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How have the sanctions against Russia and their counter sanctions affected the Russian trade?

- An analysis of panel data using the gravity model

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Abstract:

Economic sanctions are prevalent in the modern world as an alternative to war, instead aiming to maim economic growth and power by hindering trade. In recent times, sanctions have been imposed against many countries, Russia being one of them. Often seen as a response to questionable political and economic acts. The western countries and the UN being the main actors behind recent sanctions have faced relatively small negative effects of their imposed sanctions. The receiving countries however, often faced large consequences. With this thesis we aim to explain how Russia was affected and possibly still is affected by the sanctions imposed by the EU, the US, and their own counter sanctions. Searching for patterns to see if trade was diverted and if the sanctions have had lasting effects in a longer term. To research the question, we use descriptive statistics and regression analysis to explain and predict the effects over time. Our conclusions are that sanctions had a great immediate impact on trade. In the first year a decrease of up to 31.75% in bilateral trade between Russia and the EU and US was observed. As time passed, all parties significantly diverted their trade to a degree. The initial trade diversion of Russia being 42.48% in the first year.

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Abbreviations & Definitions

Country pair: 1 exporter and 1 importer

FE: Fixed effects

Intuitive gravity model: A gravity model which isn't based on theory

Structured Gravity model: Theoretically based application of the gravity model

MTR: Multilateral trade resistance

1. Introduction

1.1 What is an economic sanction?

Sanctions are one of the most common alternatives to war and are often used to pressure different states to comply with specific purposes. Sanctions are often seen as an alternative to war because they are less forceful, yet have a great and immediate impact on the country receiving the sanctions (Pattison 2018, p.39). While sanctions are popular today, as they fit the "responsibility to react" doctrine used by several countries, they are not without critique.

There are several different types of sanctions, but this thesis will focus on economic sanctions. All economics sanctions are not created equal, they can differ greatly in different parameters. Sanctions can vary in 3 different ways according to Pattison (2018, p.41);

1) Extent - do the sanctions imposed restrict or eliminate the trade of certain products? Does it apply to all products or only certain industries?

2) Coordination: How are the sanctions organized?

    a) Unilateral - only one state imposes the sanctions.

    b) Bilaterally - a group of states imposes the sanction.

    c) Multilaterally - The sanctions are very broad, organized by the EU or authorized by the UN security council for an example.

3) Reception - Who is the target of the sanction?

    a) A state in general.

    b) A particular person, or a group of persons such as a leader, and in some cases individual businesses.

An economic sanction can thus take many different forms and affect different kinds of groups to different extents. The general effects of a sanction can be hard to measure, oftentimes it is relatively easy to see a sanction as either effective or ineffective; either it persuades, or not. The general

economic effect, and the reactions can be hard to evaluate, therefore we will try to evaluate the sanctions not in a general sense, but rather a specific kind of sanction in a specific case. The economic question is not to ask whether or not the sanctions are effective or not, the goal is to understand how much the ongoing sanctions have affected the Russian economy and trade after being imposed in 2014.

Critique of sanctions

A sanction can differ in several ways, and each approach comes with different pros and cons. If the sanction targets a state in general the effect of the sanction will be greater, but this will also lead to more "non combatives" receiving some harm from the sanctions. The critique of sanctions has two main branches; The first consists of moral objections (Pattison 2018, p.42-50). A sanction might harm none combatives if the main target of the sanctions is a state in general and not persons. Sanctions can also be criticized since the state that imposes the sanction intends to harm civilians in order to persuade the state to comply. The other branch of the critique is since that sanctions are not always effective at persuading the state (Pattison 2018, p.50). This branch is based on the "pain-gain" model which states that if the gain is greater than the pain, the state will not be persuaded by the sanctions. This is the branch we are interested in. Why are sanctions not always successful, and why is the gain oftentimes perceived as greater than the pain? To investigate this, we have chosen to focus on the trade sanctions imposed on Russia by the EU and USA. Our hypothesis is that the trade sanctions imposed on Russia were not trade reducing, but trade diverting.

To clarify our hypothesis, were going to create a utility function describing the pain-gain model

$$U = Annexation - Trade\ sanctions$$

Where "U" is the utility of Russia, annexation is the annexation of Crimea and sanctions are all the trade sanctions imposed on Russia. If the utility of annexation is less than the trade sanctions, the sanctions will not persuade Russia. As of 2020, the sanctions have not persuaded Russia, thus the utility of annexation is greater than the reception of trade sanctions. One reason that the Sanctions are ineffective could be that the sanctions diverts their trade with other countries that have not imposed sanctions, thus reducing the effects of the sanctions

$$U = Annexation - (Trade\ sanctions - Trade\ diversion)$$

Where trade diversion is the trade diversion from the countries implementing the sanctions to countries that do not. To which extent does the trade diversion cancel out the effects of trade sanctions? We can tell that the sanctions have been ineffective so far, because it did not affect

Russia's decision of annexation. Could the trade diversion to other countries be a part of the explanation why the sanctions are ineffective to provoke Russia to comply?

Our model is limited to evaluating percentage based effects of the trade flows, as it will need to be log transformed, which we will cover further down.

$$H_{0:}\ Russian\ Trade\ diversion = EU/US\ Trade\ diversion = 0$$

$$H_{a:}\ Russian\ Trade\ diversion - EU/US\ Trade\ diversion) \neq 0$$

This is an interesting research question, because a great part of economic sanctions are often sanctions on trade, it is possible that a large part of the trade is not reduced, but diverted elsewhere.

1.2 Ethics and societal effects of sanctions

While war directly affects the populace with destruction and terror, sanctions could possibly be a more slow pain for the general population. Creating a distancing from the rest of the world and making the people endure trouble in a different way. So while sanctions are a cheap alternative to war of the traditional sense, it may also have undesired effects.

In modern time, sanctions have become more and more common in the world as an option to war, or rather, an economic war. Peksen (2009) describes the main goal of sanctions as a way to apply pressure on targeted countries in order to make them comply with the sanctioning country's demands. Moreover, he implies that beyond these intended goals of the sanctions, the sanctions may also inflict "Significant socio-economic and political damage in target countries". In his paper, Peksen uses empirical data to evaluate the effects of sanctions on human rights. He concludes that sanctions may in fact cause lasting issues on human rights in affected countries. For countries, such as Russia which is the topic of this paper, that have experienced extensive sanctions on a multilateral level, this is often even more apparent. Peksen explains that the longer sanctions are in place, ignoring the immediate effects, the sanctions cause economic coercion that ultimately undermines human rights. In the end he means that this is cause of more problems for the ordinary citizens which in effect are more prone to human rights violations by their own government as an undesired effect of sanctions. (Peksen 2009)

The countries that are affected by sanctions, and have been in modern time, are generally not the most developed and rich countries. In what Cortright and Lopez call 'the sanctions decade', meaning the period after the end of the cold war. Multiple countries have faced sanctions from the UN, countries like Iraq, Kuwait and Afghanistan to name a few. The list is longer but sanctions are rarely imposed against developed countries (Cortright & Lopez, 2000). Since then, the list continues, with the UN,

EU, and the US imposing sanctions against many countries in the developing parts of the world. Hufbauer et al, lists sanctions post 2000 where this pattern continues with countries like Haiti, Zimbabwe, Syria and Iran (Hufbauer et al, 2012).

With this in mind, sanctions are usually used against weak countries where the population typically do not have the best situation to begin with. Together with Peksens (2009) conclusions of the societal effects of sanctions, possibly leading to violation of human rights, it is questionable if sanctions are the best option. Sanctions are however imposed with caution and often as a last resort to condemn violations of human rights. While war is rarely a beneficial option, with the argued effects on the people however, especially in the longer term and during extensive sanctions. It could be argued that there should be better alternatives at hand since sanctions seem to cause some of the issues they are designed to put pressure on and prevent.

2. Background & Theory

2.1 The Ukraine crisis

2.1.1 History of Crimea

Crimea is a peninsula located in the northern black sea. Having a thorough history of different rulers, and throughout history belonging to several different empires, such as the Mongolian and Ottoman empires. In modern history and during the 20th century, Crimea has belonged primarily to the Russian Empire, Ukraine, and the Soviet Union. After the fall of the Russian Empire, Crimea was declared an independent democratic republic within the Soviet Union in 1921 after the Russian civil war (1918-20). Later, after the second world war, Crimea was downgraded to an oblast of the Soviet republic in 1946, effectively losing independence and becoming a region of the Russian Soviet Federated Socialist Republic. Later, in 1954, the peninsula was transferred to the Ukraine domain, remaining within the Soviet Union but under Ukrainian rule (Bebler, 2015).

In January 1991, the population of the Crimean oblast voted in a referendum to restore the Crimean Autonomous Soviet Socialist Republic and was made an autonomous region within the Soviet Union once again. However, with the simultaneous break-down of the Soviet Union, the new autonomy was not in place for long, and in December the same year, Crimea was once again transferred to the newly founded Independent Ukraine (Bebler, 2015).

With tension between Kiev and Crimea and most of the population in Crimea primarily identifying as Russian, operating under direct Ukrainian rule was something that did not last for long. The Crimean parliament voted to declare Crimea independent of Ukraine on the 6th of May 1992 (Schmemann 1992). There was however never a public referendum confirming the independence. For 22 years, Crimea remained partially independent within the Ukrainian Republic. This lasted until 2014 when the institutions of Crimea and primarily the Russian Federation decided to act again.

2.1.2 Russian Annexation

In March 2014, Crimea, still being a part of Ukrainian Republic, was annexed by the Russian Federation in a series of events. From a Russian perspective, beginning with a declaration of independence, Crimea officially separated from Ukraine on March 11, 2014, this time excluding 'autonomous' from the new name of "the Republic of Crimea" ahead of the actual referendum taking place on March 16th. Russia then, in events that were highly criticized by the rest of the world, made a deal with the new Republic of Crimea of Russian annexation. (RT 2014) This was however never acknowledged internationally.

The relationship between Kiev and Crimea was one of tension. Combined with the conflict in Ukraine that began late in 2013, led both Russia and Crimea to act. The population of Crimea has a large part of inhabitants of Russian identity, and public opinion after the referendum, based on surveys, showed that as many as 69% of inhabitants identified as Russian. After the declaration of independence, polls were held indicating that 85% of the population of Sevastopol and Crimea would vote to join Russia on March 16th. Moreover, Hopf brings up the discourse of the ownership of Crimea and argues that this act of annexation by Russia was inevitable, regardless of the fact of Russian identity within Crimea. The referendum turned out at 96.77% for the alternative to join Russia (Hopf, 2016).

On March 17th, the day after the referendum, the President of the Russian Federation signed an executive order to recognize the new independent Republic of Crimea. The day after, Crimean institutions proposed joining the Russian Federation. The local institutions signed an agreement admitting the Republic of Crimea into the Russian Federation the same day (Grant, 2015). In swift actions, Crimea had once again become part of Russia.

These events of doubtful legitimacy sparked the still ongoing crisis, which has become known as the Ukraine Crisis. One of the reasons was that in combination with the tension between Kiev and Crimea, a pro-Russian Crimean government was installed on the 27th of February, not even a month before annexation was realized. The discussion also brings up the alleged Russian military presence in Crimean institutions ahead of the referendum. Which was still recognized as Ukrainian land

internationally, escalating the doubts of the legitimacy in these actions (O'Loughlin, 2019). This has led to a situation where Crimea still is recognized internationally as part of Ukraine, while technically being under Russian rule.

2.1.3 The EU, Ukraine and Russian relations.

The involvement of the EU in the crisis has many angles, a main point being Ukrainian relations with the EU. In 2012, discussions were taken up between the EU and Ukraine regarding what later became known as the Ukraine–European Union Association Agreement (Council of the European Union, 2012). In 2013, this agreement sparked the initial unrest in Ukraine when President Yanukovych refused to sign the agreement on the 21st of November (Higgins 2014). This led to a political movement and, ultimately, a revolution in February 2014 where the government was removed (Amos, 2014). The agreement between the EU and Ukraine was signed on March 21st, three days after Russia had annexed Crimea (Council of the European Union, 2014, EUCO 7/1/14). With Ukraine opposing the Russian annexation, and the EU entering the picture through this agreement, actions from the EU came naturally. In a situation where Ukraine had to pick sides, the Ukrainian people chose the EU over Russia, and the annexation of Crimea can be argued to be Russia's timely and direct response.

2.1.4 EUs Response and Sanctions

After these events, the EU and Russia became the two main actors of the tension, Ukraine ending up in between. With the relationship since long being one of conflict and distrust, conflict ramped up further. What happened after these events in 2014 is what Kalinichenko cites as a "war of sanctions" (Kalinichenko 2017). The first sanctions were introduced the day after the referendum on the 17th of March 2014. This set of initial sanctions affected 21 officials and associated entities, freezing assets, and imposing travel bans. Three days later, on the 20th, twelve names were added to the list and requests were put forward to the European Commission to prepare "broader economic and trade sanctions" that could be imposed (Council of the European Union, 2014, 7764/14).

Focusing on the economic sanctions, The European Council immediately called out the annexation of Crimea as illegal and stated that they would never recognize it. Simultaneously asking the European Commission to evaluate the consequences and to "...propose economic, trade, and financial restrictions regarding Crimea for rapid implementation". (Council of the European Union, 2014, EUCO 7/1/14)

These broader sanctions that the council requested came into place on the 29th of July 2014 and were the first economic sanctions put into place. The European Union imposed sanctions against Russian

state-owned financial institutions and limited access to EU capital markets. Moreover, these sanctions also included an embargo on arms trade as well as a reduction of access to technology used within the Russian oil sector (Council of the European Union, 2014, EUCO 158/14). These sanctions had an immediate impact on trade between Russia and the EU.

Russia responded to this set of sanctions with counter sanctions against the EU on the 6th of August 2014. Effectively banning import of most types of food and agricultural products from the EU and the US. Compared to the EUs sanctions on Russia, these sanctions were a lot more drastic and had a much larger effect on bilateral trade. (MacFarquhar, 2014)

The second set of economic sanctions from the EU entered into force on the 12th of September 2014. Further strengthening the initial economic sanctions by preventing EU nationals and banks from lending money to five Russian state-owned banks as well as prohibiting trade in new bonds. Moreover, this reinforcement also prevented supply of services within oil exploration and production. (Council of the European Union, 2014, ST 12944/14) No more sanctions were imposed during 2014, but these sanctions had a great effect on Russian imports and exports to the EU and have been renewed since.

Russia, being an importing country with the EU, experienced a drastic decrease in both imports and exports between Q2 of 2014 and Q1 of 2015. This is likely heavily influenced by their own import ban on food and agricultural goods from the EU and the US. In Fig.1 (IMF DOTS), a breakdown of quarterly imports and exports are shown between the EU and Russia. After sanctions were imposed in 2014, the value of Russian quarterly imports from the EU dropped by 60% between Q3 2014 and Q1 2016. In Q3 2014, the EU accounted for more than half of Russian exports, by Q1 2016, that number was down to 50%. In comparison, Russia's exports to the entire world dropped by 53% in this period. (Fig. 2, IMF DOTS) These sanctions also had effects on inflation. As Russia was largely dependent on food imports, the counter sanctions by Russia had a great effect on prices of food. The ruble was at this time weakening, and combined with the sanctions, the year to year inflation rate increased to above 16% by the end of Q1 of 2015. (Tyll, et al, 2017)

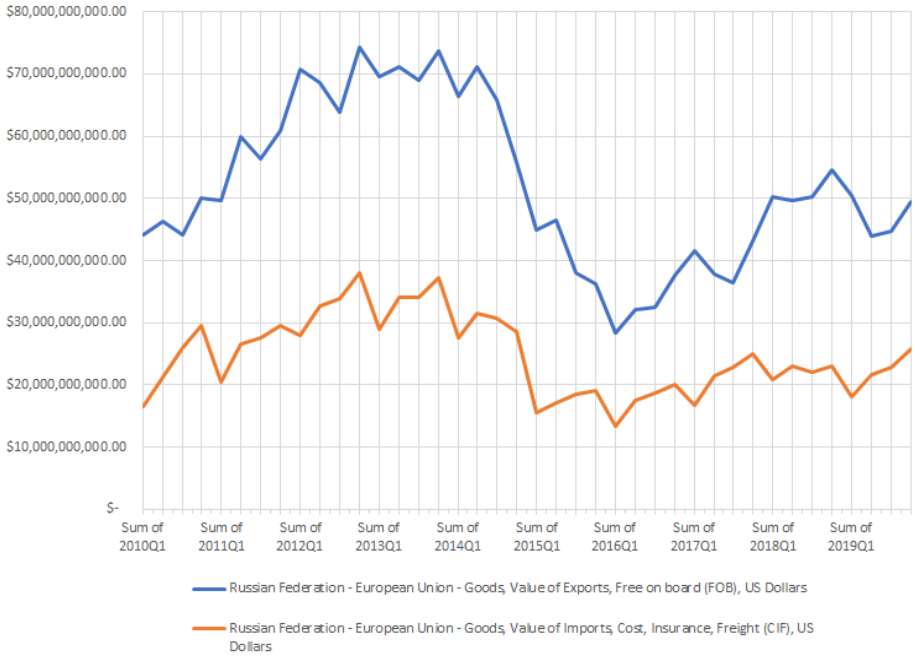

Figure 1. Quarterly sum of Russian imports and exports from/to the European Union

To explain the brutal effect of these sanctions, and especially the counter sanctions, on Russian trade and imports, we can look at figure 2, where the EUs combined trade is compared to the entire world. We can see that the movements from quarter to quarter have a small decline in comparison, not in money but percentage. The total effect on EU exports to the world from Q3 2014 to Q1 2016 was a 14% decrease. (Fig 2. IMF DOTS) This indicates that while Russia faced large consequences of the sanctions, for the EU as a whole, this was a minor setback to which adjustment and trade diversion was quick to implement. The EUs import and exports were back to the same level as in 2014 before the sanctions four years later in Q4 2017. Russia has still not returned to the same levels of trade as before the sanctions, neither with the EU nor the world in general, something that might have been in their agenda. (Fig 3. IMF DOTS)

We do notice however that Russian exports increase again after 2016, reaching higher levels again, both to the EU and the world. Russian imports from the EU, however, remain at a lower level. One reason for this could be adjustments within Russia, to focus more on production of agricultural products and food items, but also on trade diversion. Moreover, it appears Russia is becoming less dependent on both exports and imports to/from the EU, possibly because of the sanctions, their counter sanctions and diversion of trade.

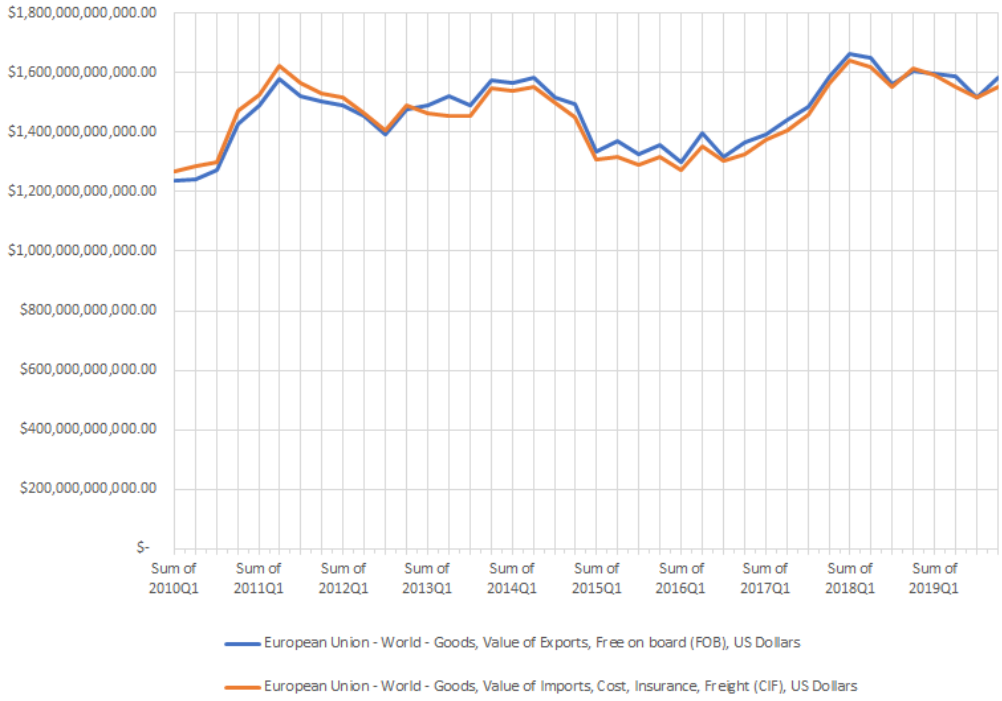

Figure 2. Quarterly sum of European Union imports and exports from/to the world

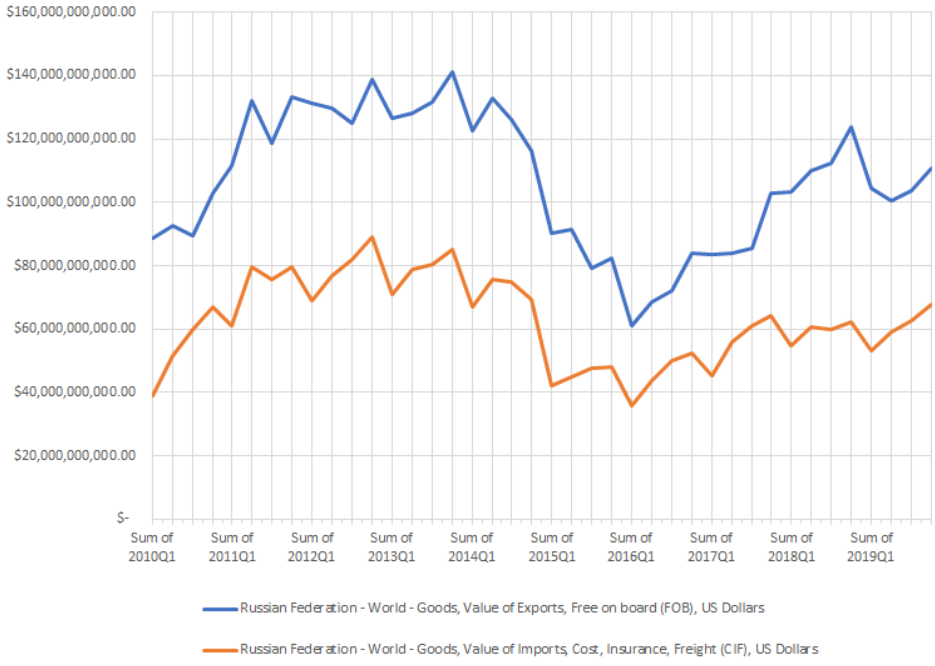

Figure 3. Quarterly sum of Russian imports and exports from/to the world

2.2 The Gravity model

Here we will present the gravity models history, theory and our application of it. While the entire section aims to explain why we chose the gravity model, our short answer is that the gravity model has been applied in a variety of subjects with high predictive power. The gravity framework offers a great starting point to research international trade policies.

The gravity model of international trade originates from Newton's law of universal Gravity, which states that:

$$F = G \bullet \frac{m_1 m_{21}}{Distance}$$

Where F is “force”, G is the gravitational constant, m is the mass of object n, and distance is the distance between the two objects. During the 1960´s the Dutch economist Tinbergen was the first to apply the gravity model outside of physics (Feenstra & Taylor 2017, p. 194-195), transforming the model to:

$$TT = B \frac{GDP_1 GDP_2}{Distance^n}$$

Where TT is “total trade” between the two countries, B is the degree of trade restrictions between the country pair, GDP is the total GDP in country j and distance is the distance between the two countries and n marks the effect distance have on total trade. This is what we today call the “theoretical gravity model” (Deardorf 1997) or the “intuitive model” (Shepard 2016, p.6). This model is simple and all it can say is that trade flows will be correlated with the GDP of the importer and exporter and inversely related to the distance of these two countries. It does not however state the impact of distance on trade flows as “n” is unknown. Note that the GDP of the importer and exporter are not summed, but multiplied together. At a first glance this might not make sense, however one can assume as either the importers or exporters GDP assumes the value 0, there would not be any trade flows between the countries.

Tinbergen (1962) was one of the first to apply Newton's law of gravity to economics, he used it to not only to predict trade flows, but also migration flows. Tinbergen's work made a great impact on modern empirical international economics, and today it is applied to a variety of subjects (Yotov et al 2017, p.5-6). Something to note is that Tinbergen's (1962) application of the gravity model was not based on economic theory, but rather intuition (Yotov et al. 2015, p.12).

The gravity model has a history that might be dubious since it originates from physics. But since Tinbergen first applied the gravity model it has evolved significantly in several different ways. The

gravity model originally had no theoretical foundation, but it has since then been incorporated into a general equilibrium model and the monopolistic competition model (Anderson & Wincoop 2003). After these advancements, the gravity model is today highly appreciated for its flexibility, high predictive power, realistic general equilibrium environment and strong theoretical foundations (Yotov et al. 2016, p.5-6).

But when we want to apply the gravity model, one must first realize that it violates the functional form assumption of OLS. The functional form assumption requires us to either transform the model into a linear model, thus fulfilling the functional form assumption or choose an non linear estimator.

To solve the violation of the functional form assumption, we take the natural logarithm of the total trade, GDP, and distance. Our model is now linear.

$$LogTT = LogB + LogGDP_1 + LogGDP_2 - LogDistance$$

When the model has been transformed into a functional form, we can generate a regression equation. First off, the traditional regression equation:

$$Y = b_0 + b_1 x_1 + ... + b_n x_n + U$$

We now replace our dependent and independent variables with our variables:

$$LogTT = b_0 + b_1 LogGDP_1 + b_2 LogGDP_2 + b_3 LogDistance + ... + U$$

Where b is the regression coefficient and U is the unobserved effects. This is the model that is usually used in cross sectional analyses using OLS. Empirical studies using this method often have a high predictive power with R^2 values around 0.7 (Baldwin & Tagilione 2007).

While this is a model with high predictive power the probability that distance captures all of the trade costs are small, and the probability of omitted variable bias is severe. To solve this issue many researchers will usually replace the “distance” with “trade costs”, and complement the distance with variables such as contiguity, whether the countries share a common language, border, etc. The variables that complement the trade costs are usually dummy coded.

In theoretical gravity models these variables are of great importance, as they aim to justify the model. This could be viewed as “traditional” econometrics where each variable is justified intuitively.

$$LogTT = b_0 + b_1 LogGDP_1 + b_2 LogGDP_2 + b_3 LogTradecosts + ... + b_n x_n + U$$

Where “trade costs” are Distance, contiguity, shared language etc.

For many years this was the model to investigate international trade, but it has been severely criticized for the lack of theoretical foundations. Today the model can be derived theoretically, and authors such as Deardorf (1997) states that the gravity model needs to be derived from a modern economic theory, which one is not as important as it can be derived in several ways, according to Deardorf (1997).

One might ask why the gravity model model needs to be derived from theory; the answer is simple. When the gravity model is derived from theory, it does come with some important implications and a new set of problems.

It could be two different approaches, with two similar models, but with different limitations and possibilities.

For this thesis we will use the derivation of Anderson & Wincoop (2003) "Gravity with Gravitas" model. While we will leave the derivation to Anderson & Wincoop (2003), we will focus on its implication.

The derivation by Anderson & Wincoop (2003) was revolutionary in several ways, but the greatest one was the inclusion of the Multilateral Trade Resistance Term.

The multilateral trade resistance (MTR) term is the term that is supposed to measure multilateral trade resistance. A fair explanation of the meaning of MTR is given by Adam & Cobham (2007); Bilateral trade resistance is given of the specific costs between country 1 and 2, however the MTR are all of the "trade resistance" both countries meet against the rest of the world.

For example, if the bilateral trade resistance decreases between country 1 and 3 decreases, this will probably divert the trade from country 1 and 2 to country 1 and 3. The bilateral resistance has decreased between country 1 and 3 - however the bilateral trade resistance has not changed in country 1 and 2. Thus it is now relatively cheaper for country 1 to trade with country 3, compared to country 2. This effect is what we call a decrease in the multilateral trade resistance between for country 1, which will result in an increase of trade with country 3 and a decrease of trade with country 2.

The modeling of MTR is a central problem which must be handled when applying the gravity model to trade. An example of a failure of taking MTR into account is when Rose (2000) was one of the first researchers to investigate the effect of a common currency. Rose (2000) found that a common currency would increase trade between countries with 200%. However, the actual effect of the euro is, according to polák (2018) around 3%. Rose met "a tsunami of scepticism" (Rose 2016) after he published his paper, following the "fixed effects revolution". Not accounting for the MTR will lead to what Baldwin & Taglioni (2007) refers to as the "gold medal error", a severe omitted variable bias.

One way to account for this, as suggested by Baldwin & Tagilione (2007), is to first use panel data. The use of panel data rather than cross sectional data will lead to more observations of the same country pairs, which will enable us to implement fixed effects.

To account for this in our regression we include "t" in our equation.

$$LogTT = b_0 + b_1 LogGDP_{1t} + b_2 LogGDP_{2t} + b_3 LogTradecosts + ... + b_n x_{nt} + U_t$$

Where t is the year of which the observation is made. Now we want to include the fixed effects. To account for MTR we will use importer exporter time varying effects. This is the method advocated by several authors (Shepard 2016, p.22-26; Yotov et al 2016, p.19). An important factor to note about the importer and exporter time varying fixed effects(fe) is that it will absorb all variables that vary within an exporter or an importer. Thus, "size" variables such as population or gdp will be dropped from the equation. What is then left for our equation? While country specific factors are absorbed the equation will still include effects that vary within country pairs. One example of this is the distance that will still be included.

$$LogTT = b_1 LogTradecosts + ... + b_n x_{nt} + Importer\ time\ varying\ FE + Exporter\ time\ varying\ FE + U_t$$

Where *Importer time varying FE* are importer time varying fixed effects and *Exporter time varying FE* absorb the GDP variables.

The next step is to try to define the "trade costs". The trade costs are usually contiguity, distance, and common language. While these variables can capture some of the trade costs, will it capture all the trade costs? Probably not. It is reasonable to assume that not all trade costs can be captured. For example, because of the cold war and soviet heritage some countries might have chosen to trade with each other, these effects can be hard to capture using dummy variables. Therefore, it is customary to apply time invariant pair fixed effects in the model (Yotov et al 2015, p.25). The time invariant fixed effects absorb all time invariants effects that occur between a country pair. These variables that do not vary over time in a pair, such as distance will be omitted from the equation and absorbed in the time invariant fixed effects.

The new equation is now:

$$LogTT = + Importer\ time\ varying\ FE + Exporter\ time\ varying\ FE + Time\ invariant\ country\ pair\ FE + b_n x_{nt} + U_t$$

As time invariant country pairs are included all country pair time invariant effects are absorbed in yet another fixed effect. One might ask what effects now are left for X to explain and what variables can

now be used, without being absorbed in the fixed effects? There are two criterias that needs to be fulfilled to make sure the variables are not excluded.

1. The variable cannot be country specific, if it is, it would be absorbed in the importer or exporter importer time variant fixed effects. The variable must obtain the same value with several country pairs. Here continuous values will probably be absorbed unless a country pair shares the same exact continuous variable. X is probably best served as binary (dummy) variables.

2. The variable must be varied over time within the pair. The regression will only measure the variation obtained the year x changes. Assume that x is a binary variable that obtains the value 1 year t. The regression will only measure the effect of x year t. year t-1, t-2,....,t-n and t+1,t+2,...,t+n will all be omitted from the regression. Thus, the regression only measures the marginal effect.

It is important to understand the implications of the "fully" fixed effects model. It can measure the marginal effect of a specific policy, but not the effect over time, nor can the effect be country specific.

It can however measure the marginal effect on trade of sanctions. We now include a variable called "bothsanction" that assumes the value 1 if one country receives sanctions and one give sanctions

$$LogTT = b_1 Both\ Sanction + FE + U_t$$

Where "bothsanction" is a binary variable that assumes the value 1 if both countries either give or receive trade sanctions against each other. "FE" is a full set of importer and exporter time invariant fixed effects and country pair time invariant fixed effects. The model is now complete. The model may at first sight be simple, yet it is a sophisticated model that accounts for most factors that can possibly affect trade in each period. Also, it does not look anything like the original gravity model, and it is therefore a reasonable question to ask whether this model is a gravity model? What defines the gravity model? No variables remained the same as even the original outcome variable was transformed in a logarithmic form, yet all the original variables are accounted for in the form of fixed effects. The original variables are omitted, the original, intuitive gravity model is also omitted. What remains is the strong theoretical foundations, the gravity with gravitas model (Anderson & Wincoop 2003), what in literature is referred as the "structured gravity model" (Yotov et al 2016).

One great limitation of the structured gravity model described above is that it is unable to measure the "trade diversion" effect of different policies. This is a great, and valid point of critique of the structured gravity model. As described Bacchetta et al. (2014, p.109) researcher sometimes includes a dummy variable if the country pair is traded with a "third" country. Assume country 1 and 2 comes to

a free trade agreement. How does this affect country 3? Will the trade with country 1(or 2) and 3 be reduced or increased? If the trade between country 1(or 2) and country 3 is increased, the policy then is "trade creating". If it is negative, it is trade diverting. In the context of sanctions one can assume that "both sanction" will be negative and the effect on trade with the third country is positive, the trade is assumed to be diverted.

But the trade diversion variable is part of the multilateral trade resistance, the import and exporter time variant fixed effects will absorb these effects. So, to measure the trade diversion we must leave the exporter and importer time variant fixed effects behind. The model will no longer be theory resistant and more of a "traditional" statistics approach. Country pair time invariant fixed effects can still be included in the model, and to decrease the bias of the model, it probably should.

The model to measure trade diversion is:

$$LogTT = b_1 LogGDP_{1t} + b_2 LogGDP_{2t} + b_3 Bothsanction_{ijt} + b_4 Onesanction_t + FE + U_t$$

In this model GDP is reintroduced as it is no longer included in the fixed effects. The fixed effects are now only a full set of country pair time invariant fixed effects. "one sanction" assumes the value 1 if the country pair includes a country who receives trade sanctions and one country that does not.

While this model isn't consistent with theory, and as argued by Hornok (2011) it is sometimes more important to measure the effects than be consistent with theory.

2.3 A general explanation of the gravity framework and fixed effects

To fully understand fixed effects and its implication on our model we will also give a more general explanation via econometric specifications.

Our model contains six types of variation.

1) Variation from the exporter that does not vary over time; x_i
    a) An example of this would be the area of the exporter
2) Variation from the importer that does not vary over time; x_j
    a) An example of this would be the area of the importer
3) Variation from a country pair that does not vary over time; x_{ij}
    a) For example the distance between two countries
4) Variation from exporters that vary over time; x_{it}
    a) For an example; the GDP of the exporter

5) Variation from importers that vary over time; x_{jt}
    a) For an example; the GDP of the importer
6) Variation from country pairs that does vary over time; x_{ijt}
    a) For example; a certain policy, such as an sanction

These are basically all types of variation that a gravity model would try to explain, a general gravity model would perhaps look more like this;

$$Y = b_0 + b_1 x_i + b_2 x_j + b_3 x_{ij} + b_4 x_{it} + b_5 x_{jt} + b_6 x_{ijt}$$

This would be what we would call the gravity model that explains everything. There are no unobserved factors. However, in reality we're not able to collect variables that explain all of the variation. This is however a logical way to approach and understand the gravity framework. While we're not able to obtain all the variables that would explain the trade, we can apply fixed effects.

A fixed effect is basically a certain application of binary variables. To understand fixed effects one must first understand what panel data is; panel data is cross sectional data over time, there are several observations of each country pair. Because there are several observations of our country pairs we could dummy them such as =1 if the country pair is Russia and Sweden (as an example) and =0 otherwise. The process is then repeated for all country pairs. The result is dummy variables which absorb country pair specific variation. This can be applied to the 6 types of variables that were explained earlier.

If we were to apply importer, exporter and pair time varying fixed effects all other variables would be omitted; all variables would be perfectly collinear with at least one of the fixed effects. A useful approach would then be to try to apply as many fixed effects as possible; without them being perfectly collinear with the variable of interest.

A sanction varies over time, within country pairs.

If one country receives sanctions it is a country specific variation.

If we would want to only investigate the sanctions a sound approach would be to implement country pair time invariant and exporter importer time variant fixed effects. This would absorb all variation, except for the country pair variant variables

$$Y = b_1 x_{ijt} + Fixed\ effects$$

There is no need for a general intercept as fixed effects give individual intercepts, this model would only leave time varying country pair variation left to explain via control variables, there is not a need for an unobserved factor as our theoretical model captures all variation.

But these effects would also absorb our trade diversion variable, which would be an exporter time varying variable. The perfect model for our purpose would be time invariant country pairs and time fixed effects.

$$Y = b_1 x_{it} + b_2 x_{jt} + b_3 x_{ijt} + FE$$

2.4 Alternative methods

While the gravity model is one of the most used methods for the analysis of trade policies, there are other options. Bachetta et al. (2012) suggest four methods for analysis of trade policy.

Analysis of trade flows is used to describe the trade patterns and try to answer the question "how much" (Bacchetta et al 2012, p.14). While the analysis of trade flows is used as a complement to our primary analysis, the use of trade flow analysis alone is not sufficient to evaluate the effects of the sanctions. It is unlikely that the ceteris paribus assumption will hold over time, there are simply too many factors that could affect the trade flows. The use of trade flow analysis is viewed as a complement, rather than a substitute in this thesis.

The general equilibrium and partial equilibrium analysis have several advantages over the chosen method. First of using either a partial or general equilibrium model the research can perform the analysis ex ante (Bachetta et al. 2012, p.139). These simulation models also enable us to infer more information about complicated policy effects (Bachetta et al. 2012, p.140). Furthermore, these models are compatible with the gravity model. One might ask why the gravity equation is the method used in this thesis? What the gravity equation lacks in ex dante predictability it makes up in simplicity and reliability. In our case the ex dante assessment is not of interest either, as the sanctions now have been implemented since 2014, and data is available. But the greatest advantage the gravity equation has over simulation models is the wide range of diagnostics that can be made on the models.

Simulation models require great theoretical foundation (of course, statistics requires this too), as you are not able to run diagnostics on the model (Bachetta et al. 2012, p.139). The only robustness checks you can run on a simulation model is running it through different parameters to check the sensitivity of the estimations, but other than that you can only trust the model (Bachetta et al. 2012, p.139).

3. Data and Methodology

3.1 Data and sources

The data sources were chosen based on availability and accuracy. As we are using a gravity model the two main factors are distance between two countries and their GDP for each year. We also need yearly GDP for all countries. Since we want to measure trade diversion, trade flows between country pairs are required as well.

Choosing a time span for the model has two aspects, the time frame and the interval. As we are looking at sanctions and trade, we defined the relevant years for the research question to be 2009-2018. By doing this we reach a few years before the Ukraine crisis, as well as a few years after. The reason for not selecting an earlier year being the 2008 crisis possibly causing interference with the model and requiring extra adjustment and dummy variables to handle. What ultimately limits our choice is the lack of accessible data post 2018. Selection of earlier years is not possible either, due to having to control for various other factors that are independent of the sanctions.

Looking at the interval, there was data available for all our needs both quarterly and yearly up until 2019. However, GDP is reported in local currencies in quarterly data from most sources. Using quarterly data would have a few advantages in level of detail, however, looking at international trade, adjustments are commonly slow. For these reasons and to avoid adding currencies as a factor to control for as well as conversions, yearly data was chosen.

For GDP, the world bank provides yearly data for most countries on a yearly basis up until 2018. Fitting our requirements with being reported in US$ and having enough countries for our model, about the same as the other datasets, this source was chosen. (World Bank, “GDP”)

From GeoDist we obtain dummy variables commonly used in gravity models. The variables include, among others, distances, community of borders, language, colonial history for 225 countries. As we are using a gravity model as the baseline of our model, these variables come in handy. Distance being the most important factor, but in optimizing our model, several of the other variables will be of use as control factors (Mayer & Zignago, 2011).

CEPII provides several databases, in addition to GeoDist mentioned earlier we also use BACI. BACI provides data on bilateral trade flows for over 5000 products and over 200 countries. As we are looking to define the effects on trade caused by sanctions and possible trade diversion as an effect.

Having bilateral trade flows for country pairs is of essence. BACI contains trade flows up until 2018 and was the database limiting the end year. It was therefore chosen in combination with it being easy to handle in the model. To fit the model time interval, we had to use HS07 classifications of products, being available from 2007-2018. (CEPII, BACI)

3.2 Choice of variables

Following our discussion of the gravity model, we conclude that the main ways that gravity models differ is with the use of fixed effects. The most regular fixed effects to apply in the model are:

1) Time invariant country pair
2) Importer time variant fixed effects
3) Exporter time variant fixed effects
4) Yearly

As discussed inte “The gravity model” the derivation of the gravity model by Anderson & Wincoop (2003) requires that the multilateral trade resistance is controlled for. The mtr term is the variable that the exporter or importer faces against the rest of the world, and is controlled for by applying 2) (Importer time variant fixed effects) and 3) (Importer time variant fixed effects). This is required for an so called theory consistent “structured” gravity model

However, this would omit our “onesanction” variable as it is a trade resistance that the parties face against the rest of the world. It is possible to include 1) in a model of 2) and 3), this will likely yield the most accurate estimate of the sanctions, and will be included in one of our main models.

For our second model, which aims to estimate the trade diversions. A combination of 1) and 4) will be used. One might ask why we will not use time variant pair fixed effects, and the reason is simple - it would absorb all effects. The combinations of pair time invariant and yearly fixed effects will however not do that.

Our two models thus differ in the way we apply fixed effects. The first model applies importer and exporter time varying fixed effects alongside pair time invariant fixed effects. This models to provide an accurate measure of the sanctions but will not be able to predict trade diversion.

The second model applies country pair time invariant fixed effects alongside yearly fixed effects. This model will predict not only the effects of the sanctions, but also the trade diversion.

We decided to use two primary models as the two estimates of the sanctions will probably, with the first model being theory consistent, and probably more accurate. The second model aims to measure the degree of trade diversion, but isn't consistent with the Anderson & Wincoop (2003) derivation of the gravity model. This is because the second model does not control for multilateral trade resistance, and therefore is not consistent with theory.

The application of our fixed effects in both of our models will require an adequate understanding of what a fixed effect is and what it controls for. What the fixed effects include, and what kind of control variables will have to be implemented to complement the fixed effects depends on the model Here is an explanation of our two models and what the fixed effects in each one absorbs.

Model 1. Time invariant country pair fixed effects, importer and exporter time variant fixed effects:

These fixed effects control for variation between country pairs that do not vary over time, such as distance and similar variables that explain the relationships between two countries that do not change. The importer and exporter time variant effects absorb all the variations that are specific to one of the countries in a country pair, such as GDP and other factors that would describe each individual country in the country pair.

Model 2. Time invariant country pair fixed effects and yearly fixed effects:

These fixed effects will control for all effects that are specific to a country pair that does not change over time. Variables such as distance and contiguity between the two countries are thus redundant. However, country specific factors are not controlled for so GDP for each country in the country pair must be included.

3.3.1 Trade cost variables

Here, we decided to select the relevant variables from Mayer & Zignago (2011), which we will cover in this chapter. Trade costs variables are typically time invariant and pair specific. These variables explain why the trade costs are higher or lower between different country pairs. These will not be needed in our two primary models as these are absorbed in our time invariant country pair fixed effects, which we apply in both our primary models. These will however need to be applied in our robustness check when we do not apply our country pair time invariant fixed effects

Table 1: Additional Variables For The Intuitive Model

Variable	Description
Contiguity	Dummy variable =1 if two countries share the same border. The theory here is that two countries that are neighbors will trade more with each other because the proximity of the countries will lead to lower transport costs.
Common official language	Dummy variable =1 if two countries share an official language. If two countries share a common language the information costs will probably be lower.
Common minority language	Binary variable =1 if at least 9% of both populations speak a common language. This will probably affect the information costs between two countries.
Colony	Dummy variable =1 if the countries have ever been in a colonial relationship . A colonial history might increase the trade between the two countries because the colonizers might have special rules for the countries that were colonized.
Common colonizer	Binary variable =1 if both countries have colonized the same countries. This is assumed to increase trade because both countries might have acquired certain customs from the colonized country, which they now share with each other.

Distance is one of the more controversial variables included, because there are many legitimate ways to measure it. Our primary models will have pair time invariant fixed effects applied and thus circumvent this issue.

Meyer & Zignago (2011) included three different measures of distance, as distance is one of the more controversial variables usually included in gravity models, all measures are in km. The choices are

1) Distance between the greatest cities in each country, measured in population
2) Distance between the two countries capitals
3) "weighted" distance where the 25 greatest cities, as measured by population are weighted according to their size between the two countries.

There are some ways we could go about selecting the correct distance variable. We decided to investigate which one have the highest correlation with Exports

Table 2: Correlation of Exports and distance. Table generated with Shah (2018)

Variables	(1)	(2)	(3)	(4)
(1) Exports	1.000			
(2) dist	-0.025	1.000		
(3) distcap	-0.025	0.999	1.000	
(4) distw	-0.024	0.998	0.999	1.000

In table 2 we can see that they are highly correlated with each other and have similar correlation with trade flows. However, as the relationship is nonlinear this does not say too much about the relationship of distance and trade. In table 3 all variables are logarithmically transformed.

Table 3: Correlation of logarithm of trade and distance . Table generated with Shah (2018)

Variables	(1)	(2)	(3)	(4)
(1) log exports	1.000			
(2) ldist	-0.271	1.000		
(3) ldistcap	-0.273	0.998	1.000	
(4) ldistw	-0.266	0.995	0.996	1.000

As we can see, the distance measures are still highly correlated with each other. But the distance between the capitals seems to have the greatest correlation with trade, and therefore we are going to

use the distance between capitals. There is a stable theoretical foundation in using either one, so we select the one with the highest correlation. In testing the different distance variables in our regression models we observe extremely similar results. This suggests that the selection has minimal impact on results regardless.

As noted earlier, all these variables are "trade costs" and could be absorbed in country pairs time invariant fixed effects, as these do not vary over our chosen time period. We decided to use bilateral trade (covered in 3.3.3 Dependent variable), which means that country a and b forms a "country pair". Country A exports and country B imports. This is the case for all our observations. The fixed effects are basically a dummy coding of each of the country pairs, resulting in each of the country pairs getting an individual intercept. The implication is thus that all variation of country pairs is then controlled for via the fixed effects, making "trade costs" variables redundant, and if they were to be included in the regression, they would be omitted due to perfect collinearity with the fixed effects.

3.3.2 Size variables

The size of the countries will probably affect how the countries trade with each other, which goes all the way back to the intuitive gravity model. But as the gravity model has progressed, the measure of the sizes of the country varies greatly between different gravity models. Common for almost all gravity models is the inclusion of the gdp, however the measure of gdp can´t be per capita nor adjusted for inflation. Because data on trade isn't available as inflation adjusted or adjusted for population the GDP data needs to be nominal and not per capita. Therefore we selected data by OECD. However, the relationship is not linear between trade and GDP. Table 3 shows the relationship of trade and GDP.

Table 3: Correlation of GDP and trade flow. Table generated with Shah (2018)

Variables	(1)	(2)	(3)
(1) Trade flow	1.000		
(2) GDP of origin	0.090	1.000	
(3) GDP of destination	0.123	-0.033	1.000

The correlation of exports and GDP isn't particularly strong. Log transforming both GDP and exports significantly increases the correlation.

Table 4: Correlation of GDP and trade flow. Table generated with Shah (2018)

Variables	(1)	(2)	(3)
(1) Log Trade Flow	1.000		
(2) Log GDP of origin	0.506	1.000	
(3) Log GDP of destination	0.331	-0.209	1.000

Table 4 shows the correlation between log of Trade and GDP. This relationship is much stronger compared to table 3.

Inflation and population increases will probably have an effect on trade. These effects can be controlled for via importer and exporter time variant effects. However, these fixed effects will absorb all country specific information, alongside gdp. This can be of great benefit because it can be hard to measure all possible factors that measure the "size" of the country. Other factors could include availability of natural resources, size of different sectors etc. Therefore the use of exporter and importer fixed effects comes in handy.

But it can in some cases be prefered to not use importer and exporter fixed effects, for example if the variable of interest is a country specific one. The use of yearly fixed effects can then be used, which will control for year specific changes such as inflation.

Combine the yearly effects with country pair time invariant effects and you'll get fixed effects that control for inflation and all variables that do not change over time, such as the physical size of the country. The years and country pairs fixed effects offer high absorption of fixed effects as well as flexibility, but the drawback of the application of country pairs fixed effects is that the interpretation of the variables included are now only as marginal effects.

3.3.3 Dependent variable

The variable of interest is exports. The data must be collected as bilateral trade flows in order to control for factors that might affect trade. If we were to select more aggregated data, i.e EU, Asia, etc we would not be able to control for multilateral trade resistance nor pair specific factors. Simply put; the use of bilateral trade increases the predictive power of our model.

One challenge with the use of bilateral flows is the availability of the data. The dataset easily becomes large as nt(n-1) trade flows are used. There are a few datasets available that have compiled the required dataset for research purposes, one of those are Mayer & Zignago (2011) , which we chose to use

The trade is measured in USD and is in nominal values, as there are no uniform real exports available currently. As motivated in previous sections trade will be log transformed. Some trade flows are "missing" or zero. This becomes a problem as it is not possible to take the log of 0. We decided to code "missing" or zero values as zeroes. Doing so, we might lose the information that might have been contained in true zeroes flow. Therefore it is an important assumption to understand about this model. The alternatives would be to either replace zero flows with a low value such as 0.0001. Doing so we would be able to include the zero flows, but the problem would then be what values we choose. The value we choose will influence the results, and therefore we decided not to include it. The other option would be to use a non linear estimator. This would complicate a complicated model even further and therefore we decided not to.

To further add to the complexity of the missing values is whether or not they are actual missing values, the "zero trade flows" can either be actual true zeroes, or they could be missing values. If we were to include the zero flows we would have to differentiate the zero flows from the missing values, which is a quite tedious task given our relatively large dataset.

3.3.4 Variable of interest

The policy we want to evaluate is the sanctions by Russia and the EU/USA. Both parties implemented sanctions against each other, both on exports and imports. Therefore this variable can be hard to differentiate the effect of the russian or the eu sanctions. Therefore we decided to use a variable which we will call "sanc" which is = 1 if either the exporter or importer is russia or EU/USA and the year is 2014 or later. The trade diversion is a bit easier to measure, here we will use two variables, "oneeusanc" which is equal to =1 if the exporter is russia and the importer is not EU or USA, the year is 2014 or later and the importer is not an EU country or USA . Similarly a variable named

“onerussanc” is =1 if the exporter is either an eu country or USA,the year is 2014 or later and the importer is not russia.

3.3.5 Selection of countries

The selection of Countries is preferably as large as possible. If only the bilateral trade flows of the countries of interest are included, then you cannot control for trade with “third partner”, furthermore the inclusion of “third country” is essential when investigating trade diversion. Therefore we decided to include all positive trade flows in the database provided by Meyer & Zignago (2011), yielding us a total of 36436 country pairs. But because there are some missing values all country pairs are not included in the entire time period. Instead of listing all country pairs included (which would be around 1000 pages if tabulated) we will tabulate the exporters, importers and how many times each appears in our dataset in appendix 1..

3.3.5 Selection of years

There are some factors to take into account when choosing years. First of all you want to include some years before the policy to measure the variation before, and also some after to see whether or not there is a lagged effect. The upper limit of the selection of years is 2018 as that is as far as the dataset by Meyer & Zignago (2011) is available. The policy was implemented in 2014, therefore data starts from 2009, which yields us ten years of observations.

4. Results

As discussed earlier there are a different set of advantages and disadvantages between the choice of different gravity models. A structured, theory consistent model has the advantage of not only being theory consistent, but also controlling for most of the possible factors. However, due to the fixed effects constraints of the model there is not much of the variation left to explain. The structured model should give the most accurate estimates of the sanctions, but it cannot estimate the trade diversion. Therefore, we are going to use additional models that can measure these effects but are not theory consistent.

When interpreting the model, please keep in mind that the dependent variable is in logarithmic form. The interpretation of variables that are not transformed (in our case only gdp is an independent and transformed variable) is made such as exp(b)-1 where b is the regression coefficient of the non-transformed variable. Also, the interpretation of non-logarithmic variables in this model is such

as a percentage increase. Assume that the binary variable "sanction" has a coefficient of -0.5, the effect on trade of "sanction" then becomes a decrease of 39.34% (exp(-0.5)-1=-.3934).

We have decided to use two primary models which will be presented in this chapter. We will however also perform some robustness checks with some alternative models further down.

Table 5: Regression results. Analysis made with Correia (2017), table generated with Shah (2018)

	(1)	(2)
	Full	Pair & Time
sanc	-0.382***	-0.100*
	(0.109)	(0.052)
sanclag1	-0.269*	-0.223*
	(0.157)	(0.134)
sanclag2	-0.104	0.012
	(0.116)	(0.049)
sanclag3	-0.038	-0.025
	(0.107)	(0.059)
sanclag4	-0.070	0.088
	(0.155)	(0.111)
onerussanc		0.038
		(0.026)
onerussanclag1		0.100***
		(0.028)
onerussanclag2		0.049*
		(0.026)
onerussanclag3		0.036

		(0.028)
onerussanclag4		-0.032
		(0.028)
oneeusanc		0.354**
		(0.149)
oneeusanclag1		0.165
		(0.134)
oneeusanclag2		0.033
		(0.158)
oneeusanclag3		0.082
		(0.104)
oneeusanclag4		0.314**
		(0.156)
lgdpo		0.065
		(0.065)
lgdpd		0.529***
		(0.052)
_cons	7.586***	-7.063***
	(0.000)	(2.080)
Obs.	137895	123647
R-squared	0.915	0.912

Country pair clustered standard errors are in parenthesis

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

In Table 5 we can see the results from our two primary models. Model 1; the “Full” model with Importer & Exporter time variant fixed effects and country pairs time variant fixed effects. Ande model two with the country pair time invariant fixed effects and yearly fixed effects.

From the variable “sanc” we can interpret what the effect of sanctions were on the trade flows. Model 1 produces the result -0.382, which we will put in the formula (e^-0.382)-1, we can now interpret this as a percentage decrease of trade at -31.75% as an initial effect of the sanctions at the 1% significance level.

To investigate the lagged effect we introduced lagged variables. Of the lagged sanction variables we can see that only sanclag1 reaches any significance level. Sanclag1 obtains the value -0.269, using the formula (e^-0.269)-1 we can interpret it as an -23.56% reduction of trade as an lagged effect of sanction at the 10% significance level.

Moving on to our second model with country pair time invariant and yearly fixed effects the results of when the reduction took place is consistent with the previous model, but the strength and significance of the estimates is slightly lower than the previous model. Model 2 estimates sanc to -0.1, which is interpreted as 9.52% ((e^-0.1)-1) at the 10% significance level.

One year after the sanctions are implemented the second model estimates the effect of sanclag1 to -0.233, which is interpreted as an reduction of exports with -19.99% ((e^-0.233)-1)

The trade diversion is measured via “onerussanc” and “oneeusanc” alongsides lagged variables. One “russanc” measures the trade diversion of the EU and USA as an result of russian sanctions while “oneeusanc” measures the diversion of Russian trade as an result of EU and US sanctions. As explained in the previous section the trade diversion is absorbed via the fixed effects in model 1 so only our estimates are only from model 2.

The initial trade diversion for Russia is measured by oneeusanc and is estimated to 0.354, which corresponds to an increase of 42.48% ((e^0.354)-1) with non sanctioned trade partners at a significance level of 5%. The lagged effects were not as great the following years as oneeusanc 1-3 is insignificant. However, oneeusanc4 is significant at the 5% value with an estimate of 0.314, which is interpreted as an increase of 36.89% ((e^0.314)-1) with non-sanctioned partners four years after the sanctions were implemented.

The EU and US trade diversion started a year after the sanctions. Onerussanclag1 assumes the value 0.1, which is a 10.58% increase of trade with non sanctioned partners for the EU and US at the 1% significance level.

Two years after the sanctions, the trade was further diverted when onerussanclag2 assumed the value 0.049 at the 10% significance level. The EU and US trade increased with 5.02% ((e^0.049)-1) with non-sanctioned countries two years after the sanctions were implemented.

4.1 Robustness

Our findings are interesting in several ways, therefore we will conduct some robustness checks of our models to see whether or not they are sane. Our first question is; why do the estimates of the sanctions differ so greatly between the two models? The lagged effects seem similar to sanctions so it is the initial effects of the sanctions that must have been absorbed by some other variable. Another possibility is that the second model is the correct one. Both models have a similar R^2 value, which indicates that we successfully obtained much of the importer and exporter fixed effects via our variables. The bias of the selection of countries might be higher in the second model, because it requires that more variables are not missing. In many ways the first model is an elegant model which does not require as many variables. Which countries might have been omitted from the second model? Probably countries that do present their GDP in OECD, as this is the only variable in the second model that is not generated by us.

Table 6: Descriptive Statistics Statistics Of Exports When GDP Is Missing. Table generated with Shah (2018)

Variable	Obs	Mean	Std.Dev.	Min	Max
Exports	31215	158000	1710000	0.0001885	6.46e+07

Table 7: Descriptive Statistics Statistics Of Exports. Table generated with Shah (2018)

Variable	Obs	Mean	Std.Dev.	Min	Max
Exports	268000	499000	7400000	0.0000669	9.98e+08

Table 8: Descriptive Statistics Statistics Of Exports if GDP is not missing. Table generated with Shah (2018)

Variable	Obs	Mean	Std.Dev.	Min	Max
Exports	237000	544000	7850000	.0000669	9.98e+08

Reviewing the summary statistics of trade in table 6 and 7 we can draw some conclusions. Table 6 shows that the country pairs that have a missing gdp typically have lower trade flows than our full sample (comparing table 6 with table 7). Model two typically omits country pairs with lower trade flows. This shows the power of a "fully" fixed effects approach, it does not omit country pairs that typically have lower exports. In addition to that we could not include zero trade flows at all in our analysis as it is not possible to take the log of 0. The effect of the exclusions of some trade flows results in a slightly higher variance in the exports in model 2 and a slightly higher mean (comparing the values in table 7 and table 8.

Another result that seems interesting to us is the fact that the gdp of the origin (lgdpo) has an insignificant effect on trade. Our initial thought is that some variable absorbs the effect of the gdp in the origin.

Table 9: covariance of non lagged variables in model 2. Table generated with Shah (2018)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) log exports	1.000					
(2) lgdpo	0.506	1.000				
(3) lgdpd	0.331	-0.209	1.000			
(4) sanc	0.050	0.030	0.031	1.000		
(5) oneeusanc	0.052	0.079	-0.014	-0.002	1.000	
(6) onerussanc	0.111	0.172	-0.060	0.045	-0.018	1.000

From table 9 we can see that onerussanc and the gdp of the origin have a certain degree of positive covariance. It is possible that "onerussanc" absorbs some of the effects "lgdpo" in our model. which would lead to an overestimated "onerussanc" because it steals some of the variance from GDP of the exporter. It is highly likely in fact.

Another concern of ours is that we were interested in the lagged effects of the trade sanctions, and our dataset is unbalanced. When merging different datasets it will inevitably be some dataset which misses at least some variables, and some information cannot simply be obtained. While our solution to the gravity model is elegant and circumvents many of the problems of the omitted variables bias, our model will still have some bias. Another point of contention is that our main specification omits countries that do not have observations in subsequent years. Our specification requires that countries have no missing variables between 2014-2018, and because our dataset is unbalanced our model omits several observations. Our solution to this is to present two secondary models which do not include lagged variables, and thus including more observations.

Table 10 : Regression results without lagged effects. Analysis made with Correia (2017), table generated with Shah (2018)

	(3)	(4)
	Full	Pair & Time
sanc	-0.636***	-0.256***
	(0.117)	(0.093)
lgdpo		0.251***
		(0.041)
lgdpd		0.492***
		(0.037)
onerussanc		0.183***
		(0.022)
oneeusanc		0.629***
		(0.123)

_cons	7.097***	-11.415***
	(0.000)	(1.372)
Obs.	234594	234596
R-squared	0.889	0.882

Country pair clustered standard errors are in parenthesis

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

Removing the lagged variables we get a slight decrease of R^2 values, even though our observations are significantly increased. But the usability of the model is somewhat reduced, as our specification with fixed effects can only measure marginal effects. The implication is that all coefficients are discrete changes, not effects over time. However, comparing model 1 (from table 5) & 3 (from table 10) we can note that the effect of sanction is much higher according to model 3, sanctions led to a trade reduction of -47.06% according to this specification, compared to -39.75% in model 1.

Comparing model 4 from table 10 with model 2 from table 5 we can see that the estimate of sanctions is now -22.58% (model 4) compared with -9.51% in model 2. Model 2 produced insignificant results of the EU and USA , while model 4 estimates a trade diversion of 20.08%. The trade diversion for russia in model 2 was 42.48%, model 4 shows a trade diversion of 87.57%

The general pattern is clear, when lagged variables are included the effects of sanctions(and diversions) is increased significantly. It is entirely possible that the smaller economies that were omitted from table four were those countries that received the greatest trade diversion.

Another objection to our main models could be that the fixed effects simply absorb too much information. This could be a concern if the gravity variables by themselves are of interest. So we will therefore present two models with only yearly fixed effects applied, one with lagged variables and one without. These models are complemented with the appropriate trade cost and size variables covered in our method.

Table 11: Basic models. Analysis made with Correia (2017), table generated with Shah (2018)

	(5)	(6)
	No lagged variables	Lagged variables
sanc	0.302	0.233
	(0.294)	(0.233)
onerussanc	0.426***	0.092**
	(0.037)	(0.043)
oneeusanc	1.025***	0.322
	(0.202)	(0.240)
ldistcap	-1.503***	-1.470***
	(0.021)	(0.023)
contig	1.442***	1.429***
	(0.116)	(0.117)
comlang_off	0.359***	0.153*
	(0.083)	(0.089)
comlang_ethno	0.526***	0.568***
	(0.081)	(0.086)
colony	0.693***	0.609***
	(0.120)	(0.120)
comcol	1.079***	1.107***
	(0.062)	(0.068)
lgdpo	1.305***	1.270***

	(0.007)	(0.009)
lgdpd	0.989***	0.967***
	(0.008)	(0.008)
sanclag1		0.081
		(0.150)
sanclag2		0.095*
		(0.053)
sanclag3		-0.148**
		(0.062)
sanclag4		0.047
		(0.115)
onerussanclag1		0.189***
		(0.032)
onerussanclag2		0.047
		(0.031)
onerussanclag3		0.099***
		(0.032)
onerussanclag4		0.011
		(0.032)
oneeusanclag1		0.607***
		(0.144)
oneeusanclag2		0.182
		(0.163)
oneeusanclag3		0.100

		(0.150)
oneeusanclag4		0.401**
		(0.181)
_cons	-37.368***	-36.054***
	(0.351)	(0.390)
Obs.	221160	117129
R-squared	0.564	0.550

Standard errors are in parenthesis

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

The conclusions we can draw from table 11 is that (pair and or importer & exporter) fixed effects significantly increase the R^2 values of the model. The general direction of the coefficients is similar to previous models. What makes this model a bit dubious is the fact that sanctions do not have an effect until for years after they are implemented, which does not make any sense. With relatively low R^2 values alongside that fact makes this model useless, and once again strengthens our choice of specification.

As the famous saying goes, "all models are incorrect, but some are useful", our models estimates have major variations depending on the specification. But our main specification in table 5 provides useful information which we can draw conclusions from.

5. Conclusions

Looking at our question of how the sanctions have affected Russian trade, we can first conclude that they have so far been inefficient. Russia continued with their annexation of Crimea. So far they have made no attempts to comply with the critique from the rest of the world. Our findings in the research indicate that sanctions have resulted in a significant trade diversion and have greatly affected trade. Russia has expanded trade with existing trade partners and trade with the EU remains lower. A country like Russia being multilaterally sanctioned, and possibly counter sanctioning, can be

predicted to divert trade from the sanctioning country. Trade does not stop entirely, and is over time moved elsewhere. In a multilateral and bilateral sanction, like this scenario, both countries appear to divert trade that no longer is possible with the sanctioned country. So while sanctions are effective in the short term, the trade diversion that they result in creates new trade partners for the country affected and strengthens existing trade relationships. As countries do not simply stop producing goods due to a sanction and businesses keeping stock, the effect is drastic shortly after the sanction. New buyers and sellers must be found. The lagged effect shows this because it proves that adjustments take time, and sanctions imposed for a long time have a decreasing effect. Some parts of trade return to the sanctioning country, and other parts do not.

Important aspects are the size of the country being sanctioned. Russia is commonly regarded as an economic powerhouse due to their size and power. However, being a country that has always had rough relations with the western economies yet still being close to the EU, trade with these countries where relations are harsh is still important. Especially the import of food. As stated earlier, sanctions are commonly targeting weaker countries in the developing world. Russia is not one of them, making this a special case. Russia has both the power and size to quickly adapt their domestic production and international trade. Bordering to both China and the EU gives Russia flexibility on large trade partners, enabling and making trade diversion easier.

Most of Russia’s imports from the EU was food. Being able to quickly adapt and starting to produce domestically, but also importing from other bordering countries in Asia, Russia was able to quickly divert their trade and minimize the effects of the sanctions. Their own sanctions against the EU were the most adverse sanctions, and should probably be considered a statement to Russia's independence of the rest of the world, and a plausible desire to become more self-sufficient.

The importance of the study stems in these sanctions against Russia being different from previous sanctions against other countries because of Russia's power and possibility to refuse to comply with the reasons behind the sanctions. But also Russia’s reaction to the sanction and refusal to comply. So how Russia acts and counteracts the negative effects is interesting to study. If for example the EU and US would at some time impose similar economic sanctions on China, which would be more similar to sanctions against Russia than for example a country like Haiti. Research in this area could therefore be valuable in predicting how a large economy responds and acts after being targeted by similar sanctions.

5.1 Further research

Further research could be made in Russian domestic production and the changes that they have had to make as an effect of these sanctions. Presumably these sanctions may have forced and allowed Russia to become more independent. Reducing their trade in general, primarily imports, and rather producing goods for themselves. Some adaptations of the gravity model choose to not only include international trade but also intra national trade. As Russia is a large country by most measures it is likely that the sanction increased the trade within Russia.

The effects sanctions have on trade within a country in an increasingly globalized world would be interesting to research. As most developed countries tend to move production abroad, and heavily rely on imports from around the world, domestic production and trade is likely to be affected. In the case of Russia, a few years later facing a global pandemic, these sanctions starting 2014 could possibly have been advantageous for Russia. They have been unable to rely on international imports from the EU for several years.

Further research could focus on sanctions in general. The scope of our thesis was only a single policy, the "general" effect of sanctions would be interesting to research. As Russia is a large economy, it would be interesting to see how a small economy that cannot divert trade inwards as easily would adapt by diverting trade as well as making economic and domestic production adjustments. With less options of trade partners and less economic power, adapting is likely much harder to do.

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Appendix 1

Table A1: Exporters

The tabulation was made with the help of Bern's (2003) command "bigtab" which allows the tabulation of many categories alongside the asdoc command written by Shah (2018)

Exporter	freq	pct	cumfreq	cumpct
ABW	632	0.240	632	0.240
AFG	980	0.370	1612	0.600
AGO	994	0.370	2606	0.970
AIA	458	0.170	3064	1.140
ALB	1220	0.450	4284	1.600
AND	1125	0.420	5409	2.020
ANT	184	0.070	5593	2.090
ARE	1812	0.680	7405	2.760
ARG	1806	0.670	9211	3.430
ARM	1072	0.400	10283	3.830

ASM	592	0.220	10875	4.050
ATA	887	0.330	11762	4.390
ATF	218	0.080	11980	4.470
AUS	2068	0.770	14048	5.240
AUT	2058	0.770	16106	6.010
AZE	1163	0.430	17269	6.440
BDI	715	0.270	17984	6.710
BEL	2127	0.790	20111	7.500
BEN	903	0.340	21014	7.840
BES	63	0.020	21077	7.860
BFA	1057	0.390	22134	8.250
BGD	1675	0.620	23809	8.880
BGR	1886	0.700	25695	9.580
BHR	1436	0.540	27131	10.120
BHS	1101	0.410	28232	10.530

BIH	1453	0.540	29685	11.070
BLM	116	0.040	29801	11.110
BLR	1565	0.580	31366	11.700
BLZ	1057	0.390	32423	12.090
BMU	648	0.240	33071	12.330
BOL	1228	0.460	34299	12.790
BRA	2059	0.770	36358	13.560
BRB	912	0.340	37270	13.900
BRN	810	0.300	38080	14.200
BTN	485	0.180	38565	14.380
CAF	828	0.310	39393	14.690
CAN	2093	0.780	41486	15.470
CCK	419	0.160	41905	15.620
CHE	2106	0.790	44011	16.410
CHL	1811	0.680	45822	17.090

CHN	2039	0.760	47861	17.850
CIV	1566	0.580	49427	18.430
CMR	1281	0.480	50708	18.910
COD	833	0.310	51541	19.220
COG	994	0.370	52535	19.590
COK	419	0.160	52954	19.740
COL	1791	0.670	54745	20.410
COM	679	0.250	55424	20.670
CPV	703	0.260	56127	20.930
CRI	1628	0.610	57755	21.530
CUB	1199	0.450	58954	21.980
CUW	702	0.260	59656	22.240
CXR	317	0.120	59973	22.360
CYM	613	0.230	60586	22.590
CYP	1794	0.670	62380	23.260

CZE	1962	0.730	64342	23.990
DEU	2151	0.800	66493	24.790
DJI	659	0.250	67152	25.040
DMA	904	0.340	68056	25.380
DNK	2092	0.780	70148	26.160
DOM	1510	0.560	71658	26.720
DZA	1316	0.490	72974	27.210
ECU	1616	0.600	74590	27.810
EGY	1750	0.650	76340	28.460
ERI	571	0.210	76911	28.680
ESP	2100	0.780	79011	29.460
EST	1707	0.640	80718	30.100
ETH	1420	0.530	82138	30.630
FIN	2007	0.750	84145	31.370
FJI	1148	0.430	85293	31.800

FLK	458	0.170	85751	31.970
FRA	2139	0.800	87890	32.770
FSM	302	0.110	88192	32.880
GAB	1011	0.380	89203	33.260
GBR	2158	0.800	91361	34.060
GEO	1408	0.520	92769	34.590
GHA	1412	0.530	94181	35.120
GIB	720	0.270	94901	35.380
GIN	929	0.350	95830	35.730
GMB	815	0.300	96645	36.030
GNB	414	0.150	97059	36.190
GNQ	561	0.210	97620	36.400
GRC	1970	0.730	99590	37.130
GRD	606	0.230	100196	37.360
GRL	510	0.190	100706	37.550

GTM	1515	0.560	102221	38.110
GUM	402	0.150	102623	38.260
GUY	1136	0.420	103759	38.690
HKG	1939	0.720	105698	39.410
HND	1339	0.500	107037	39.910
HRV	1750	0.650	108787	40.560
HTI	908	0.340	109695	40.900
HUN	1908	0.710	111603	41.610
IDN	2000	0.750	113603	42.360
IND	2113	0.790	115716	43.150
IOT	347	0.130	116063	43.270
IRL	1987	0.740	118050	44.020
IRN	1409	0.530	119459	44.540
IRQ	779	0.290	120238	44.830
ISL	1540	0.570	121778	45.410

ISR	1840	0.690	123618	46.090
ITA	2135	0.800	125753	46.890
JAM	1334	0.500	127087	47.390
JOR	1573	0.590	128660	47.970
JPN	2072	0.770	130732	48.740
KAZ	1233	0.460	131965	49.200
KEN	1503	0.560	133468	49.760
KGZ	958	0.360	134426	50.120
KHM	1479	0.550	135905	50.670
KIR	363	0.140	136268	50.810
KNA	715	0.270	136983	51.070
KOR	2099	0.780	139082	51.860
KWT	1376	0.510	140458	52.370
LAO	1061	0.400	141519	52.770
LBN	1694	0.630	143213	53.400

LBR	806	0.300	144019	53.700
LBY	772	0.290	144791	53.990
LCA	643	0.240	145434	54.230
LKA	1832	0.680	147266	54.910
LTU	1804	0.670	149070	55.580
LVA	1822	0.680	150892	56.260
MAC	1009	0.380	151901	56.640
MAR	1507	0.560	153408	57.200
MDA	1262	0.470	154670	57.670
MDG	1432	0.530	156102	58.200
MDV	653	0.240	156755	58.450
MEX	1936	0.720	158691	59.170
MHL	552	0.210	159243	59.370
MKD	1269	0.470	160512	59.850
MLI	1096	0.410	161608	60.260

MLT	1665	0.620	163273	60.880
MMR	1330	0.500	164603	61.370
MNE	830	0.310	165433	61.680
MNG	825	0.310	166258	61.990
MNP	263	0.100	166521	62.090
MOZ	1152	0.430	167673	62.520
MRT	1066	0.400	168739	62.920
MSR	385	0.140	169124	63.060
MUS	1529	0.570	170653	63.630
MWI	1200	0.450	171853	64.080
MYS	2097	0.780	173950	64.860
N/A	2064	0.770	176014	65.630
NCL	818	0.300	176832	65.930
NER	1078	0.400	177910	66.330
NFK	244	0.090	178154	66.430

NGA	1494	0.560	179648	66.980
NIC	1325	0.490	180973	67.480
NIU	325	0.120	181298	67.600
NLD	2152	0.800	183450	68.400
NOR	1992	0.740	185442	69.140
NPL	1265	0.470	186707	69.610
NRU	506	0.190	187213	69.800
NZL	2047	0.760	189260	70.570
OMN	1412	0.530	190672	71.090
PAK	1933	0.720	192605	71.810
PAN	1423	0.530	194028	72.340
PCN	285	0.110	194313	72.450
PER	1778	0.660	196091	73.110
PHL	1524	0.570	197615	73.680
PLW	265	0.100	197880	73.780

PNG	787	0.290	198667	74.070
POL	2000	0.750	200667	74.820
PRK	1091	0.410	201758	75.230
PRT	1946	0.730	203704	75.950
PRY	1362	0.510	205066	76.460
PSE	686	0.260	205752	76.720
PYF	669	0.250	206421	76.970
QAT	1367	0.510	207788	77.480
ROU	1850	0.690	209638	78.160
RUS	1853	0.690	211491	78.860
RWA	945	0.350	212436	79.210
SAU	1778	0.660	214214	79.870
SDN	1129	0.420	215343	80.290
SEN	1490	0.560	216833	80.850
SGP	2013	0.750	218846	81.600

SHN	473	0.180	219319	81.770
SLB	531	0.200	219850	81.970
SLE	1022	0.380	220872	82.350
SLV	1323	0.490	222195	82.850
SMR	786	0.290	222981	83.140
SOM	616	0.230	223597	83.370
SPM	182	0.070	223779	83.440
SRB	1608	0.600	225387	84.040
SSD	176	0.070	225563	84.100
STP	529	0.200	226092	84.300
SUR	1090	0.410	227182	84.710
SVK	1848	0.690	229030	85.400
SVN	1846	0.690	230876	86.080
SWE	2094	0.780	232970	86.860
SXM	173	0.060	233143	86.930

SYC	1017	0.380	234160	87.310
SYR	1183	0.440	235343	87.750
TCA	592	0.220	235935	87.970
TCD	611	0.230	236546	88.200
TGO	1011	0.380	237557	88.570
THA	2129	0.790	239686	89.370
TJK	689	0.260	240375	89.630
TKL	620	0.230	240995	89.860
TKM	776	0.290	241771	90.150
TLS	413	0.150	242184	90.300
TON	365	0.140	242549	90.440
TTO	1326	0.490	243875	90.930
TUN	1630	0.610	245505	91.540
TUR	2036	0.760	247541	92.300
TUV	289	0.110	247830	92.400

TZA	1540	0.570	249370	92.980
UGA	1400	0.520	250770	93.500
UKR	1749	0.650	252519	94.150
URY	1675	0.620	254194	94.780
USA	2138	0.800	256332	95.570
UZB	911	0.340	257243	95.910
VCT	701	0.260	257944	96.180
VEN	1143	0.430	259087	96.600
VGB	851	0.320	259938	96.920
VNM	1643	0.610	261581	97.530
VUT	479	0.180	262060	97.710
WLF	189	0.070	262249	97.780
WSM	563	0.210	262812	97.990
YEM	963	0.360	263775	98.350
ZAF	2087	0.780	265862	99.130

ZMB	1120	0.420	266982	99.550
ZWE	1218	0.450	268200	100.000

Table A1: Importers

The tabulation was made with the help of Bern's (2003) command "bigtab" which allows the tabulation of many categories alongside the asdoc command written by Shah (2018)

Importer	freq	pct	cumfreq	cumpct
ABW	760	0.280	760	0.280
AFG	904	0.340	1664	0.620
AGO	1721	0.640	3385	1.260
AIA	510	0.190	3895	1.450
ALB	1210	0.450	5105	1.900
AND	1148	0.430	6253	2.330
ANT	175	0.070	6428	2.400
ARE	1709	0.640	8137	3.030
ARG	1538	0.570	9675	3.610

ARM	1356	0.510	11031	4.110
ASM	416	0.160	11447	4.270
ATA	1057	0.390	12504	4.660
ATF	323	0.120	12827	4.780
AUS	2064	0.770	14891	5.550
AUT	1942	0.720	16833	6.280
AZE	1355	0.510	18188	6.780
BDI	967	0.360	19155	7.140
BEL	2071	0.770	21226	7.910
BEN	1232	0.460	22458	8.370
BES	159	0.060	22617	8.430
BFA	1351	0.500	23968	8.940
BGD	1488	0.550	25456	9.490
BGR	1570	0.590	27026	10.080
BHR	1721	0.640	28747	10.720

BHS	1005	0.370	29752	11.090
BIH	1574	0.590	31326	11.680
BLM	113	0.040	31439	11.720
BLR	1527	0.570	32966	12.290
BLZ	1052	0.390	34018	12.680
BMU	1014	0.380	35032	13.060
BOL	1273	0.470	36305	13.540
BRA	1923	0.720	38228	14.250
BRB	799	0.300	39027	14.550
BRN	1123	0.420	40150	14.970
BTN	492	0.180	40642	15.150
CAF	909	0.340	41551	15.490
CAN	2074	0.770	43625	16.270
CCK	155	0.060	43780	16.320
CHE	1969	0.730	45749	17.060

CHL	1605	0.600	47354	17.660
CHN	1984	0.740	49338	18.400
CIV	1571	0.590	50909	18.980
CMR	1292	0.480	52201	19.460
COD	874	0.330	53075	19.790
COG	1066	0.400	54141	20.190
COK	428	0.160	54569	20.350
COL	1769	0.660	56338	21.010
COM	726	0.270	57064	21.280
CPV	990	0.370	58054	21.650
CRI	1589	0.590	59643	22.240
CUB	902	0.340	60545	22.570
CUW	693	0.260	61238	22.830
CXR	166	0.060	61404	22.890
CYM	690	0.260	62094	23.150

CYP	1403	0.520	63497	23.680
CZE	2078	0.770	65575	24.450
DEU	2063	0.770	67638	25.220
DJI	842	0.310	68480	25.530
DMA	855	0.320	69335	25.850
DNK	1888	0.700	71223	26.560
DOM	1599	0.600	72822	27.150
DZA	1510	0.560	74332	27.720
ECU	1559	0.580	75891	28.300
EGY	1680	0.630	77571	28.920
ERI	592	0.220	78163	29.140
ESP	2053	0.770	80216	29.910
EST	1523	0.570	81739	30.480
ETH	1366	0.510	83105	30.990
FIN	1761	0.660	84866	31.640

FJI	1252	0.470	86118	32.110
FLK	293	0.110	86411	32.220
FRA	2164	0.810	88575	33.030
FSM	331	0.120	88906	33.150
GAB	994	0.370	89900	33.520
GBR	2122	0.790	92022	34.310
GEO	1302	0.490	93324	34.800
GHA	1482	0.550	94806	35.350
GIB	669	0.250	95475	35.600
GIN	1062	0.400	96537	35.990
GMB	1097	0.410	97634	36.400
GNB	660	0.250	98294	36.650
GNQ	788	0.290	99082	36.940
GRC	1719	0.640	100801	37.580
GRD	649	0.240	101450	37.830

GRL	993	0.370	102443	38.200
GTM	1257	0.470	103700	38.670
GUM	513	0.190	104213	38.860
GUY	1237	0.460	105450	39.320
HKG	1840	0.690	107290	40.000
HND	1161	0.430	108451	40.440
HRV	1557	0.580	110008	41.020
HTI	873	0.330	110881	41.340
HUN	1523	0.570	112404	41.910
IDN	1908	0.710	114312	42.620
IND	2020	0.750	116332	43.380
IOT	199	0.070	116531	43.450
IRL	1981	0.740	118512	44.190
IRN	1138	0.420	119650	44.610
IRQ	988	0.370	120638	44.980

ISL	1367	0.510	122005	45.490
ISR	1588	0.590	123593	46.080
ITA	2016	0.750	125609	46.830
JAM	1173	0.440	126782	47.270
JOR	1422	0.530	128204	47.800
JPN	2029	0.760	130233	48.560
KAZ	1604	0.600	131837	49.160
KEN	1331	0.500	133168	49.650
KGZ	1134	0.420	134302	50.080
KHM	1098	0.410	135400	50.480
KIR	429	0.160	135829	50.640
KNA	1011	0.380	136840	51.020
KOR	2066	0.770	138906	51.790
KWT	1589	0.590	140495	52.380
LAO	741	0.280	141236	52.660

LBN	1735	0.650	142971	53.310
LBR	972	0.360	143943	53.670
LBY	1009	0.380	144952	54.050
LCA	804	0.300	145756	54.350
LKA	1535	0.570	147291	54.920
LTU	1352	0.500	148643	55.420
LVA	1277	0.480	149920	55.900
MAC	993	0.370	150913	56.270
MAR	1359	0.510	152272	56.780
MDA	1379	0.510	153651	57.290
MDG	1313	0.490	154964	57.780
MDV	928	0.350	155892	58.130
MEX	2087	0.780	157979	58.900
MHL	599	0.220	158578	59.130
MKD	1432	0.530	160010	59.660

MLI	1140	0.430	161150	60.090
MLT	1370	0.510	162520	60.600
MMR	1313	0.490	163833	61.090
MNE	1353	0.500	165186	61.590
MNG	1036	0.390	166222	61.980
MNP	313	0.120	166535	62.090
MOZ	1390	0.520	167925	62.610
MRT	1176	0.440	169101	63.050
MSR	421	0.160	169522	63.210
MUS	1561	0.580	171083	63.790
MWI	1164	0.430	172247	64.220
MYS	1922	0.720	174169	64.940
N/A	2021	0.750	176190	65.690
NCL	1207	0.450	177397	66.140
NER	1207	0.450	178604	66.590

NFK	244	0.090	178848	66.680
NGA	1701	0.630	180549	67.320
NIC	1253	0.470	181802	67.790
NIU	188	0.070	181990	67.860
NLD	2084	0.780	184074	68.630
NOR	1743	0.650	185817	69.280
NPL	1252	0.470	187069	69.750
NRU	320	0.120	187389	69.870
NZL	1943	0.720	189332	70.590
OMN	1226	0.460	190558	71.050
PAK	1945	0.730	192503	71.780
PAN	1220	0.450	193723	72.230
PCN	165	0.060	193888	72.290
PER	1587	0.590	195475	72.880
PHL	1315	0.490	196790	73.370

PLW	460	0.170	197250	73.550
PNG	839	0.310	198089	73.860
POL	2088	0.780	200177	74.640
PRK	781	0.290	200958	74.930
PRT	1733	0.650	202691	75.570
PRY	1215	0.450	203906	76.030
PSE	1102	0.410	205008	76.440
PYF	1056	0.390	206064	76.830
QAT	1288	0.480	207352	77.310
ROU	1525	0.570	208877	77.880
RUS	1875	0.700	210752	78.580
RWA	1231	0.460	211983	79.040
SAU	1767	0.660	213750	79.700
SDN	1465	0.550	215215	80.240
SEN	1510	0.560	216725	80.810

SGP	2000	0.750	218725	81.550
SHN	284	0.110	219009	81.660
SLB	556	0.210	219565	81.870
SLE	1036	0.390	220601	82.250
SLV	1390	0.520	221991	82.770
SMR	526	0.200	222517	82.970
SOM	680	0.250	223197	83.220
SPM	214	0.080	223411	83.300
SRB	1660	0.620	225071	83.920
SSD	300	0.110	225371	84.030
STP	613	0.230	225984	84.260
SUR	1090	0.410	227074	84.670
SVK	1923	0.720	228997	85.380
SVN	1863	0.690	230860	86.080
SWE	1935	0.720	232795	86.800

SXM	260	0.100	233055	86.900
SYC	1118	0.420	234173	87.310
SYR	1028	0.380	235201	87.700
TCA	522	0.190	235723	87.890
TCD	770	0.290	236493	88.180
TGO	1226	0.460	237719	88.630
THA	2059	0.770	239778	89.400
TJK	700	0.260	240478	89.660
TKL	302	0.110	240780	89.780
TKM	728	0.270	241508	90.050
TLS	427	0.160	241935	90.210
TON	574	0.210	242509	90.420
TTO	1354	0.500	243863	90.930
TUN	1536	0.570	245399	91.500
TUR	1963	0.730	247362	92.230

TUV	278	0.100	247640	92.330
TZA	1565	0.580	249205	92.920
UGA	1422	0.530	250627	93.450
UKR	1645	0.610	252272	94.060
URY	1374	0.510	253646	94.570
USA	2110	0.790	255756	95.360
UZB	850	0.320	256606	95.680
VCT	1125	0.420	257731	96.100
VEN	983	0.370	258714	96.460
VGB	787	0.290	259501	96.760
VNM	1514	0.560	261015	97.320
VUT	558	0.210	261573	97.530
WLF	268	0.100	261841	97.630
WSM	616	0.230	262457	97.860
YEM	1142	0.430	263599	98.280

ZAF	2042	0.760	265641	99.050
ZMB	1356	0.510	266997	99.550
ZWE	1203	0.450	268200	100.000