-use lists, as well as on the export of certain energy-related equipment and technology for offshore deep-water, Arctic, or shale oil exploration and production.

III.b. Identifying U.S. and EU Sanction Targets

This section discusses the number of targets selected by the U.S. and the EU for targeted sanctions. Figure 1 shows as of July 1, 2016 the overview of entities or individuals explicitly sanctioned by the U.S. and EU authorities, beginning on March 17, 2014.

Altogether, the U.S. has designated 111 individuals and 82 entities on its SDN List as related to its Russia/Ukraine-related sanctions program. Also, the U.S. has explicitly designated 136 entities on its SSI List facing sectoral sanctions. Meanwhile, as of July 1, 2016, the EU had placed 149 individuals and 37 entities on its EU Restricted Measures List and 20 entities onto its EU Sectoral Sanctions List. Figure 2 shows the timeline of these sanctions.

We have classified sanctioned individuals into two categories: political and business figures. A political figure is an individual whose primary occupation appears to be political rather than commercial in nature, such as a legislator, a government official, or a militia commander. However, a named individual would be classified as a business figure (even if he/she had worked in public service) if the individual could be identified as being “associated” with a company according to the Bureau van Dijk standardized positions database. These associations include being part of corporate management, on the board of directors, or a major shareholder.

According to this classification, of the 111 individuals on the U.S. SDN List, 87 appear to be purely political figures, while 24 appear to have business associations. Hence, of the U.S. SDN individuals, about one-fourth are business figures. Meanwhile, the EU sanctions against individuals are skewed more heavily toward political figures. Of the 149 individuals on the EU Restricted List, only 6 have business associations.

We subsequently identified 269 companies as being “associated”, either in the past or present, with a U.S. or EU sanctioned individual. Figures 3 and 4 presents a Venn diagram of the space of U.S. and EU sanctioned entities by category, including associations with sanctioned individuals.

As discussed above, this tabulation captures those entities or individuals explicitly listed by the U.S. and EU governments as facing sectoral restrictions. However, both the U.S. and EU follow a 50% ownership rule whereby those subsidiaries 50% or more owned, directly or indirectly, by an explicitly sanctioned entity, also face the same sanctions. The United States appears to be more forward-leaning in explicitly identifying subsidiaries that should also face sanctions according to this rule.⁶

Having described the U.S. and EU targeted sanctions policy against primarily Russian targets in response to the crisis, we turn next to estimating the economic impact of these sanctions on the targets themselves.

⁶ In ongoing research, the authors are investigating how much overlap there would be if we could include those companies implicitly sanctioned via this ownership rule, and whether those companies that are implicitly sanctioned also face the same economic effects as those explicitly sanctioned.

IV. Firm-Level Economic Impact of Targeted Sanctions

In this section, we provide our methodological specification and the results of our empirical analysis of the effects of targeted sanctions.

IV.a. Data

Our firm-level approach requires a careful examination of the sanctions lists of the U.S. and the EU along with firm-level data covering sanctioned and non-sanctioned companies. Our firm-level data come from the Bureau Van Dijk (BvD) Orbis database,⁷ and we track a universe of 78,381 companies.

These include 433 specific companies identified as being sanctioned in Section III that are also present in the BvD database. The remainder is a control group of peer companies, constructed by collecting all companies that share the same home country and sector of business operation as the sanctioned companies in the global BvD database.⁸

For each company, we track its home country location, sector of business operation (according to the 4-digit NAICs code specification), and its total Operating Revenue, Total Assets, and Number of Employees for the years 2013, 2014, and 2015. We also track the status of the firm, whether it remains active or whether it has become bankrupt, liquidated or dissolved, or changed to some other non-active status.

⁷ More information about the database can be found on Bureau van Dijk's homepage at www.bvdinfo.com.

⁸ Bureau van Dijk assigns a unique identification number that tracks a company through name and ownership changes.

IV.b. Empirical Methodology

Our econometric specification is a standard difference-in-differences approach as follows:

$$\ln y_{isct} = \alpha_i + \lambda_{st} + \theta_{ct} + \beta d_{it} + \epsilon_{isct}$$

where the subscript i denotes company identification, s denotes sector, c denotes country, and t denotes time period.

The left-hand side dependent variable y_{isct} tracks the particular firm's financial metrics of total Operating Revenue, Total Asset value, and Number of Employees. Also, we construct a dummy variable which equals 1 if the firm is active in that year, versus 0 if the firm loses its active status due to a bankruptcy, liquidation, etc. The variables α_i capture company fixed-effects, λ_{st} capture sector-time fixed effects, θ_{ct} capture country-time fixed effects, and d_{it} are the sanction treatment dummies. Our sanctions dummies d_{it} capture those periods when firm i faces any of our three categories of targeted sanctions by either U.S. or EU authorities.

Table 1: Cross-Sectional Regression Results

VARIABLES	(1) D_Active	(2) IOpRev	(3) IAsset	(4) IEmp
d_Sanc	-0.0229** (0.009)	-0.3353*** (0.130)	-0.8052*** (0.091)	.03581*** (0.062)
Observations	235,143	9,383	20,080	13,896
R-squared	0.051	0.085	0.143	0.304
Number of id	78,381	5,872	9,602	6,781

Robust standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

Table 1 displays our headline results, which shows the coefficients from regressing the log Operating Revenue, log Assets, and log Employee Count on our sanctions dummy d_Sanc . Only for d_Active , our dummy indicating firm active status, do we show the results of a probit regression. The number of observations can vary across regression variables due missing or non-reported data for many companies.

We note that this result arises after controlling for both sector-time and country-time fixed effects, which should eliminate oil factors and other factors that may apply to companies in particular sectors or countries. The sectors are determined by the 4-digit NAICS core code, providing a high degree of granularity. The robustness of our results to these controls lends confidence in our results.

Table 2 converts the log coefficients in Table 1 into the estimated average impact on the firm performance metrics. We find that targeted sanctions do have a statistically significant negative impact on firm-level financial health relative to non-sanctioned peer companies. After facing targeted sanctions, a company or associated entity on average faces a 2 percent increased likelihood of losing its active status. Also, its operating revenue falls by about 30 percent, total assets by 55 percent, and employee count by about 30 percent compared to non-sanctioned or non-associated companies. These results are highly statistically significant. The significance is at the 1% confidence level for all of our financial health variables with the exception of the status dummy variable, which is significant at the 5% level.

Table 2: Headline Sanctions Impact on Sanctioned and Associated Companies

Estimated Average Impact on Indicators of Financial Health

	Higher Probability of Bankruptcy	Fall in Operating Revenue	Fall in Total Assets	Fall in Number of Employees
Sanctions on Average Target Company	2.3%**	28.5%***	55.3%***	30.1%***

*indicates significance at 10% level, **at 5% confidence level, ***at 1% confidence level

Although the magnitudes of the estimated losses are large, these results should be interpreted with caution. In particular, one should not simply add the firm-level losses of all targeted companies together to arrive at a macro-level impact. The reasons are twofold. First, the effect does not necessarily apply uniformly to all targeted companies, and may be smaller in proportional magnitude for larger-sized targets. This is also in part because the largest companies tended to face only sectoral sanctions which are deliberately designed not to have a large immediate impact but affect their long-term health via their access to credit and technology. This is one reason why the concentrated impact at the firm level does not necessarily translate into a large macroeconomic impact, despite the target list containing some of the largest Russian state-owned enterprises.

Second, the results capture the *differential* impact of sanctions on the performance of targeted or associated companies compared to non-targeted companies. They do not measure factors that might affect all firms equally in a sector or a country. For example, if sanctions contributed to a depreciation in the ruble, and this depreciation improved the performance of all firms, whether specifically targeted or not, this impact of sanctions would not be reflected in the

performance differential exploited by the regression. For this reason, a separate analysis needs to be done to capture macroeconomic impacts of the sanctions, as discussed in the appendix.

IV.c. Robustness Checks

An important assumption underlying our difference-in-differences methodology is the so-called “parallel trends” assumption, i.e., that targeted (or associated) firms would have experienced the same average change in performance as their non-targeted peers (same sector and country) had they not been targeted. This assumption could be violated if, for example, targeted companies tend to grow more slowly than non-targeted peers for reasons other than sanctions.

It seems unlikely that there is an inherent bias for slow-growing firms to be targeted. However, targeted firms were larger on average than their non-targeted peers in 2013. If hypothetically larger firms tend to grow more slowly than smaller firms, conditional on survival, then the parallel trends assumption may be violated, and our estimates could be biased.

To address this concern, we use a matching estimator. For each targeted or associated firm, a matching algorithm is used to find the non-sanctioned firm that is most similar to the targeted firm in terms of industry, country and size in 2013, measured by assets.⁹ We then compare the average change in performance of all such matched pairs between the pre- and post-sanction years. For robustness, we consider two different matching estimators: a nearest-neighbor matching estimator,

⁹ We use NAICs industries rather than 4-digit NAICs sectors to guarantee that the matching estimation satisfies the common support assumption (i.e., that there are both sanctioned and non-sanctioned firms in each industry). For the same reason, we consider only two countries, Russia and Ukraine, which comprise 97 percent of the companies in our sample.

which minimizes the Mahalanobis distance between matched pairs, and a propensity score matching estimator. The two estimators produce practically the same results.

One complication in implementing this approach is that targeted or associated firms are sanctioned at different times, some in 2014 and some in 2015. Thus, we need to be careful that each matched pair is compared across the same years, depending on when the targeted or associated firm was sanctioned. For firms sanctioned in 2014 and their matched peers, we compare the difference in performance between 2013 and the 2014-15 average. For firms sanctioned in 2015 and their matched peers, we compare the difference in performance between the 2013-14 average and 2015.

The results in Table 3, which show the average treatment effect (ATE), are in line with our headline results reported in Table 1. In each case, the impact of sanctions is to reduce the performance of targeted or associated firms relative to their non-targeted peers. The results are statistically significant and the magnitudes are consistently larger than in Table 1. This indicates that our difference-in-difference estimates above are not only robust but likely conservative.

Table 3: Matching Estimation Results

Variables	(1) DIOpRev	(2) DIAsset	(3) DIEmp
Propensity Score Matching			
ATE	-08816*	-1.7081***	-0.6123***
Std. Err.	(0.501)	(0.084)	(0.053)
Nearest Neighbor Matching			
ATE	-0.8503***	-1.5226***	-0.4455**
Std. Err.	(0.417)	(0.124)	(0.176)
Observations	2817	6950	6408

***p<0.01, **p<0.05, *p<0.1

V. Conclusion

In 2014, the United States and the European Union deployed targeted sanctions against Russia in response to the crisis in Ukraine. However, at the same time, macroeconomic shocks, notably a fall in the price of oil, obscured the economic impact of sanctions. This allowed partisans to make conflicting claims on the economic efficacy of sanctions, with critics claiming a limited impact on the targets while inflicting large damage onto collateral bystanders and neighboring economies.

Using firm-level empirical data, we find strong evidence that sanctions affected the financial health of the targeted firms or firms associated with sanctioned individuals and entities. U.S. and EU targeted sanctions appear to be as “smart,” in the sense of hitting the intended targets and those companies associated with them with significant economic damage while causing minimal collateral damage.

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VI. A Simple Model of the Impact of Sanctions against Russia's Macro-economy

In this section, we consider impact the sanctions on Russian GDP and on its imports from the EU, both of which declined substantially after the imposition of sanctions. We are interested in the contribution of sanctions to these declines, as opposed to other macroeconomic shocks, such as the major decline in oil prices. The answer is critical to the question of collateral damage, which is the second of the two criteria for "smartness."

In principle, sanctions can directly impact a country's aggregate supply, by affecting firms' access to credit or technology, or by creating uncertainty for investors (both domestic and foreign), leading to capital flight and the postponement of investments and durable purchases. Sanctions may also impact aggregate demand, via increasing the cost of borrowing or increasing precautionary savings. However, these effects may have been mitigated in the short-run by ruble depreciation and other government policies –such as expansionary fiscal policy and Russia's own embargo on agricultural imports – which passed the burden through to higher inflation and the budget deficit.

As discussed above, the main empirical problem is that, while all of these macroeconomic consequences were present in the Russian economy in the immediate aftermath of sanctions, all of them could be explained by other factors. As seen in Figure 6, world oil price (Brent) fell from over \$100 in the 2014-Q2 to under \$60 by the end of 2014, and declined further in the second half of 2015. A common rule of thumb for oil exporters suggests a \$40 drop in the world price of oil should shrink energy-dependent Russia's GDP by four to five percent.

But even before oil prices began falling, Russia's growth had been on the decline in recent years (Figure 7, black line) and growth projections were downgraded beginning in late 2013 when the weak commitment of the Russian regime to structural reform became clear. For example, the IMF nearly halved its forecast for Russia's 2014 growth rate between April 2013 and January 2014, well before the Crimea aggression. Real GDP growth fell from 1.2 percent in 2013 to 0.7 percent in 2014, and -3.7 percent in 2015 before recovering slightly. From peak to trough, real GDP fell about 5 percent. Import demand in U.S. dollars was about 37 percent lower.

VI.a. Strategy for Estimating the Macroeconomic Impact of Sanctions

Many factors can determine Russian macroeconomic variables such as GDP growth and import demand. These include oil prices, sanctions and other factors, such as consumer sentiment, investor expectations, exchange rates, and so on.

Suppose we can approximate the relationship with a linear function of the form: $g = \beta_0 + \beta_1 e + \beta_2 s + \beta_3 X$, where g is the Russian macroeconomic variable of interest, such as real GDP growth or import demand, e measures the change in oil price (possibly including lags), s is a sanctions policy indicator, X is vector of other factors, and $\{\beta_i\}$ is a set of parameters.

Oil prices and sanctions are exogenous to the Russian economy, whereas X contains many elements that are potentially influenced by oil prices and sanctions. Similarly, we can represent X as $X = \delta_0 + \delta_1 e + \delta_2 s + \delta_3 Z$, where Z a set of exogenous factors uncorrelated with e or s .

Putting these equations together gives a reduced-form equation of $g = (\beta_0 + \beta_3\delta_0) + (\beta_1 + \beta_3\delta_1)e + (\beta_2 + \beta_3\delta_2)s + \beta_3\delta_3Z$, which states GDP growth is influenced both directly and indirectly by oil prices and sanctions and separately by exogenous factors Z . Assuming the parameters of this model are stable, we can estimate a regression, $g_t = \gamma_0 + \gamma_1 e_t + \varepsilon_t$, over the decade prior to the imposition of sanctions to obtain an unbiased estimate of the impact (direct and indirect) of oil prices on growth, where $\gamma_0 = (\beta_0 + \beta_3\delta_0) + \beta_3\delta_3\bar{Z}$, $\gamma_1 = (\beta_1 + \beta_3\delta_1)$, and ε_t is a mean-zero error.

Finally, letting T denote the sanctions period, $\hat{g}_T = \hat{\gamma}_0 + \hat{\gamma}_1 e_T$ gives an unbiased out-of-sample estimate of the oil component of growth in period T . It follows that $E(g_T - \hat{g}_T) = (\beta_2 + \widehat{\beta_3\delta_2})s_T$. In other words, the difference between actual growth during the sanctions period and our oil-based out-of-sample forecast gives an unbiased estimate of the direct and indirect effects of sanctions on growth. Of course, it is possible that regime shifts in the underlying coefficients may have occurred, or there may have been deviations in other exogenous factors (i.e., deviations in Z) that have confounded the sanctions impact at exactly the same time. While these are possibilities, they are unlikely.

VI.b. Impact on GDP growth

We begin with an extremely simple reduced-form model, which attempts to explain quarterly variation in Russia's real GDP growth between 2004 and 2014 as a function of the log change in world oil prices (both current and one period lagged), a

linear time trend (to capture Russia's long term slowdown), a season dummy (winter) and a global financial crisis dummy (2007-Q4 to 2009-Q2).¹⁰

We then use this model to conduct an out-of-sample prediction of Russia's quarterly GDP growth in 2014 and 2015, and ask how well this prediction matches the actual growth, leaving the remainder as what is left to be explained by other factors such as sanctions.

The regression (Table 4, Column 1) explains about three quarters of the historical variation in Russia's GDP, and all explanatory variables except the winter season dummy are statistically significant.¹¹ Figure 8 shows actual GDP growth compared to that predicted by the model. Most of the deviation occurs in the first half of the sample period. Indeed, if the model is estimated from 2007 onward, instead of 2004, the overall model fit rises to over 85 percent. Of particular interest is the out-of-sample prediction in 2014 and 2015. The model fits almost exactly in 2014 and actually under-predicts GDP growth in late 2015.

Hence, we find that oil prices manage to drive the majority of Russian economic performance since 2004, with sanctions playing a secondary role compared to oil prices at the macroeconomic level. From peak-to-trough, Russia's real GDP declined by about 5 percent, and therefore at most 20 percent of that, or 1 percent of GDP can be potentially explained by sanctions.¹²

¹⁰ The authors attempted multiple different specifications using the ruble-dollar exchange rate, Russian consumer sentiment, and other variables and found that the results are almost identical with no additional explanatory power, likely for the reasons discussed above.

¹¹ The insignificance of the winter dummy is not surprising, given that quarterly real GDP is already seasonally adjusted.

¹² Interestingly, this 1 percent of GDP impact is similar to the IMF's estimate of a 1-1.5 percent of GDP impact from a completely different methodology.

Table 4: Reduced-Form Macro Model

VARIABLES	(1) Dlngdp	(2) Dlnimp
dlnoil	0.051*** -0.01	0.28*** -0.036
dlnoil_01	0.043*** -0.009	0.304*** -0.059
time	-0.0002 (-0.0001)	-0.001* (-0.001)
crisis	0.013*** -0.004	-0.038* (0.02)
winter	0.004 -0.003	0.056*** -0.015
Constant	0.021** -0.008	0.058 (-0.041)
Observations	40	40
R-squared	0.77	0.77

Robust Standard Errors in Parentheses

*****p<0.01, **p<0.05, *p<0.1**

Of course, this is not definitive proof. It could be that, absent sanctions, the model would have under-predicted post-sanction GDP growth even more than it does. Yet given its historical accuracy, we find it implausible that the statistical relationship between oil and Russian economic output would dramatically shift in the out-of-sample forecast.

VI.c. Import Demand and EU Effects

The main economic vulnerability of EU countries to sanctions is their exports to Russia, which have declined sharply since mid-2014. However, as with its GDP, Russia's imports from the EU could also be driven by oil prices and the deterioration in Russia's economic performance caused by domestic policies. One key determinant of a country's imports is its national income, which we have already seen is well explained by oil prices.

Another is the relative price of imports, which is affected by exchange rates that are in turn affected by oil prices. Given that energy exports account for the vast majority of Russia's total export revenue, it is reasonable to assume that the depreciation of the ruble in 2014 was largely driven by the oil price decline and therefore indirectly captured in our regression.

Note that Russia's recession and depreciation would likely affect its demand for imports in general, not exclusively from the EU or other sanctioning countries. The ruble declined strongly against all major currencies. The only exceptions were CIS countries, which because of their dependency on exports to Russia, devalued their own currencies to avoid losing ground. However, it is also possible that sanctions, and certainly Russia's countersanctions, had a discriminatory effect, reducing Russia's imports specifically from the EU (and other sanctioning countries).

In what follows, we repeat the exercise of the previous subsection for Russia's total imports to get an estimate of how much of the decline needs explaining after oil prices are taken into account. From this we construct an estimate of the non-discriminatory effect of sanctions. We then adjust our estimates to account for counter-sanctioned agricultural products, which are clearly subject to discrimination.¹³

The results are found in Table 4, Column 2, which is quite similar to the GDP model. Figure 8 shows the out-of-sample prediction. Here we find that in the first year of the sanctions period, the model predicts a smaller decline in Russia's total

¹³ It is also possible that non-counter-sanctioned products are affected by sanctions in a discriminatory way beyond the scope of this study, and a more disaggregated approach, such as that of Croznet and Hinz (2016) is required.

imports than actually occurred. Adding up the quarterly gaps between predicted and actual, we can say that 80 percent of the difference in total imports between 2015 and 2013 is explained by oil. This amounts to about \$26 billion in imports. The rest is due to other factors, one of which could be sanctions.

For counter-sanctioned agricultural products, we know that Russia's embargo directly suppresses imports specifically from the EU (as well as the U.S., Norway and Australia). Nevertheless, our model is useful for determining how much of the decline can be attributed to the embargo and how much would have occurred anyway, as the result of lower oil prices. If we assume that agricultural imports from the EU would have declined in proportion to all other imports absent the counter-sanctions, and that 80 percent of that decline was driven by oil, then the effect of counter-sanctions can be computed as a remainder.

As a final step we distribute the decline in imports to each EU country (plus Norway, Iceland, and the United States) according its 2013 level of exports to Russia and express the declines as a percentage of each EU country's GDP. The results are reported in Tables 9 and 10. The key result is that the impact of sanctions on the exports of most EU countries is quite small.

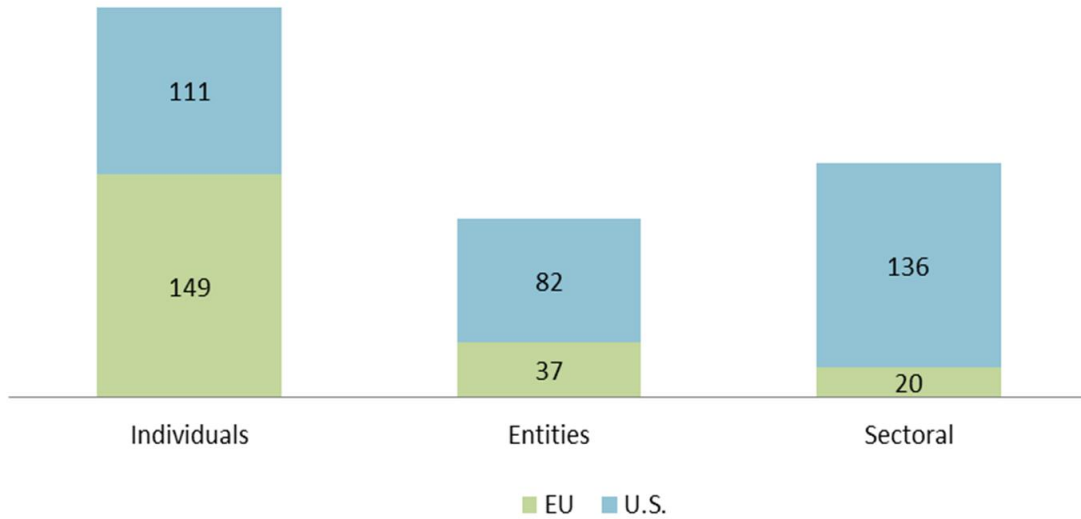
We find that sanctions and countersanctions have had a small effect on the economies of most EU countries. Adding together the impacts of sanctions and countersanctions on exports – the main vulnerability – gives a median impact across EU countries of just -0.13 percent of GDP (Figure 9). The reasons for this are: (1) Russia generally accounts for a small share of total EU countries' exports; and (2)

most of the decline in Russian imports is explained by lower oil prices and trend factors.

The countries that seem to be impacted the most by sanctions are the Baltics. Lithuania has been hit the hardest, with a sanctioned-induced drop in exports of 2.7 percent of GDP. The exports of Estonia and Latvia fell by around one percent. (Incidentally, these countries are also strong supporters of sanctions.) The hit on exports for all other EU countries ranges from -0.01 percent to -0.3 percent of GDP.

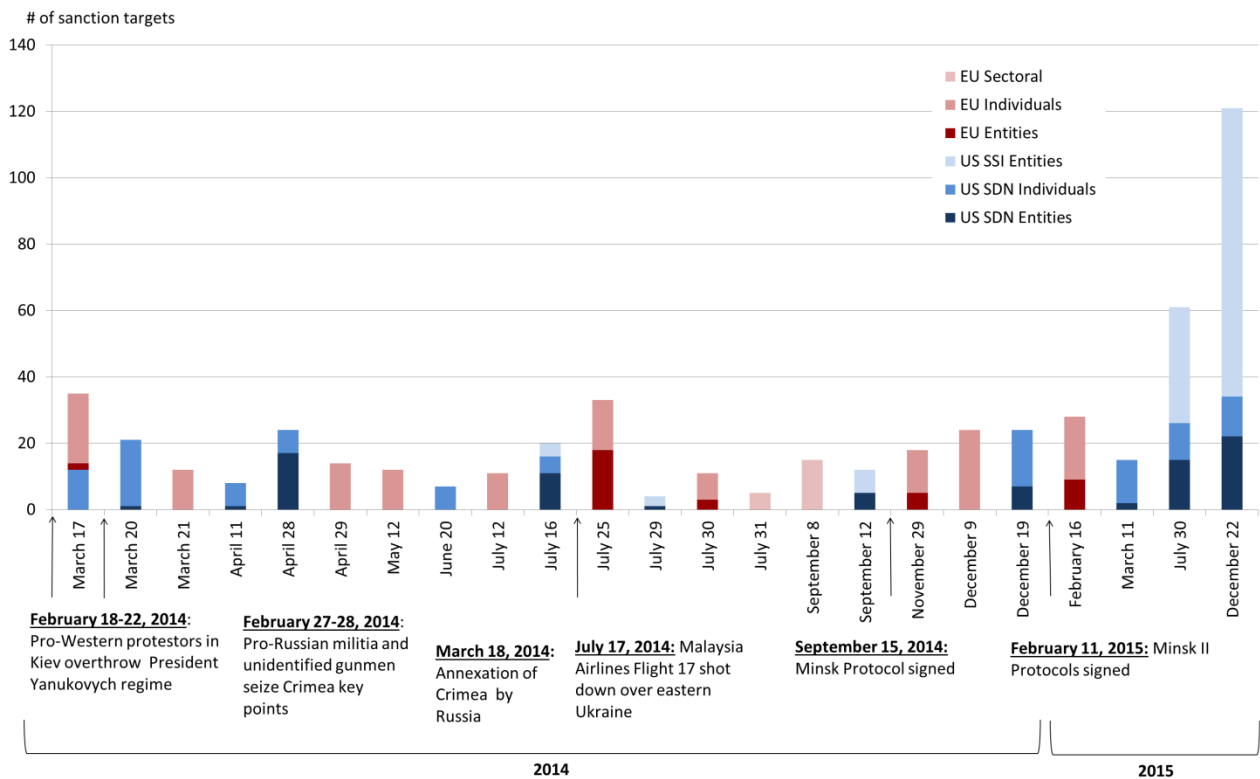
To summarize, at the macroeconomic level, given that oil price fluctuations alone can account for 80 percent or higher of the drop in Russian economic output and import demand, sanctions appear to have had a *second-order* impact, transmitting into relatively small spillover effects onto the economies of the European Union.

Figure 1: Overview of U.S. and EU Sanctions against Russia



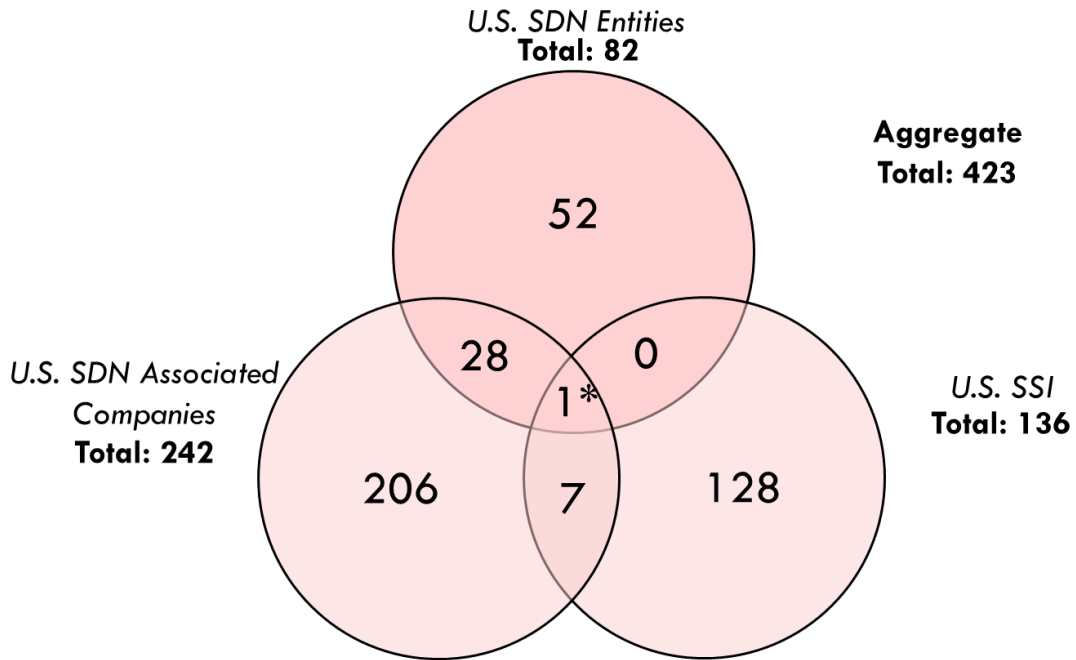
Source: U.S. Treasury OFAC, Council of the European Union

Figure 2: Timeline of U.S. and EU Targeted Sanction Designations



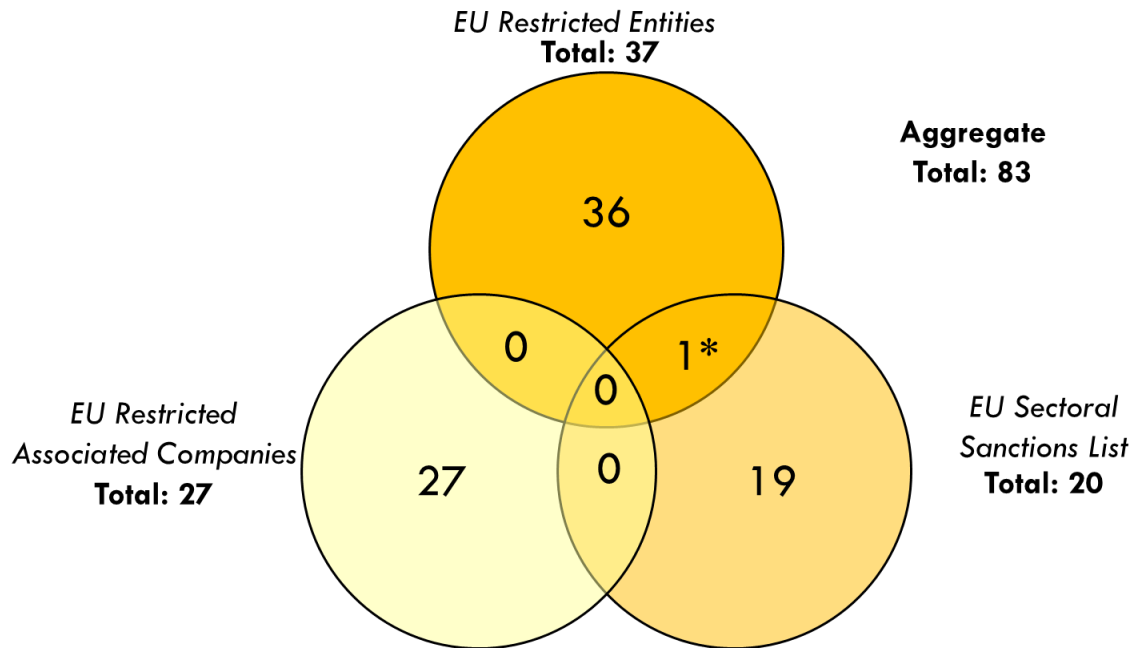
Source: U.S. Treasury OFAC, Council of the European Union, BBC

Figure 3: U.S. Sanctioned Entities by Type



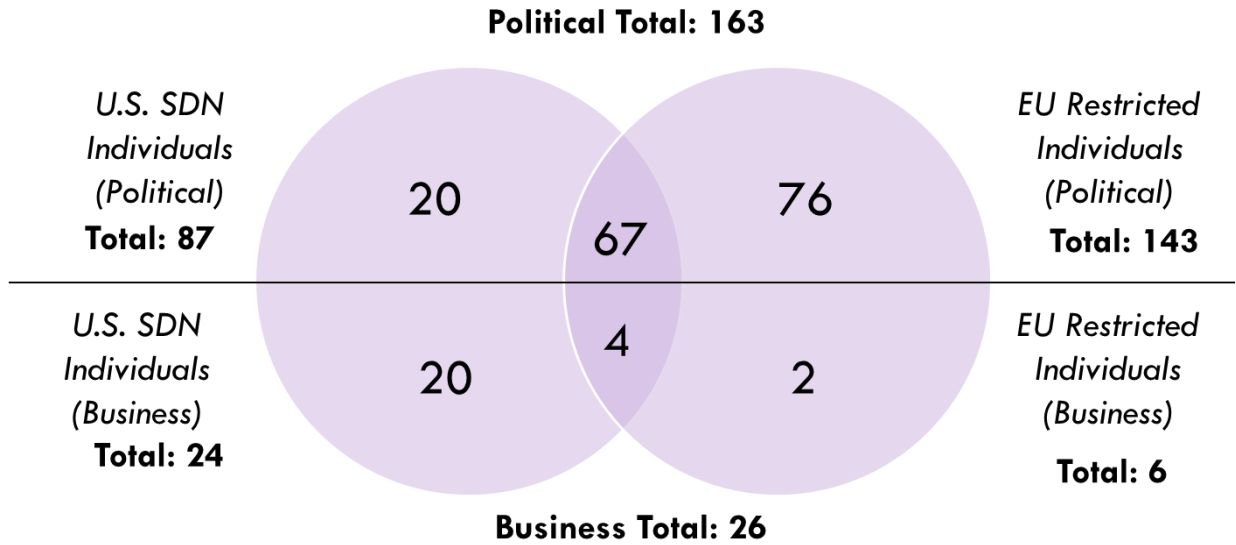
Source: U.S. Treasury OFAC

Figure 4: EU Sanctioned Entities by Type



Source: Council of the European Union

Figure 5: U.S. SDN and EU Restricted Individuals, by Type



Source: U.S. Treasury OFAC, Council of the European Union

Figure 6: World Oil Price

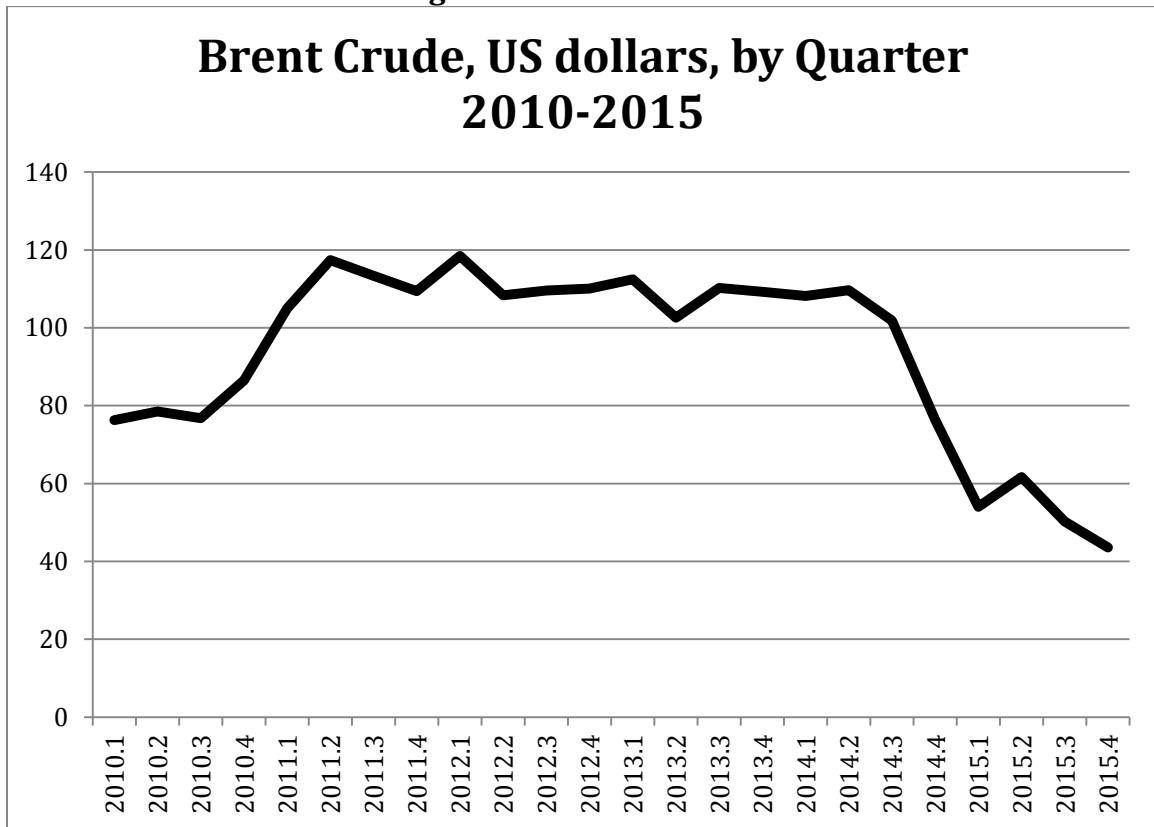


Figure 7: Actual vs. Predicted Russian real GDP growth

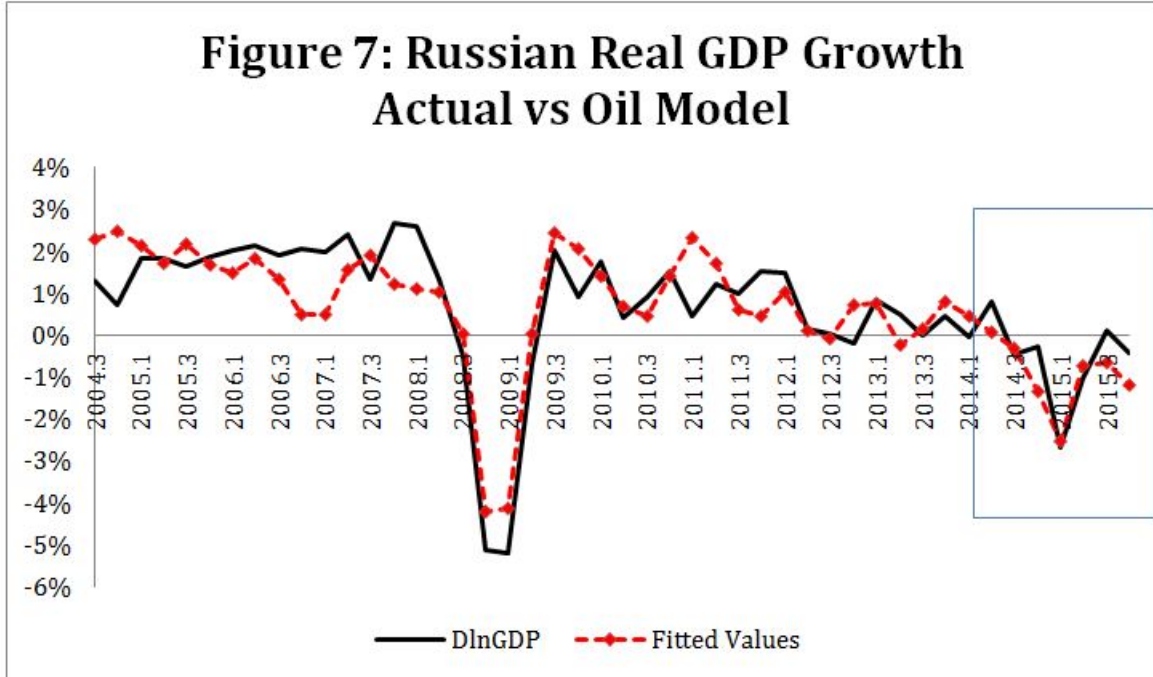


Figure 8: Actual vs. Predicted Russian import demand growth

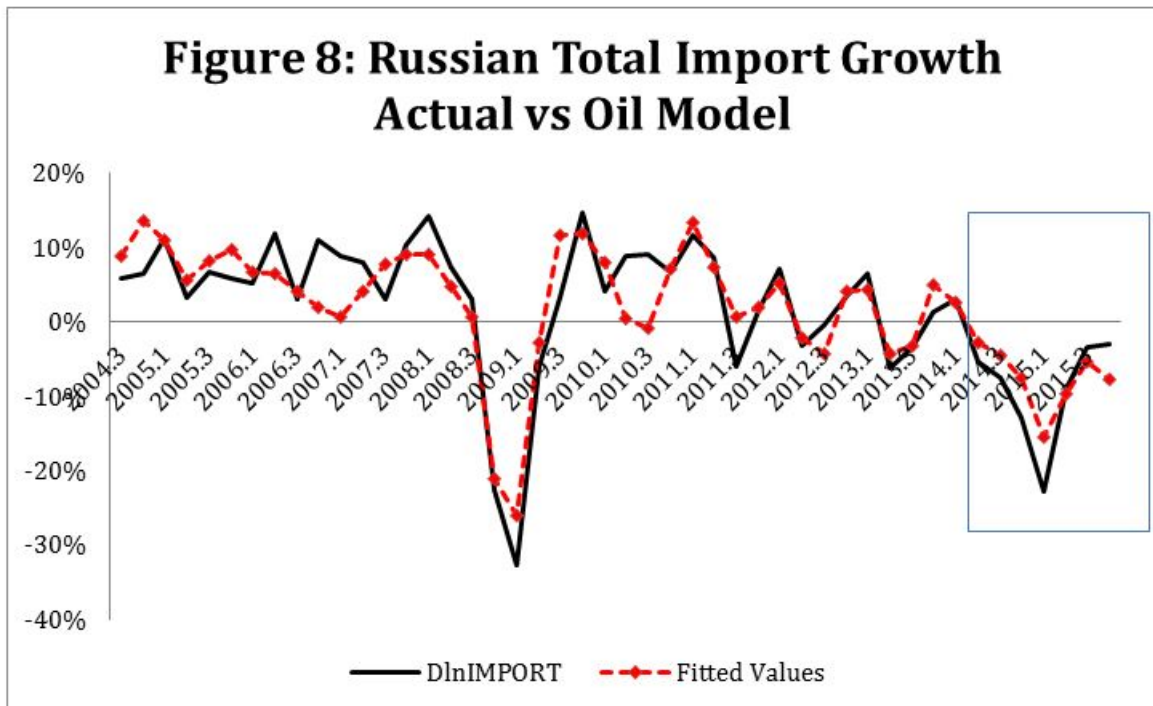


Figure 9: Estimated Decline in EU Exports to Russia from Sanctions and Counter-Sanctions, as a percent of GDP

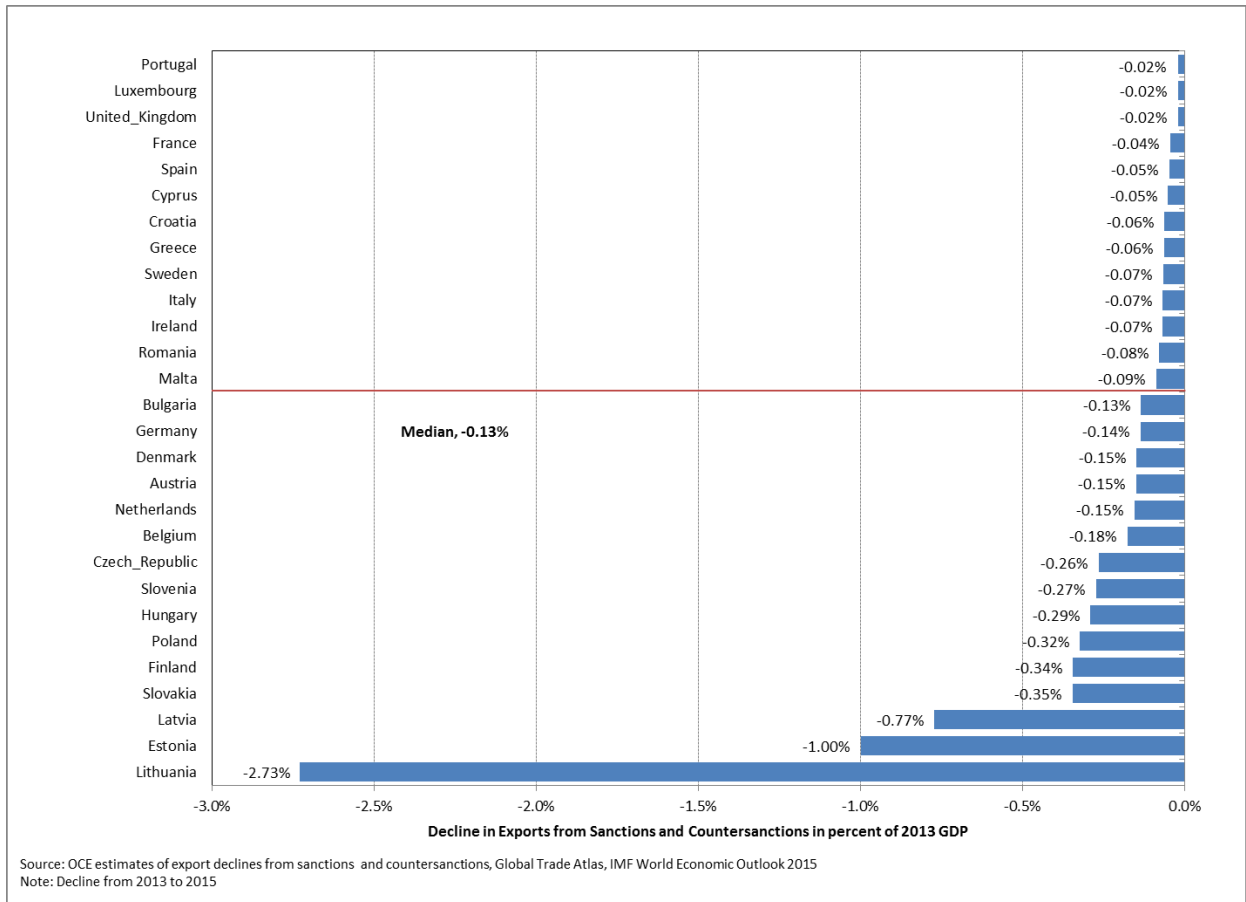


Figure 10: Estimated Decline in EU Exports to Russia from Counter-sanctions, as a percent of GDP

