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Assessing Sanctions and Their Impact on Trade:

An Application to the European-Russian Case

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Abstract

This paper analyzes the impact of the European-Russian sanctions of 2014 on the European export patterns. By applying a gravity model to disaggregated, monthly data I assess multiple effects that possibly kick in during a sanctions episode. First of all I empirically confirm the expectation that the exports of sanctioned products to Russia significantly decreased. The impact of the European embargo however appears to be limited compared to the effect of the Russian boycott. Second, evidence is found for the *sanction busting* argument, as the European exports of Russian blocked goods to the Eurasian Customs Union significantly increased. Furthermore my findings confirm the presence of the *third country effect*. Non-targeted countries attracted considerably more Russian boycotted commodities of the EU. Fourth, domestic agricultural prices faced a downward trend due to the installed trade restrictions. Contrary to my expectation of detecting a comparable price drop in the total, European export patterns, I only observed this for the exports to Belarus. Next, the exports of non-boycotted products declined as well. Finally, the results also point towards a more severe impact on perishable goods.

1 Introduction

This study aims to examine the effect of economic sanctions on the trade flows between the European Union (EU) and third countries. The recent Russian sanctions emphasize the relevance of this topic, not only in today's global economy but also in today's

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geopolitical reality. More specific, I tackle the question whether the EU flexibly diverts its trade when an export market gets blocked. To my knowledge, no research exists on this topic. Moreover, the majority of the literature focuses on the effectiveness of economic sanctions as a foreign policy tool. Consequently, formal research to document the effect of these measures on trade patterns remains largely rare. For the papers that do exist, it is possible to distinguish general macro studies and a limited amount of case studies. I use a gravity model to analyze the trade patterns between the EU and it's partners. This approach is well documented and allows me to validate my hypotheses.

As stressed before, the recent Russian and European sanctions have a significant effect on the global economy. Policymakers face difficulties managing these issues and should be offered a tool in order to estimate and gain insight in the wide array of effects. Research can fine-tune this tool by thoroughly studying previous cases and looking at specific economic sanctions. This paper will complement the current research on trade sanctions by examining the export patterns of the EU during the sanctions episode of 2014. In this period, the Russian Federation (Russia) installed a food ban on Western economies to countervail their embargoes. As a result, several agricultural industries were unable to sell their goods on a major foreign market, which attracts approximately 10% of their goods. This paper tries to empirically assess the effects this had on the European trading patterns. Hufbauer et al. (1997) were the first to provide a model and formal evidence for the disruptive effect of sanctions on bilateral trade flows. Since then several papers have continued on their path to deliver evidence.

First of all this paper evaluates the impact of both the Russian and European economic sanctions on the export of the EU between 2011 and 2014, inclusive. In order to map the possible effects I will first provide some general statistics on the evolution of the European trading patterns and their relation to Russia. This enables me to structurally explore this topic in detail and document the potential channels through which trade may be diverted. I respectively derive four of these channels. First of all, private agents or countries could opt to defect the sanctions by transferring blocked goods via neighboring countries to Russia. Second, targeted commodities are possibly exported to new markets that do not fall under the trade restrictions. Next, chances exist that the prices of targeted goods significantly drop due to excess supply. Finally, domestic demand could increase due to sensitizing campaigns or lower prices. Besides these channels, I also elaborate on the multiple spillovers that possibly spread to non-boycotted commodities. For example, non-targeted exports could face a decline due to worsened bilateral relations. Policymakers should be aware of these side effects, as they severely enlarge the scope of installing economic sanctions. Secondly I construct an augmented gravity model, with specific sanction variables, to formally underpin the two first channels. This approach allows me to correctly distill the effects of economic sanctions. Finally, a robustness check is provided to validate my results.

This study is one of the first to deliver empirical evidence for the observed effects of the European-Russian sanctions. First of all I confirm the expectation that exports of boycotted commodities from the EU to Russia were severely disrupted. However, the size of the impact depends on the used fixed effects specification. Second, I show that the exports of Russian boycotted goods to neighboring countries of Russia and countries part of the Eurasian Customs Union significantly increased. Thirdly I prove that exports of Russian boycotted products to third countries increased. Furthermore, I validate the assumption that bilateral trade of non-boycotted products suffered from the installed sanctions. In addition, I follow the literature by assessing the time-effects of this aspect.

These seem to be present for the Russian targeted products as trade of non-targeted goods diminished months after the initial installment of the sanctions. Finally, the empirical results also point towards a more severe impact on perishable goods.

The structure of this paper is ordered as follows. The first section provides the literature review. The ensuing chapter describes the used data and empirical framework. The third section covers the descriptive statistics to document the potential channels through which trade may be diverted. Next, I present the obtained results of my research and perform a robustness check to validate my findings. The latter procedure is necessary, as the correct fixed effects specification to use in gravity models remains subject to a lot of discussion and influences the size of the estimations. The paper will be concluded with a review on the key implications of the European-Russian trade restrictions.

2 Literature Review

Daoudi and Dajani (1983, pp. 5-8) define sanctions as unilateral or "collective action against a state considered to be violating international law" designed "to compel that state to conform [to the law]. Due to their favorable position, relative to other policy tools, economic sanctions have always been attractive instruments of statecraft to exert extraterritorial influence (Eaton and Engers, 1992). When diplomatic pressure fails to formulate an answer to a crisis, the use of military force often seems to be one bridge too far. Hence, sanctions, with their diverse applicability, can then be the way to go (Davis and Engerman, 2003). This aspect, in combination with the expanding amount of foreign policy goals over the past two decades, resulted in a significantly increased use of economic sanctions (Hufbauer and Oegg, 2001). I tackle two aspects of economic sanctions in my assessment: (i) their target and (ii) the actors involved.

The United Nations Security Council (2013) distinguishes five types of economic sanctions on the basis of their target: diplomatic sanctions, travel bans, asset freezes, commodity interdictions and arms embargoes. This paper focuses on the latter two, as they form the backbone of both the European and the Russian sanctions installed in the light of the Ukraine crisis. Commodity interdictions prohibit the export or import of certain goods to specified nations and arms embargoes exclusively target weapons trade. A timeline on the major measures taken by both the governments is included in Appendix 1. Apart from an arms embargo, the European Union installed its first interdictions on dual-use products and energy technologies towards the Russian Federation on the 31st of July 2014 [1] (EC, 2014a). In a response to this pressure, the Russian government passed a presidential decree to ban certain agricultural and food products from the EU, US, Canada, Australia or Norway (Russian Government, 2014) [2]. As these measures can be controlled for in the European trading patterns, they form the focus of my study.

[1] Dual-use goods cover all items with possible military end applications (EC, 2009).

[2] These countries had all imposed Ukraine-related economic sanctions against Russian citizens and companies.

The second aspect of economic sanctions characterizes the number of actors involved. Typically the literature makes a distinction between unilateral and multilateral economic sanctions. The former implies that only one country (the sender) imposes sanctions and the latter states that a coalition of governments enforces measures. The Ukraine-related economic sanctions taken by the European Commission are 'Community Law' for the 28 EU members and can therefore be considered to be multilateral. Moreover, several other countries, including the US, have joined the EU towards imposing similar measures. The Russian Federation however finds itself isolated in its foreign policy.

The research question in this paper focuses on the change in trade flows when economic sanctions are imposed. As Caruso (2003) points out, economic sanctions cause a welfare loss for both the target and sender country. Boycotts, which target the import of one or more specific commodities, and embargoes, which cut off export with the target country, withhold the involved actors from trade gains. A number of papers have shown the positive effect of trade on the economy. Already in the early 19th Ricardo described the benefits from comparative advantages. More recently Krugman (1980) showed that international trade enables firms to produce more. Melitz (2003) and Melitz and Redding (2014) argue that trade increases firm productivity due to increased competition. Moreover, Eaton and Kortum (2002) found that comparative advantages at the firm level increase societal welfare. Furthermore a number of studies have focused on the dynamic effects on the economy and *within-firm* efficiency (Melitz and Trefler, 2012). Grossman and Helpman (1991) show that that innovation caused by trade significantly stimulates national wealth. Porter (1990) also stresses the fact that new strategic and management principles induce gains. Salomon and Shaver (2005) and Damijan and Kostevc (2010) state that faster learning processes at the firm level accelerate growth. Lileeva and Trefler (2010) provide evidence that globalization causally stimulates firms to innovate. Verhoogen (2008), Bustos (2011), and Aw, Roberts, and Xu (2011) describe other interesting sources through which trade triggers innovation. When examining economic sanctions, it is thus important to keep in mind that these measures inflict both a one-time and a continuous welfare loss for the countries involved.

In order to create a precise overview of the wide array of effects caused by economic sanctions, this paper follows a similar structure as described by van Bergeijk (1995). He makes a clear distinction between the direct and indirect cost of sanctions and emphasizes the fact that the latter phenomenon, which is referred to as the *network cost*, uniquely plays a role for third parties. This differentiation is maintained throughout the paper and I will respectively discuss the effect for the target country, sender country and third parties.

The severity of the impact of sanctions on the target country varies from case to case. Nonetheless, Caruso (2003) states that economic integration is a key parameter to estimate inflicted costs by economic measures. The intuition behind this reasoning is that a country faces difficulties selling their goods when a major trading flow is blocked. Domestic firms will, for instance, incur higher transportation expenses to export to more distant locations, will have to pay risk premiums to middlemen and sanction busters or will not be able to trade at all (van Bergeijk, 1995). If the latter situation occurs, an excess supply is likely to push prices down as sellers try to get rid of their products. As a result,

sanctions on perishable goods, such as the Russian embargo installed amidst the Ukraine crisis, tend to be the most severe because the products face a short life span[3]. This analysis also implies that, when a country can divert its trade towards other partners in an easy and costless way, the sanction will be less effective (Yang et al., 2009). The literature distinguishes two channels through which this occurs. First of all the *third country effect* can kick in, implying that new export markets are penetrated to discard excess supply. The second channel tries to circumvent economic sanctions by transferring goods via non-boycotted countries. Drezner (2000) makes a distinction between defection by private actors *(sanction busting)* or by nation states *(backsliding)*[4]. Both the *sanction busting* as *third country effect* is proven to be more significant when an economic sanction is imposed unilaterally (Yang et al., 2009). Furthermore, Davis and Engerman (2003) argue that globalization is one of the main causes for the limited effect of sanctions. They argue that the world has become more of a single and fluid marketplace, which thus reduces the economic leverage of Western economies in international trade. Although the aforementioned implications are commonly part of policy goals, many side effects often take place as well. Examples range from humanitarian losses, due to insufficient imports of necessary goods, or implosions of domestic financial markets, as a result of asset freezes.

Effects on the trade patterns for sender countries have similar implications. As discussed before, the economic entanglement between the sender and target country indicates the extent of welfare losses for both countries. For example, the grain embargo of the United States on the Soviet Union in 1980 resulted in a loss of exports and led to damage for the domestic agricultural sector (Paarlberg, 1980). Moreover, Paarlberg (1980) also argues that these sanctions undermined the trustworthiness of the United States as a grain supplier. This effect forced the Soviet Union to establish and maintain trade relations with other partners, even when the sanctions where lifted. Sender countries therefore face difficulties to restore their *business as usual* trade after a sanctions episode.

Finally, third countries are also exposed to the effects of economic sanctions. This *network effect*, as it is referred to in the literature, denotes all changes in economic opportunities for actors not involved in the conflict. More specific, trade flows of boycotted countries can be redirected or terminated and cause spillovers towards other trading partners. Although it is a rather extra and hidden dimension, it is considered to cause the most severe distortions on trading patterns. The theoretical foundation for this assessment builds on two main ideas. The first one stresses the fact that sanctions increase the uncertainty about future trading gains. As a result, the political motivation to further specialize and open up borders diminishes and economies become more inward-looking (van Bergeijk, 1995). The second key driver behind decreased overall trade relies on the fact that a sanction initiates an economic bust for the target country, causing its industry to slack and to disrupt trading relations with other countries (Yang et al., 2009).

[3] Kraatz (2014) estimates that the Russian embargo affected the European agricultural sector for EUR 5.2 billion.

[4] From hereon *sanction busting* refers to defection by both private actors and nation states.

Contrary to the amount of theoretical discussions concerning the *sanction busting* and *network effects*, systematic or empirical research remains largely (Yang et al., 2009). For the literature that does exist it is possible to distinguish two types: comprehensive macro studies and case studies. A schematic overview of the existing literature in both groups is provided in Appendix 2.

Hufbauer et al. (1997) are the first to provide a formal, macro study based on a gravity equation to examine the *sanction busting* effects on global trading patterns. Apart from the standard variables incorporated in the gravity model they control for the severity of sanctions. The article delivers econometric evidence that comprehensive sanctions reduce bilateral trade flows by around 90%. In response to this research, Yang et al. (2004) criticize the short time-span used by Hufbauer et al. (1997) and their classification of sanctions. In their own work they build on the same gravity equation but adapt it to the delivered critique. The paper uses trading data between 1980 and 1998 and tries to map the effect of U.S. sanctions on target countries and third parties, such as the European Union and Japan. Their results on bilateral trade are conforming to those obtained by Hufbauer et al. (1997). Apart from these direct effects, they are also the first to study the *network effect* in a macro economic framework. More specifically they analyze whether the EU captures the trade with target countries after a sanction has been initiated. As their regression captures an increased trading volume, they claim this to be an indication for the *sanctions-busting* argument.

Caruso (2003) provides another macro study on empirical evidence for the effect of sanctions on trading patterns. He matches panel data on trade from 1960-2000 with the most significant economic sanctions imposed by the United States. First of all the paper examines the effect on bilateral trade between the U.S. and other countries. Similar to other studies, Caruso (2003) accounts for the severity of sanctions as well. The results from this analysis show that comprehensive measures have a more significant effect on the bilateral trade flow than moderate or limited sanctions. The paper also provides an analysis on the *network effect* of US sanctions on trade between 47 countries and the G7. Caruso (2003) finds evidence for both the *sanction busting* and *network effects*. The former is shown by a significant increase in the trade between the two partners after limited and moderate sanctions take place. However, if measures are comprehensive, overall trade diminishes and the *network effect* kicks in. This demonstrates the distortive aspect of severe, global trade measures. A last element the paper adds to the literature is the use of a counterfactual to estimate the real loss in trade. The dummy variables are set to zero in order to construct a sanction-free world. The estimated trading flows are then compared with the ones observed in reality.

Lastly, Yang et al. (2009) advance on the research delivered by Yang et al. (2004) and focus on the question whether the EU represents an attractive alternative market for countries when they are confronted with US sanctions. Their methodology also relies on a gravity model but examines total trade data from 1980 to 2003. In this fashion, the paper tries to find out whether the EU captures the lost trade or whether the trade patterns between the EU and third countries become distorted as well. Important to note is that Yang et al. (2009) adjust the application of the model in two major ways. First of all, they control for the effect on imports and exports separately. Second, they incorporate time dummies, which allow them to consider the lingering effects of economic sanctions. The results of the paper conform to the findings of Caruso (2003). In addition, Yang et al. (2009) find significant evidence for the over time effects, implying that after the distortive

initial phase of a sanctions episode, the EU will gradually capture more and more spillovers from the targeted countries.

Apart from these comprehensive studies, a limited amount of case studies have been conducted to discover country-specific aspects to economic sanctions. The most relevant papers are briefly discussed below.

Evenett (2002) analyzes the effect of sanctions on South Africa during the apartheid regime. The paper finds evidence that the measures taken by eight industrialized countries severely disrupted bilateral trade flows. Furthermore Evenett (2002) pinpoints that the *bounce back* of exports to their initial level, after the demise of the apartheids regime in 1991, has known different speeds dependent on the trading partner. More specific the empirical evidence shows that exports to the EU have normalized rather quickly compared to those to the US. Hengeveld and Rodenburg (1995) provide another interesting case study on South Africa but focus on the oil embargo. Torbat (2005) tackles the question whether economic policies can be adjusted to increase their effectiveness. He focuses on the measures imposed on Iran from 1979 onwards. As the majority of boycotts imposed in this case were related to financial assets, he estimates the inflicted welfare losses in the monetary sphere. The paper finds evidence that more precise targeted sanctions along with political pressure on the ruling clergy could have been a more effective policy than the comprehensive sanctions. Thirdly, Dizaji and van Bergeijk (2013) focus on the Iranian oil boycott. They tackle its short- and long-term effects and argue that the majority of success in economic sanctions is booked in the initial two years that they are imposed. Moreover, their model asserts that the long-term gain of compliance decreases during a sanction episode and is lower in the long run than acknowledged by the usual comparative static analysis.

Other interesting case studies have been presented on Yugoslavia (Dinu, 1994), Nicaragua (Graham, 1987) and the US grain embargo (Paarlberg, 1980; Mustard and Schmidt, 1983 and Webb et al., 1989). Evidence is found for the distortive effect of economic sanctions on trade patterns. Moreover, Dinu (1994) estimates that the network costs for countries surrounding Yugoslavia added up to US$ 3.5 billion for Bulgaria, US$ 1.5 billion for the Ukraine and US$ 1.5 billion for Hungary.

Important to note is that the majority of research on economic sanctions does not focus on the *sanction busting* or *network effect* but concentrates on the question whether a sanction has been successful in changing the targets country behavior (Drezner, 2001). Hufbauer and Schott (1983) present one of the landmarks in this part of the literature[5]. They construct a database that encompasses the majority of economic sanctions imposed throughout history. In addition to this database, they add a wide array of political and economic variables to describe every sanctions episode. This approach allows them to determine the key factors for effective policies.

Baldwin (1985) presents one alternative approach to Hufbauer and Schott (1983) to study the efficacy of economic sanctions. Contrary to the latter he proceeds with an analytical

[5] The book Economic Sanctions Reconsidered by Hufbauer et al. (2007) continued on the path laid out by the first contribution of Hufbauer and Schott (1983).

method and focuses on the amount of influence sanctions can obtain, rather than truly altering the target states policy (Abott, 1987). Although many scholars have devoted their research to determine the success factors for foreign economic policy, Askari et al. (2003) state that there is still a lot of doubt on the results[6]. The main reason for this challenging assessment is the complex mix of factors that influence the final outcome.

The major hiatus in the current literature thus remains the lack of empirical research on the effects of economic sanctions taken by or aimed at the European Union. The recent measures initiated in the slipstream of the Ukrainian crisis however show that these tools of statecraft become increasingly popular in the European political landscape (EEAS, 2014). By examining the recent sanctions this paper wants to take a first step towards finding empirical evidence for both the direct effect of sanctions as the *sanction busting* and *network effect*. Moreover, by using a gravity equation we can compare our results with the existing literature. Finally, this study tries to add insights to the growing empirical research on gravity models applied to disaggregated, monthly data.

3 Data & Empirical Methodology

In this chapter I will further elaborate on the used data format for the research conducted in this paper. Furthermore, I provide the theoretical underpinnings for my augmented gravity model.

3.1 Data

In order to construct the augmented gravity equation I collect data on trade, GDP, distance, geographical and cultural information, over the period of 2011-2014. The monthly trade data comes from Eurostat (2015), as no other institute provides such recent statistics. The dataset includes each of the 28 EU member countries and all of its trading partners for which data is provided. The data is disaggregated at the HS6 level[7]. This implies that our dataset takes on a significant size for every observed year. In order to maintain a workable but representative dataset, I only incorporate four years in my research[8].

The data on GDP comes from the World Economic Outlook Databases (IMF, 2015) and is expressed in current prices. It is the only institute from which official data on 2014 was available. The statistics were released on the 14th of April 2015 and offer a wide range of indicators. The distance variable incorporated in the model is the distance between the

[6] For examples of studies on the effectiveness of sanctions see among others Martin (1992), van Bergeijk (1989,1994,1995), Pape (1997), Bonetti (1998), Mastanduno (1999), Drezner (2000).

[7] I would like to express my gratitude towards Janez Kren from the Centre For Economic Studies (CES) for providing me the detailed trading data.

[8] The dataset reports approximately 77 million observations.

capitals of the respective countries and comes from the CEPII database (CEPII, 2013). Data on the colonial past, common language and geographical characteristics are derived from the same dataset (CEPII, 2013). Finally, the Corruption Perceptions Index is derived from Transparency International (2015). The index ranges between 0 and 100 and is derived from broad surveys on the likelihood of governmental fraud.

Information on the details of economic sanctions comes from official journals of government institutes. An important note is that Russia defines targeted goods at the HS4 or HS6 product level whereas the EU provides the CN8 product code in its legal journals[9]. The advantage of these classifications is that the first four and six digits of a CN8 code respectively denote the HS4 and HS6 code. However, identification issues arise because I analyze trade data on the six-digit level. For example, it could be that not all commodities falling under HS6 code 070310 (fresh or chilled onions and shallots) are boycotted but only shallots with CN8 code 07031090. The effect of sanctions on these product categories can thus be biased and therefore I maintain a distinction between the European and Russian sanctions. Moreover, as the Russian boycott only targets perishable goods it is also a necessary distinction to be made for my research question. The product codes of the sections boycotted by Russia come from the official site of the Russian government (2014)[10]. The targeted goods include almost all product codes covered by the HS2 codes 02 (meat), 03 (fish), 04 (dairy products), 07 (vegetables) and 08 (fruit). The specifics of the EU sanctions come from different documents, as no centralized document exist. The product codes of the technological goods are derived from the official decision taken by the Council of the European Union (EC, 2014a). For the arms embargo I incorporate chapter 93 of the HS classification, which is defined as 'Arms and Ammunition'. For the dual-use products I consult the decision taken by the EC in 2009, in which all goods with military end applications are defined (EC, 2009)[11].

After their initial decision on the 31st of July, the European Commission made several amendments and corrections to strengthen the sanctions[12]. More specific, the financial sanctions were extended to other Russian firms and persons. However, the commodity interdictions, which specify the product codes, did not change so there is continuity in the boycott. Appendix 1 provides a general timeline on the evolution of the sanctions episode issued by both the EU and Russia. Please bear in mind that only those directly aimed at both countries were incorporated in this study. Embargoes on Crimea and Sevastopol are not accounted for because they don't implicate an effect on the entire, official Russian territory. The Russia pork ban is incorporated from February on, the European sanctions

[9] Please consult the User Guide on European Statistics on International Trade in Goods (Eurostat, 2014) for detailed information on the differences in classifications.

[10] Apart from official documents, Baker & McKenzie (2015) provide useful background information on the implications of imposed sanctions.

[11] The European Commission provides a consolidated list on dual-use items, with correlation to other classifications, on the following link: http://ec.europa.eu/trade/import-and-export-rules/export-from-eu/dual-use-controls/

[12] The European Commission updates the sanctions in force on a quarterly base on the following link: http://eeas.europa.eu/cfsp/sanctions/docs/measures_en.pdf

together with the Russian countermeasures are both assumed to start in August. Important to note is that contracts agreed on before the 1st of August 2014 do not fall under the European embargo (EC, 2014a). Therefore it will be less likely to observe a sudden decline in these product sections.

3.2 Empirical Methodology

Analogous to the majority of the literature, the augmented gravity equation forms the core of my empirical research. After Isard (1954) firstly introduced a gravity equation to examine trade, Tinbergen (1962) optimized the model by transforming the variables into a logarithmic form. Although the gravity equation performed well in econometric research, it took more than a decade before its theoretical underpinnings were proven[13].

Hufbauer et al. (2007) describe this model as the de facto workhorse of modern-day empirical analysis of international trade and investment flows. It is derived from Newton's physics theories and assumes that there is a pull factor in international trade, which can be indicated by a nation's population or GDP, and a push factor, which can best be described by the distance between countries (Caruso, 2003). The bulk of the conducted research in this topic then combines these parameters with additional variables to construct an augmented gravity equation optimal for the intended research.

Hufbauer and his colleagues (1997) proposed this model to examine the effect of economic sanctions. Since then, the majority of the literature has continued on their path. The basic log linearized equation of my research looks the following (Cardamone, 2011):

$$\ln\left(X_{ijtm}^{s}\right) = \alpha_1 \ln\left(GDP_{itm}\right) + \alpha_2 \ln\left(GDP_{jtm}\right) + \alpha_3 A_{ij} + \alpha_{ij}^{s} + \alpha_m + \mu_{ijtm}^{s} \qquad (1)$$

where X_{ijtm}^{s} captures the bilateral trade value for a six-digit level product s between a European exporter country i (i=1,…,28) and a partner country j (j=0,…,168) in a given year t (t=2011,…,2014) and month m (m=1,...,12). The variables $\mathrm{GDP_{itm}}$ and $\mathrm{GDP_{jtm}}$ respectively denote the gross domestic product of the exporter and importer in that month. I follow Cardamone (2011) by dividing the GDP by twelve to adjust for monthly trade data, which gives $\mathrm{GDP_{itm}} = \frac{\mathrm{GDP_{it}}}{12}$ for country i. A_{ij} is a vector containing the other variables of interest such as distance, language, common border and colony. The usual random error term is indicated by μ_{ijtm}^{s}.

The advantage of using continuous logarithmic variables is depicted from the fact that its regression coefficient can be interpreted as an elasticity. This approach also implies that zero observations will be omitted because the logarithmic function is not defined for this value. As a result, estimates risk to be biased, especially for disaggregated trade data

[13] For papers on the theoretical framework of the gravity model see among others Anderson (1979), Bergstrand (1985), Deardoff, (1995) and Anderson and van Wincoop, (2003).

containing a lot of zeros[14]. In our case, zeros will arise even more due to the imposed trade restrictions. Analogous to the literature, I therefore control for this issue by replacing every zero by one. The results are provided in the robustness check. An additional bias could arise from the fact that I only analyze the export patterns of the total 28 EU members. Possible heterogeneity between these countries is thus neglected. Further research could tackle the question whether the impact of the sanctions varied throughout the EU.

A lot of discussion continues to take place in the literature on the correct fixed effects specification to examine trade. The danger exists that certain factors, fundamental to trading patterns, are not accounted for in the regression. Anderson and van Wincoop (2003) distinguish two fixed effects specifications. The first one is to control for country specific factors that may influence levels of trade and is referred to as *multilateral resistance* (Anderson and van Wincoop, 2003). The second set-up is to check for *bilateral resistance* or the link that may exist between a country-pair. The specification incorporated in my regression, based on Cardamone (2011), includes commodity-country-pair fixed effects (α_{ij}^{s}). This allows me to control *bilateral resistance*. Note that by using this specification variables on distance, common border, language and colonial ties, which normally control for *bilateral resistance*, are subsumed in the fixed effects. Further in this paper I add a second fixed effect specification that controls for *multilateral resistance*. In addition, GDP is added, as the literature repeatedly shows that it acts as a significant pull factor in international trade. Month dummies are added to control for seasonality.

In order to assess the above-mentioned potential channels I construct an augmented gravity model with additional dummies. The equation looks as follows:

$$\ln(X_{ijtm}^{s}) = \alpha_1 \ln(GDP_{itm}) + \alpha_2 \ln(GDP_{jtm}) + \alpha_3 A_{ij} + \alpha_4 SANRUS.RUS_{ijtm}^{s} + \alpha_5 SANEU.RUS_{ijtm}^{s} + \alpha_6 Z_{ijtm}^{s} + \alpha_{ij}^{s} + \alpha_m + \mu_{ijtm}^{s} \quad (2)$$

where $SANRUS.RUS_{ijtm}^{s}$ denotes sanctions imposed by Russia on the EU. The variable turns to 1 if the destination is Russia and the product code falls under the Russian boycott in that month. $SANEU.RUS_{ijtm}^{s}$ operates exactly the same but indicates product codes embargoed by the EU. These two variables allow us to assess the impact of sanctions on the bilateral trade flow of targeted product codes.

Z_{ijtm}^{s} stands for the sanction variable incorporated in each regression, to control for the potential channels discussed in the first section of this paper. An overview is given below:

$BUSTRUS_{ijtm}^{s}$ is the interaction of neighboring countries of Russia and boycotted product codes by Russia. $BUSTEU_{ijtm}^{s}$ captures the same effect but for European targeted products. If there is a significant increase in the value of exported goods we can interpret

[14] Other regression techniques, i.e. Poisson Pseudo Maximum Likelihood (PPML), could circumvent this problem. The size of my dataset however does not allow me to run these regressions.

this as a possible indicator for the *sanction busting argument*. Finally I also check whether Belarus and Kazakhstan, which were together with Russia part of the Eurasian Customs Union in 2014, caught up significantly more exports from EU by adding variables $UNIONRUS_{ijtm}^{s}$ and $UNIONEU_{ijtm}^{s}$.

$TCRUS_{ijtm}^{s}$ and $TCEU_{ijtm}^{s}$respectively turn to 1 if Russia, or the EU, blocks the product in that month and the trading partner is not Russia or a EU member. This indicator will aid us to assess the *third-country effect* or whether trade to other countries has significantly increased during the sanctions episode. As mentioned in the first section of this paper it is interesting to make a distinction between EU and non-EU members. Therefore I add the variable $TCRUS.EU_{ijtm}^{s}$ and $TCEU.EU_{ijtm}^{s}$, which respectively indicate if Russia or the EU either blocks the product code in that month and the trading partner is a EU member.

Additionally to the above described variables, which each control for a potential channel, I also incorporate variables to control for possible side effects. $BILRUS_{ijtm}^{s}$ tackles the research question of declining bilateral trade between the EU and Russia of non-targeted commodities. The variable turns to 1 if the destination is Russia and the product code does not fall under either the Russian or European sanctions. The variable could however also capture blocked goods that are exported under different non-boycotted product codes. If the latter occurs, an increase of exports in this category will be observed. Important to note is that $SANRUS.RUS_{ijtm}^{s}$ and $SANEU.RUS_{ijtm}^{s}$ are dropped in this regression because their combination is collinear with $BILRUS_{ijtm}^{s}$ on the product level. $BILRUS.T_{ijtm}^{s}$ examines the over time effect sanctions have on non-boycotted commodities. It denotes the number of months the sanctions have been installed. For example, the variable $BILRUS.T_{ijtm}^{s}$ displays three at product code 100400 (oats) in October because it is the third consecutive month sanctions have been installed. The variable sheds some light on the lingering effects of sanctions and the eagerness of European firms to divert their trade from less trustworthy markets.

Every aspect is assessed in different regressions[15]. All these variables of interest are interaction terms of other dummies. In order to keep equation (2) parsimonious I did not incorporate them. Please refer to Appendix 3 for a detailed table of the construction of the variables.

4 Descriptive Statistics

This section aims to give additional insights on the evolution of trade relations between the EU and Russia throughout the sanctions episode. I will first give an overview of the overall bilateral trade between the two partners. Next, I assess the impact of the sanctions on the exports of targeted commodities. The final section zooms in to the

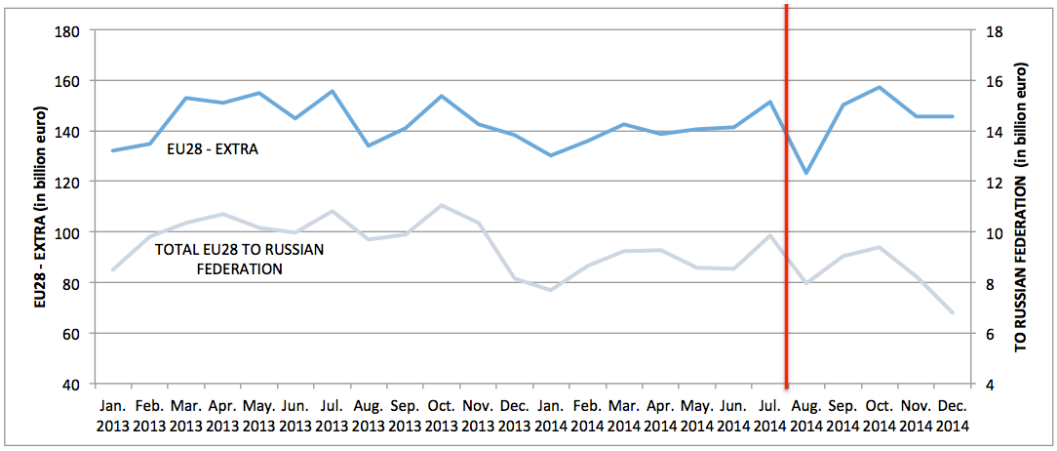
[15] Significant amounts of computational power are required to calibrate my high dimensional fixed effects gravity model on the approximately 77 million observations. I used the REGHDFE command by Sergio Correia (Fuqua School of Business, Duke University) to alleviate this problem and reduce the time-consuming estimation procedure.

potential channels through which trade may be diverted. The most informative descriptive statistics are provided below to demonstrate distortions in the trade patterns. Please refer to the appendix for supplementary documentation.

4.1 Bilateral Trade Between the EU and Russia

As Figure 1 shows, EU28 – Extra exports remained stable throughout 2013 and 2014. The value of all exported goods hovered around 140 billion euros, with a seasonal drop occurring every year in August. This could pose problems to derive the impact of the European-Russian sanctions, as these were taken in the same month. Interesting to see is that exports to Russia did not fully bounce back after the installment of the trade restrictions, but faced a downward trend from October on. As mentioned in the literature review, European firms could regard the Russian market as untrustworthy for future business. Therefore they possibly redirect their products to other markets, even after the sanctions are lifted. The share of Russia in the export patterns remained stable over the two years. Russia formed the second most important buyer of European goods in 2013, attracting between 6% and 7% of all commodities (Kraatz, 2014).

Figure 1: EU28 – Extra Exports (left axis) and EU28 Exports to Russia (right axis) (Eurostat, 2015)

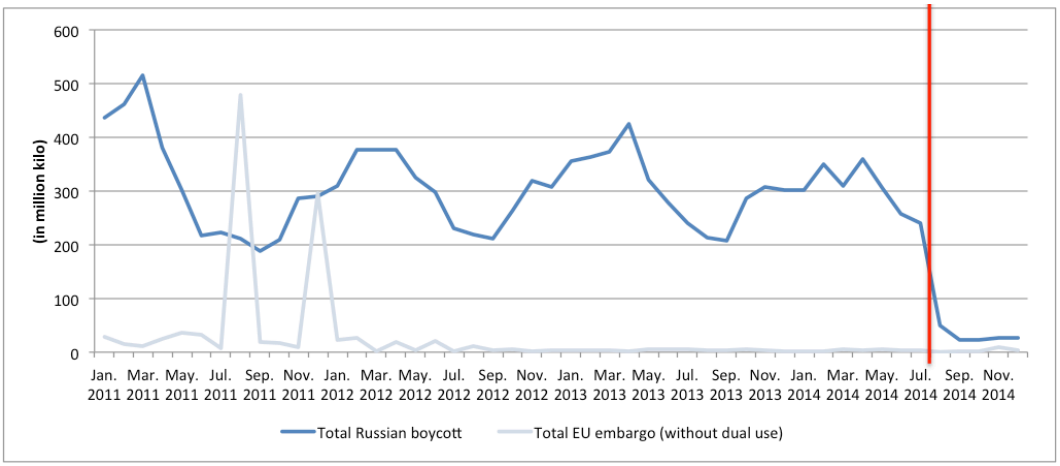


Notes: The value of EU28 – Extra exports hovered around 140 billion euros between 2013 and 2014. A drop in August can be observed in both years, making it hard to distill the effect of the European-Russian sanctions. The Russian share remained stable, attracting between 6% and 7% of all European exported commodities. However, Russian exports did not bounce back to the same level as before August and face a downward trend from October 2014 on.

4.2 European Exports of Targeted Goods to Russia

Russia represents 10% of all EU agricultural food exports (EUR 11.8 billion), making it the second most important destination after the USA. Figure 2 respectively analyzes the evolution of Russian and European targeted commodities. We see that Russian targeted exports declined with 200 million kilo between July and August 2014. I present the data in kilo's to properly correct for a potential price drop occurring in that time span. A remarkable observation is the fact that a small portion of the blocked commodities by Russia continues to get exported.

Figure 2: EU28 Exports of Targeted Goods To Russia (Eurostat, 2015)



Notes: EU28 exports to Russia were severely disrupted due to the installed sanctions in August 2014. A decrease of around 200 million kilo is observable from July 2014 to August 2014 for commodities targeted by Russia. The share of European embargoed goods is negligible and no severe disruptions can be observed.

Table 1 zooms in to a more disaggregated level of products boycotted by Russia and embargoed by the EU. I only incorporate the blocked product codes and collect their values in the respective HS2 classification. The sectors potentially most affected in terms of export share are fruit and vegetables (29% destined for Russia), cheeses (33% destined for Russia) and butter (28% destined for Russia). Worth noting is that the projected value destruction of sanctions is initially higher when perishable goods are targeted (Kraatz, 2014). As a result the Russian based sanctions will inflict more costs in the short run. This phenomenon is also visible if we compare the evolution of agricultural goods to the European based sanctions that aim for technology. Moreover, the commodities embargoed by the EU do not exhibit a similar trend. Table 1 illustrates that the exports of technological goods, targeted by the EU, are highly volatile. In combinations with the fact that total EU exports decreased in August and the fact that contracts concluded before the 1st of August can be fulfilled it is hard to establish the impact of the trade restrictions on these commodities (EC, 2014a). Finally, a decrease in exported meat from February on is visible due to the Russian import ban on pork meat[16]. The possible costs affiliated with the Russian boycott are presented per country in Appendix 4. The countries potentially most hit in absolute value include Lithuania (EUR 927 million), Poland (EUR 841 million), Germany (EUR 595 million) and the Netherlands (EUR 528 million) (Kraatz, 2014).

[16] The Russian government banned EU fresh and frozen pork meat after African Swine Flu (AFS) was detected in four isolated cases from Poland and Lithuania. The decree was imposed on the 1st of February 2014 and remained binding throughout 2014 (Kraatz, 2014).

Table 1: EU28 Exports of Targeted Goods To Russia (Eurostat, 2015)

HS2 Code	Description	Russian Sanctions (Value in million kilo)											
		Jan. 2014	Feb. 2014	Mar. 2014	Apr. 2014	May. 2014	Jun. 2014	Jul. 2014	Aug. 2014	Sep. 2014	Oct. 2014	Nov. 2014	Dec. 2014
02	Meat	18	3	3	6	5	6	5	1	0	0	0	0
03	Fish	10	22	10	10	6	6	7	2	1	1	1	2
04	Dairy Products	34	39	32	31	27	28	33	5	0	0	0	0
07	Vegetables	80	111	106	129	110	59	47	8	1	2	4	5
08	Fruit	146	158	141	168	141	140	130	24	7	5	7	9
Other Sections		14	15	16	17	16	18	18	10	14	15	15	11
Total Sections		**302**	**349**	**309**	**360**	**305**	**257**	**241**	**49**	**24**	**23**	**26**	**27**
			16%	*-12%*	*17%*	*-15%*	*-16%*	*-6%*	*-79%*	*-52%*	*-3%*	*15%*	*3%*

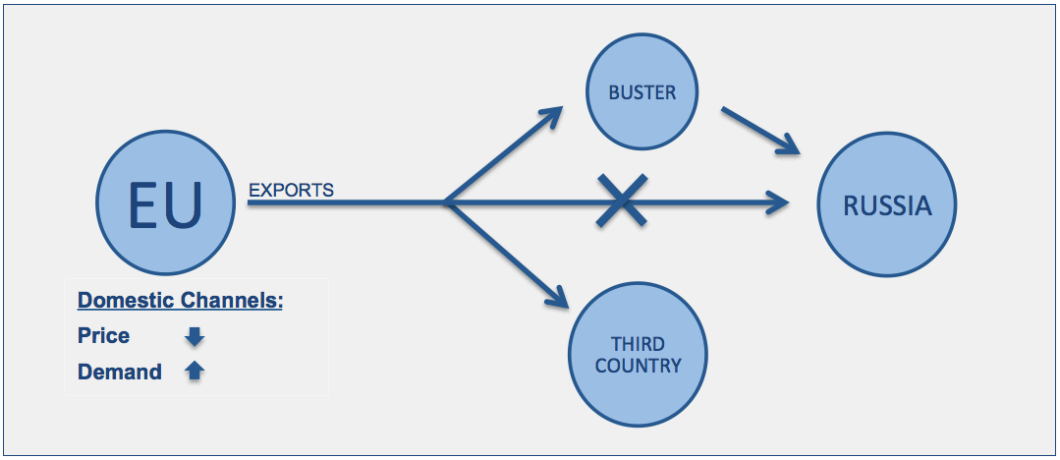
HS2	Description	European Sanctions (Value in thousand kilo)											
		Jan. 2014	Feb. 2014	Mar. 2014	Apr. 2014	May. 2014	Jun. 2014	Jul. 2014	Aug. 2014	Sep. 2014	Oct. 2014	Nov. 2014	Dec. 2014
Technological goods		1918	882	5763	2857	6187	2594	2596	310	1116	1951	8898	2898
93	Arms	30	143	136	128	94	95	142	88	125	174	171	157
Total Sections		**1948**	**1025**	**5899**	**2985**	**6282**	**2688**	**2738**	**398**	**1241**	**2124**	**9069**	**3055**
			-47%	*476%*	*-49%*	*110%*	*-57%*	*2%*	*-85%*	*212%*	*71%*	*327%*	*-66%*

Notes: EU28 exports of boycotted products to Russia (aggregated at HS2 level) show a severe disruption from August 2014 on. Fruit covers the biggest share of Russian boycotted commodities, followed by vegetables. Similar to Figure 1, exports are not completely stopped after the installment of trade restrictions. The European targeted goods are negligible compared to their Russian blocked counterparts. Moreover, no significant, continuing decline can be observed in the months after August.

4.3 Potential Channels Through Which Trade May Be Diverted

Additional to the general effects of sanctions described in the literature review, I provide a specific overview of the possible consequences, related to the European-Russian case, that are the focus of my research. As stressed before, the effects of the unforeseen termination of exports, due to economic sanctions, are propagated through different channels in the economy. The scope and impact of these channels depends on multiple economic specifics. For example, high flexibility of European farmers to divert trade to new markets will not result in severe distortions on the domestic market. However, lack of flexibility can result in a significant price drop to dispose excess supply on both the domestic as international market. The incorporated channels through which targeted goods can flow are respectively *sanction busting, third country effect*, decrease in prices and increase in domestic demand. A schematic overview is provided in Figure 3.

Figure 3: Schematic Overview of Potential Channels

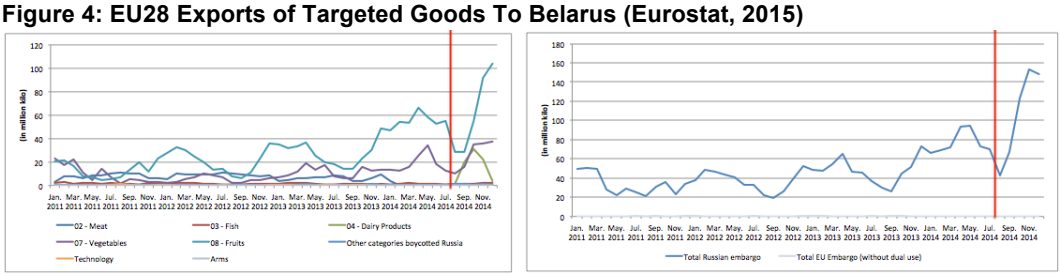


Notes: Four possible channels exist through which trade may be redirected. First of all, blocked commodities may be transferred via a sanction buster to Russia. Second, third countries can attract the excess supply created by trade restrictions. Finally, domestic channels may arise. These include the decrease of prices and the increase of demand for targeted goods.

4.3.1 Sanction Busting

First of all, Caruso (2003, p. 4) mentions that one way to bypass commodity interdictions is to "arrange triangular purchases to circumvent import controls". This *sanction busting* happens by sending products to countries not involved in the trade restrictions. There, the goods are repackaged and finally exported to the targeted country. In the European-Russian case, Belarus and Kazakhstan, both part of the Eurasian Customs Union, are most likely to be exploited by *sanction busters* due to their free access to the Russian market[17]. Figure 4 provides the evolution of targeted exports from the EU to Belarus. The yearly peaks reveal the seasonality of agricultural export flows. However, by observing the pattern over a longer time period, I can discover irregular increases of targeted goods from August 2014 on. The left panel illustrates that the exports of fruit faced the sharpest, unexpected increment, followed by vegetables and meat. This is possibly due to the timing of the economic sanctions, which coincides with the peak of the fruit season. The right panel illustrates a similar observation for all the Russian, blocked goods combined. The weight of Russian targeted goods doubled to almost 160 million kilo's. European targeted goods are not confronted with this trend. Appendix 5 supplies an identical figure for Kazakhstan, but no evidence is found for the *sanction busting*.

Figure 4: EU28 Exports of Targeted Goods To Belarus (Eurostat, 2015)



Notes: EU28 exports of Russian boycotted products to Belarus (aggregated at HS2 level) sharply increased from August 2014 on. The left panel illustrates that the main drivers for this evolution respectively are the increase in exports of fruit, vegetables and meat. The European targeted goods are negligible compared to their counterparts. Moreover, no significant continuing increase can be observed in the months after August.

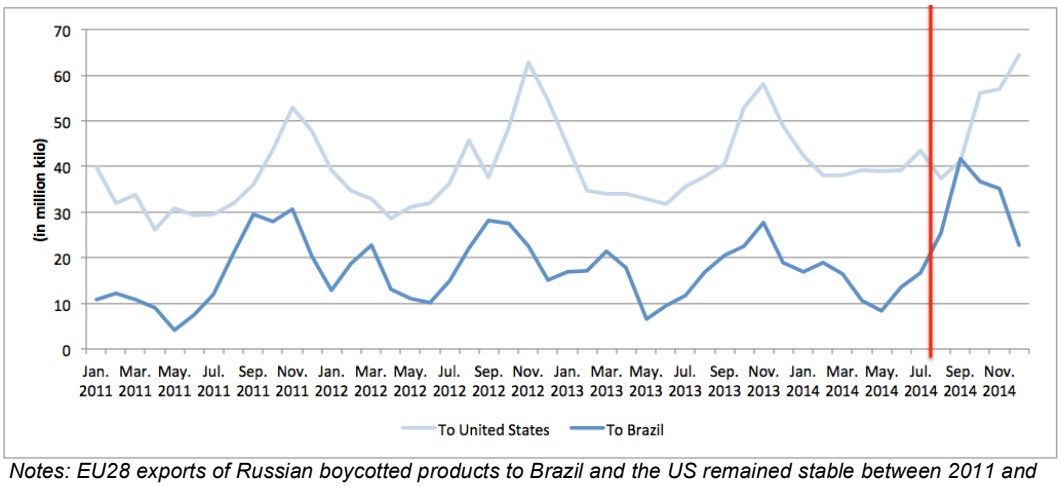
4.3.2 Third Country Effect

Second, and closely related to the previous channel, lies the possibility that exports are redirected to third countries that are not directly connected to the Russian economy. The reason for this phenomenon, referred to as the *third country effect*, results from the fact that unsold stocks forces firms to develop trading relations with new or existing partners. In the European-Russian case perishable goods, with a short life span, are possibly easier redirected via existing trade relations. I analyzed export data for the EU's top

[17] Belarus, Kazakhstan and Russia are part of Eurasian Customs Union since January 2010. On the 29th of May 2014, the triad committed to a continued cooperation by signing a treaty to constitute the Eurasian Economic Union. Later in that year, Armenia and Kyrgyzstan signed their accession to the Union as well (EEU, 2014).

export destinations for both agricultural and total exports[18]. The results indicated an unexpected increase of targeted goods to Canada, Brazil, United Arab Emirates and Saudi Arabia[19]. Figure 5 shows the evolution of Russian blocked commodities to Brazil, compared with those to the US. Both export flows are subject to seasonality and experience peaks between September and December. Contrary to the US destined exports; those directed to Brazil face an unexpected increase from August 2014 on. This points towards the *third country effect.*

Figure 5: EU28 Exports of Targeted Goods by Russia To Brazil and the US (Eurostat, 2015)



Notes: EU28 exports of Russian boycotted products to Brazil and the US remained stable between 2011 and the first half of 2014. Moreover, both experience peaks between September and December in each year. Contrary to the US destined exports; those directed to Brazil face an unexpected increase from August 2014 on.

European firms could, however, also opt to sell their goods within the European internal market, as this is often easier and less costly. To find evidence for this channel I made a distinction within between EU and non-EU members in the methodological section of this paper. The results are provided in the next section.

4.3.3 Price Decrease

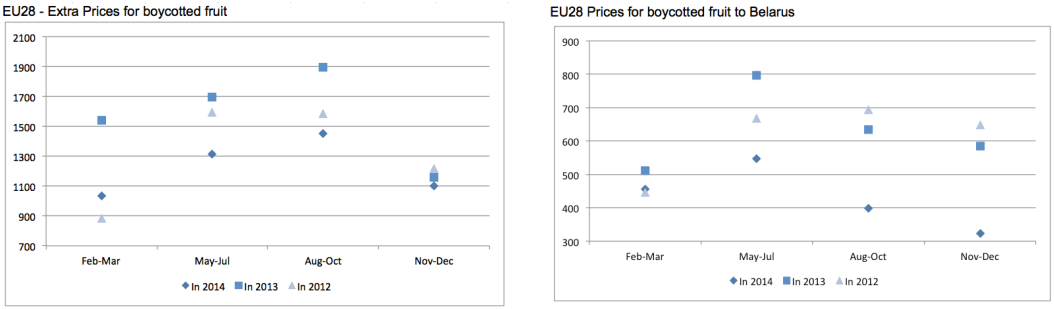
The next channel addresses the price drop of targeted goods due to excess supply. If firms are unable to use the previous described ways to circumvent economic sanctions, chances exist they will decrease their prices. This strategy increases their competitiveness, both on the domestic as international market, and aids to minimize losses. A second major cause is the dumping of targeted goods by other boycotted countries on the domestic market. Demand will be saturated and prices are forced to decrease.

[18] The countries assessed include Belarus, Kazakhstan, United States, Canada, China, Brazil, India, Turkey, Switzerland, Japan, Norway, Ukraine, United Arab Emirates, South Korea and Saudi Arabia.

[19] The figures are provided in the Appendix 7.

The European Farmers/European Agri-Cooperatives (Copa-Cogepa, 2014) stated that prices in the EU fruit, vegetable and dairy sectors drastically decreased by some 50% in certain European countries in September. Additionally, milk prices dropped by around 30% in the same period due to excess supply of unsold goods. Supplementary to these domestic price effects, it is also possible to examine evolutions in the prices of exported commodities. Eurostat (2015) provides both the value and weight of trade flows and by dividing the latter two I derive an indicator for the price/kilo of exported goods. Figure 6 shows the average price per quarter for Russian blocked fruit in the years 2012, 2013 and 2014[20]. The EU28 – Extra export prices, displayed in the left panel, do not confirm our expectation of lower prices. The right panel however shows a drastic drop in export prices for Belarus. Two main explanations exist for this observation. The first one states that European fruit prices dropped due to an excess supply and Belarus attracted these cheaper goods for its domestic market. A second explanation could be that the blocked fruit is transferred to Russia via Belarus below the market price. A similar significant price drop of approximately 50% was not observed for other countries than Belarus[21]. Therefore the latter explanation appears to be the most attractive, but needs further empirical confirmation.

Figure 6: EU28 Average Export Prices (Eurostat, 2015)



Notes: I calculated average price per quarter for Russian blocked fruit in the years 2012, 2013 and 2014. The EU28 - Extra average prices of Russian boycotted fruit remained stable throughout this period. However, the right panel illustrates the negative price effect of the Russian sanctions on fruit. For the last two periods, prices declined by almost 50%.

4.3.4 Increase Domestic Demand

The fourth and final channel incorporated in this study covers the possible increase in domestic demand for targeted goods. Apart from lower prices, sensitizing campaigns to countervail the sanctions can play a major role in this process. They stimulate the local population to consume more in order to offset the unsold stocks. However, the export

[20] I calculated the average price starting for the three months before and after the imposition of the sanctions. The four quarters are thus February-April, May-July, August-October and November-December.

[21] Price evolutions for Brazil, United Arab Emirates and Saudi Arabia are provided in Appendix 8.

data do not allow me to control for this phenomenon. Further research could investigate the importance of this channel.

4.3.5 Side-Effects of Economic Sanctions

Additional side effects can arise besides the four mentioned channels through which targeted commodities can flow. First of all, worsened bilateral relations, caused by sanctions, possibly hinder trade of non-boycotted products. On the one hand, exempted sectors could fear the trustworthiness of the Russian market for future exports. They perceive an increased risk of sanctions on their sectors and feel an incentive to redirect their sales. On the other hand, increased difficulties of trading European goods in Russia could arise. For example, tougher import controls or increased tariffs result in additional costs for operating firms. However, it is also possible that firms package their goods under non-boycotted product codes to bypass the trade restrictions. In this case, an increase for these product codes will be observed.

The lingering effects of sanctions form a source of interest as well. As discussed in the previous paragraph, firms will prefer to gradually redirect their commodities to new, more trustworthy markets. This results in a decline of non-targeted goods, continuing to take place even months after the initial installment of the economic sanctions. Yang et al. (2009) provide evidence for this and furthermore show that it takes time for countries to redirect their trade. This indicator could give us some insights on the sensitivity of European firms to volatility in export markets.

The last possible side effect tackles the different impact the Russian boycott and the European embargo each have. A major distinction can be made on the basis of the targeted commodities, since the former focuses on perishable goods such as fruit, vegetables and dairy products and the latter restricts trade in durable technologies and arms. The major question is, as Kraatz (2014) suggests, whether perishable goods are more sensitive to the *sanction busting* or *third country effect* due to their short life span.

5 Results

Regression results for the effects of sanctions on total EU exports are provided in Table 2. Importer and exporter GDP are both significant at the 1% level but their size does not conform to the literature (Feenstra, James and Rose, 2001; Redding and Venables, 2004; Baier and Bergstrand, 2009). Two possible explanations arise for not observing coefficients of approximately one. First of all, the incorporated fixed effects could absorb the impact these variables have on the level of trade. Second, evidence from Cardamone (2011) shows that variables capturing the size of an economy turn out to be insignificant when analyzing disaggregated trade data. Most likely, trade at this level is more sensitive to product specific factors than at the aggregated level. For example, countries with more natural resources will attract more technological goods intended for the exploration of these resources than other, possibly richer countries. As a result, importer and exporter GDP turn out to be less substantial.

Table 2: The effect of sanctions on total exports with commodity-country-pair fixed effects

Total Exports	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log(GDP_i)	0.007***	0.007***	0.007***	0.007***	0.007***	0.008***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log(GDP_j)	0.020***	0.020***	0.020***	0.020***	0.020***	0.021***	0.018***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
SANRUS.RUS	-1.265***	-1.261***	-1.263***	-1.237***	-1.343***		
	(0.058)	(0.058)	(0.058)	(0.058)	(0.058)		
SANEU.RUS	-0.067***	-0.065***	-0.067***	-0.054***	-0.078***		
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)		
BUSTRUS		0.030***					
		(0.008)					
BUSTEU		0.011***					
		(0.003)					
UNIONRUS			0.281***				
			(0.028)				
UNIONEU			-0.008				
			(0.011)				
TCRUS				0.107***			
				(0.006)			
TCEU				0.024***			
				(0.002)			
TCRUS.EU					-0.107***		
					(0.006)		
TCEU.EU					-0.024***		
					(0.002)		
BILRUS						-0.029***	0.125***
						(0.004)	(0.010)
BILRUS.T							-0.066***
							(0.003)
Observations	76,905,858	76,905,858	76,905,858	76,905,858	76,905,858	76,905,858	76,905,858
R-squared	0.791	0.791	0.791	0.791	0.791	0.791	0.791

Notes: Robust Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 2 provides the estimations for the commodity-country-pair fixed effects gravity model. Column (1) confirms the expectation that the economic sanctions severely distorted the exports of blocked goods. The Russian boycott has a bigger effect, compared to the European embargo. Column (2) and (3) respectively confirm that the exports of targeted goods to both the neighboring countries of Russia and countries part of the Eurasian Customs Union significantly increased. The former collection of countries however attracts a more limited amount of goods. Column (4) provides evidence that exports of blocked commodities to third, no EU countries increased. The effect on the Russian boycotted goods is more severe. Column (5) shows that the exports of these goods to EU members decreased. Finally, column (6) and (7) shed light on the effect of sanctions on non-boycotted goods. Export of non-boycotted goods to Russia diminished, although with a limited impact. However, if we add time-effects the coefficient turns positive. The negative time effect of BILRUS.T indicates that trade of these goods diminished over time.

Column (1) shows that the Russian sanctions significantly distorted export patterns of the EU. Arms and ammunition, dual-use goods and technological goods embargoed by the EU appear to be less affected. Multiple explanations exist for this finding. First of all, contracts signed before the first of August do not fall under the restrictions (EC, 2014a). As deals in these industries typically cover multiple years it is thus unlikely to observe a sudden decline. Secondly, as the Russian market only comprises a small share in the EU arms export and its value varies greatly per month it is challenging to provide evidence for the trade diminishing effect of sanctions (EC, 2014b). A third reason can be found in the fact that several countries initiated *silent arms embargoes* before the official decision taken by the European Commission[22]. This results in a steady decrease of exported arms throughout the preceding months of August instead of a sudden depression. Finally, identification issues in the targeted product codes play a role as well. As possibly not all products in the HS6 code are subject of the boycott, they can still be exported to Russia and cause the coefficients to be biased.

Columns (2) and (3) allow us to assess different elements in the *sanction busting* channel. First of all, the positive signs of $BUSTRUS$ and $BUSTEU$ indicate that the exports of blocked goods increased to neighboring countries of Russia. However, the estimated coefficients of respectively 3% and 1.1% point towards a rather limited impact. As the neighboring countries of Russia represent a heterogeneous group of countries the observation possibly captures other economic forces as well. The European targeted products appear to be less affected. Two reasons exist for this. First of all total European weapons exports declined throughout the period of 2010-2014 (Wezeman and Wezeman, 2015). Second the European Council prohibits trade of "certain technologies for the oil industry in Russia" (EC, 2014, pp. 1). This implicates that goods that have to pass neighboring countries of Russia, in order to reach the Russian territory, will also be blocked at the European border. Therefore the *sanction busting* behavior is less likely to occur in these product codes. In addition I also tested whether more corrupt, neighboring countries are more likely to participate in the *sanction busting*. This effect was negligible. Finally, column (3) zooms in to the possible *sanction busting* taking place within the Eurasian Customs Union. This procedure allows me to exclude possible estimation biases encountered in the previous regression. We find evidence that Russian boycotted products experience a significant increased export to countries part of the same customs union. Arms and ammunition, dual-use items and technologies are not significantly exported more.

Regression (4) and (5) examine whether trade to third or EU countries increased. As expected these variables capture each other's effect. The coefficient of $TCRUS$ is significant at the 1% level and indicates that Russian blocked exports to non-EU members faced an increase of approximately 11%. The effect on European embargoed goods is significant as well, but limited in size. Exports of Russian blocked commodities to EU-members significantly decreased. This could indicate that each EU member faced

[22] The United Kingdom and Germany blocked several arms deals during March and April of 2014 in response to the Ukraine crisis (UK Export Control Organization, 2014). Furthermore, France halted the sale of two warships on the 3rd of September 2014. As these decisions did not completely block arms trade in those months, they are not incorporated in the data.

an excess supply of blocked goods on their domestic market. As a result, trade of these products will less likely occur between two EU countries.

Evidence for the diminishing bilateral trade of non-boycotted products can be found in column (6). The coefficient indicates a decrease of 2.9% at the 99% confidence level and therefore supports our hypothesis that non-boycotted products are subject to more severe checks or are even unrightfully blocked at the Russian border. European exporters could also perceive the Russian market as untrustworthy for future business and start to explore alternative markets. However, in column (7) we observe that adding time-effect to the regression makes $BILRUS$ turn positive. $BILRUS.T$ has a negative effect. It gives empirical evidence for the fact that the exports of non-sanctioned goods diminish over time and indicates that European exporters require time to divert their trade to alternative markets. Moreover, this observation could also imply that shortly after the installment of the sanctions, blocked goods are possibly repackaged under non-targeted product codes.

The final hypothesis of this research tackles the different effect of economic sanctions on perishable or durable goods. If we compare the variables of the Russian and European sanctions over the seven regressions we find evidence that perishable goods are more sensitive to economic sanctions. However, the European sanctions have a different set-up so an extrapolation of this observation should be carefully assessed. More specific, the fact that commodities, from which the contracts were agreed on before the 1st of August, can still be exported possibly results in a less severe impact. Contrary to the farmers, who are targeted by the Russian sanctions, technology producers enjoy more time to gradually divert their trade.

6 Robustness Check

6.1 Alternative Fixed Effects Specification

As discussed in the methodological section of this paper, a potential *omitted variable bias* exists when using fixed effects. Therefore I control for a second specification, which includes commodity-country fixed effects. The equation looks the following:

$$\ln(X_{ijtm}^{s}) = \alpha_1 \ln(GDP_{itm}) + \alpha_2 \ln(GDP_{jtm}) + \alpha_3 A_{ij} + \alpha_4 SANRUS.RUS_{ijtm}^{s} + \alpha_5 SANEU.RUS_{ijtm}^{s} + \alpha_6 Z_{ijtm}^{s} + \alpha_i^{s} + \alpha_j^{s} + \alpha_m + \mu_{ijtm}^{s} \quad (3)$$

with α_i^s and α_j^s indicating the commodity-country fixed effects. Adding these effects allows us to control for unobservable factors influencing trade. For example, countries' trade levels of certain products may depend on country specific factors. Not incorporating these may result in biased estimates for the effect of sanctions on trade. However, as we control for both time-varying and commodity-country factors we risk that the panel specific intercepts apprehends the effect sanctions have on trade.

Table 3 shows the effect of economic sanction on EU exports with commodity-country fixed effects. Dummies controlling for distance, common border, language and colonial ties are not longer subsumed in the fixed effects specification.

Table 3: The effect of sanctions on total exports with commodity-country fixed effects

Total Exports	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log(GDP_i)	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.001***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log(GDP_j)	0.012***	0.012***	0.012***	0.012***	0.012***	0.013***	0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log($Distance_{ij}$)	-0.943***	-0.943***	-0.943***	-0.943***	-0.943***	-0.943***	-0.943***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Contig. Dummy	0.728***	0.728***	0.728***	0.728***	0.728***	0.728***	0.728***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Lang. Dummy	0.535***	0.535***	0.535***	0.535***	0.535***	0.535***	0.535***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Colonial	0.281***	0.281***	0.281***	0.281***	0.281***	0.281***	0.281***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
SANRUS.RUS	-1.04***	-1.04***	-1.04***	-1.015***	-1.117***		
	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)		
SANEU.RUS	-0.071***	-0.070***	-0.071***	-0.055***	-0.084***		
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)		
BUSTRUS		0.008					
		(0.010)					
BUSTEU		0.004					
		(0.004)					
UNIONRUS			0.377***				
			(0.036)				
UNIONEU			0.022				
			(0.014)				
TCRUS				0.102***			
				(0.008)			
TCEU				0.029***			
				(0.002)			
TCRUS.EU					-0.102***		
					(0.008)		
TCEU.EU					-0.029***		
					(0.003)		
BILRUS						-0.049***	0.088***
						(0.006)	(0.013)
BILRUS.T							-0.052***
							(0.004)
Observations	76,905,858	76,905,858	76,905,858	76,905,858	76,905,858	76,905,858	76,905,858
R-squared	0.577	0.577	0.577	0.577	0.577	0.577	0.577

Notes: Robust Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3 provides the estimations for the commodity-country fixed effects gravity model. Column (1) confirms the expectation that the economic sanctions severely distorted the exports of blocked goods. The Russian boycott has a bigger effect, compared to the European embargo. Column (2) and (3) examine whether exports of targeted goods to both the neighboring countries of Russia and countries part of the Eurasian Customs Union increased. Contrary to the latter, neighboring countries of Russia do not significantly attract more blocked goods. Moreover, only Russian blocked goods are possibly involved in the *sanction busting*. Column (4) provides evidence that exports of blocked commodities to third, no EU countries increased. The effect on the Russian boycotted goods is more severe. Column (5) shows that the exports of these goods to EU members decreased. Finally, column (6) and (7) shed light on the effect of sanctions on non-boycotted goods. Export of non-boycotted goods to Russia diminished, although with a limited impact. However, if we add time-effects the coefficient turns positive. The negative time effect of BILRUS.T indicates that trade of these goods diminished over time.

They have the expected sign and are all significant at the 1% level. Moreover, their coefficients are conforming to the literature (Feenstra, James and Rose, 2001; Redding and Venables, 2004, Baier and Bergstrand, 2009). We see that both exporter and importer GDP become less substantial but remain significant at the 1% level. The signs of the sanction variables conform to our standard model. However, the effect of both the Russian and European sanctions becomes less severe. This is explained by the fact that the first fixed effects specification (commodity-country-pair) controls for trade between two partners at the product level. If this flow is interrupted by sanctions, the effect will thus tend to be larger than our current specification, which controls for exports per country at the product level.

Column (2) shows that exports of targeted goods to neighboring countries of Russia are not significantly affected. Moreover, they are no longer significant. The above-mentioned explanation possibly drives this observation as well. Column (3) shows that countries part of the Eurasian Customs Union attracted significantly more Russian blocked goods. Similar to the previous specification, European embargoed goods do not appear to be transferred to Russia in this *sanction busting* process.

Next, column (4) conforms our previous evidence that exports of targeted goods increased to third countries that are not part of the EU. The estimates are situated close to those of the first fixed effects specification. Moreover, the effect on European targeted goods shows to be rather limited again. Finally, column (6) and (7) deliver similar results for the effect of the installed trade restrictions on non-targeted exports to Russia. Without the time-effects, BILRUS indicates that these exports decreased by around 5%. However, if we include them we observe that only after some months the negative effects kick in.

6.2 Controlling for Omitted Zero's

As stressed in the methodological section, the use of the logarithmic function results in the omission of observations equaling zero. In order to circumvent this problem I follow the literature and sum the value of trade by one unit before taking the logarithm. The results for the commodity-country-pair fixed effects model on this specification are provided in Table 4. The estimations of GDP are very similar to those found in Table 2. The coefficients of the sanction variables however significantly decrease due to adding one unit to the value of exports. First of all, column (1) shows that the effect of the Russian boycott and European embargo respectively drop to 23.8% and 1.7%. Furthermore the variables capturing the *sanction busting* to countries part of the Eurasian Customs Union turn insignificant. Columns (4) and (5) show that the signs of the *third country effect* variables changed compared to our previous regressions. Finally, the last two columns confirm the decrease of non-targeted exports.

A careful interpretation for these altered observations is at its place as I analyze disaggregated, monthly data. Many product codes are likely not to be traded at all between two partners and summing these observations by one unit does not properly reflect the expected value. The increase of observations from approximately 77 million to 326 million illustrates this unnatural approach. Moreover, by incorporating these observations I lose fundamental information on trade and risk to bias my estimates.

Table 4: The effect of sanctions on total exports summed up by one unit with commodity-country-pair fixed effects

Total Exports	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log(GDP_i)	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.001***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log(GDP_j)	0.010***	0.010***	0.010***	0.010***	0.010***	0.010***	0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
SANRUS.RUS	-0.238***	-0.238***	-0.238***	-0.254***	-0.235***		
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)		
SANEU.RUS	-0.017***	-0.016***	-0.017***	-0.022***	-0.016***		
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)		
BUSTRUS		0.004***					
		(0.001)					
BUSTEU		0.006***					
		(0.001)					
UNIONRUS			0.001				
			(0.001)				
UNIONEU			-0.001				
			(0.002)				
TCRUS				-0.019***			
				(0.001)			
TCEU				-0.006***			
				(0.001)			
TCRUS.EU					0.019***		
					(0.001)		
TCEU.EU					0.006***		
					(0.001)		
BILRUS						-0.020***	0.140***
						(0.004)	(0.010)
BILRUS.T							-0.057***
							(0.003)
Observations	326,440,624	326,440,624	326,440,624	326,440,624	326,440,624	326,440,624	326,440,624
R-squared	0.819	0.819	0.819	0.819	0.819	0.819	0.819

Notes: Robust Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 4 provides the estimations for the commodity-country-pair fixed effects gravity model on the dataset where every zero value is summed by one unit. Column (1) confirms the expectation that the economic sanctions distorted the exports of blocked goods. The size of the coefficients is lower than those obtained in Table 2. The Russian boycott has a bigger effect, compared to the European embargo. Column (2) confirms that the exports of targeted goods to the neighboring countries of Russia increased. The variables capturing the sanction busting to countries of the Eurasian Customs Union however turns insignificant. Column (4) shows that exports of blocked commodities to third, no EU countries decreased. Column (5) shows that the exports of these goods to EU members increased. The latter two observations however do not conform to those of Table 2. Finally, column (6) and (7) shed light on the effect of sanctions on non-boycotted goods. Export of non-boycotted goods to Russia diminished, although with a limited impact. However, if we add time-effects the coefficient turns positive. The negative time effect of BILRUS.T indicates that trade of these goods diminished over time.

7 Conclusion and Implication

This paper analyzed the impact of the European-Russian sanctions of 2014 on the European export patterns. By applying a gravity model to disaggregated, monthly data I checked for the possible effects that may kick in during a sanctions episode.

First of all the provided descriptive statistics gave initial insights on the wide array of effects. They showed that the bilateral trade between the EU and Russia of boycotted goods decreased from August 2014 on. Second they also provided an indication towards the *sanction busting* and *third country effects*. In addition, government publications delivered information on the economic impact of the trade restrictions beyond trade redirection. This enables me to detect price distortions of European export patterns in the aftermath of the Russian countermeasures.

Second, I provided empirical evidence for the observed change in export patterns. I derived panel data for the exports of 28 European countries and their respective trade partners between 2011-2014. Next I incorporated several sanction dummies that allowed me to control for the potential channels through which blocked commodities can be redirected. First of all, the decline of exports of Russian boycotted products has been empirically underpinned. However, for the European blocked commodities, the effect appears to be less distortive. Second, I performed an analysis on the *sanction busting* of targeted goods. I showed an increase of Russian blocked exports to the Eurasian Customs Union. Thirdly, I delivered evidence for the *third country effects* kicking in. Next, the worsened trade relations appeared to impact non-boycotted goods as well. A limited, but significant, decline of these exports was shown in our results. In addition, I followed the literature by assessing the time-effects of this aspect. These seem to be present for the Russian targeted products as trade of non-targeted goods diminished months after the initial installment of the sanctions. Finally, it was possible to distinguish a different impact on perishable and durable goods. The latter appeared to be less affected by the sanctions. To control my results I added a second fixed effects specification. Due to the fact that this alternative estimation only affected the size of my estimation, and not the observed sign, I consider my results to be robust.

These findings add insight to the broad, geopolitical landscape in which the EU and Russia interact. More specific, the distinct set-up of the installed sanctions, and their intended effects, reveal a number of key political targets for both parties. First of all, due to their limited impact, the European trade restrictions can be perceived as a rather symbolic signal to convict the Russian foreign policy in Ukraine. Nonetheless, by gradually increasing pressure on Russia's billion-dollar generating oil industry, the EU tries to erode future support for the ruling political elite. Second, the Russian countersanctions have proven to inflict severely more damage to the European industry. Yet, evidence seems to suggest that, as the EU decided to provide agricultural support for its farmers, the agricultural boycott backfired towards the Russian consumer. Moreover, poor economic prospects, a monetary outflow and low business confidence have crept into the Russian economy during the escalation of the Ukraine crisis. Future will tell if this combination turns into a toxic cocktail for Russia's political elite, leading to a different foreign policy, such as the West hopes.

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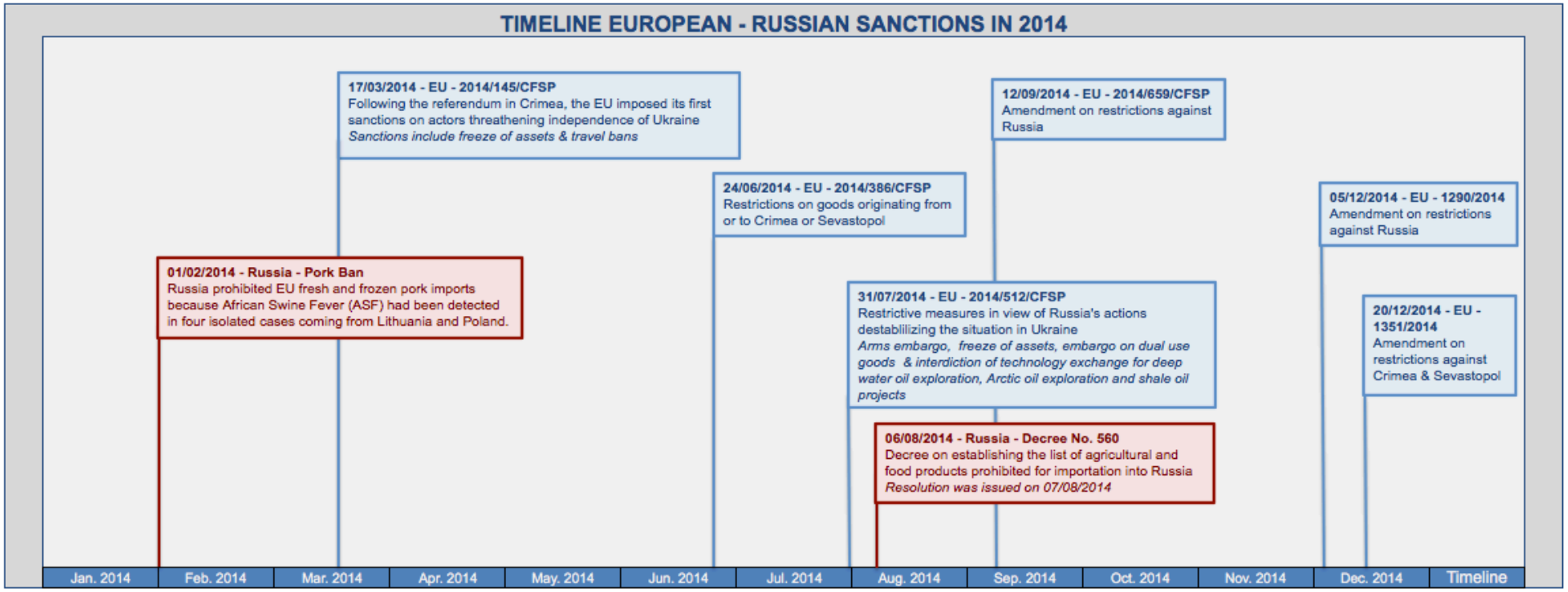
Appendix

Appendix 1: Timeline European-Russian sanctions in 2014



* Please note that only the main sanctions on the Russian Federation are incorporated in the timeline. There have been several amendments on the initial decisions by the European Council.

** Consult http://eeas.europa.eu/cfsp/sanctions/docs/measures_en.pdf for a detailed list.

Appendix 2: Overview of Empirical Studies Assessing the Impact of Economic Sanctions on Trade

Macro studies	**Focus of Research**	**Reference**
US and 88 trading partners	Bilateral trade flows	Hufbauer et al. (1997)
US, EU, Japan and 26 trading partners	Bilateral trade flows and network effects	Askari et al. (2003), Yang et al. (2004)
US, G7 and 47 target countries	Sanction busting and network effects	Caruso (2003)
US, EU and 166 trading partners	Sanction busting and network effect	Yang et al. (2009)
Case studies	**Focus of research**	**Reference**
South Africa	Bilateral trade flows	Hengeveld and Rodenburg (1995), Evenett (2002)
Iran	Monetary costs	Torbat (2005)
	Short- and long-term effects on trading patterns	Dizaji and van Bergeijk (2013)
Yugoslavia	Bilateral trade flows and network effects	Dinu (1994)
Nicaragua	Bilateral trade flows and network effects	Graham (1987)
US	Impact of US grain embargo on trading patterns	Paarlberg (1980), Mustard and Schmidt (1983), Webb et al. (1989)

Appendix 3: Extract of Specifics of Variables Incorporated in the Regression

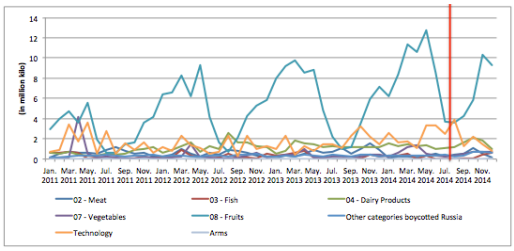
Hypothesis	Variable Name	Description	Interaction	Expected Sign & Intuition
Decrease in exports of boycotted products to Russia	SANRUSEU SANEURUS	1 if product in that month targeted by Russia or EU and export destination is Russia	SANRUS x RUS SANEU X RUS → Interaction of dummy that indicates boycotted product codes in respective months and dummy that indicates partner is Russia	Negative decrease in export due to sanction
Decrease in exports of non-boycotted products to Russia	BILRUS	1 if product in sanctions episode (aug – dec 2014) not targeted and export destination is Russia	Manually constructed → 1 if not saneurus or sanruseu in respective months	Negative (worsened trading conditions between EU and Russia)
Sanction busting by shipping to neighboring countries of Russia	BUSTRUS BUSTEU	1 if neighboring country of Russia & product targeted in that month	SANRUS X N SANEU X N → Interaction of dummy that indicates boycotted product lines in respective months and dummy that indicates if country neighbors to Russia	Positive (Increase in exports to bust the sanctions)
Trade to third countries increases	TCRUS TCEU	1 if product targeted in that month & export to "not Russia or EU member"	SANRUS X TC SANEU X TC → Interaction of dummy that indicates boycotted product lines in respective months and dummy that indicates if export destination is not Russia	Positive (we expect that the boycotted products will be redirected to other trading partners)
Trade to EU members increases	TCRUS.EU TCEU.EU	1 if product targeted in that month & export to "EU member"	SANRUS X EU SANEU X EU → Interaction of dummy that indicates boycotted product lines in respective months and dummy that indicates if export destination is not Russia	Positive (we expect that the boycotted products will be redirected to other trading partners)

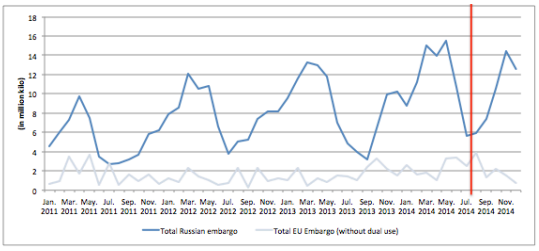
Appendix 4: Exports in 2013 of Product Categories Boycotted by Russia (Simola, 2014)

	Value of Exports (in million euro)	Share in total goods exports (in %)	Share in GDP (in %)
Lithuania	910	3.7	2.6
Norway	838	0.7	0.2
Poland	832	0.5	0.2
Germany	554	0.1	0
United States	545	0	0
Netherlands	525	0.1	0.1
Denmark	366	0.4	0.1
Spain	338	0.1	0
Finland	283	0.5	0.1
Belgium	280	0.1	0.1
France	234	0.1	0
Italy	161	0	0
Greece	125	0.5	0.1
Austria	102	0.1	0
Ireland	89	0.1	0.1
Hungary	76	0.1	0.1
Estonia	72	0.6	0.4
Latvia	67	0.6	0.3
United Kingdom	40	0	0
Cyprus	13	0.9	0.1

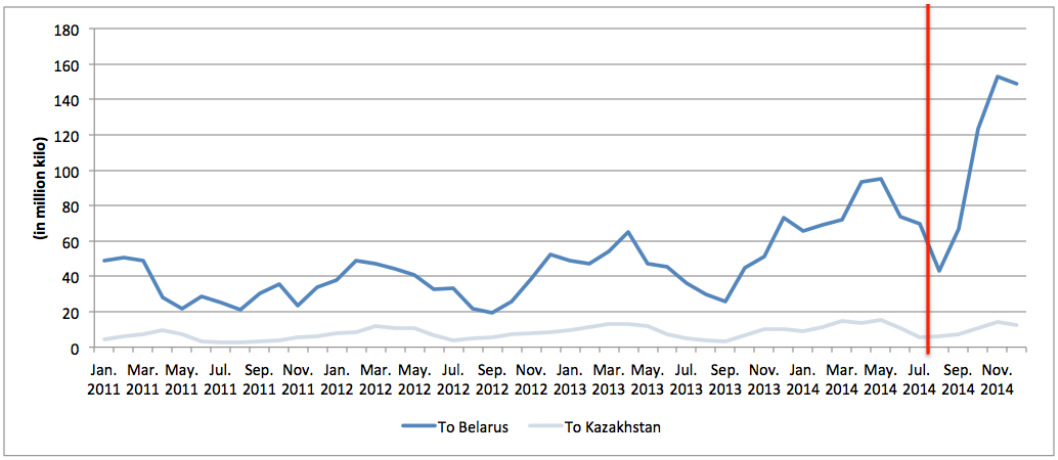
For the remaining Member States (BG, CZ, HR, LU, MT, PT, RO, SI, SK and SE) values are low (< 15 m Euro), the share in GDP = 0).

Appendix 5: EU28 Exports of Targeted Goods To Kazakhstan (Eurostat, 2015)



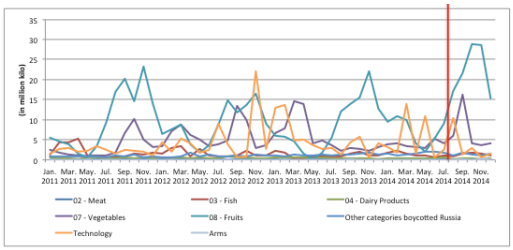


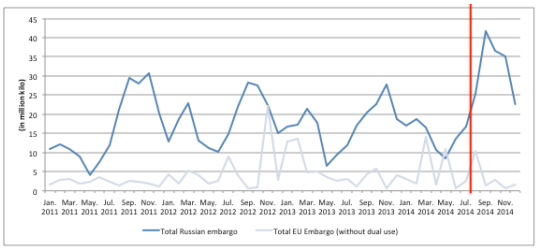
Appendix 6: EU28 Exports of Russian Boycotted Goods To Belarus and Kazakhstan (Eurostat, 2015)



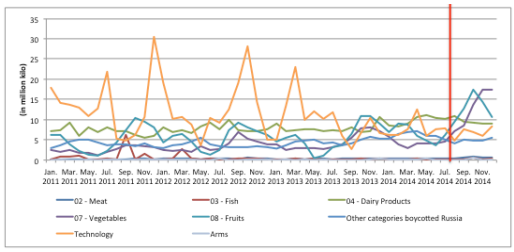
Appendix 7: EU28 Exports of Russian Boycotted Goods to respectively Canada, Brazil, United Arab Emirates and South-Korea (Eurostat, 2015)

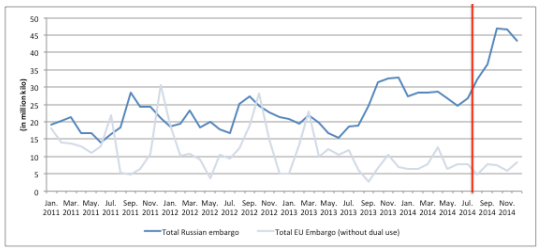
To Canada



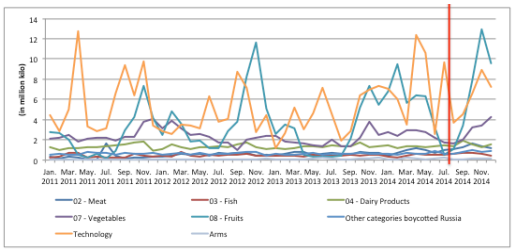


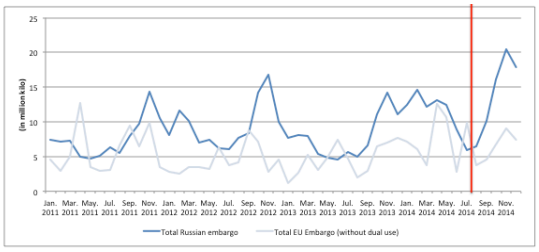
To Brazil



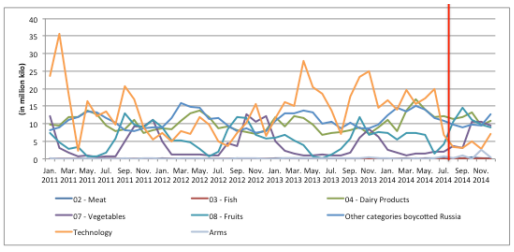


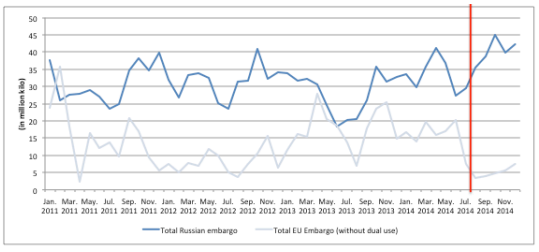
To United Arab Emirates





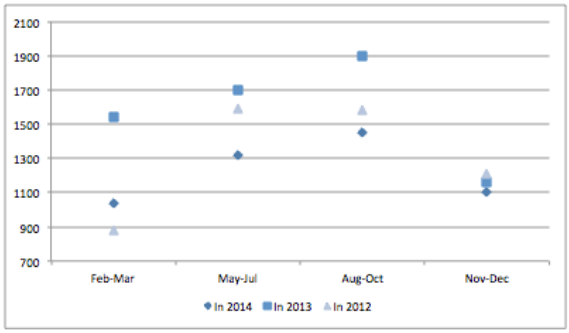
To Saudi Arabia



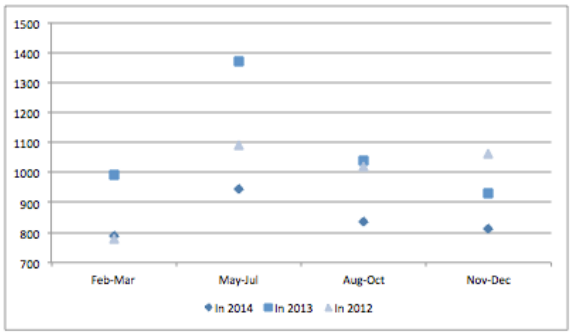


Appendix 8: EU28 Average Export Prices for Fruit for Canada, Brazil, United Arab Emirates and Saudi Arabia (Eurostat, 2015)

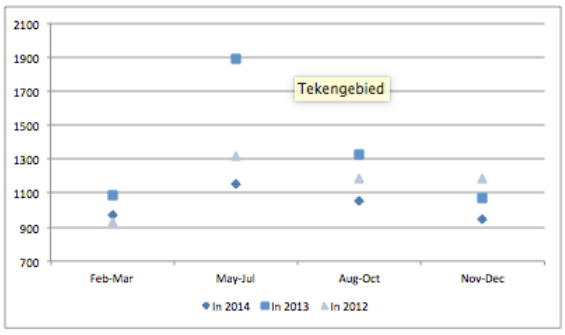
EU28 Prices for boycotted fruit to Canada



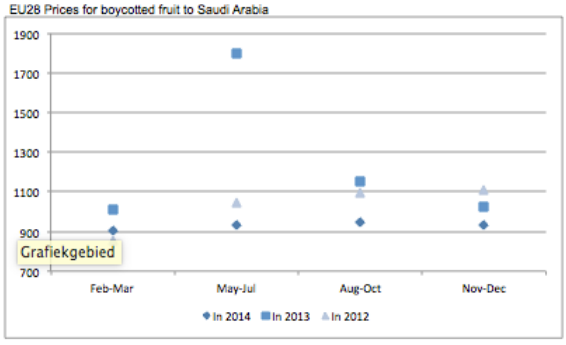
EU28 Prices for boycotted fruit to Brazil



EU28 Prices for boycotted fruit to United Arab Emiarates



EU28 Prices for boycotted fruit to Saudi Arabia



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