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**TRADE BARRIERS AND TRADE DIVERSION. CONSEQUENCES OF  
RUSSIAN TRADE BARRIERS ON GEORGIAN TRADE**

Master's thesis

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I have written this master's thesis independently. All viewpoints of other authors, literary sources and data from elsewhere used for writing this paper have been referenced.

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## Abstract

Within the current upspring of protectionism, countries are increasingly using different barriers to trade in pursuing their political interests. This paper analyses the effects of Russian sanctions on Georgian trade flow imposed in 2006 and examines the effect on trade diversion. The paper estimates the effect of complete embargo on Georgian agricultural products by applying Synthetic Control Method (SCM) and measuring the difference between the food export level of a real and synthetic country. Results reveal that difference in exports to Russia between the real and synthetic Georgia is negative after 2006. Opposite trend is examined in exports to the European Union, for which the difference between real and synthetic Georgia is positive. Paper concludes that trade sanctions had a negative impact on Georgian trade flow to Russia, which was increasing in time, however, country managed to divert its trade to the European Union countries.

## Introduction

International economic events or policy interventions gain attention of a number of researchers, especially economic events which happen due to drastic changes in political relations of the countries. Link between political conflict and trade has been extensively researched by the number of papers (Martin et.al (2008), Haidar (2017), Michaels and Zhi (2010)). As a tool of diplomatic policy, governments impose trade restrictions in order to increase export losses of sender country's economy (Crozet and Hinz 2016). Political instabilities have a strong effect on economies, however, it is difficult to estimate how would countries develop in the absence of them (Abadie and Gardeazabal 2003). This paper investigates the impact of Russian trade sanctions on Georgian agricultural products imposed in 2006, measures the impact of the event and analyses further whether these barriers resulted into trade diversion for Georgia from old partner to new partner countries.

Referring to the recent diplomatic policy of the countries, paper examines whether political events could be named as the main reason behind imposing trade sanctions on Georgian exports.

After the collapse of the Soviet Union, in 1991 Georgia restored its independence. However, since then country's main exporting market was Russia.<sup>1</sup> This was supported by political relations of two countries, until Revolution of Roses in 2003, which lead to shifting the political and economic centre towards west. As a result, political relations with Russia have been worsened. In 2005, the Russian government imposed a ban on Georgian plant origin products, blaming Georgia for violating the phytosanitary norms. This was followed by imposing trade sanctions on the main exporting goods (wine and mineral water) in April 2006, thus complete

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<sup>1</sup> National statistics office of Georgia [www.geostat.ge](http://www.geostat.ge)

embargo on agricultural products was imposed by Russian federation.<sup>2</sup> These products always had the highest share in exports to Russia compared to other product categories. Before the sanctions share of food exports was on average 65% percent of total exports, while after 2006 it decreased to 1%.<sup>3</sup>

Number of researchers have analysed effects of trade barriers on trade flows of the countries, ((Madsen (2001), Maskus and Wilson (2000), Haveman et al. (2003)). This study differs from the previous studies as it examines the effect of the event which happened ‘‘overnight’’ and was unexpected for Georgian producers. Paper applies synthetic control method, which is a developed approach for comparative case studies by Abadie and Gardeazabal (2003) who studied economic effect of conflict in the Basque country. It has been challenging for researchers to conduct an empirical analysis of non-tariff barriers, especially for transition economies, where the data may not be available or not accurate. For the case study of Russia-Georgia trade relations, analyses on the severity of this sanctions are poor. A comparison of the dynamics of Georgian exports and the export from the rest of the post-Soviet States will reflect the effect of sanctions. Furthermore, this study widens the scope of the method, contributes to the empirical analysis of trade sanctions effecting country-pair and estimates quantitative impact of Russian embargo on exports of agricultural products of Georgia.

To assess the consequences of Russian barriers on Georgian trade, this paper obtains data from World Bank, World integrated Trade Solution (WITS), National Statistics office of Georgia databases and UN Comtrade Database. Data represents annual country-level panel of 19 countries from Central and East Europe and Central Asia over the period of 1996-2012.

The case of Georgian-Russian trade relations has been discussed widely, however, there is lack of empirical analysis on the topic and to my best knowledge, none of the researchers have applied synthetic control approach for measuring the effect of Russian complete embargo on Georgian trade flows.

Analyses present two different effects on Georgian trade. First, the results depict that Russian barriers decreased export of Georgian food products significantly, which is proved as a difference of the trade flows of real and synthetic country. In the second part of the study empirical findings show that trade from the main trading partner was diverted to the European Union countries because the share of export to the Western world has been increased compared

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<sup>2</sup>Georgian parliamentary cooperation committee (2006) [http://www.parliament.ge/files/491\\_6282\\_639100\\_8th-meeti-12-september-2006.pdf](http://www.parliament.ge/files/491_6282_639100_8th-meeti-12-september-2006.pdf)

<sup>3</sup> World integrated trade solution database [www.wits.worldbank.org](http://www.wits.worldbank.org)

to the case of absence of Russian sanctions and as estimated by SCM, difference between trade of real vs synthetic country is positive .

The thesis is organized as following: Section 2 presents literature review, section 3 shares background of Georgian-Russian relations, Section 4 discusses Synthetic Control Approach for comparative case studies and describes data, section 5 depicts empirical results, section 6 discusses effect on trade diversion and section 7 concludes.

## **2. Related literature**

In this section, I will present related literature to trade barriers and their consequences. First part of the section provides a generic overview of trade barriers, along with possible socio-political motives behind their imposition. One of the aims of the chapter is to give an overview of the specific forms of barriers such as tariff and non-tariff barriers, sanctions including the trade embargoes. The literature review will refer to the studies analysing the effect of these restrictions on trade flows of the countries and underline possible consequences of them in the form of trade diversion or reduction.

Trade restrictions can be imposed due to various reasons. The most widely used economic arguments are protection of domestic production, stabilize currency, fight against dumping and technological development. Non-economic arguments could be national security or reallocation of consumption of socially nonrecommendable products, Bhagwati (1998). Furthermore, it could be used as a weapon against smaller developing countries which have few trading partners (Hawkes and Murphy 2010). The motive behind imposing sanctions in most cases is instability of political relations, meaning not only conflict between two countries but also its relations to the rest of the world. An example of an interesting impact of diplomatic relations on trade is presented by Fuchs and Klann (2013), who state that meetings with Dalai Lama have a negative effect on the host country. Authors apply gravity model of exports from 159 countries to China during 1991-2008 and measure whether countries which host Dalai Lama do experience decline in exports. Interestingly, findings show that as a punishment, exports to China experience significant reduction after the meeting with a spiritual leader.

In general, trade barriers can be divided into tariff and non-tariff barriers (Ray 1987). Fugazza and Maur (2008) state that it is hard to analyse non-tariff barriers and provide quantitative impact since their nature varies from technical barriers to sanitary or phytosanitary measures. However, with decreasing number of tariff barriers, the importance of analysis of NTBs has been raised, which stands as one of the motivations of this paper.

Some economists have a sceptical attitude towards sanctions, for example Milton Friedman once said ‘‘All in all, economic sanctions are not effective weapon of political welfare.’’ Followed by saying of George Schulz: ‘‘As a general proposition, I think the use of trade sanctions as an instrument of diplomacy is a bad idea... Our using it here, there and elsewhere to try to affect some other country’s behaviour... basically has not worked. ‘‘

Haveman et al. (2003) analyse the effects of trade barriers based on disaggregated data, which allows classifying effects of tariff and non-tariff barriers into reduction, diversion and compression. Analysis shows that besides reduction of trade, which is caused by trade barriers, diversion of trade flows is the main feature of them, as tariffs from one partner might convince a country to switch trade towards new exporters.

Madsen (2001) studies the impact of tariff and non-tariff trade barriers on worldwide trade during the period 1929-1932. Paper analyses different factors which contributed to the decrease of world trade, mainly income, tariffs and non-tariff trade barriers. Based on the analyses of panel data author studies the effects of the restrictions from the estimates of import and export function, followed by the decomposition of trade contraction into the effects of income and trade barriers. As a result, concluding that 41% of contraction in world trade over the years 1929-1932 was due to trade barriers. Maskus and Wilson (2000) refer to the analysis of non-tariff trade barriers, raising due to product regulations and standards in developing world. They state that regulations imposed by governments lead to distortions of the markets, especially when developing countries need to invest higher resources to meet export standard. Lee and Swagel (1997) study political and economic determinants of non-tariff barriers based on the data of both developed and developing 41 countries in 1988, along with the effect of protection on trade flows. Authors find that countries more often protect weaker industries, however, large industries receive protection by the imposition of non-tariff barriers. Additionally, an interesting finding of the paper is that non-tariff barriers and exchange rate controls were more significant barriers for trade compared to tariffs.

One of the key aims of trade barriers is usually protectionism in order to protect domestic producers from import competition (Scheve and Slaughter 2007), number of papers have examined it from this perspective (Hillman 1982, Bohara and Kaempfer 1991, Trefler 1993). In his analysis Trefler (1993) found out that in 1983 US non-tariff barriers (NTBs) reduced US imports by 49.5\$ million. Harrigan (1993) also analysed the link between trade barriers and import reduction and concluded that tariffs have a higher effect on the level of imports, compared to non-tariff barriers.

Nowadays, the effect of trade barriers remains an active issue for researchers. As presented above, the topic can be investigated from different perspectives by various methods. However, as mentioned by Fugazza and Maur (2008) empirical analysis of non-tariff barriers are infrequent. Having stated this, paper will make its contribution towards expansion of these analyses of trade barriers.

Trade sanctions, which by its aim restrict the trade, contradict to one of the main objectives of the World Trade Organisation (WTO) - to help its members gain from trade and support trade liberalisation events. The scope of sanctions can be quite broad, starting from trade reduction on specific goods and products to full embargo, when all types of trade relations with the country are blocked (Smeets 2018).

Many researchers try to quantify the costs of sanctions, which has been extensively researched during the last decades ((Baldwin (1990), Anderson and Wincoop (2004), Yue et.al (2006), Hummels (1999), Dee et.al (2003)). Crozet and Hinz (2016) evaluate export losses from the sanctions as a tool of foreign diplomatic strategy to influence sender country's economy. Authors analyse the case of diplomatic conflict beginning in 2014 between Western countries and Russia along with Ukraine's political crisis. Based on the monthly data from 78 countries and by conducting general equilibrium counterfactual analysis, findings provide an estimation of overall loss of exports due to sanctions, which were imposed during political instability. Going deep into analysis authors took an example of French firms and found effect of trade diversion.

Caruso (2003), Hufbauer (1990) and Drezner (1999) provide a broad overview of sanctions, analyse the reasons behind their initiation and the determinants of success. Similarly, Hufbauer (1990) looks at economic sanctions since World War 1 and provides deep analysis of their success and failure. Furthermore, Drezner (1999) argues that while imposing trade barriers both parties raise their expectations towards conflict. Allen (2008) extends analyses by studying political costs of sanctions.

Referring to country-specific example, one could draw parallels to US sanctions on Iran, as until 1979 US was Iran's main trade pattern, similar situation as Georgia had with Russia. Clawson (1998) stated that trade barriers have not pushed Iran to change its behaviour while on the contrary, Preeg (1999) evaluates US sanctions as a negative impact on Iran's trade pattern. Similar issue has been researched by Haidar (2017), who analysed the effect of sanctions imposed in 2008 on Iranian export by US, EU, Canada and Australia. Understanding how these sanctions have affected the behaviour of Iranian exporters helps to draw parallels towards the potential behaviour of other exporter countries. To examine this, author analysed



firm-level data and found that sanctions had higher impact on average Iranian exporter leading to significant welfare loss and export deflection to other markets.

Cenusa et.al (2014) analyse the effect and implication of Russian sanctions towards three Eastern European States: Ukraine, Moldova and Georgia. Obviously, for all of these 3 states, sanctions pushed them to diversify their export market and move towards EU. In the case of Moldova, after imposing trade barriers, country's export towards EU grew by 22.5% in 2014, compared to 2013, while exports to CIS countries decreased by 18.8%. Various scenarios have been noticed in Ukraine, Belarus and Georgia because for Ukraine and Georgia, market openness or proximity is strongly defined by the political leadership of the countries. However, since the introduction of Russian "punishment measures" significant increase in export level from these countries to the EU has been noticed.

Specific form of trade sanction is embargo, meaning that import is banned completely, which Bhagwati and Srinivasan (1976) name as "market disruption phenomena" and analyse optimal response policy intervention. Similarly, Lundborg (2017) examines the link between export embargoes and political factors, by application of world trade general equilibrium model, mainly relying on the analysis of US grain embargo on the Soviet Union. Embargoes might have an effect on other dimensions of the economy. Referring to the recent example of the longest embargo in history-US embargo on Cuba (Garfield and Santana 1997), which besides the direct effect on trade had also an indirect impact on health. More precisely, nutrition rich food was affected, since it was imported to Cuba, which eventually resulted into the decrease of sufficient protein amount per capita by 25% and overall sufficient decrease of calories by 18%.

Number of papers have been dedicated to the effects of trade on political relations between countries ((Maoz (2009), Dorussen (2006), Li and Reuveny (2011)). Martin et.al (2008) studied the relation between political conflict and trade. By defining multilateral or bilateral trade openness of the countries and applying instrumental variable method, authors concluded that trade increases the chance for military conflicts. Similarly, Borrus and Zysman (1990) state that dependence on trade causes insecurities which later might provoke conflict between trading partners.

An opposite view is shared by Buzan (1984), stating that conflict arises by political and military factors and not from trade. Case study of Russia-Georgia would confirm the analysis of latter, since despite the fact that Russia was Georgian main exporter market, due to the size of the

country this relation is less likely to cause insecurities for the receiver economy. However, overall loss from trade might be identical to the cost of the war itself (Glick and Taylor 2010).

## **2.1 Trade diversion**

Trade barriers lower trade on a country pair which is opposite to the case when country joins custom unions or signs Free Trade Agreements. In the long run, trade restrictions could result into trade diversion for the countries. Viner (1950) coined the term “trade diversion”. According to him, “trade diversion” occurs when the low-cost rest of the world partner is replaced by a high cost partner country and there is a welfare loss for the home country.” This paper will measure the trade diversion as a result of Russian sanctions on Georgian exports and contribute to the measurement methods of such trade diversion by application of synthetic control approach.

During the last two decades, economic regionalism lead to the spread of Free Trade Agreements (Sun and Reed 2010). Number of papers refer to the analysis of trade diversion, supported by regional trade agreements ((Freund (2005), Ornelas (2005), Sun and Reed (2010)). For the case study of Georgian trade flow after the ‘shock’ of 2006, number of free trade agreements provide solid ground for the opportunity of trade diversion from Russia to new partner countries. Georgia signed a free trade agreement with Turkey in 2007 on 27<sup>th</sup> of June, in 2014 EU and Georgia signed an Association Agreement which has entered into force since 1 July 2016,<sup>4</sup> in 2017 free trade agreement was signed with the Republic of China. Currently, Georgia has free trade regime with all CIS countries, Turkey, European Union, Peoples Republic of China and European Free Trade Association (EFTA).<sup>5</sup> FTAs have created a significant possibility to adjust trade embargo of Russia-oriented trade to other partners.

As has been concluded by several papers ((Kohl (2014), Frankel (1997), Carrere (2006), Jayasinghe and Sarker (2008)) the statement that free trade agreements have driven to the increase of trade flows among countries is inevitable. Relating these studies to Georgia, increased number of free trade agreements of the country after 2006, stands as an argument for switching trade from Russia to new partner countries.

To my best knowledge, there is a lack of research based on the case study of Georgia-Russia trade relations, which will be investigated in my thesis. Paper focuses on the analysis of trade

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<sup>4</sup> European commission [www.ec.europa.eu](http://www.ec.europa.eu)

<sup>5</sup> Ministry of Economy and Sustainable development of Georgia [www.economy.ge](http://www.economy.ge)

patterns after 2006 from Georgia to new trading partners and analyses, whether Russian embargo, lead to the changes in trading partners of Georgia.

### **3. Background of Georgian-Russian relations.**

I will refer to the history, both political and economic, of Georgian-Russian relations since the collapse of the Soviet Union, which meant also collapse of the command economy. In 1991 Georgia gained independence and took the path towards improving diplomatic relations with the European Union and NATO. After this, relations with Russia worsened.

Papava (2008) outlines Russian-Georgian diplomatic crisis of 1990 but nevertheless mentions that Russia was still the main trading partner of the country. Straight after the collapse of the Soviet Union, Commonwealth of Independent States (CIS) was formulated, which Georgia joined slightly later, in 1993, compared to the other former Soviet countries. The motive of joining the union was the hope of territorial integrity of the country. Author emphasizes on the fact that CIS was struggling to achieve one of its aims, which was considered to be establishment or improvement of economic contacts between member states. As for Georgia and Russia, Papava (2008) states that in the mid of 1990s both countries were undergoing the process of developing market economy and the strategies applied during the economic system of the Soviet Union would not work for the independent states. In 2004 new president of Georgia was elected, whose main motivation was to restore territorial integrity of the country and as the core strategy claimed country's aim to join the EU and become both economically and politically closer to the Western World.

Newnham (2015) shares a historical overview of the harsh bilateral actions taken by both parties. In 2006 Russia expelled 2300 Georgians within 4600 deportation notices. Meanwhile, Tbilisi arrested four Russian spies and government was refusing to release them. Additionally, despite the fact that trade relations between countries generated huge volumes and Georgian wine and mineral water were quite popular on Russian market since the times of Soviet Union, political instability between neighbouring countries had a strong impact on both economies. Russia started an introduction of sanctions on Georgian export in December 2005 and by the end of April 2006 complete embargo was imposed on Georgian wine and mineral waters. Russian Chief Sanitary Inspector Gennady Onishchenko named Georgian wine as "poison". Number of economists state that after this event, natural diversification of Georgian exports took place. Cenusa et.al (2014) examined the impact of Russian sanctions on Georgian trade and states that before the embargo Georgian wine was exported to 36 countries, while after

Russian embargo this number increased by 15 new markets, among which are China, Poland, Germany and Singapore.

Kelkitli (2008) outlines the main events between Georgian-Russian relations, which had a significantly negative impact on diplomatic as well as economic relations of the countries. Author analysis relations of two countries until the 5 days war in August 2008 and provides historical overview of the mid-1990s crisis. Georgian Russian relations reached its peak in August 2008 when Russian forces invaded Georgia. Georgians expected support from the West and when Russian troops crossed Georgia and military airforce started to bomb cities, French President Nicolas Sarkozy negotiated with Moscow to stop ceasefire, however it was inevitable that Georgia has lost Abkhazia and South Ossetia and no one could help the country restore territorial integrity (Antonenko 2008).

As for comparison, Muiznieks (2008) shares Latvian perspective on Georgian security which has been a complex issue in terms of domestic and foreign policies of the country. Author draws parallels between Georgian-Russian and Latvian-Russian relations, by pointing out that Russian politics towards Georgia may be copied to Latvia as well, further stating that Georgia is one of the main countries in need of development assistance.

Thus, during the governing period of M.Saakashvili Georgian-Russian relations were at the peak of the crisis, which had a huge impact in terms of socio-economic situation of the country. Especially after the war, an attitude of Georgians towards Russian changed completely. Russian schools were merged with Georgian ones and education in Russian was barely available for ethnic groups living in Georgia.

The situation changed drastically in 2012, when newly created coalition, Georgian Dream took over Saakashvili's regime. Georgian-Russian relations were reconsidered and the new government claimed that they should fix historical mistakes and improve relations with the neighbour.

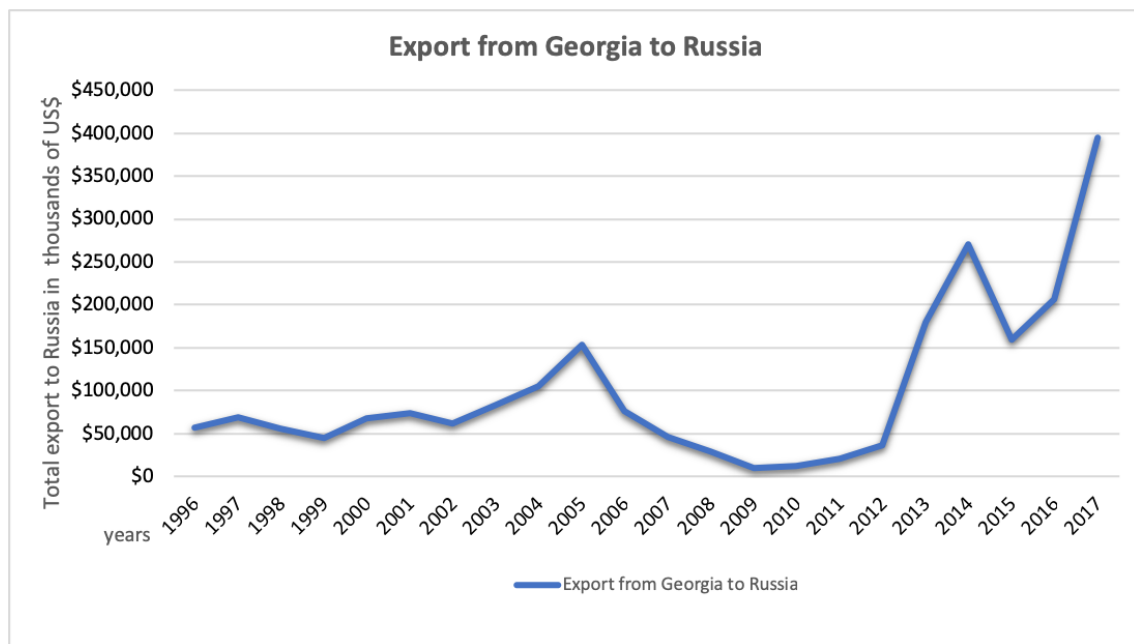
After 7 years of ban, on 15<sup>th</sup> of June 2013 export of 36 Georgian wine producers and 4 types of mineral waters was restored to Russia.<sup>6</sup> Based on this, export to Russia increased, which is depicted in the graph 1.

Despite the increase of exports in 2013, there was a considerable decrease in 2015, which proves the claim that Russian economic sanctions are strongly related to the political orientation of the partner countries. In 2015 Russia took measures towards the countries joining EU sanctions imposed against Crimea.

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<sup>6</sup> "Georgia Doubles Wine Exports as Russian Market Reopens" Sputnik international. ([www.sputniknews.com](http://www.sputniknews.com)).

Graph1. Total export to Russia from Georgia



Data source: National statistics office of Georgia: [www.geostat.ge](http://www.geostat.ge)

Based this, the Federal Service for the Supervision of Consumer Rights Protection and Human Welfare - Rospotrebnadzor statement<sup>7</sup> made in 2015 states that in 2015, 45 producers have exported wine to Russia the volume of which was estimated to be around 6,720,310.95 liters. 10 alcoholic beverages didn't meet the safety standards of Russian federation, over which Russian party takes serious control. During that period Russia's main argument towards the ban of Georgian exports were safety standards which Georgia couldn't meet. However, the quality of Georgian wine is controlled by national wine agency of Georgia.<sup>8</sup>

#### 4. Methodology: The Synthetic Control Approach

Case studies for regional economic events are estimated through detailed analyses by comparing economic conditions before and after the intervention. Synthetic control approach is one of the methods for evaluating the quantitative impact of a policy intervention or economic event at an aggregate level (McClelland and Gault 2017). Synthetic control method is developed for comparative case studies by Abadie and Gardeazabal (2003) who studied the economic effect of conflict in the Basque country and found that per capita GDP declined by 10 percentage points compared to synthetic control region. As an advantage of the synthetic

<sup>7</sup> "On alcohol control from Georgia" Rospotrebnadzor  
[https://rospotrebnadzor.ru/about/info/news/news\\_details.php?ELEMENT\\_ID=3983](https://rospotrebnadzor.ru/about/info/news/news_details.php?ELEMENT_ID=3983)

<sup>8</sup> National wine agency of Georgia [www.georgianwine.gov.ge](http://www.georgianwine.gov.ge)

control method, authors state the possibility to systematically select comparison groups. This approach was later developed by Abadie, Diamond, and Hainmueller (2010), who presented advantages and limitations of the method and analysed the effects of the proposition 99, a tobacco control program which was implemented in California in 1988. Under this method, researchers construct a weighted combination of control countries- i.e., a synthetic control, which approximates the treatment group or unit as closely as possible in the counterfactual case of no treatment. As defined in Abadie et al. (2010) terms “treatment unit”, “treatment group” “region” and “intervention” or “treatment” can be later used as “country” and “shock” or “event”. Detailed technical outline of the equations of synthetic control method is presented in Appendix 1.

Weights of the synthetic control unit are chosen in a way that pre-intervention outcome and predictors of the synthetic control are on average very similar to the ones of the treated country. Sum of the weights is restricted and equal to 1, which enables the model to avoid extrapolation (Abadie et. al 2010). Therefore, this approach is characterized with the “transparency” and “flexibility” meaning that weights identify countries which are used to estimate the dependent variable for the treated region and potential controls can be chosen to be relevant for the studies. (Billmeier and Nannicini 2011). One of the difficulties of the approach is to choose the list of the potential control countries which will have similar characteristics as the unit exposed to the intervention and at the same time, none of them would have had any similar event for the pretreatment period.

In this study, the treated unit is Georgia. Intervention or treatment is Russian sanctions on Georgian agricultural products imposed in 2006. Synthetic version of the treatment unit is created by the control pool of 18 countries from Central and East Europe and Central Asia. Georgia – an 8<sup>th</sup> country from the list of all 19 countries ordered alphabetically and is an only region affected by the intervention because none of the countries examined trade barriers by Russia on agricultural products over the period 1996-2012. One of the reasons behind choosing time period of analysis were trade relations of the countries with Russia, which started to worsen after 2012, for example, Ukraine and Albania, towards which sanctions were imposed later and extending the time frame of the analysis would make method invalid and lead to biased results. Preintervention period is 1996-2006, intervention period is 2006, the postintervention period is 2006-2012. Treatment had no effect on the outcome before the event, meaning that real vs synthetic Georgia match perfectly before the intervention in 2006.

One of the shortcomings of the method is that standard ways of inferential techniques cannot be applied, usually due to a small number of observations (Abadie and Hainmueller 2010). To check the robustness of the results placebo test is commonly used (Billmeier and Nannicini 2011). For reference, Abadie and Gardeazabal (2003), applied the same technique to the similar region to Basque country - to Catalonia for comparing it to the actual unit which was exposed to the intervention. This approach was extended by Abadie, Diamond, and Hainmueller (2010) who applied synthetic control algorithm to every US state (other than the treatment state California), in other words to every control group member and compared the estimated placebo gaps with the effect of the actual treatment unit California. This paper follows the approach and applies placebo in space and in-time placebo for checking the robustness of the results, which are presented in section 5.

## 4.1 Data

Data used in this thesis is the yearly panel of 19 countries from Central and East Europe and Central Asia<sup>9</sup> during the years of 1996-2012. Data includes 3894 observations for 19 countries and their trading partners: Russia and the European Union over the period 2006-2012. While measuring the impact of Russian sanctions, the dependent variable is food export level to Russia, taken from World Integrated Trade Solution (WITS) database<sup>10</sup>, independent variables are obtained directly from World Bank Database<sup>11</sup>.

Independent variables also known as predictors are measured before the sanctions and are following: Foreign direct investment, GDP, GDP growth, Unemployment rate, population size and food export to the EU. Analysis also consist of measuring effects in terms of trade diversion. In this analysis, dependent variable is food export to the EU and food export level to Russia is switched to predictors and measured before the sanctions, therefore the list of predictors is following: Foreign direct investment, GDP, GDP growth, Unemployment rate, population size and food export to Russia.

As one of the advantages of the method, synthetic control approach gives flexibility to researchers for choosing predictors and comparison countries (Billmeier and Nannicini 2011). Reasoning behind choosing each independent variable for this study is shared below:

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<sup>9</sup> Armenia, Azerbaijan, Belarus, Bulgaria, Croatia, Cyprus, Estonia, Georgia, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Moldova, Romania, Serbia, FR(Serbia/Montenegro), Slovak Republic, Slovenia, Turkey, Ukraine

<sup>10</sup> <https://wits.worldbank.org/>

<sup>11</sup> World Bank Database <https://data.worldbank.org/>

- **Food export to Russia-** Represents aggregate food export level to Russia, measured in thousands of US dollars based on deflated variables and stands as a dependent variable while measuring the effect on real trade after imposition of Russian embargo on Georgian agricultural products. Largest proportion of overall export to Russia has been accounted for food products, on average ~65% and remaining stable over the years, the level of which dropped drastically to 1% after imposing trade restrictions. For constructing synthetic Georgia information for food export from all countries included in the controls is obtained from WITs database. In the second part of the paper, while measuring the effect of trade diversion, food export to Russia is applied as a predictor and the dependent variable is export to the EU.

This variable had highest influence on choosing list of countries which could be included into the control pool, since Synthetic Control Method doesn't allow to have a missing observation for any dependent variable, so countries for which data was missing weren't included into the list of potential controls.

- **Food export to the EU-**represents aggregate food export level to the EU, is measured in thousands of US dollars and presented for all countries of the control group. Since most of the countries in the control pool are post-Soviet states who started to develop market economy at the end of the 20<sup>th</sup> century, during Soviet times none of the countries would report export to any single EU countries, thus for creating synthetic and real treated unit food export to the EU stands as a significant measurement.
- **GDP-**real GDP measured in US dollars source of which is World Bank national accounts data, and OECD National Accounts data files. GDP as one of the main indicators of economic performance and wealth of the countries (Summers and Heston 1991). Number of papers have used GDP variable as a control in order to analyze export growth or diversification. (Henriques and Sadorsky (1996), Marhubi (2000))
- **Foreign direct investments (FDI)**– Data are in current U.S. dollars. Obtained from "International Monetary Fund, Balance of Payments database, supplemented by data from the United Nations Conference on Trade and Development and official national sources." <sup>12</sup>

Based on one of the motivations of paper, defined as studying the effect of trade diversion, FDI stands as an important measurement. Similar to the Unemployment rate, this variable is a common indicator for most post-Soviet states. Furthermore,

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<sup>12</sup> World Bank Database <https://data.worldbank.org/>



highlighting the importance of export diversification, Iwamoto and Nabeshima (2012) have found that FDI inflow strongly correlates with export diversification of the country. Additionally, number of studies have examined effect of FDI on the export level of the countries ((Sharma (2000), Zheng et. al (2004), Harding and Javorcik (2011)). Paper includes FDI into the predictors to construct synthetic Georgia since its trend for potential controls is similar and the variable matching between real and synthetic Georgia is significant.

- **GDP growth rate**- an annual percentage growth rate of GDP at market prices based on constant local currency obtained from World Bank national accounts data, and OECD National Accounts data files. Similar to FDI and unemployment rate GDP growth rate is a common indicator for the countries included in the control pool, since most of them started developing the market economy at the beginning of 90's after the collapse of Soviet Union. Therefore, this variable should be considered as an important determinant of export growth of the countries. Number of papers have studied the link between GDP and export growth of the countries ((Xu (1996), Shafaeddin (1995), Feder (1983))
- **Population size** – is based on the facto definition of the population, counting all residents of the country. Values are midyear estimates. This variable is another measurement for the size of the economy which has the potential to affect pattern of international trade relations of the country, (Alesina et. al 2005) Population size has potential in determining specialization of the country, for instance, assuming that larger population would mean higher “equipped labour” depicting the difference between total factor productivity (TFP) and capital endowments of the countries. Furthermore, Delacroix (1977) studies the relation between export and economic growth and states that population size effects specialization of the country and its level of exports. In this paper, as shown in predictor balancing table, population size of real vs synthetic Georgia match well, thus presenting the validity of this variable to be included to the analyses as a predictor.
- **Unemployment rate**-Unemployment, total (% of the total labour force, modelled ILO estimate). Unemployment rate is the common indicator for post-Soviet states and transition economies, since in Soviet Union almost all citizens were employed without any salary differentiation. However, after the collapse of the system, these states started to experience financial deficit, increased unemployment rate and foreign debt

(Silagadze 2017). Since most of the countries included in the control pool represent post-Soviet economies, this variable has been included into the predictors, in order to create a synthetic unit which would resemble its real version in case of absence of the event. Furthermore, unemployment rate has a direct impact on the trade relations of the countries, namely Batra and Naqvi (1987) analysed the relation between unemployment rate and trade openness of the country, concluding that even in the presence of unemployment, free trade dominates over no trade. Dutt et al. (2009) analyse link between trade liberalisation and unemployment and find a significant difference between short and long-run effects of them. Unemployment rate has been extensively applied in the field of international trade ((Davidson et al. (1999), Helpman et al. (2010), Epifani et al. (2005))), thus presenting its relevance for including it to the list of independent variables for estimating the impact of Russian trade sanctions on Georgian trade flow.

**Countries** which are included in the pool for constructing synthetic Georgia, are chosen in terms of similarities in macroeconomic indicators and history. Most of them represent post-Soviet states, sharing the same “ground” for economic development after restoring independence. These countries are following:  
Armenia, Azerbaijan, Belarus, Bulgaria, Estonia, Croatia, Cyprus, Latvia, Lithuania, Kazakhstan, Kyrgyz Republic, Moldova, Romania, Serbia, Slovakia, Slovenia, Turkey, Ukraine. Georgia represents the treated unit, however for robustness check of the results (section 5) the country is switched to the pool of controls.

## 5. Empirical results

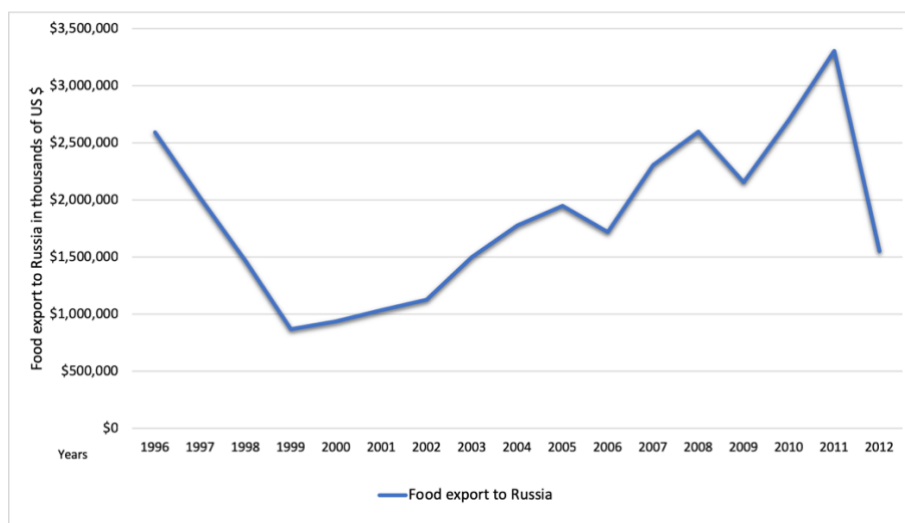
Using the SCM paper investigated the effect of Russian sanctions on Georgian trade. Synthetic Georgia is constructed with the control units (countries) from Central and East Europe and Central Asia. Study eliminated countries which had barriers from Russia on agricultural products, eventually, 18 countries were chosen to be included into the control. Outcome variable is the level of food exports to Russia. Treatment year is 2006 when complete embargo on agricultural products was imposed by Russia. Predictors are averaged over the pre-treatment year range. Pre-treatment year range is 1996-2005.

First of all, referring to the sample statistics I compare the trends of food export to Russia from the rest of the controls against the trend from Georgia. This is the first step of identifying

whether countries from control pool will create a suitable comparison group for Georgia to estimate the effects of Russian sanctions on Georgian trade flow.

Comparing figure 1 and 2 trends are similar until 2005, however after the treatment period trends start to diverge, exports from Georgia began to decrease, while for the rest of the controls it was still increasing until 2008, after which drastic drop is noticed.

Figure 1. Food export to Russia from the rest of the controls



Data source: World integrated trade solution database [www.wits.worldbank.org](http://www.wits.worldbank.org)

Figure 2. Food export to Russia from Georgia



Data source: World integrated trade solution database [www.wits.worldbank.org](http://www.wits.worldbank.org)

The reason behind the decreased trend in 2008 might be Russian crisis, during which overall Trade Restrictiveness Indices (OTRI) have been increased from 0.9 to 1.2 percentage points. (Kee et al. 2013). Comparing the decrease for Georgia against the rest of the controls, the drastic drop has been examined for the treated unit, while for the rest of the controls food export to Russia started to increase after 2006.

The central question is what would be the export level to Russia from Georgia in the absence of sanctions. Synthetic control method provides us the way to estimate this effect. As it is described above, based on the methods outlined in Abadie and Hainmueller (2010) synthetic Georgia is constructed by the combination of the countries included in the control pool.

Potential control units include 18 countries from Central and Eastern Europe and Central Asia. As shown in Table1, these are countries which resemble Georgia in terms of relations with Russia as well as macroeconomic indicators which are later chosen as explanatory variables. Synthetic control approach assigns weights to each country, based on the estimated results the largest weight is assigned to Armenia equal to 0.842. This result seems logical since both countries belong to Caucasus region, meaning they share common values, culture and at some extent history as well. Additionally, as it can be seen from the Figure3 until 2006 food exports from Armenia to Russia resemble the trend of Georgia until the intervention.

Figure3. Food exports to Russia from Armenia



Data source: World integrated trade solution database [www.wits.worldbank.org](http://www.wits.worldbank.org)

Other participants in the weighted average are following: Belarus (0.057) Kazakhstan (0.001) and Serbia (0.1) all the rest of the countries have been assigned 0 weight.

Table 1. Weights assigned to the pool of controls

Country	Weight
Armenia	0.842
Azerbaijan	0
Belarus	0.057
Bulgaria	0
Croatia	0
Cyprus	0
Estonia	0
Kazakhstan	0.001
Kyrgyz Republic	0
Latvia	0
Lithuania	0
Moldova	0
Romania	0
FR(Serbia/Montenegro)	0.1
Slovak republic	0
Slovenia	0
Turkey	0
Ukraine	0

Source: author

In order to demonstrate similarity between real and synthetic treated unit, table 2 presents predictor balancing table for Georgia, which is the outcome of a comparison between explanatory variables for the treated unit over the pre-treatment period. As it can be seen from the table, independent variables, FDI, unemployment rate, population size and food export to the EU are well balanced for synthetic vs treated unit, slightly higher gap is noticed within independent variables - GDP and GDP growth rate, which is not well balanced for treated and synthetic country. All variables are averaged for the pre-treatment period (1996-2005). FDI, GDP, food export to EU and food export to Russia are measured in thousands of dollars, unemployment rate and GDP growth is measured in percentages and population in thousands. As presented in table2 comparing the numbers with the average of 19 control states, it can be seen that average level of FDI, GDP growth and Unemployment rate was lower in control pool compared to real Georgia before the preintervention period. An average number of populations

is bigger in the rest of the controls, which is logical, since the population of Georgia is 3.27 million<sup>13</sup>, while for some countries (for example, Ukraine, Kyrgyz Republic) number is bigger. Mean Square Prediction Error (MSPE) is minimized before the pretreatment period 1996-2005. Goodness of fit can be evaluated by calculating the root mean squared prediction error (RMSPE) between the actual and synthetic unit (Abadie, Diamond, and Hainmueller 2015). RMSPE is the average of the squared discrepancies between food export to Russia from real Georgia and its synthetic counterpart for the pretreatment period and equal to 10135.28 and as presented in figure 4 after the treatment, real and synthetic Georgia start to diverge, presenting the significant negative effect of the treatment.

Table 2. Predictor balancing real and synthetic Georgia along with average values of 19 control countries

<b><u>Georgia</u></b>			
<b>Variables</b>	<b>Treated</b>	<b>Synthetic</b>	<b>Average of 19 controls</b>
GDP	3.82	4.95	5.66
FDI	2.53	1.86	2.35
Export to the EU	5429.7	6322.94	206825
GDP growth	6.62	8.09	4.55
Unemployment rate	13.00	12.07	10.5865
Population	4398520	3914480	8267081
Export to Russia (2005)	108028.4	87293.06	108360
Export to Russia (2001)	37467.52	38358.35	56494.35
Export to Russia (1997)	35127.66	31470.58	107975.6

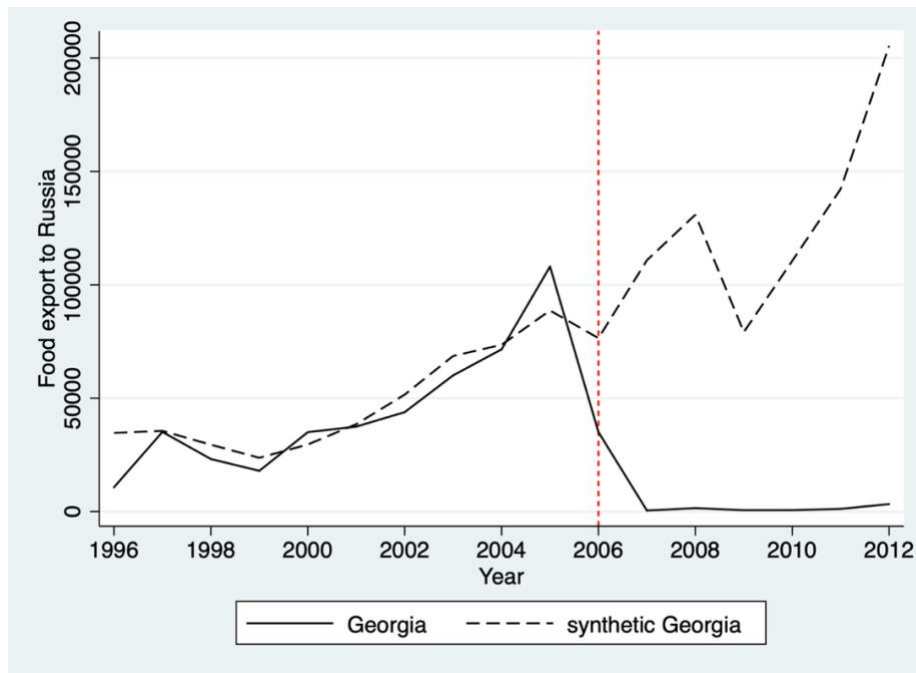
Source: author Note: "Export" refers to food exports.

Figure 4 depicts the trend over the period 1996-2012, which shows that before the event, actual and synthetic data fit well, meaning that the level of exports of Georgia versus its synthetic counterpart is very close to each other for the entire pre-treatment period. This proves that synthetic Georgia is able to provide precise projections of the export level in case the event would not occur. After the intervention in 2006, the lines start to divert in a way that synthetic Georgia has higher values compared to real Georgia, meaning that the gap is significantly negative. The effect of the intervention will be measured by the difference between the real and synthetic data.

Additionally, figure 4 shows that while synthetic Georgia followed the trend of the rest of the controls (shown in figure 1) real Georgia experiences a sharp decrease right after the treatment.

<sup>13</sup>National Statistics office of Georgia [www.geostat.ge](http://www.geostat.ge)

Figure 4. Food export to Russia from Georgia vs Synthetic Georgia



Source: author

Note: measured in thousands of US dollars

Results reveal that export in 2007, right after the event was lowered by 132904.9 thousands of US\$ compared to the case of absence of sanctions, this decrease was increasing in time (figure 5) which proves that sanctions had a large negative effect on the food export level to Russia.

Figure5. Gap of food exports to Russia between Georgia and synthetic Georgia.



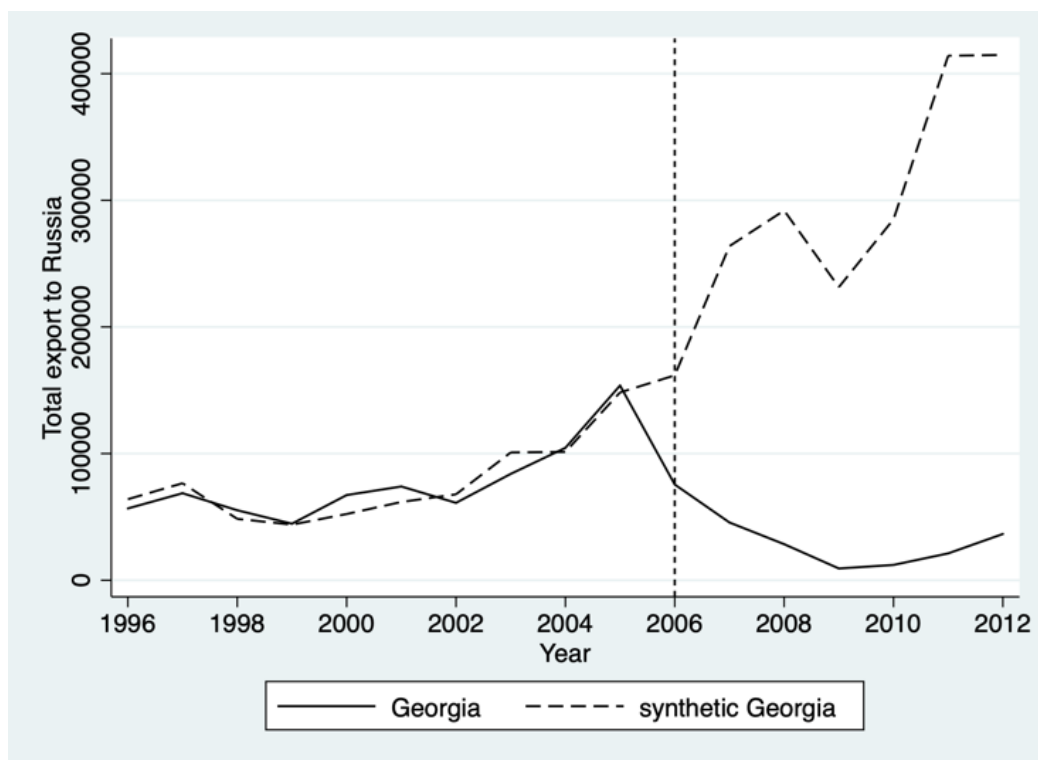
Source: author

Note: measured in thousands of US dollars

Gap for the countries which were assigned weights higher than 0 are presented in Appendix 2. Compared to the countries, by which synthetic Georgia has been constructed the gap for the unit which was exposed to the intervention is considerably higher.

Percentage shares of food exports to Russia to total export have been stable over the years and on average remained at 65%. Therefore, following the same approach paper analysed the effect of the agricultural embargo on total exports for Georgia to Russia which are depicted in figure 6 below. In this case, largest weight is assigned to Armenia, equal to 0.788, followed by Azerbaijan with 0.179, Kyrgyz Republic (0.02) and Romania (0.014). Predictor balancing and weight tables are presented in Appendix 3. Analysis later is based on food exports from the treated unit.

Figure 6. Total exports to Russia from Georgia vs Synthetic Georgia



Source: author

Note: measured in thousands of US dollars

## 5.1 Robustness check of the results

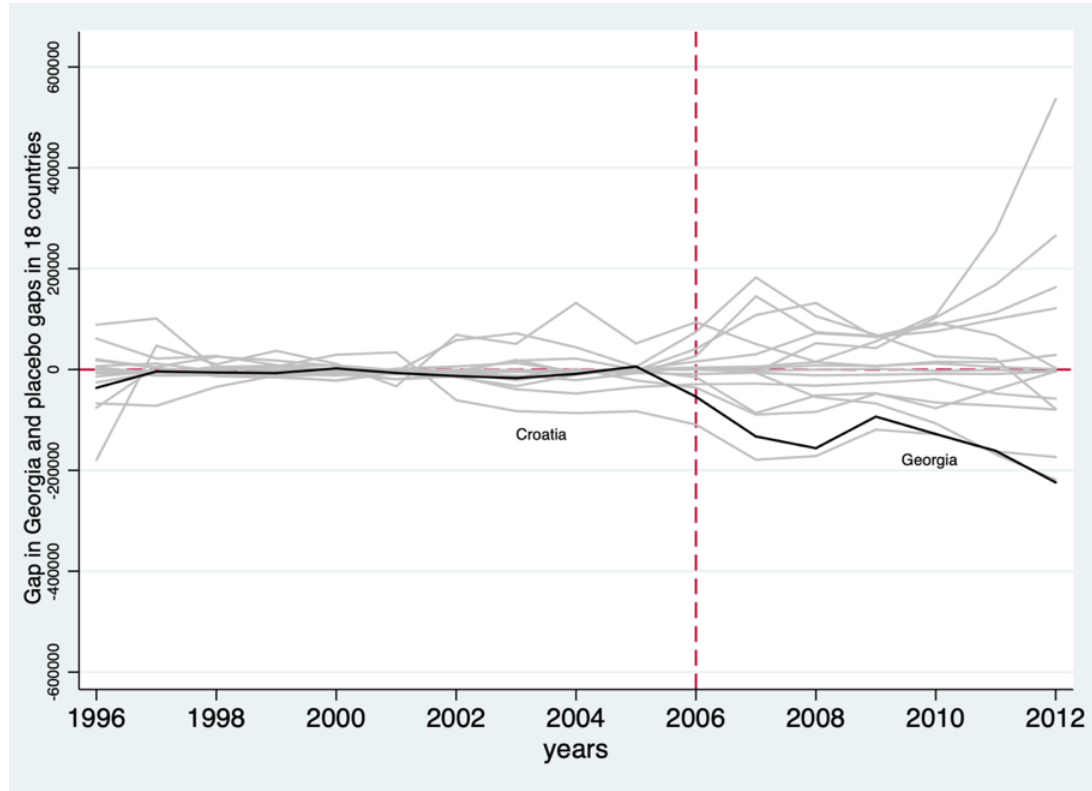
A question which arises at this stage of the research is, if we had chosen another country, would we receive the same empirical results and conclusion. In order to answer this, I check the robustness of the estimated impact, by applying "placebo" exercises, similar to Abadie and Gardeazabal (2003). Application of placebo in space means applying the synthetic method to the countries previously used as potential controls. For obtaining placebo results, I run loop



which iteratively reassigns the intervention in space to all 19 countries, where the treatment unit is incremented and Georgia is switched to control pool. After this, I calculate the level of exports in case of the event for each synthetic country and estimate the effect with each placebo run. Eventual results in the form of placebo gaps are shown in figure 7. Grey lines show the difference between exports level of each country compared to its synthetic version. The gap for Georgia is presented with a darker line. If the gap for other countries is similar to Georgia then it could be concluded that the empirical results and analysis of the paper stating that sanctions had a negative effect are not significant.

As it can be observed from figure 7 sanctions had a significant impact on food export from Georgia to Russia. However, gap for Croatia after the intervention is slightly bigger than for Georgia, which doesn't come as a surprise, because this gap is higher even before the intervention, more precisely compared to other countries in the control pool, in our country list there won't be a combination of countries which could produce synthetic Croatia, therefore this method wouldn't be applicable for this country within these explanatory variables or potential control groups.

Figure 7. Gap of Food export to Russia from Georgia and placebo gaps for the rest of the controls



Source: author

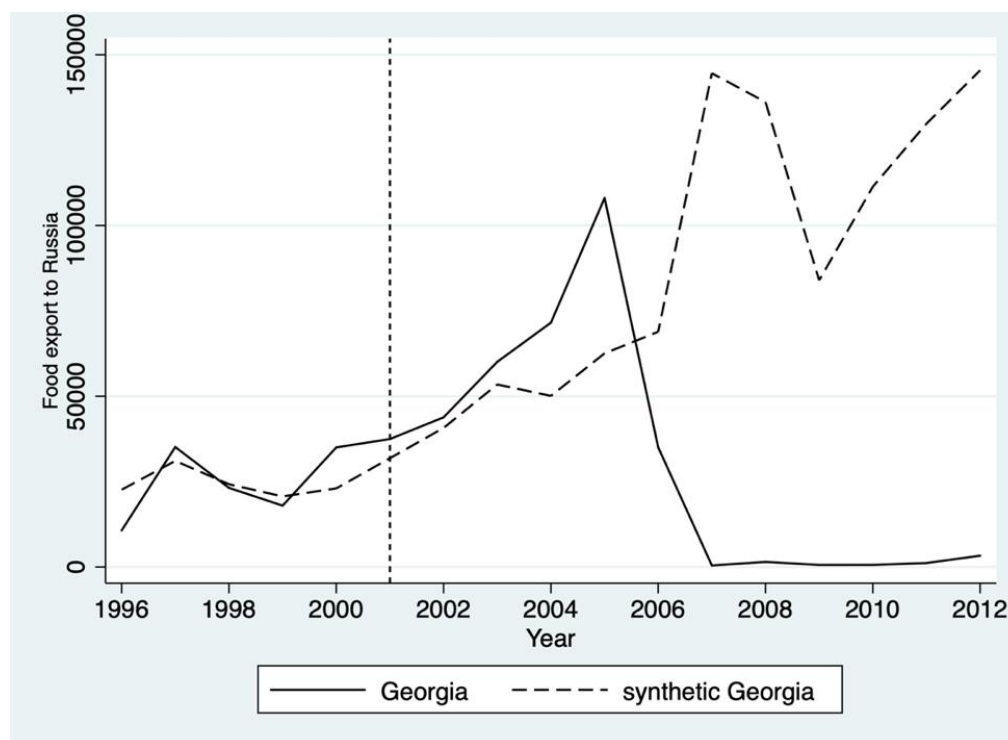
Note: measured in thousands of US dollars

If the same situation would be observed for Georgia, for example not matching before the treatment then we would say that fit wasn't created correctly and the gap between export level of real versus synthetic Georgia wasn't close to reality since the control group or the predictors weren't created correctly. As it can be seen treated and synthetic Georgia match quite well before the ‘‘shock’’. Estimated impact for Georgia is unusual – higher than in other ‘‘donor pool’’ countries – this is additional evidence that the sanctions had an impact on export from Georgia.

## 5.2 Placebo in time

Another type of Placebo test which is described in Abadie, Diamond, and Hainmueller (2015) is in-time placebo, where intervention is assumed to occur during any pretreatment period and the results are compared to the outcome of the main empirical analysis. For this study, let's assume that the event has happened in 2001, roughly in the middle of the pre-treatment period. In order to avoid effects of the actual event, the sample period is chosen until the year of intervention. I use the same predictors, which are averaged for the pretreatment period 1996-2000. As shown in figure 8 divergence after the treatment is not that big as after the treatment in 2006. For the evidence, one should compare figure 8 to figure 4.

Figure 8. Synthetic Georgia Placebo treatment for 2001.



Source: author

Note: measured in thousands of US dollars

Country weights and predictor balancing tables for a 2001 placebo treatment are presented in Appendix 4. Part of the divergence can be explained by the fact that for the treatment year of 2001, 0 weights are assigned to Kazakhstan, Belarus and Serbia, opposite to the weights for the actual event of 2006.

## 6. Effect on trade diversion

To measure the effect on trade diversion paper takes food export to the EU as a dependent variable and runs the same analyses, on the treated unit Georgia. As can be seen from Table 4, weights assigned to the countries from the control pool differ compared to the case where export to Russia is treated as a dependent variable. In this case, synthetic Georgia is constructed by Armenia (0.639), Azerbaijan (0.023), Bulgaria (0.017), Kazakhstan (0.027), Kyrgyz Republic (0.262), Latvia (0.026) and Ukraine (0.007)

Table 4. Weights assigned to the pool of controls

Country	Weight
Armenia	0.639
Azerbaijan	0.023
Belarus	
Bulgaria	0.017
Croatia	0
Cyprus	0
Estonia	0
Kazakhstan	0.027
Kyrgyz Republic	0.262
Latvia	0.026
Lithuania	0
Moldova	0
Romania	0
FR(Serbia/Montenegro)	0
Slovak republic	0
Slovenia	0
Turkey	0
Ukraine	0.007

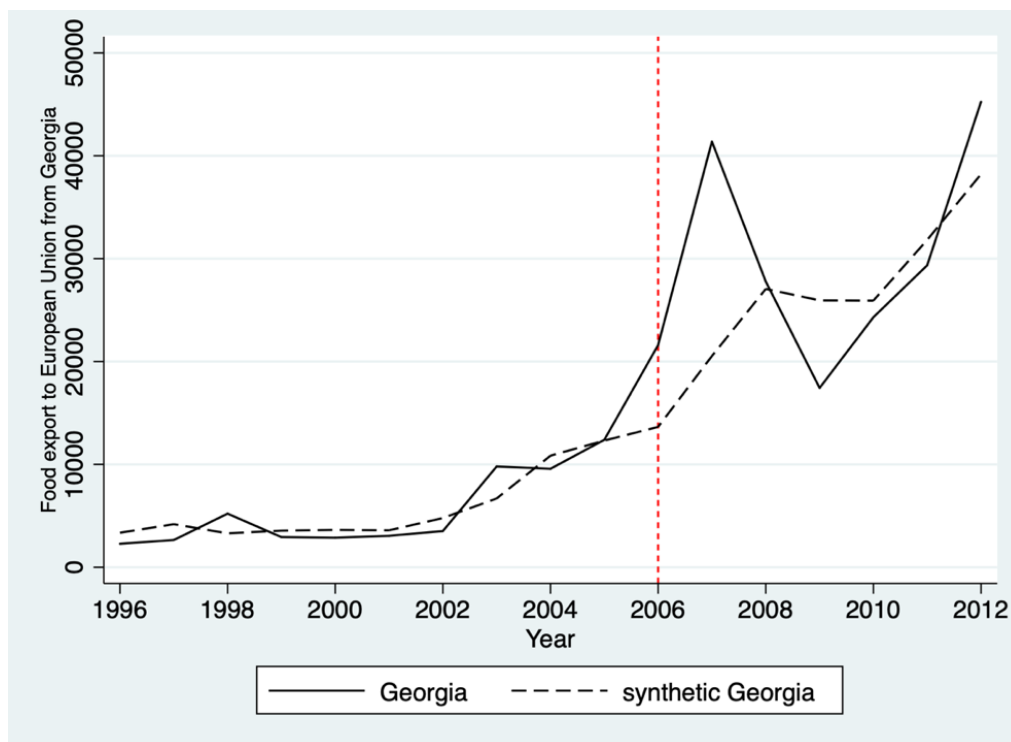
Source: author

Table 5. Predictor balancing

Variables	<u>Georgia</u>	
	<u>Real</u>	<u>Synthetic</u>
GDP	3.82	3.81
FDI	2.53	2.52
Export to Russia	44291.98	34357.37
GDP growth	6.62	7.44
Unemployment rate	13.00	11.4
Population	4398520	4377450
Export to the EU (2005)	12391.07	12318.18
Export to the EU (2001)	3060.09	3593.31
Export to the EU (1997)	2650.86	4189.75

Source: author

Figure 9. Export to the EU from Georgia vs Synthetic Georgia



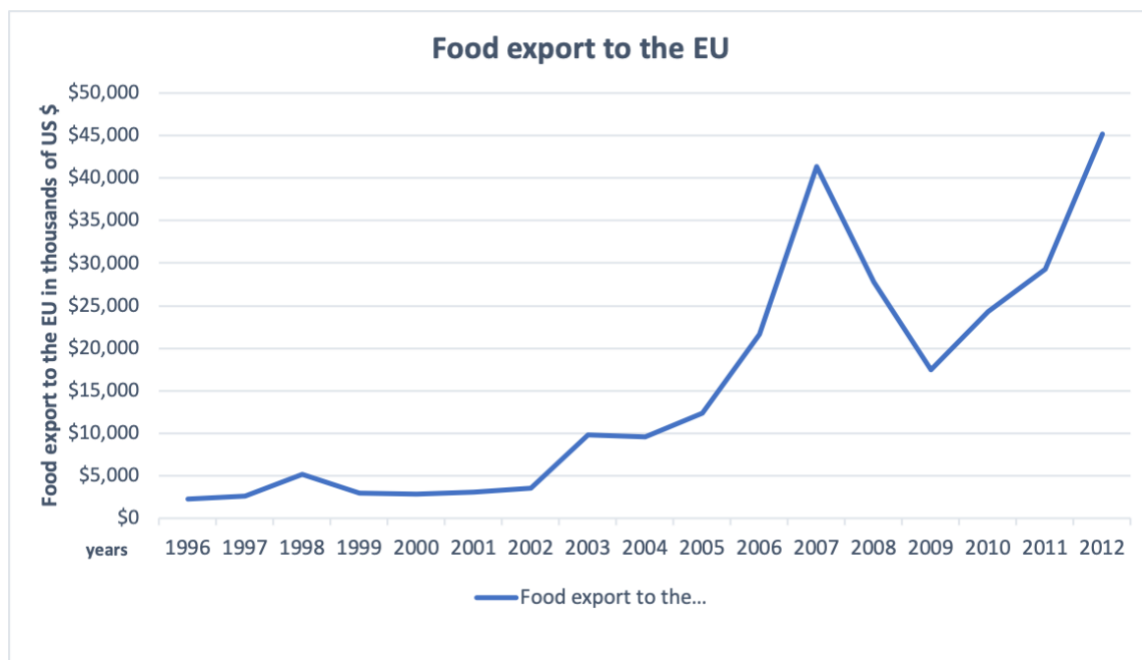
Source: author

Note: measured in thousands of US dollars

As depicted in figure 9 after the event, gap between exports of real and synthetic Georgia was positive until 2009, meaning that the trade with the EU would be lower in case of absence of sanctions. However, gap becomes negative beginning from 2012. This didn't come as a surprise, since the process of diversion takes time, especially from the transitioning economy after socio-political crisis happening in Georgia.

Figure 10 presents trend of exports to the EU from Georgia over the period 1996-2012. In 2006 trend depicts an increase, which drops in 2008, the reason for which might be Georgian-Russian 5 days war. After the country started the process of recovery export to the western world has restored and reached its peak in 2014, when DCFTA was signed with the European Union.

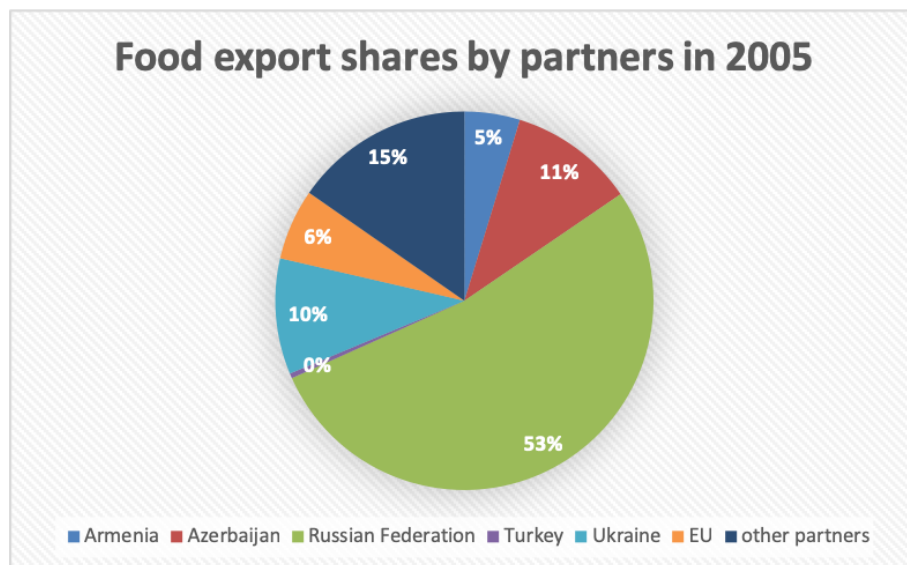
Figure 10. Exports from Georgia to the European Union



Data source: World integrated trade solution database [www.wits.worldbank.org](http://www.wits.worldbank.org)

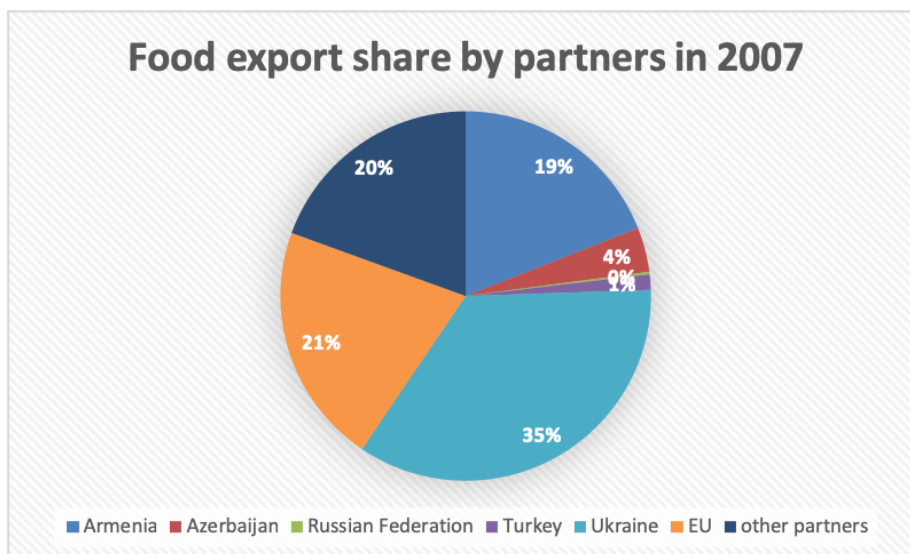
Furthermore, as shown in figure 11, until the intervention, highest share of food export from Georgia was accounted for Russia 53%, for European Union it was only 6%, however, right after the imposition of Russian sanctions on Georgian trade flow in 2006, these shares changed drastically. As shown in figure 12, in 2007 share of food export to Russia dropped to 0%, while export to the European Union had increased to 21%. Food export shares from Georgia for the year of 2017 are presented in figure 5.1 (Appendix 5).

Figure11. Food export from Georgia by partners in 2005



Data source: World integrated trade solution database [www.wits.worldbank.org](http://www.wits.worldbank.org)

Figure12. Food export from Georgia by partners in 2007



Data source: World integrated trade solution database [www.wits.worldbank.org](http://www.wits.worldbank.org)

Overall, to check how sensitive are the analysis presented in this paper one can compare food export to Russia from other geographic regions of the world (African countries, South America..) against the countries included into the control pool of this study, construct synthetic Georgia based on them and examine the effect of the event. As this paper includes mainly post-Soviet countries and several Central and East European states, which at some extent resemble Georgia in terms of socio-political, historical or economic process and created a synthetic country which matched its real version quite well before the intervention.

## 7. Conclusion

This paper examined the effect of Russian sanctions on Georgian trade flows and measured the effect on trade diversion. After demonstrating the ability of Synthetic Control Method (SCM) to be applied for studying the effects of sanctions, results depict the quantitative negative impact of Russian sanctions on Georgian food export. This method has been applied in several papers for examining country related trade effects (Billmeier and Nannicini 2013). Empirical analysis provides a comparison of real Georgia vs its counterfactual case of no treatment. For real country, food export to Russia was lower by 132,9 millions of US dollars, compared to the case of absence of the intervention. However, right after the event food exports to the European Union increased by 20,48 millions of US dollars compared to the case of absence of sanctions. After the intervention, in 2007 food export share to the European Union increased from 6% to 21%, while the share of food exports to Russia was dropped from 53% to 0,004%. Results reveal that sanctions influenced structural processes of the trade flows of Georgia, as the country switched trade to new partners, which by empirical findings of the study lead to the evidence of trade diversion from Georgia to the European Union countries. Robustness check by placebo tests proved the significance of the results.

One of the shortcomings of the synthetic control approach is considering the thought that countries have the same properties across time and an only country undergoing changes is the one, which was exposed to the intervention. In the real world, with an ongoing process of globalisation number of events can influence outcome variable of the study, thus unobserved heterogeneity can be present.

Findings of the paper support the statement that political relations have affected trade flows of Georgia, however, country managed to divert its trade to the European Union countries. This diversion has not overcome the loss of trade with Russia, because right after the intervention in 2007, the difference between the export of synthetic Georgia to Russia and real Georgia to the European Union was approximately 112 millions of US dollars.

Based on the flexibility of Synthetic Control Approach, this study can be extended further. One option could be considering an increased number of comparison groups and macroeconomic indicators as predictors which would create synthetic treated unit as close to its real version as possible. Also, one could conduct interviews with top exporters of Georgia to find out how Georgian producers overcame Russian sanctions. Furthermore, analyses could be extended by investigating whether Georgian products have been reaching Russian market by the use of “trade triangles” during the blockade.

Additionally, in 2013 Russia opened its borders to Georgian wine and mineral waters, however over the period of 2006-2013 other products would have replaced Georgians, thus investigating market share of Georgian products on Russian market before 2006 and after 2013 stands as an extended topic for further analysis of the effects of sanctions. Furthermore, as presented in figures 5.2 and 5.3 (Appendix 5) in 2018 export of wine and mineral water to Russia resembles the trend before the intervention, this topic should be researched further by considering changes in market shares of these exporting goods and their overall trade value.



## Appendix 1. Technical outline of Synthetic Control method

As presented by the authors of the model, let's assume that we observe  $K + 1$  countries where only the first region is affected by the intervention. According to this, we have  $K$  countries for potential controls. Let  $Y_{it}^N$  be an outcome variable which will be observed for the country  $i$  at time  $t$  for the case where no treatment takes place, for units  $i = 1, \dots, K + 1$  and time period  $t = 1, \dots, T$ . Let's denote number of preintervention periods with  $T_0$ , with  $1 \leq T_0 < T$ .

Let  $Y_{it}^I$  be the outcome for unit  $i$  in time  $t$  in case of intervention during the periods  $T_0 + 1$  to  $T$ . We should assume that treatment has no effect on the outcome before the event time  $T_0$ , meaning that  $Y_{it}^N = Y_{it}^I$  for  $t \in \{1, \dots, T_0\}$

$\alpha_{it} = Y_{it}^I - Y_{it}^N$  is the effect of the intervention for  $i$  unit at time period  $t$ . Here we need to consider indicator  $D_{it}$ ,

Which will take value 1 if intervention happens to unit  $i$  and 0 otherwise. Outcome for unit  $i$  will be  $Y_{it} = Y_{it}^N + \alpha_{it}D_{it}$

$$D_{it} = \begin{cases} 1 & \text{if } i = 1 \text{ and } t > T_0 \\ 0 & \text{otherwise} \end{cases}$$

To estimate  $\alpha_{1T_0+1}, \dots, \alpha_{iT}$  for the period after the intervention ( $t > T_0$ ) we refer to the following equation:  $\alpha_{it} = Y_{it}^I - Y_{it}^N = Y_{it} - Y_{it}^N$ . Since  $Y_{it}^I$  is estimated to measure  $\alpha_{it}$  we need to observe  $Y_{it}^N$ . For this factor model needs to be considered  $Y_{it}^N = \delta_t + \theta_t Z_i + \lambda_t \mu_t + \varepsilon_{it}$  where notations have following meaning as explained by Abadie et.al (2010):

$\delta_t$  – unknown common factor

$Z_i$  -  $(r \times 1)$  vector of observed covariates not affected by the intervention

$\theta_t$  -  $(r \times 1)$  vector of unknown parameters

$\lambda_t$  -  $(1 \times F)$  vector of unobserved common factors

$\mu_t$  -  $(F \times 1)$  vector of unknown factor loadings

$\varepsilon_{it}$  - error terms, unobserved shocks

Now we should consider a  $(J \times 1)$  vector of weights  $(W = w_2, \dots, w_{J+1})'$

In a way that  $w_j \geq 0$  for  $j = 2, \dots, J+1$  and  $w_2 + \dots + w_{J+1} = 1$  and each value of  $W$  is a potential synthetic control and the value of the dependent variable for each synthetic control is:

$$\sum_{j=2}^{j+1} w_j Y_{jt} = \delta_t + \theta_t \sum_{j=2}^{j+1} w_j Z_{jt} + x \lambda_t \sum_{j=2}^{j+1} w_j \mu_{jt} + \sum_{j=2}^{j+2} w_j \varepsilon_{jt}$$

Based on Abadie, Diamond, and Hainmueller (2010) since we can choose  $w^*$  so that:

$$\sum_{j=2}^{j+1} w_j^* Y_{jT_0} = Y_{1T_0} \quad \text{and} \quad \sum_{j=2}^{j+1} w_j^* Z_j = Z_1$$

Then as an estimator for  $\alpha_{1t}$  this suggests using following formula during the periods  $t \in \{1, \dots, T_0\}$

$$\hat{\alpha}_{it} = Y_{1t} - \sum_{j=2}^{j+1} w_j^* Y_{jt}$$

$w_j$  denotes the  $j_{th}$  element of a given  $(J \times 1)$  vector  $W$ , composed of optimal weights that solve the following problem.

$$\min \|X_1 - X_0 W\| = \sqrt{(X_1 - X_0 W)' V (X_1 - X_0 W)}$$

subject to  $w_j \geq 0; \sum w_j = 1; j = 2, \dots, J+1;$

$X_1$  is pre-intervention characteristics for the treatment unit and  $X_0$  for untreated ones.  $V - (k \times k)$  symmetric matrix with non-negative components determining the importance of explanatory variable. Since  $W$  depends on  $V$ , the latter should be chosen attentively, in order to assign larger weights to the pre-treatment variables, which have bigger predictive power on the outcome variable. One option for choosing  $V$  is based on minimizing MSPE (Mean square prediction error) of the dependent variable. (Abadie and Gardeazabal 2003). However, iteration optimization procedure can be implemented which can search across all non-negative semidefinite  $V$  matrices and set weights for the best convex combination of the control units (Abadie et.al 2010).

## Appendix 2. Placebo gap for countries having assigned weights >0

Figures 1-4 show the gap between real and synthetic countries for which SCM has assigned weights higher than 0, thus Georgia has been constructed by the combination of them. As it can be compared to Armenia, Belarus, Kazakhstan and Serbia gap for Georgia is bigger. Similar trend is noticed for Kazakhstan, while the opposite situation is examined for Armenia Belarus and Serbia, where the gap after the intervention in 2006 is positive.

Figure1. Gap for Armenia

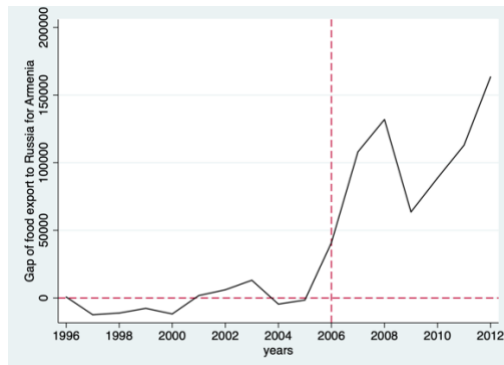


Figure 2. Gap for Belarus

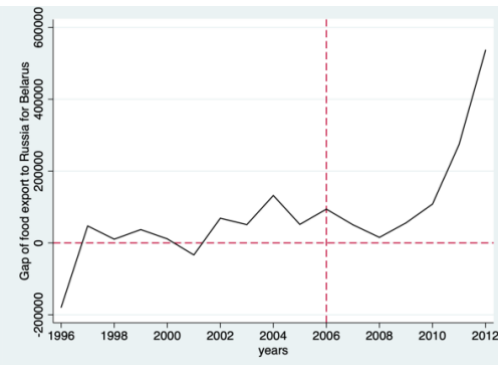


Figure3. Gap for Kazakhstan

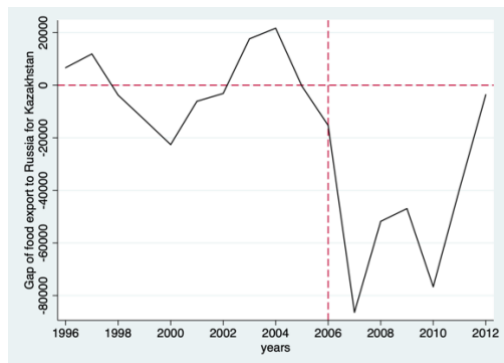
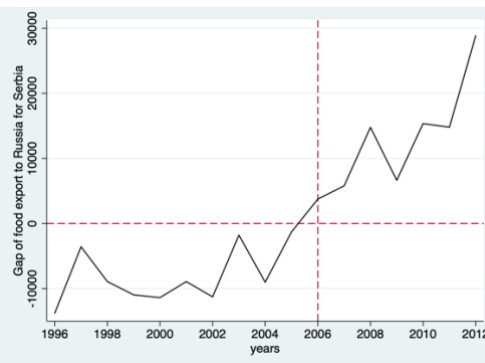


Figure 4. Gap for Serbia



### Appendix 3 Results of the estimation of total exports.

Table 3.1. Weights assigned to countries while estimating the effect on total exports from Georgia to Russia

Country	Weight
Armenia	0.788
Azerbaijan	0.179
Belarus	0
Bulgaria	0
Croatia	0
Cyprus	0
Estonia	0
Kazakhstan	0
Kyrgyz Republic	0.02
Latvia	0
Lithuania	0
Moldova	0
Romania	0.014
FR(Serbia/Montenegro)	0
Slovak republic	0
Slovenia	0
Turkey	0
Ukraine	0

Source: author

Table 3.2. Predictor balancing table for estimating effect on total export to Russia from Georgia

	<b>Georgia</b>	
<b>Variables</b>	<b><u>Real</u></b>	<b><u>Synthetic</u></b>
GDP	3.82	3.81
FDI	2.53	4.88
Total export to EU	61031.48	444983.4
GDP growth	6.62	8.83
Unemployment rate	13.00	11.99
Population	4398520	4268351
total export to Russia(2005)	153725	148290.8
total export to Russia(2001)	74005.2	61798.33
total export to Russia(1997)	68691.1	76568.92

Source: author

#### Appendix 4. Results for Placebo treatment in 2001.

Table 4.1. Weights assigned to countries for Placebo treatment in 2001.

Country	Weight
Armenia	0.624
Azerbaijan	0.291
Belarus	0
Bulgaria	0
Croatia	0
Cyprus	0
Estonia	0.085
Kazakhstan	0
Kyrgyz Republic	0
Latvia	0
Lithuania	0
Moldova	0
Romania	0
FR(Serbia/Montenegro)	0
Slovak republic	0
Slovenia	0
Turkey	0
Ukraine	0

Source: author

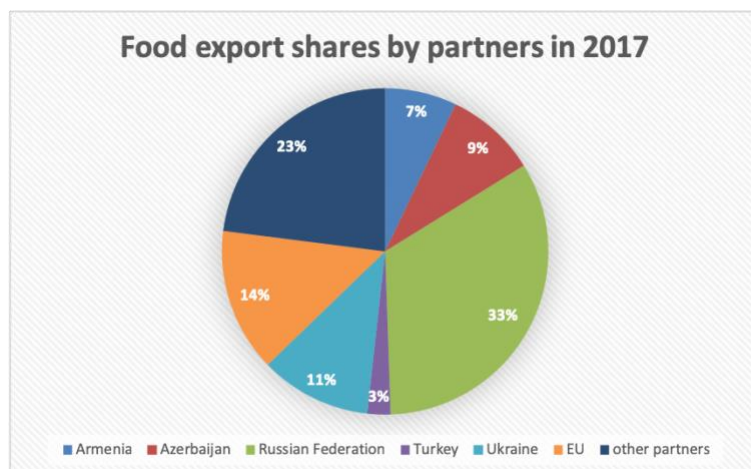
Table 4.2. Predictor balancing table

Variables	<b>Georgia</b>	
	<b><u>Real</u></b>	<b><u>Synthetic</u></b>
GDP	3.22	2.81
FDI	1.80	2.92
Export to EU	3190.57	5887.88
GDP growth	5.90	5.80
Unemployment rate	13.66	10.96
Population	4501160	4363319
Export to Russia(2000)	35014.47	23012.25
Export to Russia(1998)	23168.53	24231.13
Export to Russia(1997)	35127.66	31065.55

Source: author

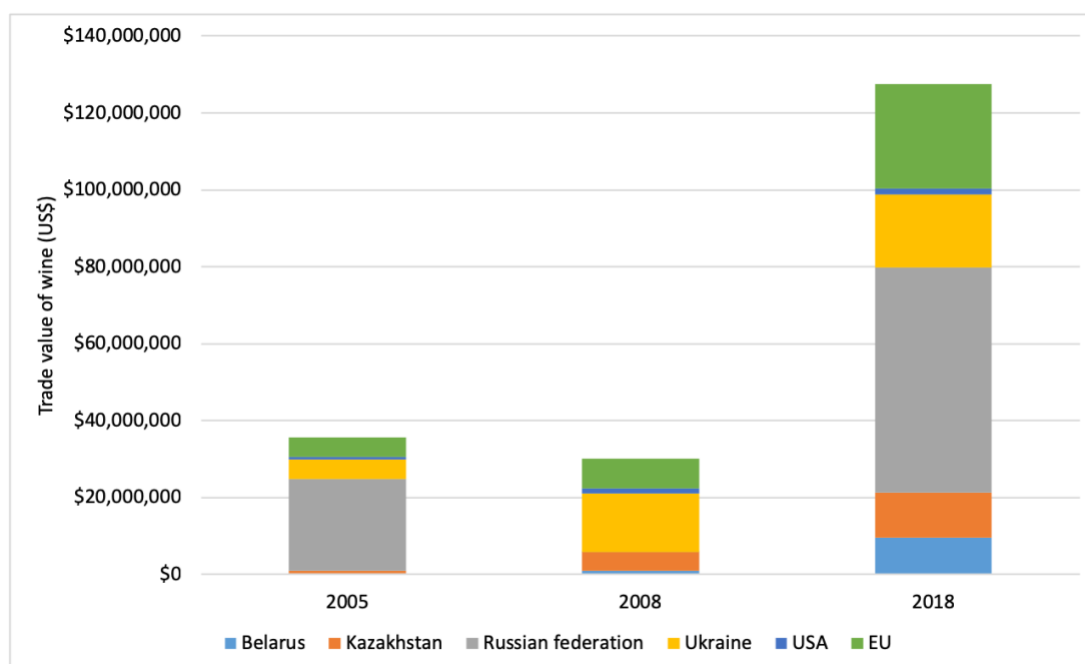
## Appendix 5. Statistics of export shares

Figure 5.1. Food export from Georgia by partners in 2017



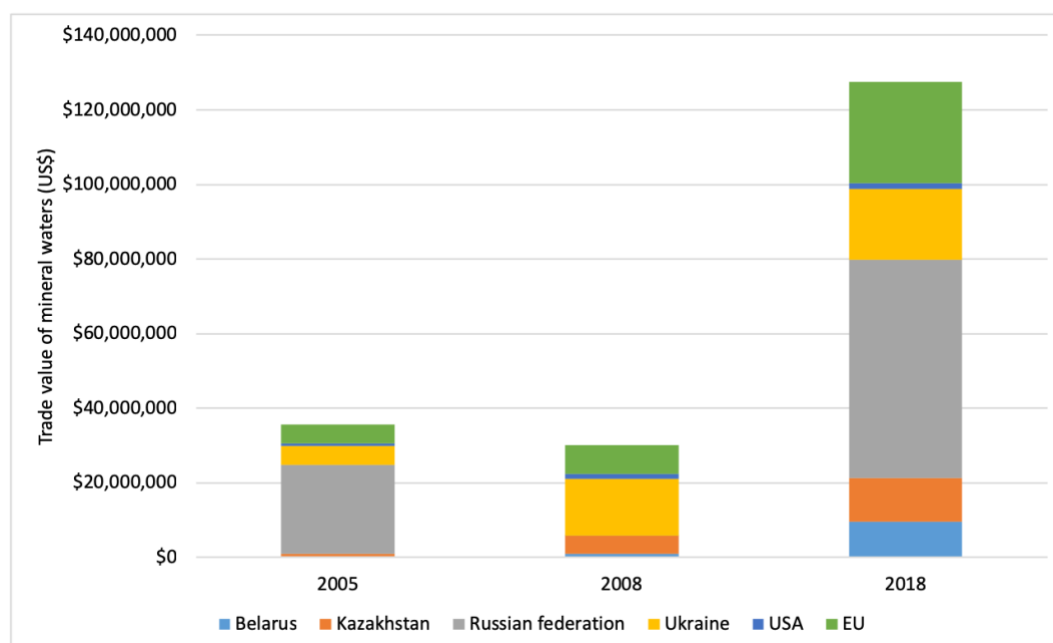
Data source: World integrated trade solution database [www.wits.worldbank.org](http://www.wits.worldbank.org)

Figure 5.2. Dynamics of wine export from Georgia by top trading partners.



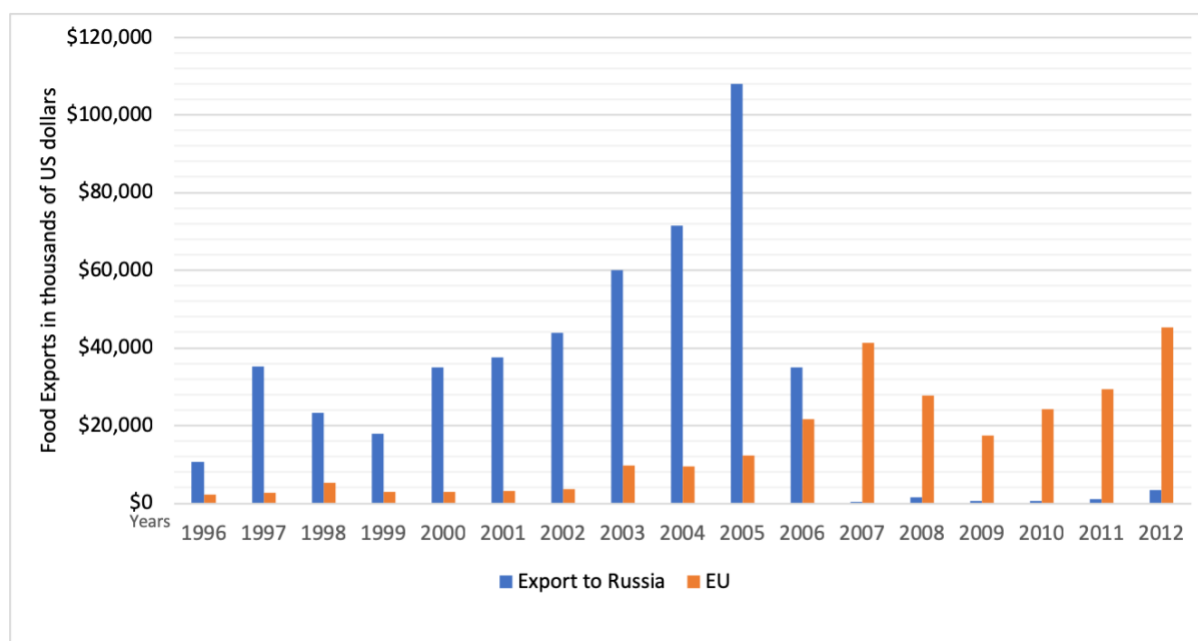
Data source: UN Comtrade database [www.comtrade.un.org](http://www.comtrade.un.org)

Figure 5.3. Dynamics in export of mineral waters from Georgia by top trading partners.



Data source: UN Comtrade database [www.comtrade.un.org](http://www.comtrade.un.org)

Figure 5.4. Trend of food export to Russia vs the European Union.



Data source: World integrated trade solution database [www.wits.worldbank.org](http://www.wits.worldbank.org)

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