Effects of Sanctions on EU – Russia Trade: A Gravity Model Approach

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ABSTRACT

This thesis studies trade relations between the European Union and the Russian Federation. The main objective is to see how international sanctions have affected bilateral trade volume between the Russia and the EU. Data for Russia and 28 European Union countries is used. The augmented gravity model with a panel data methodology is used. The main results suggest that distance between the countries has no effect on trade, another insignificant variable is the Linder variable that was manually calculated by the authors. Variables like GDP of EU member states and the GDP of Russia were significant and have a positive effect on trade. Variables representing common border and the exchange rates were significant and have a positive effect on trade. On the other hand, variables representing common history and sanctions have a negative impact on trade. As expected research found that sanctions have a negative impact on trade and should be avoided if possible.

Keywords: International trade, Sanctions, Gravity model of trade.

ÖZ

Bu tez Avrupa Birliği ve Rusya Federasyonu arasındaki ticari ilişkileri incelemektedir. Esas amaç, uluslararası yaptırımların Rusya ve AB arasındaki ikili ticaret hacmini nasıl etkilediğini görmektir. Rusya ve 28 Avrupa Birliği ülkesi verileri kullanılır. Panel veri metodolojisi ile gelistirilmiş gravite modeli kullanılmıştır. Başlıca sonuçlar, ülkeler arasındaki mesafenin ticaret üzerinde hiçbir etkisinin olmadığını, başka bir önemsiz değişken ise yazarlar tarafından manuel olarak hesaplanan Linder değişkenidir. AB üyesi ülkelerin GSYH'sı ve Rusya'nın GSYH'sı gibi değişkenler önemliydi ve ticaret üzerinde olumlu bir etkiye sahipti. Ortak sınırı ve döviz kurlarını temsil eden değişkenler önemliydi ve ticaret üzerinde olumlu bir etkiye sahipti. Öte yandan, ortak tarih ve yaptırımları temsil eden değişkenlerin ticaret üzerinde olumsuz bir etkisi vardır. Beklendiği üzere, yaptırımların ticaret üzerinde olumsuz bir etkisi olduğu ve mümkünse önlenmelidir.

Anahtar Kelimeler: Uluslararası ticaret, Yaptırımlar, Ticaretin Yerçekimi modeli.

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INTRODUCTION

1.1 Background

This thesis is about investigating the effects of international sanctions on EU – Russia trade relations. The EU and Russia had a long trading relations and until recently the EU was Russia's biggest trading partner. However, regional conflicts which emerged in early 2010s have changed that quickly.

The Ukraine crisis began in 21 November 2013 when then President Viktor Yanukovych failed to sign an association agreement with the European Union. This led to mass national protests and thus replacement of pro-Russian government with a pro-Western one in Ukraine. In return, separatist movement increased among the Russian minority, leading to regional conflicts in Luhansk, Donetsk and Crimea. In March 2014, Crimea declared independence from Ukraine and shortly after joined to Russian Federation.

In response to the annexation majority of western governments and some international organizations, led by the United States and European Union decided to impose "smart" sanctions on Russian individuals and businesses.

The sanctions were gradually expanded every few months by an increasing number of Western countries and their allies; and each time they included larger and larger group

of Russian businesses and products. As a response Russian government imposed counter sanctions and introduced their list of people that included various politicians and businessman from various countries that were now prohibited to enter Russian territory. Russian government also introduced an embargo on fruit, vegetables, meat, fish, milk and dairy imports from Western countries.

Several trade theories, if not all, such as comparative advantage model, Heckscher – Ohlin model or specific factor model, state that as a result of trade both countries engaging in trade would gain. Policies which restrict trade such as trade tariffs, quotas or embargoes reduces such welfare gains

Surely, these mutual embargoes affected the Russian economy in many ways; trade volume, exchange rates, inflation and interest rates all seem to be affected. The diagrams and data presented in Chapter 2 clearly demonstrates the recent volatilities and decline in these measurements. Indeed, this study aims to study the effects of these sanctions on Russian trade. To this end, the paper uses an augmented Gravity model as a framework for explaining the trade, and a dummy variable 'Sanctions' is then used to capture the effects of sanction on the trade volume between Russia and EU member states.

Gravity model of trade simply states that the trade volume between any two trading partners would be larger, if these two partners have larger GDPs, and if these partners are geographically close to each other, hence implying lower transportation costs would encourage trade activities. Subsequent several studies augmented the model by adding other explanatory variables such as dummies for cultural similarities, and sharing a common land-border which are both expected to increase trade activities.

Within this framework, this thesis uses a panel data of 28 EU countries trading with Russia between the years 2011 and 2017. Our dependent variable is trade volume between Russia and each of 28 members of EU. The explanatory variables used are: GDPs of trading partners, the distance between the capital cities, dummies for common border and for shared history, the difference between the per person GDPs accounting for Linder theory of trade as well as exchange rates and a dummy for Sanctions.
We also estimate a slightly different versions of the model where the dependent variable trade volume is replaced by either export volume or import volume. Similarly, we use alternative versions of exchange rate such as nominal exchange rates versus real exchange rates.

The rest of the thesis is organized as following: Chapter 2 includes a brief and recent historical developments on Russian economy. Literature Review is presented in Chapter 3 while empirical specifications and data are presented in Chapter 4. Chapter 5 talks about estimation techniques used in this thesis. Estimation results are presented in Chapter 6, and Chapter 7 presents the overall conclusion of the thesis.

Following this chapter some background history on how the sanctions started and interesting data on Russia will be presented. It will then be followed by the literature review where I will review and present some resent studies on international trade and sanctions. In chapter 4 I will present the empirical specification and data. Meanwhile estimation techniques and estimation results will be presented in chapters five and six respectively.

In my thesis I analyse Russia – EU trade in particular the significance of bilateral sanctions between Russia and EU member countries by using the augmented gravity

model with the panel data approach. The period of seven years or years between 2011 and 2016 were chosen. One of the reasons I choose to start collecting my data from year 2011 is to avoid the financial crisis years and economy adjustment years from the crisis. Main variables of the model include GDP, per capita GDP, exchange rates, distance between the two capitals and variety of dummy variables that are expected to have a significant effect on bilateral trade volumes between countries.

Chapter 2

BRIEF ON RUSSIAN ECONOMY

This thesis is about investigating the effects of international sanctions on EU – Russia trade relations. The following section will show some effects that sanctions had on Russian economy. Graphs for Russian GDP, exchange rates, interest rates, inflation rate, food inflation, exports, imports and unemployment rate is shown and briefly explained.

2.1 The Aftermath of sanctions on Russian economy

The graph starts from 1200 billion therefor it might look like there is a scaling problem

Figure 1: Russia GDP

As it can be seen in Figure 1, above, Russian GDP started declining in 2014 and went all the way down from a level of $2.2 trillion in 2013 to $1.2 trillion in year 2016. This is actually very close to year 2009 where Russia`s GDP was $1.222 trillion which was

a low value for Russia due to global financial crisis. These numbers show that Russian economy clearly took a heavy hit from western sanctions.

Figure 2: Ruble exchange rate graph (Rubles per US Dollar)

As a result of sanctions, there had been rapid movements in exchange rates. Figure 2 above shows that, starting from 2014 Russian RUBLE started to depreciate rapidly and reached its all – time high of 76 Rubles for a Dollar in 2016. Before 2014, the exchange rate was about 30 Rubles for a Dollar on average for about five years. As expected this rapid depreciation led to uncertainty in the economy, particularly in investments and spending. However, Russia were able to stabilise their exchange rate in 2017 at around 60 Rubles for a Dollar, which is still twice the rate before 2014.

Figure 3: Russia interest rate graph

In response to inflationary shock and sanctions Russian Central Bank had to increase their interest rates to reduce spending and control the inflation rate. Starting 2014 interest rate started to rapidly increase and reached to its all – time high 17% in 2015. However, since 2016 the interest rate declined slowly and it is currently at around 7%. Nevertheless, as it can be seen in Figure 3, current interest rate is about 1.5% higher than the levels before sanctions in 2014. Needless to say these higher interest rates are contributing to reduced economic activities but are needed to stabilise the inflation rate fluctuations.

Figure 4: Russia inflation rate graph

In 2014 – 2016 Russian economy also faced an inflationary shock. This can be seen on Figure 4. Inflation rate was 17% at its peak in 2015 which is a 10 year high. As the Figure 4 shows, the inflation shock in 2015 even surpassed the inflationary shock of 2009 when global financial crisis happened.

We can also see on Figure 5 the food inflation data for Russian economy. Russian embargo on food and agricultural products led to a supply shock of food and as expected food prices had rapidly increased in 2014 – 2016. However, this led to an opportunity for domestic producers and other food suppliers from abroad. Russian domestic production of different agricultural products has increased and different deals with countries like Brazil and Argentina were signed. As a result, food inflation went back down to 5% in 2016. After 2017 Russian food inflation dropped and even achieved better numbers to those prior the sanctions.

Figure 5: Russia food inflation graph

Figure 6: Russia exports graph

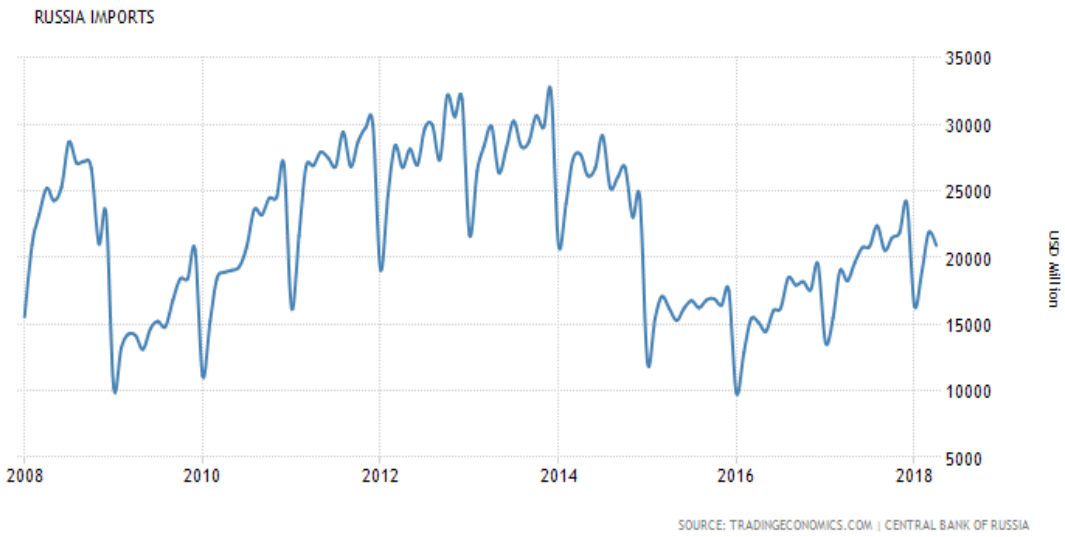

Figure 7: Russia imports graph

On figures 6 and 7 we can see a clear decrease in Russian exports and imports similar to those seen during global financial crises of 2009. Russian exports dropped from around $500 billion in 2014 to around $200 billion in 2016 and Russian imports dropped from around $300 billion in 2014 to around $150 billion in 2016. EU is Russia`s biggest trading partner. According to European commission Russia – EU trade have been decreasing since 2012 and dropped by 44% from €339 billion to €191 billion in 2016.

Surprisingly despite all the setbacks in Russian economy, Russian unemployment rate did not see any difficulties and remained stable. We can see that from figure 8. Possible reasons for this are actions taken by the Central Bank of Russia and its monetary policies.

Figure 8: Russia unemployment rate

Chapter 3

LITERATURE REVIEW

This study uses gravity model as a framework to study the effect of bilateral sanction between the European Union and the Russia. Main objective is to see how bilateral sanctions have affected the trade between the European Union countries and the Russia. The gravity model originally has only three independent variables, which are the GDPs of trading countries and the distance between them. However, in most cases the basic model is modified and extended by including other explanatory variables such as GDP per capita, cultural similarities, exchange rates or any other external or internal causes effecting or explaining the trade patterns. In this section I will review and summarize some recent papers that used gravity model as basis of their model. This section will be divided into two parts. In first part papers supporting the basic gravity model will be listed. Second part will have papers where traditional gravity model variables were insignificant or the results were not as expected.

Alleyne and Lorde (2014) use a gravity model with panel data approach to analyze trade flows of CARICOM member states. The sample data covers the 13 CARICOM countries, coupled with 54 counter-part nations. The independent variables of the model would include the GDPs, per capita GDP, population of countries, absolute difference between the per capita GDP of the partnering countries, the nominal exchange rate between the countries and distance. A set of dummy variables like common language, a dummy variable indicating if two trading countries have trade

agreements and a dummy variable indicating the presence of an extensive trade relationships and extra – regional trading partners like EU, US and Canada. All of the data was collected from the UN data bases. The results show that traditional gravity model variables played a significant role in the determination of total international trade for countries within the CARICOM region. As expected geographical distance had a negative effect on trade while common culture/language had a positive effect on trade. Exchange rate was also negatively effecting CARICOM`s bilateral trade. Authors report that an effective management of exchange rate movement should improve the total trade. Research also found that trade agreements like CARICOM have benefited the trade in general but further reduction of trade barriers will not improve the total trade any further since it is at its potential already. Instead it is recommended to improve the competition within the markets and to look into other trading partners that are not too remote from the region and not necessarily those where a long historical ties exist.

OH and Thant (2016) studied the ASEAN countries and their 85 trading partners for a period of 15 years (1994-2008). Gravity model with a panel dataset was used to study empirically ASEAN members trade patterns. Then, using that empirical result, Myanmar`s gravity model equation was simulated to predict its trade flows. Variables used were, GDP, per capita GDP, distance and a Linder variable (is the absolute difference of per capita GDP between ASEAN countries and their trading partners). Three dummy variables were also used, ASEAN (is 1 if a partner country is a member of ASEAN, and 0 otherwise), landlocked (is 1 if a partner country is landlocked, and 0 otherwise), border (is 1 if a partner country shares a border with ASEAN members, and 0 otherwise). Simulation results show that Myanmar`s actual and predicted trade

values differ significantly. Paper states that Myanmar`s trade with the US is highly undermined, the predicted export value with the US is 29.57%, whereas actual number is only 6.33%. Similarly, predicted value of Myanmar`s imports with US is 16.86%, while actual number is 0.49%. Myanmar Japan trade has been distorted as well, however the difference gap between predicted and actual trade between Myanmar and Japan have been declining over the years. It fell from 50% in the first period to less than 10% in the third period. The distortions with the USA are explained by economic sanctions imposed by US on Myanmar. China Myanmar bilateral trade predicted and actual values were similar in the first and second periods but quite different in the third period especially in the exports part. Predicted exports portion is 46.11% while actual one is only 7.64%. China did not impose nor it joined in any of the sanctions that were imposed on Myanmar, the difference in third period is explained by China`s booming economy where Myanmar`s economy simply could not keep up. EU – Myanmar trade numbers (predicted - actual) did not differ significantly. This finding confirmed that EU sanctions targeted only the military government of Myanmar and did not lead to any trade distortions. Contrarily, actual exports and imports with India and Thailand are higher than the predicted once. Myanmar`s predicted exports to Thailand are 8.03%, while actual export number is 50.63%. That abnormally is explained by the embargoes from other countries.

B. X. Nguyen (2010) in his paper studies important factors that have effect on Vietnamese export flows. This paper selects 15 largest trading partners of Vietnam, which includes industrial Europe. Industrial Europe is comprised of 18 industrial countries. Those 15 main trading partners altogether absorb 88% of all Vietnamese exports. Yearly data for the years 1986 to 2006 is used. Two gravity models are used,

static gravity model and dynamic gravity model. The dynamic model is formed by adding the lagged endogenous variable as an explanatory variable. The dynamic gravity model seems to fit the model better. All the coefficients generated by the dynamic gravity model are statistically significant at the 5 percent level of significance. Variables include income levels, exchange rates, distance and dummy variables like PINC for trading partner country and ASEAN for Association of Southeast Asian Nations (ASEAN) member. As expected results show that distance has a negative effect on trade and increased income levels compared to previous years both for destination country and the exporter country generate a higher trade values. Surprisingly the coefficient of ASEAN member has a negative effect meaning that Vietnamese export levels are higher to non – ASEAN members. It is explained by the fact that non – ASEAN members have bigger economies. Exchange rate variable also as expected has a positive results meaning that depreciation of Vietnamese dong would lead to a higher export levels. Research results produced suggest that standard gravity model variables like economy size and distance between the countries have a significant effect on trade along with the exchange rates.

Ekanayake, Mukherjee and Veeramacheneni (2010) analyze the trade creation and trade diversion effects of the regional trade agreements (RTAs) in Asia. By using the Gravity model as the framework Annual data for 19 Asian countries is used for the period of 1980 – 2009. Then trade flows of those 19 countries to a sample of 64 countries were analyzed. Four sets of regression models were estimated during the periods of 1980 – 2009, 1980 – 1989, 1990 – 1999, 2000 – 2009. The model was estimated using the ordinary least of squares (OLS). The coefficients of GDP have a positive sign and are significant for all models at 1% significance level. Population

coefficient has a negative sign and is statistically significant in all models. The distance variable as expected has a negative sign and is significant in all models estimated. Distance variables supports the hypothesis that transportation and other distance related costs play an important role in determination of trade flows. The border coefficient as expected, has a positive sign, however it is not statistically significant in all four models estimated. Common language and common colony dummy variables have positive signs and are statistically significant in all four models estimated. The coefficient on relative factor endowments variable has a positive number and is statistically significant in 3 models estimated. The positive sign explains that inter – country differences in the level of technological advancements affect the trade flows positively. Three out of four dummy variables for membership in regional trade agreements, ASEAN, BA and SAARC have a positive sign and are statistically significant as expected. Surprisingly fourth dummy variable for membership in regional trade agreement (ECO) has a negative sign. This is explained by the fact that only 2 countries out of 19 are the members of ECO. In general, it is concluded that trade agreements have a higher positive effect on trade compared to those that have bilateral trade agreements only.

Mingque and Slisava (2016) in their research paper analyse Russian non – tariff measures and their influence on the European Union exports of agricultural products by using the gravity model. Model variables include GDPs of countries, the distance between the capitals, population of countries and the variable W which is the vector of resistance to trade. The model also introduces dummy variables for common language and border. Variable GDP as expected has a positive sign meaning that increase in countries GDPs increases the trade flows. Variable distance also as expected has a

negative sign and is statistically significant, greater distance increases the transportation costs therefore lowers the trade flows. The dummy variable for common language surprisingly has a negative sign but is statistically insignificant. The gravity model in general shows that Russian non – tariff measures are weaker for EU agricultural exports compared those to USA exporters but stronger than those for Chinese exporters. The conclusion is that Russian NTMs are strict but are not stricter than in any other country.

So far we have looked into papers that had supportive evidence for the basic gravity model variables. Now, let`s move on to papers that had some unfavorable findings. In other words, the papers below failed to provide evidence for the gravity model, where the variables were either statistically insignificant or of a wrong sign.

Z. M. Abu-Lila (2018) in his research tries to identify most important factors that affect Jordan`s foreign trade flows with its main trading partners by using the gravity model approach. He uses the panel data of 22 major trading partners for the time period of 21 years (1995 – 2016). Gravity model includes variables like GDPs of countries, distance, real exchange rates and the similarity index variable which was calculated separately. Model also includes a dummy variable for common border. All variables are in their natural logarithmic forms. Surprisingly the research finds that the GDP of a partnering country has a negative sign and is insignificant. The GDP of Jordan has a positive effect on trade and is almost 1 to 1. Research found that a 1 percent increase in Jordan`s GDP would lead to a 1.23% increase of its trade flows. Distance variables as expected has a negative sign. Another surprising finding is that the similarity index has a negative sign and is statistically significant. It is explained by the fact that the

major exports of Jordan are the agricultural products or low – skilled commodities. Imports on the other hand are the manufactured goods. Dummy variable for common border as expected has a positive sign and is statistically significant.

Rasoulinezhad and Popova (2016) in their research study analyse Iran – Russia bilateral trade between the time period 1991 – 2014. Paper uses vector error correction approach (VEC). Paper does not use the panel data because the study focuses only two countries only. Model consists of standard variables of the gravity model: GDP represents joint size of the economy in Iran and Russia, variable POP represents joint population of countries, variable TC and TO are the transportation cost and the trade openness respectively. Three main dummy variable were also introduced which are SANCF, $SANCF_2$ and OILSHOCK. Which are dummy variables, which stand for non – financial sanctions, financial sanctions on Iran and shocks in oil prices respectively. Two control dummy variable were also introduced which are PV and WTO which stand for time periods when president visited and accession to the World Trade Organization respectively. Dickey – Fuller (ADF) and Philips – Perron tests were used for Unit Root Tests and all the variables become stationary through doing the first difference. By using Johanson Cointegration Test co – integration analyses were applied. Since all series are co – integrated, a VEC model is set up for exploring short – run and long – run relationships. The research results state that there is a positive relationship of population growth and the trade flows. Also increase in trade openness increases the bilateral trade as expected. The combined GDP variables has a negative sign. Indicating that increase in GDP would lead to a decrease in bilateral trade. The research findings state that a 1% increase in GDP would decrease the bilateral trade by 0.57%. Main explanation for this is the fact that an increase in GDP is usually

caused by improved relations with the western countries and the trade tends to diversify. In the long – run a 1% increase in transportation cost decreases the bilateral trade volume by 0.06%. Also a 1% in the joint population of Iran and Russia increases the bilateral trade by 0.73%. Finally, a 1% increase in trade openness increases the bilateral trade flows by nearly 0.12%. The study found that both financial and non – financial sanctions effect the bilateral trade negatively. Shocks in oil prices also have a negative impact on bilateral trade, however it is found that sanction have a much greater effect on trade compared to those of oil price shocks. Two control variables results suggest that visits by presidents to countries increase the bilateral trade. The effect of Russia`s membership in WTO is not statistically significant.

Shahriar, Qian, and Kea (2018) in their paper analyse the major determinants of China`s regional economic integration with Cambodia, Laos, Myanmar, Thailand and Vietnam or Greater Mekong Sub – regional Countries (GMS). Economic integration is measured in terms of bilateral trade and foreign direct investment (FDI). Panel gravity framework is used to analyse significant variables that effect China`s export flows to five countries. Data used is between 1993 – 2016 and collected from Chinese national and international sources. Gravity model includes six independent variables which are: exports for previous year, GDPs of countries, distance between the capitals, bilateral exchange rates, openness to trade variable and a population variable for GMS countries at a given year. The gravity model is sub – divided into three models. In which income variables GDP, GDP per capita and the absolute difference between GDP per capita appear separately in each and the remaining of the variables are consistent. Variable standing for trade dynamics has a positive sign and is statistically significant at 5% and 10% in all models. Income variables GDPs also have a positive

sign and have a positive effect on China`s trade. On the other hand, variables distance, bilateral exchange rates and the population size all have a negative effect on China`s trade flows. Fixed effect model shows that GDP and income levels have a positive effect on trade but surprisingly random effect model has a negative sign for those variables. Meaning that China tends to export more to smaller countries of GMS countries compared to those that are bigger. A 1% increase in GDP of China would lead to a 1.4% increase in bilateral trade with GMS countries. A 1% population increase in GMS countries leads to 0.4% decrease in exports from China to them. Finally, a 1% increase in distance would lead to a 5.7% drop of exports from China to all five GMS members. Research also states that factors like common boarder, common culture and common language should have a significant effect on trade but were not included in to the study.

Ahmed and Martínez-Zarzoso (2016) in their research paper try to calculate factors that affect migrants from sending money back home. Bilateral data on remittance flows to Pakistan for 23 major host countries is used. Gravity model where the remittance is the depended variable is used. Independent variables include GDPs of host and home country, distance between the countries, bilateral exchange rates and the variable Stock that stands for stock of migrants from home that live in a host country. All variables except the exchange rates are taking in their natural logarithmic forms. Model was later extended and augmented by adding the variables for transaction costs of remittance and the variable Z referring to the vector of all control variables. After introducing the variables for remittance cost the variable for distance was removed. Variable GDP has a positive effect when the GDP of Pakistan growth meaning that migrants tend to send more money when Pakistan`s economy growths. On the other

hand, GDP for host country did not seem to matter. Variable distance is insignificant and has no effect on remittance flows. Migrants stock variable has a positive sign meaning that countries with increasing migrant stock lead to a higher remittance flows. Exchange rate variable also has a positive sign meaning that appreciation of currency in Pakistan tends to increase to remittance flows into country. It is explained by the fact that appreciation would decrease the real amount send and the migrants would increase the amount they are sending in foreign currency to match the real amount. Increase in transaction costs of remittance or a tighter control over them seems to reduce the remittance flows through the formal channels. Research finds that tighter control or increase in remittance cost would lead to migrants using informal channels to send the money home. It is advised by the paper that instead of increasing the remittance cost it would be better to improve the technology or branchless banking to increase the remittance flows to Pakistan.

Various forms of gravity models have been used in a variety of researches and have been successful in doing so. In literature review, I have reviewed some papers mostly on trade flow analyses that have used gravity models and were able to achieve their objectives. In my thesis I will use an augmented gravity model to analyse bilateral trade flows of Russia with 28 European Union countries. Special emphasize on the impact of sanction on trade flows is given. The main objective of the thesis is to estimate the impact of sanction on trade flows between the Russia and the EU.

Chapter 4

EMPIRICAL SPECIFICATION AND DATA

As mentioned earlier, this thesis is about measuring the impact of sanctions on EU – Russian trade volume. To this end the thesis uses the gravity model of trade as its framework.

The gravity model was first introduced by Walter Isard in 1954. The basic model for trade volume between the two countries (i and j) is given as follows:

$F_{ij} = G * M_i * M_j / D_{ij}$

Where G is the constant, F stands for trade volume (total exports + total imports), D stands for distance between the two capital cities and M is the size of economies measured by GDPs. In my thesis I will analyse the effects of sanctions on the bilateral trade flows between Russia and 28 member countries of the European Union by using an augmented version of the gravity model, outlined above.

4.1 Empirical specification

The augmented gravity model that will be used in this research takes the form of:

$Trade_{ij} = \beta_0 + \beta_1 Trade_{tij-1} + \beta_2 GDP\_EU + \beta_3 GDP\_RU + \beta_4 Linder + \beta_5 Exch + \beta_6 Distance + \beta_7 Border + \beta_8 History + \beta_9 Sanction$

Where the dependent variable $Trade_{ij}$ denotes the total trade volume between the country i (foreign country) and country j (Russia). Total trade volume was manually calculated by adding total exports and total imports. The independent variable $Trade_{t-1}$ denotes the total trade volume for a previous year between the two countries. Variable

GDP_EU stands for GDP of a trading partner country while GDP_RU stands for GDP of Russia (home country). Linder variable in this model is calculated as (Ypc_i - Ypc_j) where Ypc_i is the income per capita of the Russian Federation and the Ypc_j is the income per capita of EU member country. Variable Exch, stands for the exchange rates between the US dollar and Russian Ruble. The real exchange rate is in Rubles per USD. Real exchange rate data is used to represent the variable. Real exchange rate variable is in PPP conversion factor, GDP is in constant 2010 USD and is sourced from World Bank online database. Variable "Distance" denotes the distance between the two capitals. Three dummy variables are used in the model. Dummy variable "Border" stands for common border and takes the value of 1 if the country shares border with Russia and 0 otherwise. Dummy variable "History" stands for common history. The variable will take the value of 1 if the country had historical relationship with Russia and 0 otherwise. Our last dummy variable "Sanction" stands for international sanctions and is the focus of this thesis. The variable will take the value of 1 during the years when sanctions were applied on Russia and 0 otherwise.

4.2 Theoretical expectations

In this section, in Table 1, we present expected signs. Later, in the paragraphs following, we explain the theories relating the independent variables to dependent variable, hence their expected signs.

Let us now present the Table 1:

Table 1: Theoretical expectations table

Variable	Description	Expected sign
$Trade_{t-1}$	Lagged total trade volume	+

GDP_EU	GDP (foreign country)	+
GDP_RU	GDP (home country)	+
Linder	Linder theory of trade	-
Exch	Real exchange rate	?
Distance	Distance between capitals	-
Border	Dummy variable	+
History	Dummy variable	+
Sanction	Dummy variable for sanctions	-

Our first independent variable is the lagged volume of the total trade variable ($Trade_{t-1}$). It was included because countries that have a good previous trading record tend to trade with each other even more. Therefor the lagged value of trade volume is expected to have a positive effect on current trade volume as countries that have been in good trading relations for a period of time are expected to trade more than those that didn't have a strong trading relationship.

Our second and third independent variables are the GDPs of a foreign country and the home country (Russia). According to gravity model of international trade the bigger the economies are, and the closer the countries are, the bigger is the trade volume between these two economies. Therefore, an increase in GDP would lead to an increase

in trade and it has an expected positive sign. Some research papers multiply the GDPs of countries and use them as one independent variable. However, through our reviewing of other papers we have found that sometimes one of the GDPs might be insignificant while the other is significant, therefore it was decided to use two GDPs as separate independent variables.

Our fourth variable (Linder) attempts to capture the effects outlined in the Linder theory of trade. The Linder theory of trade suggests that economies with similar incomes tend to trade with each other more. Thus it is expected to have a negative sign. Since the Linder variable is measured as the difference between the per capita GDPs of two countries, we expect that the more similar the income levels, the smaller is the Linder variable and thus the bigger is the trade.

The fifth variable is the "Exch" the variable represents the real exchange rates between the Russian Ruble and US dollar. For this variable we do not have an expected sign as it may be positive or negative. In theory when a currency depreciates the exports increase and imports decrease. If an increase in exports is greater than the decrease in imports, then a positive sign is expected.

Sixth independent variable "Distance" represents the transportation costs and is also a part of the traditional gravity model, bigger distances will have a higher transportation costs therefor decreasing the trade volume between the countries. Thus the variable distance has an expected negative sign.

Dummy variable "Border" represents countries that share the borders with Russia. We already mentioned that the closer the trading partners geographically, the less is the

transportation cost and thus the bigger is the trade between these countries. However, several studies also indicate that showing a common land border further facilitates trade. Thus in this paper too, we expect that countries sharing border with Russia have a higher trade volume. Thus the theoretically expected sign is positive. In other words, the variable will take the value of 1 if the country shares the borders with Russia and 0 otherwise.

Our second dummy variable which represents common history will take the value of 1 if a given country had some historical ties to Russia and 0 otherwise. The dummy variable for history has an expected positive sign because countries with historical ties tend to trade with each other more.

Dummy variable "Sanction" stands for sanctions and will take the value of 1 in time periods when Russia and EU were under bilateral sanctions and 0 otherwise. Variable is expected to have a negative sign because various forms of embargoes and trade barriers were in place during those time periods.

4.3 Data

The objective of this thesis is to test the significance of sanctions on bilateral trade between the Russia and European Union countries. To this end we use a panel data of 28 EU countries trading with Russia between the years of 2011 and 2017. Thus the panel data consists of 28 countries per seven years. The 28 EU countries are the Germany, France, Netherlands, Italy, Poland, Belgium, Finland, UK, Croatia, Spain, Sweden, Croatia, Romania, Greece, Bulgaria, Hungary, Czech Republic, Austria, Ireland, Denmark, Portugal, Slovenia, Malta, Cyprus, Lithuania, Slovakia, Latvia, Estonia, Luxembourg. Data for Russia and five biggest trading partners among the EU

countries will be presented in this section. Data for other countries can be found in the appendix part of the thesis. The biggest 5 trading partners presented here are Germany, France, Netherlands, Italy and Poland. Data that is collected includes GDPs of countries, per capita incomes, distances between capital cities and total amount of trade volume between a respected country and Russia.

Real GDP and GDP per capita data are in constant 2010 US dollars. GDP per capita is obtained by dividing the country`s gross domestic product, adjusted for inflation, by the total population. Total trade volume was calculated by adding exports and imports. Linder variable in this model is calculated as (Ypc_i - Ypc_j) where Ypc_i is the income per capita of the Russian Federation and the Ypc_j is the income per capita of EU member country. All of the data was obtained from internet databases which include trading economics, World Bank and United Nations COMTRADE. Data was collected for seven years from 2011 to 2017.

Now we present summary statistics for the data of Russia and the biggest 5 trading partners.

Table 2: Descriptive statistics of data for Germany

Germany	**Min.**	**Mean.**	**Max.**	**S.D.**
Trade Volume (USD Billions)	52.50	81.86	105.50	24.82
GDP (USD Billions)	3542	3669	3866	122.65
YPC (USD)	44125.33	45120.67	46747.19	974.98

In table one we present the data for the Russia`s biggest trading partner in the EU which is Germany. Data on trade volume was manually calculated by summing imports and exports. Total trade volume and the GDP variable is billion US dollars. Minimal trade volume between Russia and Germany were in year 2016 with total trade value of 52.5 USD billions. The mean trading value between the years of 2011 – 2017 was 81.86 USD billions. The maximum value of 105.5 USD billions happened in year 2011. In general, total trade value has been decreasing since 2011 however, trade have been rabidly decreasing since 2014 and the minimal trade of 52.5 USD billions happened in 2016. 2017 have seen an increase in trade from 52.5 USD billion to 56 USD billions but that's still lower value compared to those years' prior the sanctions. Compared to year 2013 year 2015 have seen around 40-45% decrease in trade. Data for the GDP is in constant 2014 US dollars. The mean GDP for Germany between the years of 2011 to 2017 is 3669 USD billions. German GDP has been increasing from 2011 reaching its maximum point of 3866 USD billions in year 2015. However, after that it went into decline reaching its seven-year low point of 3542 USD billions in 2017. Data for German GDP per capita is in constant 2010 USD. German GDP per capita has been increasing since 2011 from its minimum point of 44125 USD to its maximum point of 46747 USD in 2017. Data for Germany was sourced from the World Bank online data bases and the Tradingeconomics online data base.

Table 3: Descriptive statistics of data for France

France	**Min.**	**Mean**	**Max.**	**S.D.**
Trade Volume (USD Billions)	11.60	20.44	30	7.53
GDP (USD Billions)	2698	2756.857	2857	58.95
YPC (USD)	41158.89	41597.05	42567.74	515.36

Our second table represents the data for France. Similarly, like Germany, French total trade volume keeps on decreasing since year 2011 starting with its maximum point of 30 USD billions going down all the way to its minimum point of 11.6 USD billions in 2016. Trading volume has slightly increased to 15.1 USD billions in 2017. It is the only increase compared to previous years for France since the 2011. The mean for total trade volume between the France and Russia is 20.44 USD billions and the standard deviations from the mean is 7.53 USD billions. It is also worth mentioning that total trade volume between the countries have decreased by more than 50% from year 2013 to year 2015. French GDP have been slowly increasing over time starting with its minimal point of 2698 USD billions and reaching its maximum point of 2857 USD billions in 2017. French GDP per capita saw a small decrease between the years 2011-2012 and was increasing constantly since then. Starting with its minimal point of 41158 USD in 2012 and reaching its maximum value of 42567 USD in 2017. Data for the GDP of France is in 2014 constant USD while GDP per capita is in constant 2010 USD. All of the data for France was sourced from World Bank online data base and the tradingeconomics online data base.

Table 4: Descriptive statistics of data for Netherlands

Netherlands	**Min.**	**Mean**	**Max.**	**S.D.**
Trade Volume (USD Billions)	17.84	27.66	36	7.64
GDP (USD Billions)	839.715	866.040	918.284	29.13
YPC (USD)	49969,85	51270.52	53597	1287.72

Third table presents the data for Netherlands. Netherlands total trade volume with Russia have been increasing between the years 2011 to 2013 with the maximum value

of 36 USD billions in 2013. However, total trade flows started declining in 2014 reaching its minimum point of 17,84 USD billions in 2016. In 2017 trade volume has increased a bit compared to year 2016. Compared to 2013 total trading volume between the Netherlands and Russia have decreased by 50% in 2016. Netherlands GDP was decreasing between the years of 2011 – 2013 with its minimal value of 839.715 USD billions in 2013. Starting from 2013 Netherland`s GDP have been constantly increasing reaching its maximum value of 918.284 USD billions in 2017. Similarly, Netherland`s GDP per capita was decreasing from 2011 to 2013 with its minimal value of 49969.85 USD in 2013. Later GDP per capita started to increase starting from 2014 to 2017 reaching its maximum point of 53597 USD in 2017. GDP data for Netherland`s is in constant 2014 USD while GDP per capita data is in constant 2010 USD. All of the data for Netherlands was sourced from World Bank online data bases and the tradingeconomics online data base.

Before moving forward, I would like to mention that currently we have looked at 3 biggest trading partners of Russia in the European Union. Coincidently or not all three countries have seen a big decline in their trading volume with Russia starting from year 2013. Meanwhile GDPs and GDP per capitas were increasing for all of the following countries.

Table 5: Descriptive statistics of data for Italy

Italy	**Min.**	**Mean**	**Max.**	**S.D.**
Trade Volume (USD Billions)	19.40	30.80	41.50	8.54
GDP (USD Billions)	2041	2079.143	2137	35.25
YPC (USD)	33615.97	34506.82	35994.13	816.03

Fourth county that we will look at today is the Italy. Italian Russian bilateral trade volume was increasing from 2011 to 2013 reaching its seven-year high point at value of 41.50 USD billions in 2013. After 2013 total trade volume between the countries went into decline and were decreasing until 2016 with its seven-year low point at value of 19.40 USD billions. Compared to 2016 bilateral trade volume saw a small increase in 2017 going up from 19.40 USD billions to 22.8 USD billions. Total trade volume has decreased by around 40 – 50 percent from 2013 to 2016. It is now fourth country out of four countries that we have looked into that saw a big decrease in trading volume starting from 2013 to 2016. On the other hand, Italian GDP was decreasing between the years 2011 to 2013 starting with its maximum point in 2011 with the value of 2137 USD billions and later reaching its minimal point in 2013 at value of 2041 USD billions. After 2013 Italian GDP started to increase again however, it did not surpass its maximum point and only reaching the value of 2112 USD billions in 2017. Similarly, GDP per capita of Italy started with its maximum point in 2011 with the value of 35994 USD and went in to decline later reaching its minimal point in 2014 with the value of 33615 USD.

All four countries that we have looked at so far saw a decrease in trading value with Russia starting from 2013 and falling to their minimal points in 2016. I also would like to remind that bilateral sanctions between the EU and Russia began in 2014.

Table 6: Descriptive statistics of Data for Poland

Poland	**Min.**	**Mean**	**Max.**	**S.D.**
Trade Volume (USD Billions)	17.80	28.69	37.40	8.55
GDP (USD Billions)	503.370	542.218	598.166	34.83

YPC (USD)	13224.57	14263.75	15751.23	930.41

Last country that we will be looking in detail is Poland. Poland is the only eastern European country among the big five biggest trading partners with Russia. It is also the closest one geographically to Russia. Polish Russian trade reaching its peak in 2012 with the value of 37.4 USD billions. After 2012 bilateral trade volume went into decline reaching its minimal point in 2016 with the value of 17.80 USD billions. Bilateral trade volume between the countries have the mean of 28.69 USD billions with the standard distribution of 8.55 USD billions. Trade volume between the countries saw a decrease by more than 50% between the years of 2012 to 2016. Polish GDP have been increasing during the period of seven years starting with its minimal point in 2011 with the value of 503.370 USD billion and going all the way up to its maximum point in 2017 with the value of 598.166 USD billions. Similarly, GDP per capita of Poland was constantly increasing during the period of seven years. Starting with its minimal point in 2011 with the value of 13224.57 USD and slowly going up over the years reaching its maximum point in 2017 with the value of 15751.23 USD in 2017.

Chapter 5

ESTIMATION TECHNIQUES

This thesis intends to investigate total trade volume between Russia and the European Union. In particular, we are interested how international sanctions have affected the bilateral trade volume between the Russia and its EU partners. To this end, we plan to use panel estimation technique on a sample of data covering 28 EU countries for 7 years from 2011 to 2017.

However, before one proceeds to such regression analysis one must check for stationarity of the data otherwise the results would be spurious and would not give the right conclusion.

5.1 Unit Root

In this section we look at the issue of stationarity. Normally for any linear regression model like $Y_t = c + \beta X_t + u_t$ where variables: Y_t, c, X_t and u_t are the dependent variable, constant, independent variable and the error term respectively, the estimation analyses are based on the assumption that the error term is a stationary series. However, many economic variables such as GDP illustrate trending behaviour or in other words are non – stationarity in the mean. There are multiple ways of trend removal or de-trending procedures. Simply said variety of methods can be used in an attempt to convert non – stationary variables to stationary. The two common once are first differencing and time – trend regression.

As mentioned earlier many economic variables tend to be non – stationary as they are, therefore multiple panel unit root tests are going to be run to check for the stationarity. Unit root tests used in this paper include Levin, Lin & Chu, Im, Pesaran and Shin W-stat, Augmented Dicky Fuller ADF – Fisher Chi-square, PP – Fisher Chi-square tests. If our test results reveal that the variables are not stationary, then the first differencing method will be used in an attempt to make the variables stationary. This method can be used simply by taking the first difference of the variables. The results of those unit root tests are presented in the next chapter.

5.2 Cointegration test

After our unit root tests made all of the data are stationary, we can move to panel cointegration tests. Pedroni Residual Cointegration is used in this paper. Test is based on 196 observations with the null hypothesis that there is no cointegration between the variables. Test assumes that there are no determenistic trends. Lag length will be autamaticly calculated by the Eviews 10 based on SIC with a maximum lag of 1. Hopefully the results reveal that variables are cointegrated and explain the changes in our dependent variable in the long run.

If the cointegration test results reveal that the variables are cointegrated, then the model will be estimated using the cointegrated regression. However if the cointegration test results reveal that the variables are not cointegrated, then the model will be estimated in the first differece. The test results will be presented in the next chapter.

5.3 Panel data estimation techniques

After finishing with the unit root tests and the cointegration tests the model can be estimated. However before estimating the model we need to decide between the fixed

effects model (FEM) and random effects model (REM). The decision to use FEM or REM will based on several methods.

One of the ways to decide wheather to use fixed effects model or random effects model is to calculate the between and within variation of the panel data set. If the variation between all of the variables is greater than the variation within, then it is adviced to use the random effects model. The fixed effects model makes an assumption of homogeneity which does not exist in our case, whereas random effects model will allow for modelling heterogeneity across the units. Based on this the random effects model can be used, however it was decided to find further supportive factors in favour of the random effects model before continuing.

Another consideration that could be made before choosing between the REM and FEM is the omission of variables from the model. It is advised to use the fixed effects model if some variables were omitted in the model because the model may provide a means for controlling for omitted variable bias. However, if the researcher thinks that no variables have been omitted it is advised to use the random effects model because it will produce unbiased estimates of the coefficients. In our research we use the traditional gravity model for the international trade, and in fact it has been further augmented by adding more variables to the basic model. Based on this assumption it can be concluded that no variables have been omitted therefore the random effects model is advised.

Finally the Hausman Test can be used and based on its results the decision can be made. The Hausman Test was run in eviews 10 and its results suggest that random effects model would be more appropriate. Based on all three criteria above, without

any hesitation it can be concluded that it would be more apropriate to use the random effects model.

To this end, we plan to use OLS estimation technique in our regression analyses. Our model consists of 9 independent variables 3 of which are the dummy variables. Beside the main model two other models will be estimated. Same independent variables will be used. The only difference is that we will change our dependent variable total trade volume with exports and imports. This is done to see how our independent variables effect exports and imports separately and if the same conclusion will be made.

Chapter 6

ESTIMATION RESULTS

This research used the gravity panel model approach to study the effect of sanctions on Russia – EU bilateral trade volume. Data collected from 28 EU member countries for a time period of seven years from 2011 to 2017.

6.2 Unit Root results

Summarized results of the unit root tests for all of the variables will be presented below. Table 7 contain the unit root test results at the level. Meanwhile the first difference unit root test results will be presented in table 8. It can be concluded from the results that all variables were made stationary through taking the first differece of the variables, or in other words all variables in panel data are I(1).

Table 7: Unit root test results at level

	Levin, Lin & Chu		ADF – Fisher Chi-square		PP – Fisher Chi-square	
Variable	Statistic	Probability	Statistic	Probability	Statistic	Probability
Trade vol.	-3.51978	0.0002	30.5557	0.9978	33.3729	0.9930
GDP	6.29318	1.0000	32.9629	0.9940	40.3336	0.9432
GDP_RU	-11.8084	0.0000	131.895	0.0000	209.648	0.0000
Linder	4.51969	1.0000	18.7652	1.0000	19.1076	1.0000

$Trade_{t-1}$	-9.51439	0.0000	67.2205	0.1449	70.9034	0.0867

H_0: Not stationary
H_1: Stationary

Table 7 presents the Levin, Lin & Chu unit root test results for all of the variables at level. Our dependent variable that stands for total trade volume has t-statistic of -3.5 and the probability of 0.0002 therefor it is significant at 1% significanse level. The lag length was automaticly selected by the eviews 10. Variable GDP that stands for GDP of foreign countries has the t-statistic value of 6.29 and the probability of 1. The null hypothesis can not be rejected therefor the variable is not stationary and the first difference needs to be takken. Results for the first difference will be presented later in another table. Our next variable GDP_RU represents the Russian GDP. T-statistic of the variable is -11.8084 with the probability of 0.0000. Given the probability the null hypotherhis can be rejected therefor it can be concluded that variable is stationary at level. Our last independent variable is Linder. Variable Linder was manually calculated. Linder variable has the statistic value of 4.51969 and the p-value is 1.0000. Based on the P-value we can not reject the null and therefor variable is not stationary at level. The first difference results for this variable will be presented later in another table below. Our last variable that we will look at is the lagged trade volumme variable that has the statistic value of -9.51439 with probability of 0.0000. Based on the probability value we can reject the null hypothesis at 1% significanse level and therefor the variable is stationary. The first difference of this variable will not be takken since it is stationary according to all tests at level.

Now lets move on to ADF – Fisher Chi-squer unit root test. Our dependent variable Trade volume has the t-statistic value of 30.5557 with the probability of 0.9978. Based

on the p-value we can not reject the null hypothesis therefor the variable is not stationary at level. Our first independent variable GDP has the statistic value of 32.9629 with the probability of 0.9940. Based on test results null hypothesis can not be rejected and the variable is not stationary at level. The first difference of the variable will be takken in an attempt to make it stationary and the results will be presented in another table below. Our next independet variable is GDP_RU that stands for Russian GDP. The variable has the statistic value of 131.895 with the probability value of 0.0000. Based on the P-value null hypothis can be rejected at 1% significanse level. Variable is stantionary and the first difference will not be takken for this variable. Next lets have a look at our Linder variable. The variable has the statistic value of 18.7652 with the probability value of 1.0000. The null hypothis can not be rejected, the variable is not stationary at level and the first difference will be takken in an attempt to make it stationary. The results for the first difference will be presented below in another table. Now lets have a look at our lagged trade volume variable. The lagged trade volume variable has the statistic value of 67.2205 with the probability value of 0.1449. Based on p-value the null hypothesis can not be rejected and therefor the variable is not stationary according to this test. However, this is the only test based on which we can not reject the null therefor we will assume that the variable is stationary due to majority of tests stating so.

And finaly lets have a look at PP – Fisher Chi-squer unit root test at level. Our dependent variable that stands for total trade volume has the statistic value of 33.3729 with the probability value of 0.9930. Based on the P-value the null hypothesis can not be rejected therefor the variable is not stationary at level. The first difference of the variable will be takken in an attempt to make the variable stationary. Results for the

first difference will be presented in another table below. Our first independent variable GDP has the statistic value of 40.3336 with probability value of 0.9432. The null hypothesis can not be rejected and the variable is not stationary at level. our next independent variable is GDP_RU that stands for Russian GDP. The variable has the statistic value of 209.648 with the probability of 0.0000 the null hypothesis can be rejected therefor the variable is stationary at level. Our next variable Linder has the statistic value of 19.1076 with the probability of 1.0000. The null hypothesis can not be rejected therefor the variable is not stationary. The first difference of the variable will be takken in an attempt to make it stationary. The first difference results will be presented below in another table. Our last variable is the lagged trade volumme variable. The variable has the statistic value of 70.9034 with the probability value of 0.0867. Based on the p-value the null hypothesis can be rejected at 10% significance level and therefor variable is stationary.

Unfortunetly most of the variables were not stationary at level. Further testing is requered to make the data stationary. Table 8 below presents the unit root test results at the first difference. Since lagged trade volume variable and Russian GDP variable was concluded to be stationary at level their first differece results will not be presented and only the remaining variables will be tested.

Table 8: Unit root test results at the first difference

	Levin, Lin & Chu		ADF – Fisher Chi-square		PP – Fisher Chi-square	
Variable	Statistic	Probability	Statistic	Probability	Statistic	Probability
D(Trade)	-6.91184	0.0000	67.6948	0.1360	75.3621	0.0432

D(GDP)	-17.4688	0.0000	74.3264	0.0512	107.846	0.0000
D(Linder)	-10.0825	0.0000	75.4606	0.0425	137.969	0.0000

H_0: Not stationary
H_1: Stationary

Table 8 presents the first difference results for Leving, Lin & Chu unit root test. D(Trade volume) is the first difference of the trade volume. Variable has the t-statistic of -6.91184 and the probability value of 0.0000. According to this test variable is stationary both at level and at the first difference. GDP variable was not stationary at level and the first differece is takken to make it stationary. D(GDP) has the t-statistic value of -17.4688 with probability 0.0000. Taking the first difference made the variable stationary. The null hypothises can be rejected at 1% significase level. The variable representing Russian GDP is significant at level in all tests therefor the first difference is not takken. Variable Linder was not significant at level therefor the first difference is takken. D(Linder) has the t-statistic value of -10.0825 with the probability of 0.0000. Variable was made stationary through taking the first difference. The null hypothis can be rejected and the variable is not stationary according to this test.

Now lets move on to ADF – Fisher Chi-squer unit root test. Our trade volume variable has the statistic value of 67.6948 with the probability value of 0.1360. The null hypothis can not be rejected therefor the variable is not stationary even at the first difference. This is the only test according to which our Trade volume variable is not stationary at both level and the first difference. Our next variable is D(GDP) the GDP variable was not stationary at level therefor the first difference is takken in an attempt to make it stationary. The variable has the statistic value of 74.3264 with the

probability value of 0.0512. Based on this test the variable was made stationary through taking the first difference. The null hypothis can be rejected at 10% significase level. GDP_RU that stands for GDP of Russia was stationary at level and is stationary at level according to the all unit root tests therefor the first difference will not be takken. Our last independed variable Linder was not stationary at level and the first difference is takken. The variable has the statistic value of 75.4606 with the probability of 0.0425. The null hypothis can be rejected at 5% significase level and the variable has become stationary.

Finally lets have a look at the PP – Fisher Chi-squer unit root test results at the first difference. The first difference of the variable Trade volume has the statistic valie of 75.3621 with the probability value of 0.0432. The null hypothesis can be rejected at 5% significanse level and therefor the variable is stationary. The first difference of GDP has the statistic value of 107.846 with the probability value of 0.0000. The null hypothesis can be rejected at 1% significance level and the variable has now became stationary. The variable representing Russian GDP is stationary at level according to all tests therefor the first difference is not takken. The first difference of the Linder variable has the static value of 137.969 with the probability value of 0.0000. The null hypothesis can be rejected at 1% significance level and the variable has now became stationary.

Based on the test results our dependen variable Trade volume has became stationary after taking the first difference. However, one of the tests suggests that the variable is not stationary even after the first difference is takken, But since 2 out of 3 tests suggest that the variable is stationary we will assume that the variable is stationary at the first

difference. Our GDP variable and the Linder variable were not stationary at level according to the most tests. However, all tests suggest that both of the variables are stationary at the first difference therefor the problem of stationarity was solved after taking the first difference of the variables. Our variable that represents the Russian GDP was stationary at level according to all tests that we have runned and there were no problems. Now that we have concluded that all of our variables are stationary we can move on to the co – integration test.

6.2 Co – integration Test results

In this section co – Integration Test results will be presented. Test will be based on 196 observations with the null hypothesis that there is no cointegration between the variables. Test will assume that there are no determenistic trends. Lag length will be autamaticly calculated by the Eviews 10 based on SIC with a maximum lag of 1.

Table 9: Pedroni Residual Cointegration Test
Alternative hypothesis: common AR coeficients. (within dimension)

	Statistic	Probability	Weighted Statistic	Probability
Panel v-Statistic	-0.168780	0.5670	-1.611444	0.9465
Panel rho-Statistic	3.765518	0.9999	3.141861	0.9992
Panel PP-statistic	-8.021749	0.0000	12.84228	0.0000
Panel ADF-statistic	-4.369595	0.0000	-7.198200	0.0000

Table 9 presents the Pedroni Residual Cointegration Test with the alternative hypothesis: common AR coeficients (within dimension). Based on this test our Panel

v-Statistic has the statistic value of -0.168780 and the value of weighted statistic is -1.611444. The probability values are 0.5670 and 0.9465 for the statistic and the weighted statistic respectively. Based on the probability values the null hypothesis for both statistic and the weighted statistic can not be rejected meaning that variables are not cointegrated based on Panel v-Statistic. Panel rho-Statistic has the statistic value of 3.765518 with the weighted statistic value of 3.141861. Probability values of statistic and the weighted static are 0.9999 and 0.9992 respectively. Based on the probability value the null hypothesis can not be rejected. Panel PP-Statistic has the statistic value of -8.021749 with weighted statistic value of 12.84228. Probability values for statistic and weighted statistic are 0.0000 and 0.0000 respectivly. Based on the probability values the null hypothesis can be rejected for both statistic and the weighted statistics thefore the variables are cointegrated based on Panel PP-Statistics.

Now lets look at the Panel ADF-Statistic. Panel ADF-Statistic has the statistic value of -4.369595 with weighted statistic value of -7.198200. Probability values for statistic and weighted statistic are 0.000 and 0.0000 respectivly. Based on the probability values the null hypothesis can be rejected for both statistic and the weighted statistic therefore the variables are cointegrated based on Panel ADF-Statistic.

Table 10: Alternative hypothesis: individual AR coeficiants

	Statistic	Probability
Group rho-Statistic	5.863062	1.0000
Group PP-Statistic	-14.31515	0.0000
Group ADF-Statistic	-7.351300	0.0000

Table 10 presents the Pedroni Residual Cointegration Test with the alternative hypothesis: individual AR coeficiants (between dimensions). Based on this test our groupd rho-Statistic has the statistic value of 5.863062 with the probability value of 1.0000 the null hypothesis can not be rejected. Group PP-Statistic has the statistic value of -14.31515 with the probability value of 0.0000. based on the probability value the null hypothesis can be rejected. Group ADF-Statistic has the value of -7.351300 with the probability value of 0.0000. Based on the probability value the null hypothesis can be rejected at 1% significance level.

Some tests suggest that there is no cointegration while others suggest that there is conintegaration. However, to avoid further complications we will assume that data is not co-integrated and the model will be run by taking the first difference of the variables.

6.3 Panel data estimation results

This thesis is about investigating the effects of international sanctions on EU – Russia trade relations. To remind the reader through running the unit root tests it was concluded based on the probability value that all of our variables were made stationary some of them through taking the first difference. Regarding our co-integration tests it was concluded based on test results that our data is not co-integrated and the model will be run using the first difference of variables. Our main model and it`s result is as follows below:

$$Trade_{ij} = \beta_0 + \beta_1 Trade_{t-1} + \beta_2\ GDP\_EU + \beta_3 GDP\_RU + \beta_4\ Linder + \beta_5 Exch + \beta_6 Distance + \beta_7 Border + \beta_8 History + \beta_9 Sanction \quad (1)$$

The following model above will have extra three variations as addition to the main estimation. Some research papers multiply the GDPs and use them as one variable, hence, in our first variation estimation we will multiply the GDPs and use it as a new independent variable and check if there are any changes in our results. There is also a concern that the information in our "distance", "border" and "history" variables might be overlapping therefor in our second variation dummy variable "history" will be removed to see if any changes occur. In the third variation the "history" variable will be placed back and this time we will remove the dummy variable "border" to observe if any changes happen. By running the following variations, we hope to eliminate possible errors that might have occurred due to overlapping information.

Table 11: Estimation results for trade volume

Variable	Main Model	Variation (1)	Variation (2)	Variation (3)
$Trade_{t-1}$	0.33***	0.20*	0.42***	0.39***
	(4.05)	(1.93)	(5.26)	(4.73)
GDP_EU	-0.04***	-	-0.04***	-0.04***
	(-4.17)		(-4.41)	(-4.33)
GDP_RU	0.08***	-	0.07***	0.08***
	(7.28)		(6.91)	(6.98)
GDPs_Multiplied	-	0.000005	-	-
		-		
		(0.97)		
Linder	-0.41*	0.07	-0.39*	-0.40*
	(-1.93)	-	(-1.77)	(-1.84)
		(0.28)		
Exch	0.92***	0.86***	0.99***	0.96***
	(3.67)	(2.71)	(3.88)	(3.76)
Distance	-0.23	-0.38	0.43	-0.32
	(-0.51)	(-0.66)	(1.05)	(-0.71)
Border	2.67**	3.03**	0.66	-
	(2.32)	(2.08)	(0.68)	

History	-3.09***	-3.32***	-	-1.78**
	(-3.09)	(-2.64)		(-2.11)
Sanction	-1.90*	-4.21***	-2.01*	-1.97*
	(-1.69)	(-3.07)	(-1.73)	(-1.70)

Numbers without parentheses are the coefficient values
One star – statistically significant at 10% significance level
Two stars – statistically significant at 5% significance level
Three stars – statistically significant at 1% significance level
Numbers in parentheses are the t-statistic values

Our first independent variable representing lagged trade flows, is statistically significant at 1% significance level and has the coefficient value of 0.33. The variable has a positive sign and matches theoretical expectation, which states that countries that have good trading record tend to trade with each other more. Based on our estimation result a 1 USD increase in previous years' trade would increase current years' trade by 0.33 USD.

Our second independent variable is "GDP_EU" the variable represents the GDPs of the European Union. The variable is statistically significant at 1% significance level and has the coefficient value of -0.04. The variable has a negative sign and does not match the theoretical expectation, which states that economic growth leads to a higher trade. We explain this phenomenon with the fact that Russia is producing a lower quality of goods compared to other developed countries and therefor an increase in the EU member countries GDPs increases the demand for higher quality goods and hence trade is shifted to other more quality goods that are produced elsewhere. As a result, a 1 USD increase in the GDP of the European Union member country leads to a decreased trade with Russia by 0.04 USD.

Our third independent variable is “Linder” the variable represents the Linder theory of trade. According to which countries with similar income levels tend to trade more with each other. The variable has the coefficient value -0.41 with the probability value 0.0556. Based on the probability value it can be concluded that the variable is statistically significant at 10% significance level. The variable matches the theoretical expectations and has a negative sign. An increase in the variable would mean that the gap between the income levels of two countries is increasing and becoming more different from each other as a result, there is a decrease in trade. A one-unit increase in Linder variable causes 0.41 units decrease in trade volume. In other words, 1000 USD increase in Linder causes 410 million USD decrease.

Our fourth independent variable is “EXCH” the variable represents the real exchange rate between the Russian Ruble and the USD. The variable is in Rubles per US Dollar. The variable is statistically significant at 1% significance level and has the coefficient of 0.92 with the probability value of 0.0004. The results match theoretical expectations. According to theories a depreciation in countries exchange rate would lead to an increase in its exports and to a decrease in its imports. Russia is a trade surplus country, meaning that its exports are higher than their imports and in fact the gap between the exports and imports is big. Therefor it was expected that the Russian exports would be increasing in higher rates than the decrease in its imports. Based on result 1 Ruble increase in real exchange rate leads to almost a 1 billion USD increase in trade volume.

The fifth variable is “distance”, the variable represents the distance between two capital cities and is a traditional gravity model variable. Unfortunately, the variable is

not statistically significant. Nevertheless, variable has a negative sign that matches our theoretical expectations. In theory higher distances increase the transportation costs, therefor the variable is expected to have a negative sign like in our case. Based on the coefficient value of -0.23 it can be concluded that a 1km increase in distance between the two capital cities decreases the trade volume by around 0.2 USD thousands.

Our first dummy variable is “border”, the variable considers countries that are sharing borders with Russia. Based on theories countries that are sharing borders tend to be trading more compared to those that are similar in economic size but have no common border. The variable has the coefficient of 2.67 with the probability value 0.0218. Based on the probability value it can be concluded that the variable is statistically significant at 5% significance level and matches the theoretical expectations. Based on result it can be concluded that EU countries that are sharing a common border with Russia tend to be trading more by 2.67 USD billions compared to those EU countries that do not share the border.

Second dummy variable is “history”, the variable considers countries that have common history with Russia. It is theoretically expected that countries with common history would be trading more with each other compared to countries that had no historical ties. Hence the variable is expected to have a positive sign. The variable has the coefficient value of -3.09 and the probability value of 0.0024. Based on the probability value it can be concluded that the variable is statistically significant at 1% significance level. The variable has a negative sign and does not match the theoretical expectations. However, it was expected because most of the countries of the Soviet Union that are now EU members are trying to distance themselves from Russia both

politically and economically. Based on this estimation, EU member countries that have a common history with Russia tend to be trading less by -3.09 USD billions when compared to those EU member countries that have no historical ties with Russia.

Our last dummy variable “sanctions” represents the time periods when sanctions were present and is the main focus of this study. It is expected to have a negative impact on trade volume between the EU and Russia because variety of trade barriers are applied by both sides during the sanctions. The variable has the coefficient value of -1.91 and the probability value of 0.0942. Based on the probability value it can be concluded that the variable is statistically significant at 10% significance level. As expected the variable has a negative impact on trade volume. Keeping all other things constant the presence of sanctions decreases the trade volume between the European Union and the Russian Federation by 1.91 USD billions.

Now we would like to briefly discus our findings from the different variations of the model. To remind the reader in the first variation model the GDP of the European Union countries was multiplied by the GDP of Russian Federation and is used as one independent variable instead of it being as two separate variables. This is done due to some research papers suggestions and to check if the meaning of the estimation will be changed. In the second variation dummy variable “history” will be removed from the main model and the model will be estimated without it. Third variation will be run without the “border” dummy variable. This is done due to concern that the information in variables “distance”, “border” and “history” might be overlapping. Since the distance variable is in the core gravity model it will not be removed.

First variation results reveal that summing up the GDPs of the European Union and Russian Federation made the variable statistically insignificant. Never the less, the variable has a positive sign but with a very small coefficient. We can also see that our "Linder" variable has become statistically insignificant but still has the negative sign as it is expected theoretically. On the other hand, the effect of sanction in this variation is stronger and more statistically significant when compared to the main model results. Very small changes are observable in all other variables. Overall it can be concluded that both the main model and the first variation model are yielding similar results.

Second variation model uses the GDPs separately as in the main model. The only difference is that second variation model is estimated without the dummy variable "history". Removing the variable made some changes to our "distance" and "border" variable as expected. The "distance" variable from being negative to positive which is theoretically not possible. Never the less, the variable is still statistically insignificant. Removal of the "history" variable also made the "border" variable statistically insignificant. However, the variable still has the positive sign but its coefficient value decreased from 2.6 to 0.6. Apart from those changes all other variable yield very similar results as in the main model.

In the third variation model the previously removed "history" variable is placed back in and only the "border" variable is now removed instead. Removing the variable made almost no changes when compared to the main model. All of the independent variables have the same signs and all are statistically significant apart from the "distance" variable which is also insignificant in the main model. The only noticeable change in

the coefficient value is observable in the "history" variable. The coefficient of the variable increased from -3.09 to -1.78.

As an addition to the trade volume estimation model it was decided to estimate exports as well as imports separately to see how our independent variables will vary and to see if similar results will be found.

We start with the imports equation and it is as follows:

$$M_{ij} = \beta_0 + \beta_1 M_{t-1} + \beta_2 GDP\_EU + \beta_3 Linder + \beta_4 Exch + \beta_5 Distance + \beta_6 Border + \beta_7 History + \beta_8 Sanction \quad (2)$$

Where M stands for total imports by country "i" (foreign country, EU member country) from country "j" (home country, Russia). Two estimations will be made: main and alternative. In alternative estimation the insignificant "Linder" variable will be removed to see if any changes occur.

The variables used in the imports model are going to be exactly as in the total trade volume estimation with only a few changes. Our dependent variable is now total imports of a EU country from Russia. Similarly lagged trade volume variable was replaced by lagged imports variable. The variable representing the GDP of Russia was also removed since theoretically it is not expected to have any effects on EU imports.

Table 12: Import estimation results

Variable	Main import estimation	Alternative import estimation
M_{t-1}	0.21^{**} (2.12)	0.21^{**} (2.13)
GDP_EU	-0.01^{*}	-0.01^{*}

	(-1.85)	(-1.84)
Linder	-0.04 (-0.25)	-
Exch	0.39* (1.96)	0.39* (1.97)
Distance	-0.14 (-0.39)	-0.13 (-0.37)
Border	2.12** (2.32)	2.11** (2.32)
History	-2.35*** (3.00)	-2.34*** (3.00)
Sanction	-2.20** (-2.53)	-2.16** (-2.54)

Numbers without parentheses are the coefficient values
One star – statistically significant at 10% significance level
Two stars – statistically significant at 5% significance level
Three stars – statistically significant at 1% significance level
Numbers in parentheses are the t-statistic values

Results show that our lagged import variable is statistically significant at 5% significance level. The variable has the positive sign with the coefficient value of 0.21. Meaning that an increase in previous years' imports by 1 USD would lead to an increase of 0.21 USD this year. The variable representing the GDP of the EU countries has a negative sign and is statistically significant at 10% significance level. The coefficient sign does not match the theoretical expectations. We explain these phenomena by the fact that relatively new EU member countries that are in Eastern Europe are growing relatively faster than other central EU countries. Those Easter EU countries also happened to be ex-Soviet countries. Those countries are trying to shift their market orientation from Russian markets to the EU markets, hence it is possible that their GDP increase effects are dominating in the estimation and we get the results that an increase in the EU GDP leads to decreased imports. Linder variable is

insignificant in this imports model, therefore, in alternative estimation it will be removed and the model will be estimated without it to see if any changes will occur. Dummy variables “border”, “history” and “sanctions” are statistically significant and yield very similar results like in the main trade volume estimation with coefficients 2.12, -2.35 and -2.20 respectively.

Alternative imports estimation was estimated without the “Linder” variable. The decision to estimate the alternative model was decided after estimation the main imports model. Since we saw that Linder variable was statistically insignificant it was decided to try the estimation without it to see if it leads to any changes in the estimation results. As it can be seen in the table 14 above removal of the variable led to almost no changes. Results are almost identical and no meaning is lost or changed.

Now let`s have a look at our exports equation it is as follows:

$$X_{ij} = \beta_0 + \beta_1 X_{t-1} + \beta_2 GDP\_RU + \beta_3 Linder + \beta_4 Exch + \beta_5 Distance + \beta_6 Border + \beta_7 History + \beta_8 Sanction \quad (3)$$

Where X stands for total exports from country “i” (EU member) to country “j” (Russia).

We have now replaced import variables with export variables and table 15 will present the export estimation results. However, this time GDP of Russia is used and the GDP of EU removed from the model.

Table 13: Export estimation results

Variable	Main export estimation	Alternative Export estimation
	0.27^{***}	0.28^{***}

X_{t-1}	(2.97)	(3.07)
GDP_RU	0.03*** (4.83)	0.03*** (4.80)
Linder	-0.08 (-0.69)	-
Exch	0.44*** (3.29)	0.44*** (3.31)
Distance	-0.16 (-0.67)	-0.14 (-0.59)
Border	0.64 (1.04)	0.63 (1.02)
History	-0.96* (-1.79)	-0.95* (-1.76)
Sanction	-1.12* (-1.83)	-1.06* (-1.76)

Numbers without parentheses are the coefficient values
One star – statistically significant at 10% significance level
Two stars – statistically significant at 5% significance level
Three stars – statistically significant at 1% significance level
Numbers in parentheses are the t-statistic values

Results for the exports estimation are similar to imports estimation model results with one exception. Dummy variable "border" turned out to be statistically insignificant in exports estimation model. Variables "Linder" and "Distance" are also statistically insignificant like in the imports estimation model. Variable representing Russian GDP is statistically significant and have a positive sign. Variable representing exchange rates also has a positive sign and is statistically significant at 1% significance level. Dummy variables "history" and "sanctions" are both statistically at 10% significance level with coefficient values of -0.96 and -1.12 respectively.

Alternative exports model is run without statistically insignificant “Linder” variable. Removing the variable made almost no changes. Variables “distance” and “border” are still statistically insignificant. All of the variables show almost identical results as in the main exports model. Elimination of the “Linder” variable had no effect on the model.

Chapter 7

CONCLUSION

This thesis is about investigating the effects of international sanctions on EU – Russia trade relations. The EU and Russia had a long trading relations and until recently the EU was Russia's biggest trading partner. However, regional conflicts which emerged in early 2010s have changed that quickly.

Research used the gravity panel model approach to study the effect of sanctions on Russia – EU bilateral trade volume. Data collected from 28 EU member countries for a time period of seven years was used. Before estimating the model variety of unit root tests were used to ensure that our variables are stationary. After the unit root tests, co-integration tests were run. Based on co-integration test results it was concluded that our variables are not co-integrated therefor the model was run on the first difference of the variables. After running all the tests necessary, the model was estimated.

The main objective of this research was to analyse the bilateral trade volume between the EU member countries and the Russian Federation through applying the gravity model. Even though one traditional gravity model variable "distance" representing the transportation costs turned out to be insignificant all other variables were statistically significant and yielded some good results. However, our variable history that represents historical ties of countries to Russia was theoretically expected to have a positive sign, but has a negative sign in our case. We explain it by the fact that some

eastern EU member countries that formerly were members of Soviet Union have currently bad political relations with Russian Federation and that reflects on trade volume.

The variable for EU GDP had also theoretically unexpected negative sign. We explain this phenomenon by the fact that Easter European countries that once were part of the Soviet Union had a much higher GDP growth compared to other EU developed countries. These Eastern Europe countries have been shifting their market orientations from Russia to EU for years. Hence, we get the negative sign on EU GDP variable. It is also worth mentioning that two studies from the literature review had same surprising result, where the GDP of a partnering country would yield a negative result. M. Abu-Lila in his study about factors influencing Jordan`s foreign trade states that research reveals some surprising results where the GDP of a partnering country has a negative sign and is insignificant. Second paper is written by Rasoulinezhad and Popova. In their study about Iran – Russia trade, they find that the combined GDP variable has a negative sign. Indicating that increase in GDP decreases the bilateral trade by 0.57 percent.

Based on export and import estimation results it can be concluded that the imports from Russia to EU have been hurt more by the international sanctions compared to exports from EU to Russia. Never the less both exports and imports have been damaged by the international sanctions.

The main focus was to see the effect of sanctions on bilateral trade volume and to see if it would be a significant factor or not. Sanctions clearly have a negative effect on bilateral trade volume between the countries. Sanctions are still active to this date and

economies of countries are adapting to the changes as time goes. However, sanctions are also toughing up and even more sanctions are being applied to Russia by the US. A further research can be conducted on sanctions and international trade as sanctions are being now a common thing. Never the less for the short period of data that was available and used for this research we can clearly say that sanctions have a very bad effect on international trade and might be affecting other aspects of the economies worldwide. Politicians need to solve their political disagreements using political tools without intervening with the economics so that we all could enjoy the growth of international trade and the overall growth of the economies ensuring better living standards in all over the world. It is also worth mentioning that the gravity model was a use-full tool in estimating the cost of sanctions.

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