CHARLES UNIVERSITY
FACULTY OF SOCIAL SCIENCES
Institute of Economic Studies

Analysis of Russian efforts to avoid economic sanctions

Bachelor's thesis

Author: Vojtěch Tomšů
Study program: Economics and Finance
Supervisor: Ing. Vilém Semerák, M.A., Ph.D.
Year of defense: 2024

Declaration of Authorship

The author hereby declares that he or she compiled this thesis independently, using only the listed resources and literature, and the thesis has not been used to obtain any other academic title.

The author grants to Charles University permission to reproduce and to distribute copies of this thesis in whole or in part and agrees with the thesis being used for study and scientific purposes.

Prague, July 30, 2024

Vojtěch Tomšů

Abstract

This thesis examines how economic sanctions between 2014 and 2022 have affected Russian international trade. This thesis scrutinises detailed trade data and executes econometric analysis for all sanction rounds in the selected period, presenting how the sanctions can be evaded in both long and short terms. The methods used for the gravity model of trade are Fixed Effects OLS and PPML, based on the gravity dataset provided by CEPII and the third release of the Global Sanction Database. The resulting estimates do not show any significant effects on Russian trade between 2014 and 2022, and the results of the trade analysis on the example of the Czech Republic and CCA3 members show patterns of trade diversion through third-party countries from 2023.

JEL Classification	F14, F13, F51, C13, C50
Keywords	economic sanctions, Russia, gravity model of trade, sanction evasion
Title	Analysis of Russian efforts to avoid economic sanctions

Abstrakt

Tato práce zkoumá, jak obchodní sankce v letech 2014-2022 ovlivnily ruský mezinárodní obchod. Tato práce zkoumá podrobné obchodní údaje a provádí ekonometrickou analýzu pro všechna kola sankcí ve vybraném období a představuje, jak se lze sankcím vyhnout v dlouhodobém i krátkodobém horizontu. Pro gravitační model obchodu jsou použity metody OLS s fixními efekty a PPML, které vycházejí ze souboru gravitačních dat poskytnutých CEPII a třetího vydání Global Sanction Database. Výsledné odhady nevykazují žádné významné dopady na ruský obchod v letech 2014-2022 a výsledky analýzy obchodu na příkladu České republiky a členů CCA3 ukazují vzorce odklonu obchodu přes třetí země od roku 2023.

Klasifikace JEL	F14, F13, F51, C13, C50
Klíčová slova	ekonomické sankce, Rusko, gravitační model obchodu, obcházení sankcí
Název práce	Analýza ruských snah vyhnout se ekonomickým sankcím

Acknowledgments

The author is grateful especially to Ing. Vilém Semerák, M.A., Ph.D.for his profound knowledge, always supportive attitude and patience. Many thanks also belong to the author's family, friends, and girlfriend for their support during the writing of this thesis.

Typeset in FSV LaTeX template with great thanks to prof. Zuzana Havrankova and prof. Tomas Havranek of Institute of Economic Studies, Faculty of Social Sciences, Charles University.

Bibliographic Record

Tomšů, Vojtěch: *Analysis of Russian efforts to avoid economic sanctions.* Bachelor's thesis. Charles University, Faculty of Social Sciences, Institute of Economic Studies, Prague. 2024, pages 62. Advisor: Ing. Vilém Semerák, M.A., Ph.D.

Contents

List of Tables

List of Figures

Acronyms

BACI	Base pour l'Analyse du Commerce International
CCA3	Armenia, Kazakhstan, and the Kyrgyz Republic
CEPII	Centre d'Études Prospectives et d'Informations Internationales
CSO	Czech Statistical Office
EAEU	Eurasian Economic Union
EU	European Union
FDI	Foreign Direct Investment
GSDB	Global Sanctions Database
MNC	Multinational Company
OLS	Ordinary Least Squares
PPML	Poisson Pseudo-Maximum Likelihood
RUSI	Royal United Services Institute
SWIFT	Society for Worldwide Interbank Financial Telecommunication
UNSC	United Nations Security Council
US	United States
VAR	Vector Autoregression
WDI	World Development Indicators

Chapter 1

Introduction

In recent years, the sanctions imposed on Russia following its offensive foreign policy, especially its invasion of Ukraine, have become a frequent target of research not only for political scientists but also for economists. This thesis explores changes in trade with Russia that point towards the circumvention of these economic sanctions. Understanding how these evasion tactics work and their effectiveness is crucial as it gives us insight into how resistant the targeted nation is. The importance of this study is underscored by the war conflict in the part of Europe and the strong reactions from Western nations.

The main goal of this research is to uncover the strategies Russia may have used to avoid sanctions imposed between 2014 and 2022. By examining trade and sanction data using the gravity model of trade, this study seeks to spot trends, evaluate the impacts of sanctions, and investigate trade shifts through parties. This research adds to our understanding of how countries respond to pressures and what it means for global economic stability and policymaking.

The thesis is organized as follows: Chapter 2 offers a review of existing literature delving into the history of the Ukrainian conflict, categorization of sanctions, their effects and effectiveness, as well as enforcement methods and evasion techniques. Chapter 3 delves into the sanctions imposed on Russia from 2014 to 2022, analysing their development and extent. Chapter 4 outlines the data sources and methodology used in this study, including where trade data was obtained, how the resulting dataset was created, and how the econometric analysis was conducted. Chapter 5 explores the outcomes, emphasizing discoveries and their impact on sanction policies. **??** presents an analysis of trade data on the example of the Czech Republic, pinpointing any anomalies or shifts in trading patterns. Chapter 7 concludes the thesis by summarizing

the results, proposing potential improvements for policymakers, and suggesting directions for future research.

Chapter 2

Literature review

2.1 History and Russian involvement in the Russian-Ukraine conflict

Ukraine declared independence in 1991 (Subtelny 2009). Nevertheless, Ukraine has not experienced peace even in the 21st century, as it continues to face conflicts threatening its sovereignty. In early 2014, Vladimir Putin, president of the Russian Federation, decided to seize the Crimean Peninsula from Ukraine. Three possible reasons motivated Vladimir Putin to proceed with this move - defending Russia, recapturing former USSR territories, and improvisation linked to the unanticipated change in Ukraine's presidential post (Treisman 2016). The first reason could be intended as a *"strategic denial of Ukraine to NATO and the European Union"* (Allison 2014). This explanation complies with Russian rhetoric aimed against the two mentioned organisations. The second reason also seems plausible, as Vladimir Putin *"never accepted the loss of Russian prestige that followed the end of the Cold War"* (Treisman 2016). The third hypothesis mentioned by Treisman does not sound convincing because this invasion looked sophisticated on the outside. But some signs hint that the Russian president simply took an opportunity after removing Viktor Yanukovych, former president of Ukraine (Treisman 2018). One can only argue over the real motivation behind the biggest security challenge for Europe since the Cold War. However, the invasion of 2014 provided Russia with a strong basis for the current conflict. In early November 2021, Ukraine President Volodymyr Zelensky announced that Russia had started to gather nearly 100,000 troops on the Russian-Ukraine border. A month later, Russia presented *"a list of security demands in order to defuse the crisis over Ukraine,*

including a legally binding guarantee that Ukraine will never be accepted as a NATO Member State and that NATO will give up any military activity in eastern Europe and Ukraine." (Walker 2023). However, the problem of Ukraine joining NATO is more complex than this statement and the situation did not suggest that Ukraine would go through the entire acceptance process and join NATO (RUSI 2022). These events led to further escalation during January and February 2022. Subsequent events showed that it is at least debatable whether this ultimatum was aimed at preventing conflict or was more of a distraction from what was happening on Ukraine's borders. On February 21, 2022, the day after the Winter Olympics ended, Russian President Vladimir Putin signed a decree recognizing the independence of Donetsk and Luhansk regions of Ukraine. Those regions were already recognised with special status in the Minsk agreements following the annexation of Crimea in 2014. Three days later, on February 24, 2022, the Russian Federation officially launched the first attacks on Ukrainian territory, which erupted into the Russian-Ukrainian war. (Walker 2023)

2.2 History of sanctions

Although sanctions have a rich history that goes into 432 BC with the Megarian decree, their usage started to be a common foreign diplomacy measure in the twentieth century. Also, the sanction history before World War I was not that well documented, as in the following periods (Hufbauer *et al.* 2007). Later, especially after World War II, sanctions became *"a powerful instrument in coercive foreign diplomacy"* (Felbermayr *et al.* 2020). Their aims are considered primarily political, as they have been interpreted as a punishment or as an instrument, influencing the behaviour of sanctioned targets. The three actors frequently behind imposing these sanctions in recent times are the United Nations, the United States, and the European Union. Historically, the form of sanctions was trade restriction or economic blockade, often as a substitute for military force; however, nowadays, their contents, targets, and implementations differ. (Felbermayr *et al.* 2020). Targets of sanctions are nowadays even sports events, telecommunications, or civil aviation (Hufbauer & Oegg 2001). As sanctions popularity rose in the 20th century, we can see that it accompanied every important event - be it the Cold War, oil conflicts in the Near East, the fight against terrorism or dictators, the production of nuclear weapons, or the elections of new governments (Hufbauer *et al.* 2007). The list and analysis

of sanctions in the 20th century could go on for much longer, but the world evolves quickly, sanctions with it, and they vary from case to case. That is why we will be particularly interested in the 21st-century sanctions against Russia, with a spike in 2014 and then in 2022.

2.3 Classifying sanctions by their type

According to Felbermayr *et al.* (2020), sanctions can be divided into six categories by their type for better understanding. These categories are trade, finance, arms, military, travel, and additional category, which includes all residual sanctions outside the five main categories.

For better clarity, we can distinguish trade sanctions by three different criteria - trade flow, type of targets, and number of imposing countries. Trade flow lets us divide *"sanctions on exports from the sender to the target (i.e., export sanctions), sanctions on imports from the target to the sender (i.e., import sanctions), and sanctions that simultaneously apply to both exports and imports between the two sides (i.e., bilateral trade sanctions)"* (Felbermayr *et al.* 2020). Then, sanctions on specific goods or sectors of trade (partial trade sanctions) can be differentiated from sanctions that apply to all sectors, like complete trade sanctions (complete trade sanctions). Ultimately, we distinguish unilateral and multilateral sanctions. As the names suggest, unilateral sanctions are imposed by one country, and multilateral sanctions are a product of more countries, such as the UN sanctions against Iran. In past data from the Global Sanction Database (GSDB), we can see that in 2015, around 70% of all countries imposing import sanctions used only partial restrictions. This is a changing trend, as in the early 1950s, all imposed import sanctions were restricting imports to the full extent. The cause of this change is explained as the growing importance of global value chains and the bigger dependence of countries on others - e.g. Europe's dependence on Russian oil and natural gas (Felbermayr *et al.* 2020).

The popularity of financial sanctions grew significantly over time for two reasons - expansion of global economic activities plus financial markets integration and advanced technology. The latter reason enables imposing countries to implement, monitor, and enforce measures more easily. Popular ways of applying financial sanctions are asset freezes, whether partial or in its entirety. Targets of asset freezes are usually powerful individuals, such as politicians or industry leaders. Financial sanctions can also restrict financial investments or

limit credit availability for payments. The effectiveness of these sanctions was also improved in recent years *"by technically prohibiting any financial transaction related to a sanctioned economy"* (Felbermayr *et al.* 2020).

Arms and military sanctions were directly linked to supplying wars or arms supplies being abused by terrorist groups, such as Australian sanctions against Russia in 2014, UN sanctions against Lebanon in 2006, and US sanctions on Afghanistan in 1996 (Felbermayr *et al.* 2020).

Travel sanctions can be differentiated between *"(i) travel restrictions for people into the sender country; and (ii) journeys from the sanctioning to the sanctioned country"* (Felbermayr *et al.* 2020). For example, after Georgia expelled Russian officers after spying accusations in 2006, Russia banned Georgians from travelling to Russia (Felbermayr *et al.* 2020).

According to Felbermayr *et al.* (2020), sanctions that cannot be put in any of the mentioned categories are usually diplomatic measures or flight and harbour restrictions.

The sanction classification cited above is not the only one, but it is explained in detail, as the subsequent analysis of sanctions is based primarily on GSDB. Cited paper by Felbermayr *et al.* serves as a supporting document for this database.

Another used classification by type is, for example, by Morgan *et al.* (2014). They divide sanctions into multiple categories, such as *"tariffs, export controls, embargoes, import bans, travel bans, freezing assets, cutting aid and blockades"* (Morgan *et al.* 2014). On the other hand, Filipenko *et al.* (2020) classify sanctions into trade, investment, financial, and separate targeted sanctions or "smart" sanctions categories. Designation of the latter category came into use at the turn of the 20th and 21st centuries, when Kofi Annan, the then Secretary-General of the United Nations, *"expressed concern about the harm that sanctions inflict on vulnerable civilian groups and the collateral damage that they cause to third states"* (Hufbauer & Oegg 2000). The popularity of targeted sanctions rose after that, especially with cases like Pinochet or Bosnian war crimes trials. It is also necessary to distinguish "targeted" sanctions from "selective" ones. *"'Selective' sanctions, which are less broad than comprehensive embargoes, involve restrictions on particular products or financial flows. 'Targeted' sanctions focus on certain groups or individuals within the targeted country and aim to impact these groups directly"* (Hufbauer & Oegg 2000).

Filipenko *et al.* (2020) also classify sanctions as "positive" and "negative", where positive sanctions affect existing or promised gains and negative sanc-

tions affect concern existing or threatening penalties. These authors use one more classification, this time by areas affected by sanctions imposition. This classification is partly similar to the one used by Felbermayr *et al.* (2020). It comprises nine categories: Culture and sports, diplomacy, transportation, communications, development cooperation, military issues, finances, trade, and criminal justice (Filipenko *et al.* 2020). In conclusion, there are multiple ways to group sanctions by their target, and it is important to select one to prevent difficulties caused by misalignment.

2.4 Classifying sanctions by their objective

As we stated in the previous section, GSDB is an important source for this thesis. Thus, we are going to stick to their classification even in the case of sanctions' objectives. According to GSDB, there are nine different categories that frequently appear in official documents. Objectives are key to the whole sanction problem, as official documents declare that the sanctions should be lifted when their objective is fulfilled. The categories of objectives are policy change, regime destabilisation, territorial conflict, war prevention, fight against terrorism, ending war, ending human rights violation, restoring democracy, and other objectives (Felbermayr *et al.* 2020).

Sanctions aimed at policy change seek change in economic, political, or social policy of the targeted country, e.g. the US sanctioning Venezuela for not helping enough to fight terrorism in 2006 or Japan sanctioning Russian individuals and organisations responsible for political instability in the eastern part of Ukraine. Regime destabilising sanctions were historically used to fight the spread of communism or by the US to bring down Nigerian president Mamadou Tandju in 2006. When both sanctioning and sanctioned countries are taking part in a militarised territorial conflict, we label sanctions with a "territorial conflict" objective. There is a difference between territorial conflict and war ending - *"If sanctioning countries are not part of an underlying conflict related to a sanction, then the objective in the GSDB is generally defined as 'end war'"* (Felbermayr *et al.* 2020).

Sanctions preventing war want to de-escalate military conflict with other countries, as the UN did in 2003 when Liberia represented a threat to international peace and security in Western Africa. Sanctions against terrorism are used to halt the country's support or toleration of terrorist groups. In 2006 the US sanctioned Syria, which was actively participating in the terrorist attack

in Beirut that led to the assassination of the Lebanese Prime Minister. When it is too late to prevent war, countries use sanctions to end it. That is why the EU sanctioned Sudan in 2005, with the motivation to promote peace and harmonisation within the country's population (Felbermayr *et al.* 2020).

Sanctions with human rights as their objective have become more popular in recent years. An example is export control to Belarus, imposed by Canada in 2006 when democratic supporters were put in jail. Restoring democracy is the goal of sanctions mainly after coup d'états. This case was, for example, in 2012, when the EU Council decided to sanction individual entities responsible for destabilizing the Republic of Guinea-Bissau. When we classify sanctions by their objective, there are still sanctions that could not be placed into any of the listed categories, as in classification by their type. These sanctions are aimed at ending drug trafficking, fighting corruption, or releasing prisoners (Felbermayr *et al.* 2020).

We can also combine various sanctions by their objectives, as some of them follow the same patterns, e.g., policy change and regime destabilisation, human rights with ending wars and territorial conflict, and remaining categories as a last group (Felbermayr *et al.* 2020).

Another classification by aims was used by Lindsay (1986). According to him, *"states have one or more of five aims when imposing trade sanctions: compliance, subversion, deterrence, international symbolism, or domestic symbolism"* (Lindsay 1986). Lindsay uses this classification to analyze sanctions as policy instruments and he comes to a very pessimistic conclusion, his results are discussed in detail in the next subchapter.

On the other hand, Barber (1979) implies that the objectives of sanctions are *"far from simple or straightforward"* (Barber 1979). He groups sanctions in three categories by their objective: primary objectives, secondary objectives, and tertiary objectives. The first category is focused on the actions of the targeted state. Secondary objectives regard the imposing state's government, its behaviour, and expectations. Tertiary objectives are those concerned with the broader international context - whether it is the functioning of the whole international system or just its parts that are important for the sanctioning actor. Examples can be presented for each of these categories. Stopping Italy from attacking Abyssinia was the primary objective of corresponding sanctions. When the US sanctioned Cuba, American politicians seeking to gain domestic support was a secondary objective. The US-Cuba sanctions also had a tertiary objective, and that was to stop communism from spreading to the Western

Hemisphere (Barber 1979).

2.5 Effectiveness and effects of sanctions

At the outset, it is essential to distinguish between the effectiveness of sanctions and the effects of sanctions, as these terms are often conflated in the literature, leading to potential biases and misleading conclusions. The effectiveness of sanctions refers to the success of the policy measure, whether it has achieved its intended goals or not. In contrast, the effects of sanctions encompass a range of outcomes, from changes in international trade volume to impacts on public health.

2.5.1 Effectiveness of Sanctions

Effectiveness in relation to sanctions has generated significant discussion and, as a result, has become a subject of much research. This topic was the aim of the study done by Hufbauer *et al.* (2007), who estimated that only around 34% of sanctions between the 1940s and 1980s were successful. However, the success rate was heavily influenced by the type and objective of the sanctions imposed. Sanctions with modest goals, such as the release of political prisoners, approached a 50% success rate. Sanctions with military impairment as a policy goal had a 31% success rate, and sanctions aiming at the disruption of military adventures achieved only a 21% success rate.

Nevertheless, Hufbauer *et al.* used a rating system with a scale of 1-16, where a score equal to or bigger than 9 was considered successful. This does not mean that sanctions scoring less than 9 on this scale were completely unsuccessful, but they at least partially achieved the sender's objective. Taking this into account, the claim that sanctions "never work" is incorrect. The cause of the lack of success can be explained in three main ways. First, if the policy forces the target to take inconvenient action, sometimes it pays off not to comply at all, especially when the pain caused by sanctions is smaller than the pain caused by complying with them. Second, it is hard to analyze the effect of sanctions when they are intended just as a gesture or political statement-for example, US sanctions against China in 1989, triggered as a response to the Tiananmen Square massacre. The third reason is a conflict of interest in the sender country. It is complicated to sanction a country's important trade part-

ner. Thus, sanction packages have a more complex structure that can lead to equivocal signals of the sender's intent (Hufbauer *et al.* 2007).

He also discovered interesting findings when allowing for sender-target prior relation or trade magnitude. It seems that sanctions are effective more often when they are imposed on cordial countries rather than on antagonistic ones. A higher success rate was also connected with the larger amount of trade prior to the sanctioning episode. Hufbauer *et al.* also tried to estimate the relationship between the success rate and the regime of the target country. *"It is hard to bully a bully with economic measures"* (Hufbauer *et al.* 2007). This finding is meaningful for this thesis, as the development of the Russian Federation under Vladimir Putin bears signs of autocracy (Hassner 2008).

This is supported by Brooks (2002). According to her article *"Sanctions and Regime Type: What Works, and When?"*, there is a difference between responses to sanctions from authoritarian and democratic leaders. Comprehensive trade and financial sanctions are expected to work in democracies, as they create macroeconomic pressure and pressure on the average voter, which forces the government to seek policy change. However, the effectiveness of such sanctions varies significantly across different types of political systems; notably, in authoritarian regimes, comprehensive trade sanctions can be counterproductive, potentially leading to the strengthening of the regime. The only sanctions that can hurt authoritarian regimes are sanctions targeted at people allied with the leader. These can be either specifically targeted financial sanctions or travel bans (Brooks 2002).

Peksen (2019), in his literature review on the effectiveness of sanctions, states that targeted sanctions became the most preferred sanction type; however, they fail to achieve their objectives more frequently than traditional trade and investment sanctions.

Another author that criticized sanctions was Lindsay (1986). In his analysis of sanctions as a policy instrument, he concludes that sanctions with objectives such as compliance and subversion often fail. This study also claims that sanctions are not substitutes for the use of force, and even when they do cause economic pain to the target, their costs do not exceed the benefits gained from the desired policy change. Although criticizing the symbolism of sanctions, the author admits that sanctions strongly respond to the target's behaviour (Lindsay 1986).

An interesting observation on effectiveness was presented by Bapat *et al.* (2013). They suggest that many recent studies do not take into account sanc-

tions that were only threatened but not imposed. In some of these cases, targets decide to alter their policy before the sanctions are imposed (Bapat *et al.* 2013).

2.5.2 Effects of Sanctions

We will focus on quantitative methods to assess the effects of sanctions. A quite popular method is the gravity model of trade, used by Hufbauer *et al.* (2007), Felbermayr *et al.* (2019; 2020), Caruso (2003), Popova & Rasoulinezhad (2016), Askari *et al.* (2003), and many more. Hufbauer *et al.* (2007) states that the gravity model of trade is "*de facto workhorse of modern-day empirical analysis of international trade and investment flows*" (Hufbauer *et al.* 2007). Hufbauer *et al.* (2007) used core variables from the dataset constructed by Rose (2004), but more variables were added in the process (e.g., sanctions-specific variables, global economic conditions, or common cultural signs of countries) (Hufbauer *et al.* 2007). It is essential to mention this, as the basic gravity model employed by Rose is sometimes criticized for its misspecification (Baldwin & Taglioni 2006).

Hufbauer *et al.* (2007) conclude that US-imposed sanctions typically lead to a reduction of trade between the target and sender. Sanctions also negatively affect trade volume between the target country and its trade partners. However, sanctions with large scope and higher intensity do not reduce trade flows significantly (Hufbauer *et al.* 2007). With the use of a gravity model, Felbermayr *et al.* come to three main results. First, the impact of economic sanctions depends on their type. Without splitting sanctions into categories by type, estimation does not provide meaningful results. This explains why distinguishing sanctions by types is important for econometric analysis. Second, appropriate quantification of effects on trade depends on the proper specification of time-invariant costs, such as pair fixed effects. Third, the impact of sanctions differs between export and import sanctions, as export sanctions are more effective in reducing trade volume than import sanctions. Two-way sanctions reduce trade by 77%, complete export sanctions lead to a 76% reduction, and complete import sanctions decrease trade by only 52% (Felbermayr *et al.* 2020). Popova & Rasoulinezhad (2016), in their article about sanctions modifying Iran's trade policy, incline to these findings as well. They used a gravity model based on panel data to analyze bilateral trade patterns between Iran and 50 countries from the EU and Asia. The final gravity model used in this article was derived from a simple gravity model introduced by Tinbergen

(1962) that estimates the volume of trade based on the GDP of two countries and their distance. Other variables, such as multilateral resistance term, GDP per capita, composite trade intensity, index of financial openness, and a dummy variable for sanctions, were used to extend this model. After concluding that sanctions lead Iran to Asianisation and de-Europeanisation, they suggest that further research on the topic should consider estimating the model with more variables that have an impact on Iran's trade with Asian countries or with the EU. Based on their literature review, they also mention that "*the gravity model is a proper approach to find out the effects of sanctions on trade flows*" (Popova & Rasoulinezhad 2016). By using the gravity model, Caruso (2003) showed in his first part of the analysis, aimed at the trade of the US with 49 countries, that "*extensive and comprehensive sanctions have a large negative impact on bilateral trade, while this is not the case for limited and moderate sanctions*" (Caruso 2003). In the second part of his analysis, he focused on the bilateral trade impact of unilateral US sanctions. He shows that unilateral extensive sanctions have a large negative impact, and limited sanctions can lead to the opposite effect, such as a positive effect on aggregate bilateral trade of other G-7 countries (Caruso 2003).

Although the gravity model is a popular tool, different methods were also used for estimations related to economic sanctions. Besides the gravity model, Hufbauer *et al.* (2007) also used ordinary least squares (OLS) estimation, arguing that economic sanctions are rather ineffective. This opinion was criticized by Lam (1990), who used the Probit model to address methodological concerns of the OLS regression. The Probit model allowed Lam (1990) a better understanding of sanctions outcomes using a binary scale (success or failure) rather than a continuous success scale. Only imposed sanctions were included, preventing bias from sanctions that were only threatened. Variables in the Probit model included the imposition of export, import, and capital controls, costs to both the target and sender countries (as a percentage of GNP), and other factors such as international cooperation, prior relations, economic health, and the scale of the policy goals sought by the sender country. Lam rejected the null hypothesis that "*the sanctions and their consequences jointly have no impact on foreign policy goals*" (Lam 1990). He refuses to dismiss economic sanctions as a whole and calls for reconsidering effectiveness evaluation in future research (Lam 1990).

Bapat *et al.* (2013) used sensitivity analysis to address potential model dependency of empirical findings and to systematically check the robustness

of empirical results across different specifications of models. Specifically, 18 variables were identified, and Bernoulli-logistic regressions were run on every possible combination of these variables, which is 262,143 models. One of the results regarding robustness was that the target costs and involvement of international institutions are robust determinants of success. This analysis also suggests that sanctions are more likely to achieve set goals "*when carrots are offered by the senders; when the senders are democratic; when the targets are not democratic; when sanctions do not include export restrictions; when issues are less salient; when multiple issues are involved; and when the target highly depends on the trade with the sender*" (Bapat *et al.* 2013). This shows that in some cases, researchers get different results with the usage of different methodologies. Another interesting finding is that financial sanctions are more likely to succeed in the imposition stage rather than in the threatening stage. They also conclude that when multiple issues are involved, threats are less likely to succeed, and imposed sanctions are more likely to succeed (Bapat *et al.* 2013).

Determinants of sanctions effectiveness were also analyzed by Caetano *et al.* (2023). They used the risk-discrete hazard model to analyze if the reason for the end of sanctions was sender capitulation or target compliance. The model employed economic indicators such as GDP per capita, political stability metrics like democracy levels or the number of coups, globalization indices, and specifications of the sanctions (e.g., type and objectives). According to the authors, the likelihood of compliance is increased when there is "*the best allocation of resources, the highest level of democracy, and high political volatility*" (Caetano *et al.* 2023). On the other hand, the likelihood of sender capitulation is lower with a higher per capita GDP and degree of democracy in the target country. This analysis also reminds us that the global political and economic context can influence the results of sanctions. The effectiveness of sanctions imposed during stable times differs from those imposed in periods of high international tension. Interesting findings were also made regarding the effectiveness based on the type of sanctions. Target states are more likely to comply in cases of sanctions aimed at ending military conflict or strengthening democracy. The reverse applies to sanctions aimed at changing political regimes or combating terrorism. From the sender's perspective, only one objective is significantly different from others in increasing the probability of capitulation—respect for human rights. Regarding the effect based on the target, acceptance by the target is more likely for diplomatic, military, and financial sanctions. For travel limits and trade restrictions, the probability of the sender's capitulation is

higher (Caetano *et al.* 2023).

In conclusion, while much research has been conducted on the effectiveness and effects of sanctions, it is crucial to distinguish these two aspects to avoid biases and ensure clear, meaningful analysis. The effectiveness of sanctions evaluates whether the policy goals were met, while the effects of sanctions encompass the broader economic and social consequences.

2.6 Sanction enforcement and evasion

The issues of effectiveness, enforcement, and evasion are closely connected and have been generating significant discussion concerning sanctions. Simple logic suggests that sanctions that are easy to evade and lack enforcement from the sender are not going to be effective. Enforcement of sanctions is more of a law-related problem, but there are also economic insights from its examination worth mentioning. Bapat & Kwon (2015) studied this problem with the use of the game-theoretic model. Their study shows that imposers face an enforcement problem as sanctions do not need only the public but also the private sector to cooperate. Even if senders use large amounts of resources to enforce sanctions, they still affect only local firms, but not firms of the target country. The firms in the target country can even benefit from that situation, as they can more easily replace sanctioned firms in the market. This creates a dilemma for sending countries because they do not want to decrease the competitiveness of home countries, thus the enforcement is not desirable. On the other hand, sanctions tend to fail when they are not enforced. The answer to this problem is finding an optimal level of enforcement between sanctions being successful and not harming local firms (Bapat & Kwon 2015).

Early & Peterson (2022) explored the effectiveness of enforcing economic sanctions through penalties against sanctions violators. They analysed how penalties imposed by the U.S. Department of Treasury's Office of Foreign Asset Control (OFAC) on both U.S. and foreign entities for sanctions violations influence U.S. firms' trade with sanctioned countries. Findings were that enforcement actions including penalties (against both domestic and foreign actors) led to a significant decrease in U.S. trade with sanctioned states. It also caused greater compliance and even overcompliance in some cases, where firms avoided engaging not only in directly prohibited trade but also in trade that could be perceived as risky. Thus, authors conclude that robust enforcement of

sanctions, through strategic and significant penalties against violators, can significantly enhance the economic impact of sanctions (Early & Peterson 2022).

Overcompliance is also mentioned by Johnston (2022). According to him, Western entities, out of caution or fear of violating sanctions, restrict their dealings with Russian counterparts more than required. This has led to a significant reduction in Western lending and investment in Russia, contributing to an economic slowdown that went beyond the direct effects of sanctions (Johnston 2022).

Hufbauer *et al.* (2007) state that sanctions encourage targets to bypass them, and new innovative trade networks and triangular trade agreements are created. This makes tracking the origins and destinations of traded goods challenging. Historically, Iran and Argentina obtained military parts despite the sanctions, and Libya kept selling oil in Europe in the 1980s through complex trade networks. Another way of circumventing sanctions is transshipping goods through countries that are supportive or neutral - for instance, Rhodesia maintained its trade through South Africa, Zambia, and Mozambique in the 1960s. However, the success of sanctions is possible by imposing tangible costs - this was observed in connection with a total cost to target: "*On average, the costs to the target as a share of GNP are twice as high in successful episodes as in failures* " (Hufbauer *et al.* 2007).

The mentioned findings of Hufbauer *et al.* (2007) raise questions regarding international cooperation in the case of economic sanctions, which was a research subject of more following authors.

According to Syropoulos *et al.* (2023), multilateral sanctions may result in greater economic damage to targeted nations, as they often involve broader collaboration and could lead to more stringent implementation of measures within alliances (Syropoulos *et al.* 2023). This is supported by Peksen (2019) in his literature review on economic sanctions. Peksen states that studies show higher effectiveness of multilateral sanctions than in cases of sanctions imposed by a single country or ad hoc coalition of a few countries (Peksen 2019). The latter view is also backed by Drezner (2000), who analysed cooperative sanctioning efforts. Drezner criticises the assumption that multilateral cooperation among sanctioning states is always beneficial or necessary for the success of sanctions. His findings reveal a surprising pattern: statistical analyses constantly show no link or negative correlation between the cooperation of sanctioning states and success. Drezner argues that without the backing of an international organisation, sanctioning coalitions are less effective because of weaker enforcement

possibilities (Drezner 2000).

The problem of cooperation and multilateral sanctions was also studied by Weber & Schneider (2020), where he compared EU and US sanctioning efforts with data based on imposed and threatened sanctions between 1989 and 2015. Sanctions imposed by the EU are typically considered multilateral, and they face a problem before imposing. The complexity and varied economic interests within the EU make the process of imposing sanctions more difficult, which, in turn, affects the credibility and eventual success of these sanctions. However, empirical analysis indicates that EU sanctions are more successful than US sanctions. On the other hand, the US is acting unilaterally, so it can enforce sanctions more readily. Although the EU has a better record of success, the US is more effective in leveraging sanction threats. The authors also found heterogeneity in economic interdependence with the target state between member states of the EU, such as Germany, France, Italy, Poland, and now former member, the UK. As mentioned above, this makes the imposition less likely and imposed measures less severe (Weber & Schneider 2020).

An interesting case of sanction enforcement is the United Nations Security Council (UNSC) Resolution 2094. This resolution was supposed to be a comprehensive measure adopted to escalate the sanctions regime against North Korea in response to its continued nuclear weapons and missile development activities. In this case, the UNSC imposed financial sanctions, asset freezes and travel bans, import and export restrictions, and maritime and cargo inspections. Despite the measures, North Korea's response was the use of front companies and third-party companies, cyber operations, illicit ship-to-ship transfers diplomatic channels, and sophisticated evasion techniques. The whole sanction process is also significantly influenced by an important partner of North Korea - China (Habib 2016). Although the UN presented a clear plan with specific objectives, it falls short and shows that even such an organisation is not omnipotent when the target puts significant effort into the evasion.

As outlined in the previous paragraphs, evading sanctions is a complex problem, and targets try to circumvent imposed enforcement methods. As will be obvious from the following text, it is hard to track evasion because evading countries often manipulate in a grey area to hide their tracks. In his empirical analysis, Giumelli (2015) states that the Targeted Sanctions Consortium (TSC) identified eight types of sanction evasion techniques: "*disguise of identity or use of forged documents, use of front companies, reliance on family members, use of informal value transfer systems, use of safe havens, disguising*

vessels, use of black market contractors, and denial of inspection" (Giumelli 2015). In his research, evasion efforts were present in 91% of the total 63 sanction episodes, with black market contractors being used to purchase prohibited goods as the most common option. The second most frequent technique is the use of safe havens to make banned trades and purchases. Then disguising identity in 31%, using front companies in 28 % (used by non-individual and non-state actors), disguising vessels in 26 %, and circumventing financial sanctions in 25%. When talking about evasion, it is also necessary to distinguish the context of the sanctions. For example, when the UNSC deals with terrorists, the constraining aspect is more important than the nature of the sanction. In contrast, post-conflict situations act as a part of the target legal system, and the process becomes more political. In this case, "*individuals and companies evade, or try to evade, targeted sanctions just as they would evade, or try to evade, domestic legislation*" (Giumelli 2015). As a possible solution to this, the design and implementation phases should be critically considered, involving tailoring sanctions to the type of crisis and targets, ensuring sanctions are adaptable to changing situations, and maintaining compliance with legal standards to protect individual rights (Giumelli 2015).

Some authors described various methods used to evade sanctions that were used in past sanctioning cases. One of them is Habib (2016), already mentioned in the paragraph concerning enforcement. One of the ways used by North Korea to avoid the impact of the UN Resolution 2094 was the abuse of diplomatic and consular power. North Korea has leveraged its diplomatic channels to circumvent sanctions, particularly through involving diplomatic personnel in illicit activities. Diplomats have been implicated in negotiating contracts for banned arms sales, procuring banned technologies, using diplomatic bank accounts to shield illicit financial transactions, and violating luxury goods embargoes. They circumvented financial sanctions as well. Pyongyang has established complex networks of front companies and shadow banking operations to bypass asset freezes and financial sanctions. Transactions were carried out in cash, gemstones, or barter systems. Another shadow method was the misuse of international shipping. During a search in Panama, a missile was found hidden between bags of sugar on the ship Chong Chon Gang. Although this specific shipment was discovered, North Korea falsified customs declaration and ship logs and tried evading tracking. That illustrates the lengths North Korea went to to transport prohibited cargo. One of the methods was also the exploitation of loopholes in the sanction systems, leading to transactions in ju-

risdictions with less strict enforcement or those willing to overlook sanctions for economic or strategic reasons (Habib 2016). Delineated techniques employed by North Korea are also described in greater detail by (Mallory 2021) in a report dedicated specifically to this topic.

Russia employed a few similar methods to avoid sanctions imposed as a reaction to the seizure of Crimea in 2014, analysed by Secrieru (2015). Russia traded on loopholes as well and navigated around the sanctions through the restructuring of business operations and leveraging third-party intermediaries to maintain trade flows and financial transactions. Russian officials tried to use loopholes regarding travel bans, e.g., securing exemptions that allowed them to travel to the West under the pretences of attending meetings at the headquarters of international organisations. An aggressive way of disapproval with sanctions was also used, as Russian entities embarked on initiating legal proceedings against the sanctions, challenging their validity and seeking their revocation through judicial means. One of the other external manoeuvres was trying to influence political discourse around the "non-recognition policy" pertaining to Crimea, aiming to sway opinion towards lifting or easing the sanctions. They reached out to a spectrum of political parties within Europe, from far-right factions to those in the mainstream. Internal moves were also carried out. Individuals and businesses close to the Kremlin, which were affected by the economic sanctions, were compensated through state contracts and Russia's sovereign wealth funds. This not only mitigated the financial strain imposed by the sanctions but also ensured the loyalty and stability of the inner circle (Secrieru 2015).

Third-party countries are one of the common ways of evading economic sanctions, as stated in (Lektzian & Biglaiser 2013), (Smeets 2018) or (Peksen 2019). The triangular trade patterns appear when a sanctioned country cooperates with a third-party country that is not sanctioned by the sender nor sanctioning the target. In case of sanctions imposed on Russia, are suspected third-party countries some of the members of the Eurasian Economic Union (EAEU), such as Armenia, Kazakhstan or Kyrgyzstan. According to (Kutlina-Dimitrova 2017), exports to Armenia almost trebled right after the imposition of sanctions on Russia in 2014. In 2022, Armenia and Kazakhstan benefitted from sanctions the most. Not only from becoming an alternative import route to Russia but also from the relocation of businesses. "Armenia hosted over 50,000 IT specialists from Russia. About 850 companies with Russian roots and 350 individual entrepreneurs (IEs) have registered in Armenia. In general,

40,000 legal entities and individuals have opened about 100,000 accounts in Armenian banks"(Arapova 2023). Some of the renowned international companies conveyed their aspiration to move their offices in Kazakhstan, including Skoda, Philips, McKinsey and fifty-two more (Arapova 2023). One of the contributions of this thesis will be an analysis of trade that potentially confirms changes in trade patterns and the use of third-party countries as an intermediary between Russia and sanctioning countries.

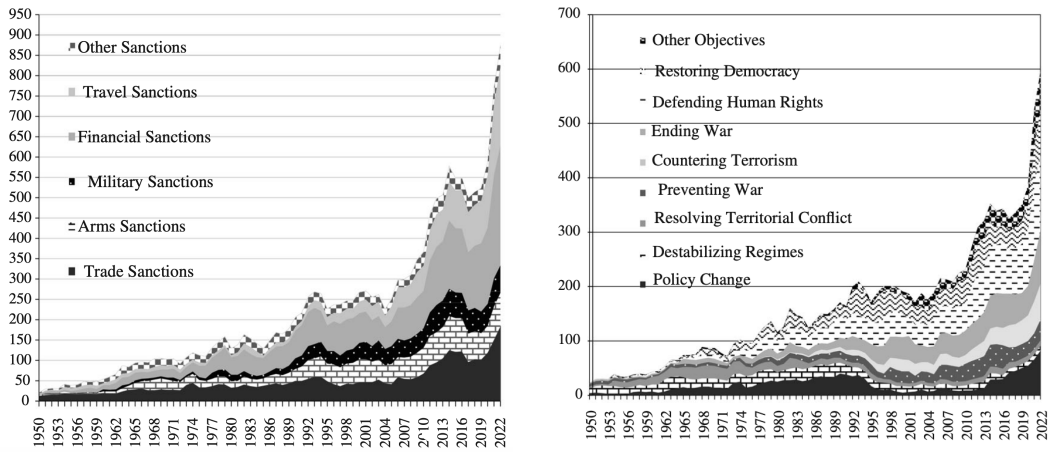
With the evolving world, there is also a new threat to the imposed sanctions - cryptocurrencies. Wright (2023) states that although both good and bad actors can use cryptocurrencies, their decentralized and pseudo-anonymous nature presents a great tool for avoiding economic sanctions. However, some cryptocurrency optimists are sceptical about the evasive use of cryptocurrencies for a few reasons. The first one is liquidity because the industry of cryptocurrencies is still relatively small, with a market cap of around $2 trillion. Second, compared to the Society for Worldwide Interbank Financial Telecommunication (SWIFT), the cryptocurrency system is small and not robust enough to handle the same amount of financial messages. Anonymity is a benefit of using cryptocurrencies, but all transactions are still recorded in Blockchain, which makes them traceable. There is also a practical obstacle - finding an asset that is available for widespread use, which is currently not the case. Nevertheless, there are methods and loopholes that make the evasion possible. That is why regulatory rules are being applied to prevent malicious intents (Wright 2023). The evasion could be avoided by applying international regulations (similar to anti-money laundering rules), leading to better enforcement and punishment of the targets (Wronka 2022). Creating those rules will be time and effort-demanding, as cryptocurrencies are still comparatively new assets, and until then, the risk of sanction evasion through them will always be present.

Chapter 3

Economic sanctions imposed on Russia between 2014 and 2022

As mentioned earlier in the thesis, economic sanctions imposed on Russia spiked in 2014 and 2022. In both cases, sanctions were used to react to Russian military incursions. This chapter will describe how sanctions evolved from global and Russian perspectives.

The overall trend in Figure 3.1 shows an increase in the use of sanctions over time, particularly from the early 1990s onwards. Figure 3.1 (a) suggests that financial sanctions have significantly increased. Figure 3.1 (b) shows a notable increase in sanctions aimed at policy change starting in 2014.



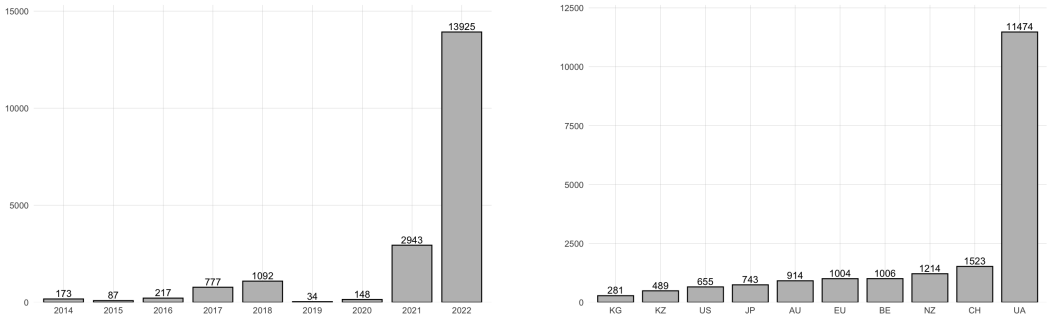
(a) By Type (b) By Objective

Figure 3.1: Evolution of all sanctions in time, imposed worldwide
Source: Syropoulos *et al.* (2023).

But what is the connection between a worldwide increase in sanctions and Russia? Since 2014, thirteen sanction packages were adopted by the EU —

nine of them before the start of the invasion in 2022 and four of them after it, the latest of which is from February 2024 (European Council 2024). The EU was not the only actor imposing sanctions on Russia. A very similar procedure was adopted by the US and other countries, such as Ukraine, Canada, Japan, Australia, Switzerland, and Norway. Sanctions from non-members of the mentioned transatlantic partners were frequently aligned to the EU and US ones, but not in all cases, e.g., arms, military, or financial sanctions (De Galbert 2015).

Analysing the total number of sanctions is an arduous task. Accessible databases use different methods of grouping sanctions, so the figures related to the sanctions count differ. As stated in the thesis and described in Chapter 4, the dataset of choice for the econometric analysis is the GSDB. The sole purpose of the figures below is to visualize the rapid growth of the use of sanctions between 2014 and 2022 and their distribution by the largest imposers.



(a) By year (b) By Country

Figure 3.2: Total number of sanctions imposed on Russia, 2014-2022
Source: Author, based on https://correctiv.org/en/latest-stories/2022/03/01/sanctions-tracker-live-monitoring-of-all-sanctions-against-russia

Both figures include various imposed measures, such as sanctions imposed on individuals, travel bans and more. However, figure (a) clearly presents how the number of sanctions skyrocketed since the Russian invasion of Ukraine. The local peak from 2018 was caused mostly by reactions to alleged poisonings of Russian detractors (Sergei and Yulia Skripal), cyber-attacks, and other diplomatic disputes.[1][2] A rising amount of sanctions in 2021 was connected to further escalation of the conflict before the end of the year. Figure (b) shows

[1]https://www.businessinsider.com/trump-new-russia-sanctions-election-meddling-cyber-attacks-2018-3

[2]https://www.theguardian.com/world/2018/aug/08/us-russia-sanctions-nerve-agent-attack-salisbury

the countries that imposed the most sanctions on Russia between those years. As expected, Ukraine is leading this list with a total exceeding 10,000 sanctions. The EU and the US combined imposed around 1,700 sanctions. In contrast to the EU and the US, the motivation behind imposing the sanctions by Ukraine was most likely a political gesture rather than paralyzing the Russian economy.

The first thought behind assessing the effects of economic sanctions is their macroeconomic impact on the target. However, using this method for the effects of sanctions from 2014 was not simple. In this case, the effects of sanctions on macroeconomic indicators were overshadowed by the impact of changes in oil prices. This finding is shared by multiple researches, such as (Tchakarov & Vlasova 2015), (Gurvich & Prilepskiy 2015) or (Dreger *et al.* 2016). The first mentioned research paper estimated that the economic sanctions explain only 10% of the decline in Russian output, and the rest was caused by the fluctuations in the oil prices (Tchakarov & Vlasova 2015). Gurvich & Prilepskiy (2015) compares these two effects. By 2016-2017, the drop in oil prices was accountable for a 19—20% drop in the fiscal revenues, and sanctions were responsible only for 1—2%. The impact of sanctions was reduced by about 40% due to a decrease in Russian capital outflow. (Gurvich & Prilepskiy 2015). The third-named research used VAR models and came to the same conclusion as the authors, stating that the sanctions appear unfit to influence the Russian political course in the short run. Yet, their negative effect on the investments by both domestic and foreign firms may weaken the Russian economy in the long run (Dreger *et al.* 2016). Although observing the effects of the sanctions in 2014 was complicated, one cannot say that sanctions had no effects. According to the study from the European Parliament, the growth of Russia's GDP fell to 0.7% in 2014 and further contracted by 2.7% in 2015. The stabilization of the economy began in 2016, with only a 0.2% decrease in GDP, even though the sanctions were still in place. Foreign direct investments into Russia stopped in 2014 and 2015 but resumed in 2016 as well. Compared to the 20% increase per year in EU exports from 2009-2012, they declined by 20.7% annually between 2013 and 2016. Important are also noticeable patterns of sanctions evasion - Russia redirected trade flows from the EU to Africa and China and recorded a 13% increase in agri-food imports from the Eurasian Economic Union (EEU). Some EU exports were rerouted through Serbia, Macedonia, or Belarus - exports from the last two countries increased by 13% between August and December 2014 compared to the same period one year before (Fritz *et al.* 2017).

Predictions from the beginning of 2022 were looking severe for Russia. In-

flation for 2022 was expected to grow as high as 35%, the Russian stock market ceased to exist, the US and the UK discontinued their oil and gas trade with Russia, and the EU reduced its gas imports significantly, 47% of Russia's reserves in Western jurisdictions were frozen, and the GDP was expected to contract by 10—12% (Astrov *et al.* 2022). This list could be longer, but it is evident that all aspects seemed to be aimed against the prosperity of the Russian economy. One year later, the real effects were much more clear. Following are multiple effects from the first half of 2023. Russia's oil and gas revenues decreased by 41.4% (during this decreased period, Russia was earning around $425 million per day from oil sales). Oil shipments to Asia increased, with Russian imports to China rising by 45% compared to the pre—invasion period. However, the shift of the oil trade lacked the ability to substitute for the oil and gas trade with Europe. Although Russia managed to substitute between 10 and 25 per cent of missing EU—shipments through non—sanctioning countries, it also found other ways of obtaining unavailable goods. New supply chains were created involving China and former Soviet states despite the increased costs and delays caused by the black market (Anna & Angelos 2023).

These findings lead to this thesis's main topic—the evasion of sanctions. It seems that Russia has found a good way to do this. After the exports from the UK and the EU to Russia significantly decreased, exports from the same countries to Armenia, Kazakhstan, and the Kyrgyz Republic (a group called CCA3) rose by 50 to 252 per cent. For sanctioned goods, exports to those countries rose by an additional 30% compared to other goods. There is also evidence of indirect trade and trade diversion to CCA3, goods being "lost in transit" through Russia and also patterns suggesting misspecification and misclassification of destination countries, all used to evade sanctions. From mid-2022, exports from China and Turkey to Russia also increased, with new trade routes created in two to four months (Chupilkin *et al.* 2023). Now, it is time to see what evidence can be found when the gravity model is employed as a tool of econometric analysis.

Chapter 4

Data & Methodology

4.1 Data

Three sources of data were used to create the final dataset with the goal of analysing irregularities, trade creation, and diversion caused by recent economic sanctions imposed on Russia in 2022. The core dataset is the gravity dataset[1] from Centre d'Études Prospectives et d'Informations Internationales (CEPII), supplemented with values from Base pour l'Analyse du Commerce International (BACI), database from the same institute, for 2021 and 2022 (Conte *et al.* 2022). Some readers might appreciate the note provided by the CEPII itself — although their datasets are robust and serve as a good and reliable source, this may not apply to energy goods. Energy goods, such as natural gas or crude oil, do not pass through customs, making the trade hard to track. Thus, these datasets might not be the right source for analysing changes in the trade of the specifically mentioned goods, but they present a good source for analysing the trade as a whole. For 2022, values of GDP and population were imported from the World Development Indicators (WDI) database from the World Bank to keep a consistent source to the previous data from the mentioned sources. Data concerning economic sanctions were added from the third release of the GSDB (Syropoulos *et al.* 2023).

4.1.1 CEPII Gravity Dataset

The CEPII gravity database presents a sound foundation for conducting sanction analysis. This dataset records tradeflows of 252 countries between 1948 and 2020, identifying between country of origin and country of destination. The

[1] "This is the 202211 version."

total of 87 variables contains core gravity model variables - GDP values for both country of origin and country of destination and countries' distance. As well as an extensive range of macroeconomic indicators and cultural or trade facilitation variables. A description of the key variables for the performed analysis can be found in the following table:

Table 4.1: Key variables from CEPII Gravity Dataset

Variable Name	Description
iso3	3-letter alphabetical code of country
iso3num	3-digit numerical code of country
gdp	GDP in thousands of $
tradeflow_baci	Trade flow in thousands of $, source: BACI
dist	Distance between most populated cities of exporting and importing country
contig	Bilateral dummy variable equal to 1, if the countries share a common border
comlang_off	Bilateral dummy variable equal to 1, if the countries share a common official or primary language

For variables iso3, iso3num, and GDP, variables denoted by "o" as for origin and "d" as for destination are present

Source: Author, based on The CEPII Gravity Database (Conte *et al.* 2022)

Despite thorough coverage of the various categories, the scope of this dataset was insufficient for the subject of this thesis. As a next step, values for trade flows in the years 2021 and 2022 were added from the BACI 2021 and BACI 2022 datasets. CEPII dataset already had rows for trade in 2021, so the values of tradeflow_baci from the BACI 2021 dataset were added to according rows identified by iso3 of countries and year. However, this was not the case for 2022, which was missing completely. By analysing changes in data in previous years, the only changing variables were GDP and population-related. GDP and population data for the latest years were imported from WDI databases for all years to unify the data source and fill in the missing values needed for estimation. WDI was one of the sources listed by the authors of the dataset. Before proceeding with this step, values were compared to the old ones to ensure that the values would not change significantly, which would negatively affect the results. Following this, the tradeflow_baci values from the updated BACI 2022 and BACI 2021 datasets supplemented the corresponding rows in the gravity dataset, resulting in a complete trade column for years ranging from

1948 to 2022. Other time-invariant variables were extended for the added years as well.

4.1.2 Global Sanction Database

The key dataset, enabling trade analysis concerning economic sanctions, has already been mentioned in multiple previous parts of the thesis. The third release of GSDB from 2023 maps 1325 sanction cases between 1950 and 2022, representing a perfect tool for desired analysis. Important note - it does not contain sanction threats (Syropoulos *et al.* 2023). Key variables from this database are described in the table below:

Table 4.2: Variables from the GSDB

Variable Name	Description
sanctioned_state & **sanctioning_state**	Name of the target country and name of the sender country
sanctioned_state_iso3 & **sanctioning_state_iso3**	ISO3 letter code following U.S. ITC's Dynamic Gravity Database, for sanctioned and sanctioning country, respectively
arms	Dummy variable equal to 1 in case of arms sanctions
military	Dummy variable equal to 1 in case of military sanctions
trade	Dummy variable equal to 1 in case of trade sanctions
descr_trade	Type of trade sanction, e.g. exp_compl means complete export sanction, same logic applies for imp_compl, exp_part and imp_part
financial	Dummy variable equal to 1 in case of financial sanctions
travel	Dummy variable equal to 1 in case of travel sanctions
other	Dummy variable equal to 1 in case of other sanctions
target_mult	Dummy variable equal to 1 in case of multilateral target
sender_mult	Dummy variable equal to 1 in case of multilateral sender
objective	Objective of the sanctions, can be more than one
success	Success of the sanction, in case of multiple objectives, the order in **success** is the same as in **objective**

Source: Author, based on GSDB v3 (Syropoulos *et al.* 2023)

For further analysis, more dummy variables were created in the dataset. The dummy variable **sanc** equals 1 for every row of GSDB, as it denotes imposed sanction regardless of its type. Column **sanc_RUS** takes a value of 1 for cases where Russia was the sanctioned state, and 0 otherwise. Then, dummy variable **sanc_RUS_imp** equals 1 for all cases, where Russia was the sanc-

tioned state and trade sanctions were described as **imp_part** or **imp_comp** (**imp_part** means partial import sanction and **imp_comp** stands for complete import sanction). The same holds for the dummy variable **sanc_RUS_exp**, which is equal to 1, when trade sanctions imposed on Russia were either **exp_part** or **exp_comp** (where **exp_part** stands for partial export sanction and **exp_comp** stands for complete export sanction). Another variable was added in case we are going to use Russian countersanctions as well. Thus, column **countersanc_RUS** takes a value of 1 when Russia was sanctioning state and 0 otherwise. Variable **mutual_sanc_rus** is equal to 1 in cases where Russia was both sanctioned and sanctioning country. Variables **sanc** and **countersanc_RUS** do not appear in the final model specification, but they were used for creating the **mutual_sanc_rus** variable.

Table 4.3: Added sanction dummy variables

Variable Name	Description
sanc	Equals 1 for every row of GSDB, as it denotes imposed sanction regardless of its type.
sanc_RUS	Takes a value 1 for cases where Russia was the sanctioned state, and 0 otherwise.
sanc_RUS_imp	Equals 1 for all cases where Russia was the sanctioned state and trade sanctions were described as **imp_part** (partial import sanction) or **imp_comp** (complete import sanction).
sanc_RUS_exp	Equals 1 when trade sanctions imposed on Russia were either **exp_part** (partial export sanction) or **exp_comp** (complete export sanction).
countersanc_RUS	Takes a value of 1 when Russia was the sanctioning state and 0 otherwise.
mutual_sanc_rus	Equals 1 in cases where Russia was both sanctioned and sanctioning country.

Source: Author, based on GSDB v3

The last steps of creating the final dataset were merging the updated gravity dataset and GSDB with added dummy variables, limiting the dataset for years 2014—2022 and removing incomplete parts of the data. In this step, the distribution of removed data was inspected to prevent a negative influence on the results of the estimations. The resulting dataset is robust, and it contains all variables needed for analysis using a gravity model, the creation of which is described in part 4.2.

4.2 Gravity model of trade

The journey from the original idea of the gravity equation to the current variations of gravity models is a long one, and the nature of this thesis makes it unnecessary to go into all the details. However, as the statement "*The equation has thus apparently gone from an embarrassing poverty of theoretical foundations to an embarrassment of riches!*" (Frankel *et al.* 1997) suggests, it became apparent during the development of the gravity model that some of the specifications may cause bias and negatively affect the results. These pitfalls need to be mentioned to avoid these issues.

First, it is good to mention that we distinguish the general gravity model from the structural gravity model. General gravity models describe bilateral trade flows with a flexible equation based on multiplicative interactions of countries' economic sizes and bilateral trade costs. On the other hand, structural gravity models, as a subset of general gravity, require that the shares of an importer's total expenditures allocated to each country must be represented through specific functions that incorporate not only the bilateral trade costs but also the concept of "multilateral trade resistance" (MTR) (Head & Mayer 2014). The most common structural gravity in trade relies on two core assumptions — how importers allocate spending and how exporters clear their markets. The expenditure system is set up so the shares of spending that go to each exporting country are determined by certain factors, ensuring all spending is distributed and the market balance is maintained. This allocation is independent of the importer's income and is based on the exporter's ability to attract spending. Additionally, an exporter's total exports must equal its production value. This is assessed through a market potential index that averages out relative access to different markets. These principles guide the construction of the gravity equation in trade, which connects trade volumes between countries to their economic output and trading costs. If conditions like balanced trade and symmetric costs are met, an equal exchange between countries is predicted (Head & Mayer 2014).

Multiple ways exist to make the gravity model respect the assumptions derived from the structural form. These ways usually deal with unobserved or non-linear effects that can cause bias. The following sections will describe three of those that showed their reliability. Finally, one of the methods described for dealing with unobserved heterogeneities will be used as an analysis tool in this thesis.

4.2.1 Anderson, van Wincoop and multilateral resistance terms

According to (Anderson & Van Wincoop 2003), at the time of their analysis, the empirical literature on gravity either did not contain any form of MTR in its analysis or included a "remoteness" variable related to distance to all bilateral patterns. This variable did not capture any other trade barriers. Even if distance is the sole bilateral trade obstacle, its use in the remoteness index still doesn't align with theoretical expectations. The only author that recognized MTR was Bergstrand in time series application, but this was unsuitable for dealing with cross-section data (Anderson & Van Wincoop 2003). This research deficiency motivated Anderson & Van Wincoop (2003) to "*(I) develop a method that consistently and efficiently estimates a theoretical gravity equation, (ii) use the estimated general equilibrium gravity model to conduct comparative statics exercises of the effect of trade barriers on trade flows, and (iii) apply the theoretical gravity model to resolve the "border puzzle"*" (Anderson & Van Wincoop 2003). Thus, the authors decided to improve the gravity model by including MTR terms, which measure the average trade resistance faced by a region with all its trading partners, not just bilaterally. Specifically, their model included price indices for each region that encapsulate the trade barriers with all other regions, making the model theoretically sound and empirically accurate. The authors used non-linear least squares estimation to fit their model, and by incorporating MTR terms, they could correctly estimate the effect of trade barriers on trade flows, overcoming the limitations of previous models that either ignored these terms or used inadequate proxies like the remoteness index. One of the main applications of their method was to solve the "border puzzle" highlighted by McCallum (1995), which found that trade between Canadian provinces was vastly higher than between US states and Canadian provinces. Anderson and van Wincoop's model showed that this puzzle was largely due to omitted variable bias and the small size of the Canadian economy. Their results indicated that national borders reduced trade between the US and Canada by about 44%, a more moderate effect than previously suggested (2200%), while still substantial. The authors also provided robust evidence to support their claims, as they conducted extensive comparative statics exercises to demonstrate how removing trade barriers would affect trade flows. Their theoretical model accurately predicted trade pattern changes, confirming the validity of their approach (Anderson & Van Wincoop 2003).

4.2.2 Baier, Bergstrand and Bonus Vetus OLS

The major takeaway from previously cited work is that there are, in fact, unobserved or non—linear effects, which are not negligible and need to be dealt with. And this is what led Scott L. Baier and Jeffrey H. Bergstrand to examine this topic six years later. They also realised that traditional gravity models often omit crucial MTR terms, leading to biased estimates. Their motivation was to develop a method that approximates these MTR terms without the computational complexity associated with Anderson and van Wincoop's nonlinear least squares (NLS) approach. Thus, they introduced a method named "Bonus Vetus OLS". This approach involves using a Taylor—series expansion to approximate the MTR terms, allowing the use of ordinary least squares (OLS) for estimation. First, they applied a first-order log-linear Taylor-series expansion to the system of price equations in Anderson and van Wincoop's model. This expansion helped derive a reduced-form gravity equation that includes theoretically motivated exogenous MTR terms. Using the expanded equations, the authors showed that these MTR terms can be estimated using OLS. This approach avoided the challenging solving of nonlinear equations, making the method more accessible and easier to implement. Then, Monte—Carlo simulations were carried out to demonstrate that their linear approximation method provides virtually identical coefficient estimates to those obtained using Anderson and van Wincoop's NLS method - Bonus Vetus OLS was applied to the context of Canadian-US trade flows, using data similar to that employed by McCallum (1995) and Anderson and van Wincoop. Specifically, the distance coefficient estimated using their method was consistent with theoretical expectations and previous empirical findings. The same result held true for the border effect, but it was achieved with significantly less computational complexity (Baier & Bergstrand 2009).

4.2.3 Baldwin, Taglioni and dummy variables

Although the two previous works provided reliable methods, another is of the utmost importance to this thesis - "Gravity for Dummies and Dummies for Gravity Equations" from Richard Baldwin and Daria Taglioni. These authors identified common errors in the empirical implementation of the gravity model of trade, which they termed the gold, silver, and bronze medal errors. To resolve those errors and provide a more accurate method to estimate the gravity model, Baldwin and Taglioni proposed the use of three kinds of dummies:

(i) Time-Invariant Country Dummies

(ii) Pair Dummies

(iii) Time-Varying Country Dummies

Time—Invariant Country Dummies capture country-specific factors that do not change over time but affect trade flows, such as geographical, cultural, and institutional characteristics. Pair dummies account for time-invariant factors specific to each country pair, such as historical trade relationships or persistent bilateral trade agreements. The two described dummy variables allow the model to account for unobserved heterogeneity related to the specific attributes of each country and control for unobserved heterogeneity that affects trade between two specific countries, respectively (Head & Mayer 2014). Time—Varying Country Dummies capture time-varying country-specific factors, such as changes in economic policies, political stability, or other dynamic characteristics that influence trade flows over time. By incorporating those, the model can better account for temporal changes in trade resistance that are not directly observable but significantly impact trade patterns. After adding dummy variables, the model was applied to panel data, extending Anderson and van Wincoop's approach to allow for time variation. As a result of including time-invariant and time-varying country dummies, they effectively controlled for the multilateral resistance terms, reducing bias in the estimation of the role of trade costs and other variables. The authors validated their approach through empirical applications and robustness checks. They compared their results to those obtained using traditional gravity models and demonstrated that their method provided more consistent and theoretically justified estimates. Conducted simulations showed that they solved bias and endogeneity introduced in the medal errors (Baldwin & Taglioni 2006). Baldwin and Taglioni presented another efficient and robust yet simple method of dealing with unobserved factors in the gravity model, which can be applied to panel data. This laid the foundations for the model used in this thesis.

4.2.4 Dealing with zero trade flows

After understanding how the bias and endogeneity problems are solved, one important factor remains — zero trade flows. The problem with zero trade flows is that their origin is unknown, and a standard way of estimating gravity models is by a log-linear method. Thus, zero values are dropped. In addition

to the possibility that no trade has occurred between the two entities, zero trade may result from a rounding error; it can be a missing observation or a result of a firm deciding not to export. Three standard approaches to handling this difficulty are dropping observations with zero trade values, adding a small value before proceeding with logarithms, or estimating the model in levels. The first approach is correct, but only when the zeros are randomly distributed. However, it could lead to the loss of useful information in cases such as the small size of the country or its landlockedness. The other two approaches are incorrect when Ordinary Least Squares (OLS) estimation is applied. Replacing zero trade values with small values to keep observations in the model is arbitrary and may not accurately represent the true expected values, leading to unreliable estimates. The last option has no support among theoretically founded gravity equations that present a multiplicative form (Bacchetta *et al.* 2012). It is also exigent to mention that the first two approaches are incorrect when zero is the true value and not a missing one.

4.2.5 Poisson Pseudo-Maximum Likelihood estimator

Poisson Pseudo-Maximum Likelihood (PPML) is a commonly used tool for overcoming the previously mentioned matter and heteroscedasticity, which is usual in trade data. It was propounded by Silva & Tenreyro (2006) as a robust alternative to OLS estimates of log-linear models. Typically, when one encounters heteroscedasticity or autocorrelation, all assumptions are not met, which means the estimates may remain unbiased but will have incorrect standard errors. The authors assert that, due to Jensen's inequality (the mean of the logarithm is not the logarithm of the mean), the coefficients in log-linear form would also be incorrectly estimated for the standard gravity model. PPML effectively handles zero trade flows and corrects biases caused by heteroscedasticity in log-linear models. When PPML was applied, it yielded significantly different results from OLS: GDP elasticities were smaller, and the effect of distance on trade was less pronounced. The PPML also suggested that colonial ties and preferential trade agreements had smaller impacts on trade than previously estimated by OLS (Silva & Tenreyro 2006). In the following analysis, the PPML model and the fixed effects linear model will be employed, and the results will be compared.

4.3 Methodology

After describing the background of the gravity model in the previous parts, two different models will be applied to the trade dataset: OLS with fixed effects and PPML. OLS is adjusted according to Baldwin & Taglioni (2006) by adding dummy variables with a goal of bias minimisation. Two different model specifications were applied to get a more comprehensive data view. In the first model, the dummy structure is:

(i) Dummy for exporting country i: ϕ_i

(ii) Dummy for importing country j: χ_j

(iii) Year dummy: ψ_t

In the second model, the following dummy variables were used:

(i) Time-Varying dummy for exporting country i: ϕ_{it}

(ii) Time-Varying dummy for importing country j: χ_{jt}

(iii) Time-Invariant pair dummy for countries i and j: ψ_{ij}

After adding the fixed effects, two log-linear equations were created for FELM estimation (Equation 4.1, Equation 4.2) and two equations without logarithm for trade variable were create for PPML estimation (Equation 4.3, Equation 4.4).[2]

$$ln(tradeflow\_baci)_{ijt} = \beta_0 + \beta_1 ln(dist_{ij}) + \beta_2 contig_{ij} + \beta_3 comlang\_off_{ij} + \beta_4 mutual\_sanc\_rus_{ijt} + \beta_5 sanc\_rus\_exp_{it} + \beta_6 sanc\_rus\_imp_{jt} + \phi_i + \chi_j + \psi_t + \epsilon_{ijt} \quad (4.1)$$

$$ln(tradeflow\_baci)_{ijt} = \beta_0 + \beta_1 ln(dist_{ij}) + \beta_2 contig_{ij} + \beta_3 comlang\_off_{ij} + \beta_4 mutual\_sanc\_rus_{ijt} + \beta_5 sanc\_rus\_exp_{it} + \beta_6 sanc\_rus\_imp_{jt} + \phi_{it} + \chi_{jt} + \psi_{ij} + \epsilon_{ijt} \quad (4.2)$$

[2]Description of the variables can be found in Table 4.1. and Table 4.2.

$$tradeflow\_baci_{ijt} = \beta_0 + \beta_1 ln(dist_{ij}) + \beta_2 contig_{ij} + \beta_3 comlang\_off_{ij} + \beta_4 mutual\_sanc\_rus_{ijt} + \beta_5 sanc\_rus\_exp_{it} + \beta_6 sanc\_rus\_imp_{jt} + \phi_i + \chi_j + \psi_t + \epsilon_{ijt} \quad (4.3)$$

$$tradeflow\_baci_{ijt} = \beta_0 + \beta_1 ln(dist_{ij}) + \beta_2 contig_{ij} + \beta_3 comlang\_off_{ij} + \beta_4 mutual\_sanc\_rus_{ijt} + \beta_5 sanc\_rus\_exp_{it} + \beta_6 sanc\_rus\_imp_{jt} + \phi_{it} + \chi_{jt} + \psi_{ij} + \epsilon_{ijt} \quad (4.4)$$

Chapter 5

Gravity results

In this chapter, the results of the analyses conducted in STATA software are presented and discussed. For the estimations of equations Equation 4.1, Equation 4.2, Equation 4.3 and Equation 4.4 with the dataset discussed in Chapter 4 were used two different estimators - Fixed effects OLS and PPML. The PPML estimators used clustered standard errors by pairs to account for the correlation of errors within each cluster and deal with heteroscedasticity, providing more accurate standard error estimates. Although both methods carried out the estimations, the results of the PPML estimator are more robust than the results of the OLS estimator, as explained in Chapter 4 by Silva & Tenreyro (2006); hence, they are used to test the main hypothesis of this thesis: The effects of economic sanctions imposed on Russia in the selected period had a significant negative effect on its trade with other countries.

Table Table 5.1 shows a positive coefficient for the GDP of both importer and exporter countries, which is consistent with the gravity model of trade. The coefficient for distance is negative, aligning with the expectations as well. Estimates of the variables for the contiguity of trade partners are positive, as sharing a border increases trade flow, consistent with findings of (Frankel & Romer 2017). For common language, one can observe a difference between the estimates, possibly caused by the different nature of the estimating methods and their ability to handle heteroscedasticity, non-linear relationships, or model assumptions. The effects of economic sanctions on trade, captured by variables sanc_rus_exp, sanc_rus_imp and mutual_sanc_rus (explanation can be found in the Table 4.3) share the same directions for both models, however, none of them being statistically significant.

The first thing that catches the eye in the summary of the second model

Table 5.1: Comparison of OLS and PPML results for equations Equation 4.1 and Equation 4.3

	FE_dummies	**PPML_dummies**
ln_gdp_o	0.334***	0.331*
	(0.0417)	(0.1682)
ln_gdp_d	0.434***	0.205
	(0.0404)	(0.1777)
ln_dist	-1.632***	-0.660***
	(0.0184)	(0.0331)
contig	1.186***	0.842***
	(0.1035)	(0.0984)
comlang_off	1.014***	-0.0422
	(0.0364)	(0.0764)
mutual_sanc_rus	-0.164	-0.188
	(0.2125)	(0.2359)
sanc_rus_exp	-0.146	-0.046
	(0.4603)	(0.2788)
sanc_rus_imp	0.021	0.148
	(0.4529)	(0.2282)
_cons	7.613***	10.004***
	(1.0543)	(6.6191)
R-squared	0.741	
Exporter dummy	✓	✓
Importer dummy	✓	✓
Year dummy	✓	✓
N	226,956	226,956

Table 5.2: Comparison of OLS and PPML results for equations Equation 4.2 and Equation 4.4

	FE_dummies2	**PPML_dummies2**
ln_gdp_o	(omitted)	(omitted)
ln_gdp_d	(omitted)	(omitted)
ln_dist	-0.513	-0.134
	(0.3361)	(0.3453)
contig	(omitted)	(omitted)
comlang_off	(omitted)	(omitted)
mutual_sanc_rus	-0.035	-0.0064
	(0.2260)	(0.2762)
sanc_rus_exp	-0.165	-0.223
	(0.5369)	(0.1689)
sanc_rus_imp	-0.111	-1.378***
	(0.3330)	(0.2083)
_cons	11.853***	17.504***
	(2.9121)	(2.7787)
R-squared	0.914	
Time-Varying exporter dummy	✓	✓
Time-Varying importer dummy	✓	✓
Time-Invariant pair dummy	✓	✓
N	224,433	224,433

specification is that some estimates are omitted. This is because of the added fixed effects that absorb the effects of the omitted variables. As for the previous case, sanction variables have negative signs and are statistically insignificant, except one - sanc_rus_imp. This means that partial and complete import sanctions imposed on Russia led to a decrease in trade volume by 74.8%. The interpretation of the results may not be clear at first sight. However, an econometric analysis showed that sanctions imposed on Russia in the selected period had no significant effect on trade. It is important that this finding is in conformity with the third release of the GSDB, which claims that sanctions before the year 2022 were less complex than the ones after and changes in trade caused by them should be smaller (Syropoulos *et al.* 2023).

Chapter 6

Analysis of trade data

6.1 Identifying suspicious goods

Analysis of trade data was carried out on CSO (Czech Statistical Office) merchandise trade data and data obtained from UN Comtrade by comparing exports and imports related to Russia in the years 2013 and 2023. If there was an observable pattern of trade through third-party countries, other years within the range were also analysed. Visualised is not only the value in CZK but also information about weight. This note is important for the topic of sanctions because when sanctions are imposed and have at least some effects, the prices of goods change. Weight allows us to analyse us the changes more precisely. The analysis was applied to products defined by 4-digit HS (Harmonized System) codes, for which a change could be expected during the war, e.g., bearings, machine tools, or electronic components. Especially bearings and machine tools do not seem important for military employment at first sight. *"During a war they are particularly useful in airplane motors, tanks, automobiles, guns, submarine engines and similar war materiel. During the Second World War, ball bearings and the machinery for producing them were among the most sought-after and disputed products"*(Golson 2012). The usefulness of machine tools in the production of weapons-related products is also demonstrated by the fact that approximately 80% of military aircraft components are machined by 5-axis machine tools (Weck & Staimer 2002).[1] The latest reports from 2024 present information about Russia using third countries as a frequent method of evading sanctions. Along with mechanical components such as various types of bearings

[1] 5-axis machine tool is a greatly advanced tool of modern engineering, making it uneasy to produce.

and machines used for manufacturing them, Russia is also sourcing electronic components such as microchip processors, integrated circuits, and many more (Feldstein & Brauner 2024).

6.2 Analysis of exports from Czech Republic and CCA3 countries

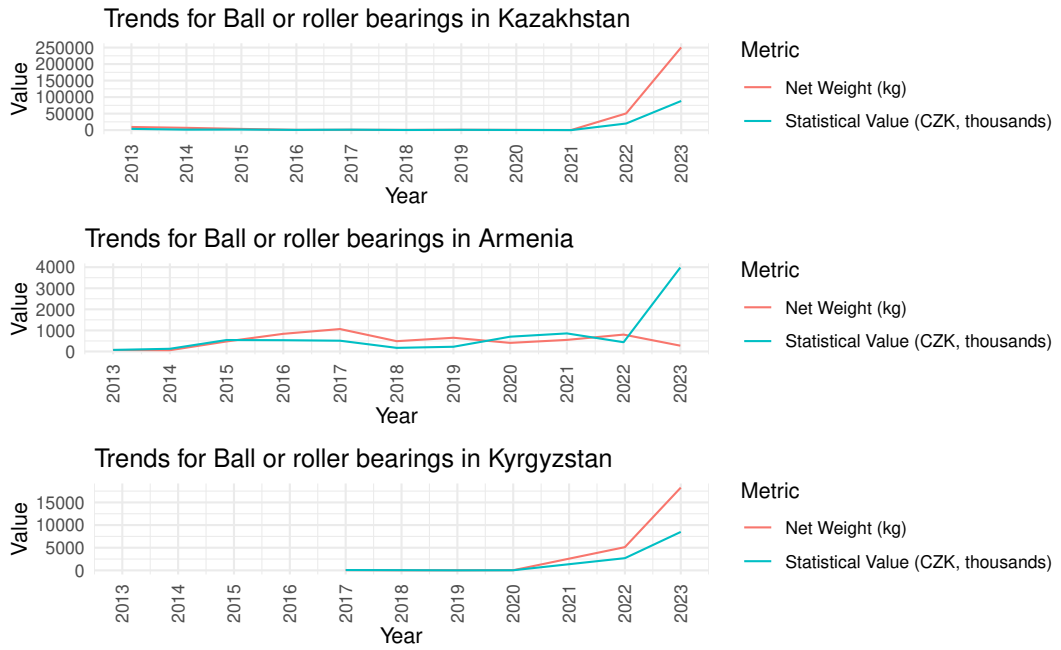


Figure 6.1: Exports of HS 8482 from Czech Republic to CCA3
Source: Author, based on https://apl.czso.cz/pll/stazo/STAZO.STAZO

In the CSO database, interesting changes can be observed in trade in the last 11 years (January 2013 — January 2024), starting with the category of various kinds of bearings. 4-digit HS code 8482 that contains "Ball or roller bearings, and parts thereof". Exports from the Czech Republic to Kyrgyzstan were equal to 30 kilograms in 2020, then rose to 5,128 kilograms in 2022 and 18,267 kilograms in 2023. The increase between 2020 and 2023 was over 60,000%, possibly explained by re-routing trade to Russia through Kyrgyzstan.

Bearings exports to Kazakhstan were equal to 9,536 kilograms in 2013 and decreased through 2014 and 2015 to only 933 kilograms exported in 2016. Then, after fluctuating around approximately one ton per year between 2017 and 2020, the minimum of the selected period was recorded in 2021 - 348 kilograms. However, exports skyrocketed in 2022, and 50,633 kilograms of bearings were

exported in 2022, a 14,450% increase from the previous year. Exports kept increasing in 2023 and quintupled to 250,444 kilograms with a value of over 88 million CZK. As for the previous case, serving as an intermediary between the Czech Republic and Russia could be the reason behind those extreme increases.

An increase in volume brought with it, at least to some extent, an increase in value for both Kyrgyzstan and Kazakhstan. However, quite the opposite can be observed for Armenia in 2023. After exports declined from 801 kilograms worth 440,000 CZK in the previous year to 276 kilograms in 2023, the value was 3,983,000 - approximately 9 times higher. A possible explanation for this change is that exporters could charge their counterparts larger amounts of money for these goods as they became more scarce and potentially played a role in circumventing sanctions.

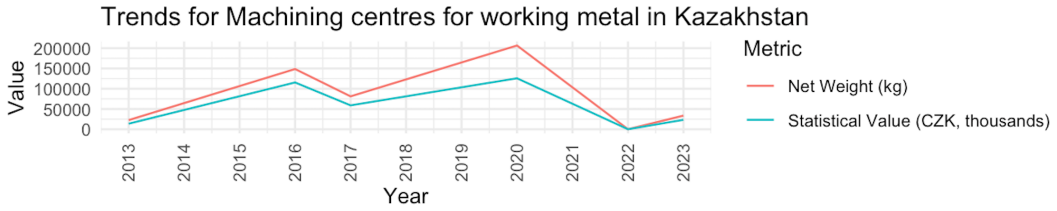


Figure 6.2: Exports of HS 8457 from Czech Republic to CCA3
Source: Author, based on https://apl.czso.cz/pll/stazo/STAZO.STAZO

For HS code 8457, representing "Machining Centers, Unit Construction Machines And Multistation Transfer Machines, For Working Metal", no data were available for Armenia, and the CSO database contained only one record for Kyrgyzstan - 139,080 kilograms exported in 2023. As the data about exports in previous years are missing, it is impossible to examine trends over the selected time period. On the other hand, 206,563 kilograms valued at approximately 126 million CZK were exported to Kazakhstan in 2020. After a significant decline in exports in 2022, with only 90 kilograms exported, there was a 37,311% increase in 2023, as Czech suppliers exported 33,670 kilograms.

The data for HS code 8542 which represents "Electronic Integrated circuits and microassemblies" did not show any significant fluctuations over the selected period.

6.3 Analysis of exports from CCA3 countries to Russia

Having information about exports to the suspected countries makes it mandatory to examine how these countries handled the large amounts of imported goods.

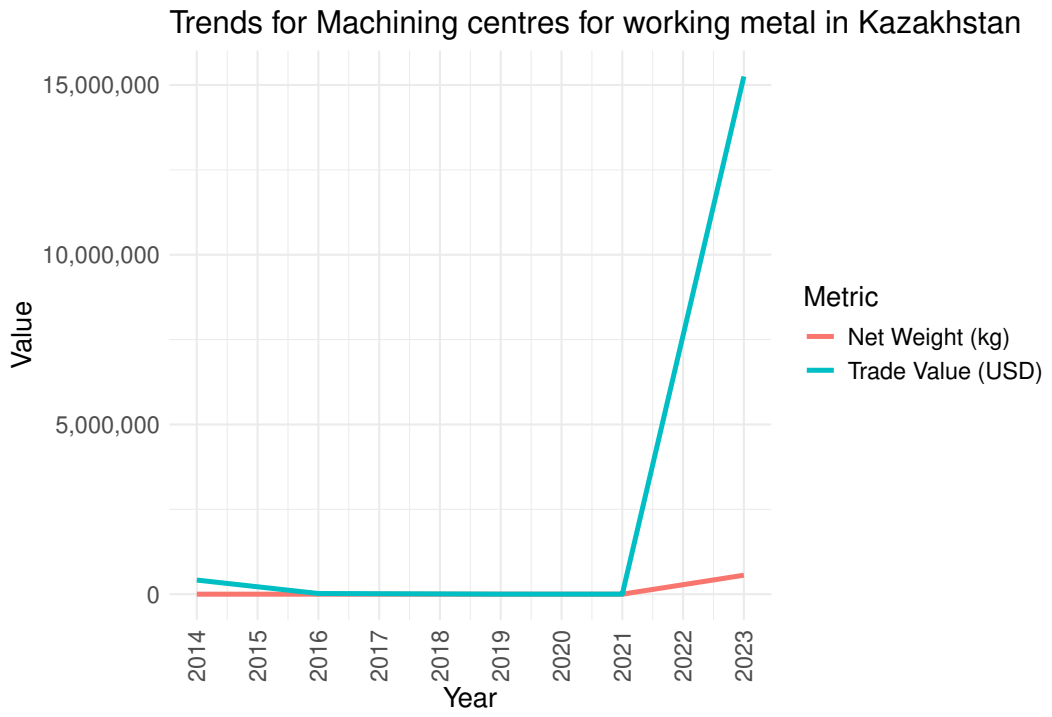


Figure 6.3: Exports of HS 8457 from CCA3 countries to Russia
Source: Author, based on https://comtradeplus.un.org/tradeflow

For HS code 8457 related to machine tools, exports from Kazakhstan to Russia were only 5,5 kilograms in 2014, then 30 and 39 kilograms per year in 2016 and 2019, and 0 weight was reported in 2021. After seeing trade balance this low, 559,334 kilograms of machine tools exported in 2023 seem more than suspicious. This is an evidence which clearly shows the flow of products to Russia, using Kazakhstan as an intermediary.

Exports of bearings, represented by code 8482, decreased in 2015 from 24,272,088 kg to 13,349,084 kg and recorded a sharp increase in 2018 to 26,092,111 kg. We could see a decline in trade in 2020 and 2021. However, it seems that there is a growing tendency from then on, with 26,184,928 kg exported in 2023. Data for exports from Kyrgyzstan to Russia are incomplete, but there is still one observation to be made — approximately 2 tonnes were exported in 2017,

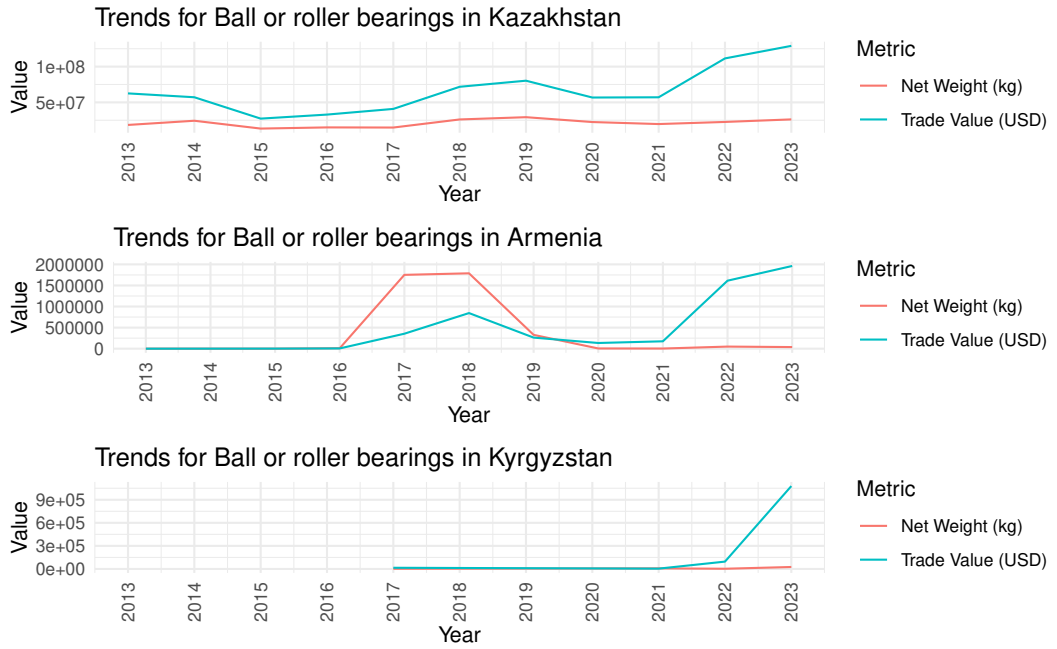


Figure 6.4: Exports of HS 8482 from CCA3 countries to Russia
Source: Author, based on https://comtradeplus.un.org/tradeflow

only around 76 kilograms in 2021, and after an increase to 2.5 tonnes in 2022, Kyrgyzstan exported 25,483 kilograms of bearings with value over $1 million to Russia. Armenia is the last remaining country from the CCA3 group. The available data are incomplete, as for Kyrgyzstan, allowing us to analyse two groups—8482 and 8542. In the selected period, the largest amount of bearings was exported to Russia in 2017 and 2018, exceeding 1,750 tonnes each year. Then, volume decreased to only 3 tonnes in 2021, then shot up to around 50 tonnes in 2022 and 38 tonnes in 2023. The trade values in those years in US dollars far exceeded those from 2017 and 2018. There are more reasons why this happened. Some bearings are harder to manufacture, and we do not precisely know what was the composition of the exported bearings in each year. The same rule applies also for machine tools and electric circuits. Another explanation, which also seems plausible thanks to the context of supplying a country at war, is that exporters can set a higher price due to the scarcity of given goods.

Code 8542, related to electronic circuits, recorded the largest exported amount to Russia in 2014, as 12,697,178 kilograms were exported—approximately 110 times more than in 2013. However, the value of these exports in 2014 was less than half of the 2013 value. After a steep decline to only 6 kilograms in 2015 and a local maximum in 2018 with 4,658 kg exported, only 982 kilograms

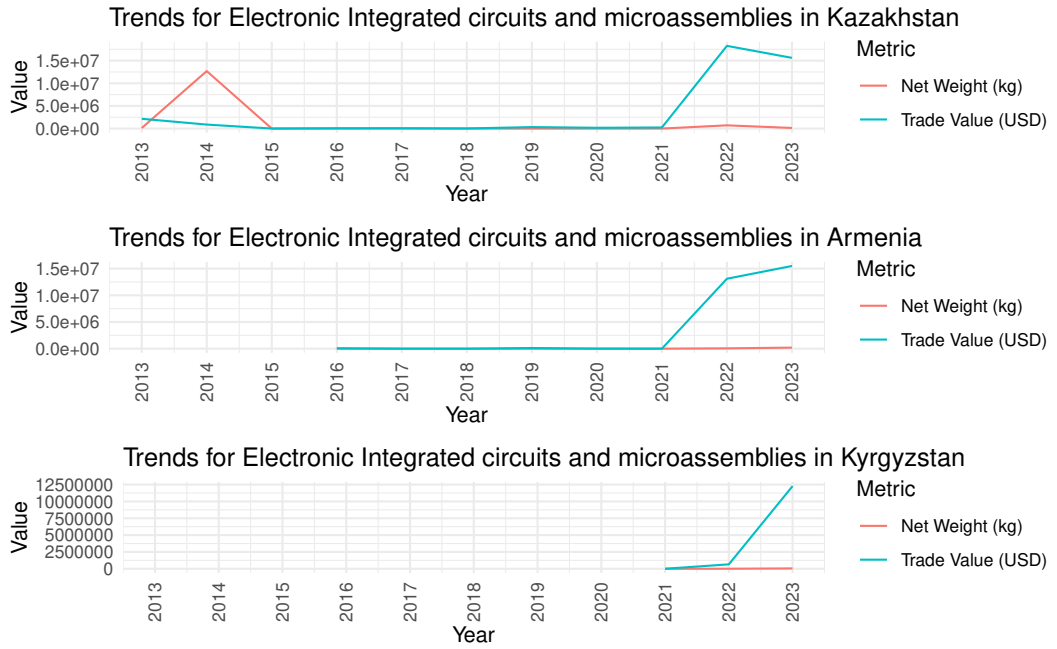


Figure 6.5: Exports of HS 8542 from CCA3 countries to Russia
Source: Author, based on https://comtradeplus.un.org/tradeflow

were recorded in 2021. But suddenly, in 2022, 713,379 kilograms of electronic circuits with a value of $18,258,557 left Kazakhstan and were traded to Russia. A year later, approximately 137 tonnes were exported, but the drop in value was not as great, with traded value in excess of $15.5 million. Three observations for exports of electronic circuits show a very steep increase in the years 2021, 2022, and 2023, with 9 kg, 8,575 kg, and 53,727 kg, respectively. The latter export volume was valued $12,272,222. Exports of electronic circuits from Armenia recorded a sharp increase in 2022 as well, rising from 2 kilograms worth $1,715 to 62,508 kilograms worth $13,105,311 and further growing in 2023 when 197,147 kg were traded for $15,493,283.

As the first paragraph of this chapter explains, the three selected groups were selected for their not-so-obvious relation to war conflict. However, thorough research reveals that other merchandise has even higher year-on-year (between years 2022 and 2023) increases in exports to the CCA3 countries when looking at the HS2 level. For example, an extreme net weight increase of 31,549,700% from the Czech Republic to Armenia for HS86, a code that represents "Railway or tramway locomotives, rolling-stock and parts thereof; railway or tramway track fixtures and fittings and parts thereof; mechanical (including electro-mechanical) traffic signalling equipment of all kinds". The percentage increase of the CZK value for exports of this category is even higher

— 128,120,200% increase from 1,000 CZK to 1,281,203 CZK. However, the increase of exports of HS86 from Armenia to Russia was worth 810,000 CZK. The largest percentage increase in exports to Kazakhstan is unexpected in category HS97, representing "Works of art, collectors' pieces and antiques." This category rose from 1 kilogram to 142 kilograms. However, the value in CZK rose "only" from 1 thousand CZK to 28 thousand CZK, and there are no signs of subsequent trade to Russia. For Kyrgyzstan, the largest increase in exported net weight was for a category HS06 — "Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage" and it rose from 39 kilograms by 38,358% to 14,995 kilograms. In this case, the percentage value of the increase was smaller as well — 2,730% increase from 13,000 CZK to 368,000 CZK. The reported increase in the price of exports of HS06 from Kyrgyzstan to Russia is from $19,327 to $22,979.

Results of Chapter 5 and Chapter 6 correspond to Syropoulos *et al.* (2023). Sanctions imposed on Russia before 2022 were just toothless policies that failed to send a strong message. However, this trend changed, as observed in the shifts in trade in 2023. And for some of the goods, there are evident patterns of trade triangles created through CCA3 countries.

Chapter 7

Conclusion

The objective of this thesis was to analyse the trade effects of sanctions imposed on Russia between the years 2014 and 2022. Sanctions became a widely used policy instrument in the twenty-first century; however, their effects and effectiveness are being increasingly questioned. This thesis provides readers with a comprehensive literature review that introduces sanction problematics and the gravity model of trade, which is used as an econometric method to assess the results of performed research. The hypothesis of this thesis states that sanctions imposed on Russia in the specified period have a significant impact on trade, and it was rejected. Estimates were carried out in STATA software with two estimators, OLS (reghdfe) and PPML, and two different groups of fixed effects: dummies for the exporting country, the importing country, and the year, and then a time-varying dummy for the exporting country, a time-varying dummy for the importing country, and a time-invariant pair dummy for both countries. The estimated dataset was based on the GSDB and the CEPII gravity datasets. Results for the PPML model with time-varying exporter and importer dummies and time-invariant pair dummies showed a 74.8% decrease in trade for import sanctions, 20% for export sanctions, and 0.64% for mutual sanctions between Russia and its trade partners.

In Chapter 6, changes in trade between the years 2014 and 2022 were analysed on an example of the Czech Republic, Kazakhstan, Kyrgyzstan, and Armenia. This analysis provided evidence of the increasing export of goods that can be used with malicious intent in the years affected by the Russian invasion of Ukraine (Golson 2012), (Weck & Staimer 2002). This thesis contributes by examining the effects of all sanctions imposed on Russia in past years, including the most recent ones, imposed in response to the military conflict on

Ukrainian territory that began in 2022. The estimation results indicate what impact sanctions have upon closer examination and how economic sanctions can be avoided. The combined result of the two analyses is that economic sanctions before the year 2022 were just toothless gestures, but sanctions imposed after the Russian invasion of Ukraine forced Russia to find other ways around them. However, this topic is much broader than this thesis can cover, and various estimation methods can be used for further analysis. Another approach is to examine specific industries in greater detail to see how they were affected individually.

If policymakers wanted to stop Russia from attacking Ukraine, the economic sanctions in the rounds before 2022 should have been more severe. In this case, sanctions were imposed only as a gesture, a toothless message that did not scare the target away. It is essential not only to impose sanctions but also to track the movements of goods, identify loopholes, and sanction third countries that serve as intermediaries between the imposers and targets. As the results of the analyses indicate, policymakers failed to send a message, that would have been loud and clear. As the media observes, in the past two years of the Russian-Ukrainian conflict, a massive amount of sanctions have already been imposed, but Russia has not been stopped. It is arguable that this war can be stopped solely by economic sanctions, and thus, it is uncertain if the imposing countries want to spend more money and energy on the enforcement process. But if they do, they need to act, before it is too late and their measures become just another meaningless cry that will be lost in the history.

Bibliography

Allison, R. (2014): "Russian 'deniable' intervention in Ukraine: how and why Russia broke the rules." *International affairs* **90(6)**: pp. 1255–1297.

Anderson, J. E. & E. Van Wincoop (2003): "Gravity with gravitas: A solution to the border puzzle." *American economic review* **93(1)**: pp. 170–192.

Anna, C. & D. Angelos (2023): "EU sanctions on Russia: Update, economic impact and outlook." .

Arapova, E. (2023): "The sanctions dilemma: How sanctions against Russia affect regional integration within the EAEU states." *Strategic Analysis* **47(3)**: pp. 289–294.

Askari, H. G., J. Forrer, H. Teegen, & J. Yang (2003): *Case studies of US economic sanctions: the Chinese, Cuban, and Iranian experience*. Praeger Publishers.

Astrov, V., V. L. Inozemstev, & N. Vujanović (2022): "Monthly report no. 03/2022." *Technical report*, The Vienna Institute for International Economic Studies, wiiw.

Bacchetta, M., C. Beverelli, O. Cadot, M. Fugazza, J.-M. Grether, M. Helble, A. Nicita, & R. Piermartini (2012): *A Practical Guide to Trade Policy Analysis*. Geneva, Switzerland: World Trade Organization and United Nations Conference on Trade and Development. Available at: http://vi.unctad.org/tpa.

Baier, S. L. & J. H. Bergstrand (2009): "Bonus vetus OLS: A simple method for approximating international trade-cost effects using the gravity equation." *Journal of International Economics* **77(1)**: pp. 77–85.

Baldwin, R. & D. Taglioni (2006): "Gravity for dummies and dummies for gravity equations."

Bapat, N. A., T. Heinrich, Y. Kobayashi, & T. C. Morgan (2013): "Determinants of sanctions effectiveness: Sensitivity analysis using new data." *International Interactions* **39(1)**: pp. 79–98.

Bapat, N. A. & B. R. Kwon (2015): "When are sanctions effective? a bargaining and enforcement framework." *International Organization* **69(1)**: pp. 131–162.

Barber, J. (1979): "Economic sanctions as a policy instrument." *International Affairs* **55(3)**: pp. 367–384.

Bergstrand, J. H. (1985): "The gravity equation in international trade: some microeconomic foundations and empirical evidence." *The review of economics and statistics* pp. 474–481.

Brooks, R. A. (2002): "Sanctions and regime type: What works, and when?" *Security Studies* **11(4)**: pp. 1–50.

Caetano, J., A. Galego, & A. Caleiro (2023): "On the determinants of sanctions effectiveness: An empirical analysis by using duration models." *Economies* **11(5)**: p. 136.

Caruso, R. (2003): "The impact of international economic sanctions on trade: An empirical analysis." *Peace economics, peace science and public policy* **9(2)**.

Chupilkin, M., B. Javorcik, & A. Plekhanov (2023): "The Eurasian roundabout: Trade flows into Russia through the Caucasus and Central Asia." .

Conte, M., P. Cotterlaz, T. Mayer *et al.* (2022): "The CEPII gravity database." .

De Galbert, S. (2015): "A year of sanctions against Russia-now what." *A Report of the CSIS Europe Program* .

Dreger, C., K. A. Kholodilin, D. Ulbricht, & J. Fidrmuc (2016): "Between the hammer and the anvil: The impact of economic sanctions and oil prices on Russia's ruble." *Journal of comparative economics* **44(2)**: pp. 295–308.

Drezner, D. W. (2000): "Bargaining, enforcement, and multilateral sanctions: when is cooperation counterproductive?" *International organization* **54(1)**: pp. 73–102.

Early, B. R. & T. M. Peterson (2022): "Does punishing sanctions busters work? sanctions enforcement and US trade with sanctioned states." *Political Research Quarterly* **75(3)**: pp. 782–796.

European Council (2024): "History of restrictive measures against Russia over Ukraine." Accessed: 2024-04-13.

Felbermayr, G., A. Kirilakha, C. Syropoulos, E. Yalcin, & Y. Yotov (2020): "The Global Sanctions Data Base." *School of Economics Working Paper Series 2020-2*, LeBow College of Business, Drexel University.

Felbermayr, G. J., C. Syropoulos, E. Yalcin, & Y. V. Yotov (2019): "On the effects of sanctions on trade and welfare: New evidence based on structural gravity and a new database." .

Feldstein, S. & F. Brauner (2024): "Why Russia has been so resilient to western export controls." *Carnegie Endownent for International Peace* .

Filipenko, A., O. Bazhenova, & R. Stakanov (2020): "Economic sanctions: theory, policy, mechanisms." *Baltic Journal of Economic Studies* **6(2)**: pp. 69–80.

Frankel, J. A. & D. Romer (2017): "Does trade cause growth?" In "Global trade," pp. 255–276. Routledge.

Frankel, J. A., E. Stein, & S.-J. Wei (1997): *Regional trading blocs in the world economic system*. Peterson Institute.

Fritz, O., E. Christen, F. Sinabell, & J. Hinz (2017): "Russia's and the EU's sanctions. economic and trade effects, compliance and the way forward." *WIFO Studies* .

Giumelli, F. (2015): "Understanding United Nations targeted sanctions: an empirical analysis." *International Affairs* **91(6)**: pp. 1351–1368.

Golson, E. B. (2012): "Did Swedish ball bearings keep the second world war going? re-evaluating neutral Sweden's role." *Scandinavian Economic History Review* **60(2)**: pp. 165–182.

Gurvich, E. & I. Prilepskiy (2015): "The impact of financial sanctions on the Russian economy." *Russian journal of economics* **1(4)**: pp. 359–385.

Habib, B. (2016): "The enforcement problem in resolution 2094 and the United Nations Security Council sanctions regime: sanctioning North Korea." *Australian Journal of International Affairs* **70(1)**: pp. 50–68.

Hassner, P. (2008): "Russia's transition to autocracy." *Journal of Democracy* **19(2)**: pp. 5–15.

Head, K. & T. Mayer (2014): "Gravity equations: Workhorse, toolkit, and cookbook." In "Handbook of international economics," volume 4, pp. 131–195. Elsevier.

Hufbauer, G. & B. Oegg (2001): "A short survey of economic sanctions." `https://ciaotest.cc.columbia.edu/casestudy/hug01/hug01.pdf`. Accessed: 10.3.2024.

Hufbauer, G., J. Schott, K. Elliott, & B. Oegg (2007): *Economic Sanctions Reconsidered*. Peterson Institute for International Economics.

Hufbauer, G. C. & B. Oegg (2000): "Targeted sanctions: A policy alternative." *Law Pol'y Int'l Bus.* **32**: p. 11.

Johnston, C. (2022): *Sanctions against Russia: Evasion, compensation and overcompliance*. European Union Institute for Security Studies (EUISS).

Kutlina-Dimitrova, Z. (2017): "The economic impact of the Russian import ban: a CGE analysis." *International Economics and Economic Policy* **14**: pp. 537–552.

Lam, S. L. (1990): "Economic sanctions and the success of foreign policy goals: A critical evaluation." *Japan and the World Economy* **2(3)**: pp. 239–248.

Lektzian, D. & G. Biglaiser (2013): "Investment, opportunity, and risk: Do US sanctions deter or encourage global investment?" *International Studies Quarterly* **57(1)**: pp. 65–78.

Lindsay, J. M. (1986): "Trade sanctions as policy instruments: A re-examination." *International Studies Quarterly* **30(2)**: pp. 153–173.

Mallory, K. (2021): *North Korean Sanctions Evasion Techniques*. RAND Corporation Santa Monica, California.

Morgan, T. C., N. Bapat, & Y. Kobayashi (2014): "Threat and imposition of economic sanctions 1945–2005: Updating the TIES dataset." *Conflict Management and Peace Science* **31(5)**: pp. 541–558.

Peksen, D. (2019): "When do imposed economic sanctions work? a critical review of the sanctions effectiveness literature." *Defence and Peace Economics* **30(6)**: pp. 635–647.

Popova, L. & E. Rasoulinezhad (2016): "Have sanctions modified Iran's trade policy? an evidence of Asianization and De-Europeanization through the gravity model." *Economies* **4(4)**: p. 24.

Rose, A. K. (2004): "Do we really know that the WTO increases trade?" *American Economic Review* **94(1)**: pp. 98–114.

RUSI (2022): "Ukraine-NATO relations: Closer Partnership or Membership?" `https://www.rusi.org/explore-our-research/publications/commentary/ukraine-nato-relations-closer-partnership-or-membership`. Accessed: 2024-03-28.

Secrieru, S. (2015): "Russia under sanctions: Assessing the damage, scrutinising adaptation and evasion." .

Silva, J. S. & S. Tenreyro (2006): "The log of gravity." *The Review of Economics and statistics* **88(4)**: pp. 641–658.

Smeets, M. (2018): "Can economic sanctions be effective?" .

Subtelny, O. (2009): *Ukraine: A history*. University of Toronto Press.

Syropoulos, C., G. Felbermayr, A. Kirilakha, E. Yalcin, & Y. V. Yotov (2023): "The global sanctions data base–release 3: COVID-19, russia, and multilateral sanctions." *Review of International Economics* **32(1)**: pp. 12–48.

Tchakarov, I. & E. Vlasova (2015): "Russia Macro View." `https://ir.citi.com/Ns6%2BuSgO5bg45MCK6HCwlUVxbZo5TXkL%2BBrYQ2S19pKubi3rbFbTU255d6er4oAaBvV4bqrOgYE%3D`. [Accessed 12-05-2024].

Tinbergen, J. (1962): "Shaping the world economy; suggestions for an international economic policy." .

Treisman, D. (2016): "Why Putin Took Crimea: The Gambler in the Kremlin." *Foreign Affairs* **95(3)**: pp. 48–54.

Treisman, D. (2018): "Crimea: Anatomy of a decision." *The New Autocracy: Information, Politics, and Policy in Putin's Russia* pp. 277–95.

Walker, N. (2023): "Conflict in Ukraine: A timeline (2014 - eve of 2022 invasion)."

Weber, P. M. & G. Schneider (2020): "How many hands to make sanctions work? comparing EU and US sanctioning efforts." *European Economic Review* **130**: p. 103595.

Weck, M. & D. Staimer (2002): "Parallel kinematic machine tools–current state and future potentials." *CIRP Annals* **51(2)**: pp. 671–683.

Wright, S. (2023): "The evolution of sanctions evasion: How cryptocurrency is the new game in evading sanction and how to stop it." *Int'l JL Ethics Tech.* p. 25.

Wronka, C. (2022): "Digital currencies and economic sanctions: the increasing risk of sanction evasion." *Journal of Financial Crime* **29(4)**: pp. 1269–1282.