HÖGSKOLAN
DALARNA

Degree Project

bachelor's thesis economics

Sanctions, what sanctions?

An empirical study on the effect of economic sanctions against the Russian Federation between 2014 and 2019

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Subject/main field of study: Economics

Course code: NA2008

Credits: 15 hp

Date of examination: 2022-06-21

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Abstract

In this thesis we examine if sanctions had a causal effect on total trade on Russia after its annexation of Crimea 2014. To answer this a synthetic control method (SCM) and a difference in difference (DiD) method was implemented. The results show that a causal effect of sanctions was not found by neither method. However, the year 2016 and 2017 result gave a statistically significant causal effect with the SCM where the synthetic unit is 1.23 times greater than Russia. A general practical or statistically significant causal effect was not found.

Keywords: Russia, sanctions, SCM, DiD, Crimea case

Innehåll

1. Introduction

The U.S. Secretary of State said an invasion of Ukraine would lead to “a range of high impact economic measures that we have refrained from using in the past” (Pamuk, 2022, p.1). Despite these threats, Russia still went ahead to invade Ukraine late February 2022. Since the threats were not enough to deter Russia to take further actions in Ukraine, this raises the question if sanctions even work? The consequences of these events make the topic of effectiveness of sanctions topical. We will in this thesis investigate the impacts sanctions have on Russia's total trade. The aim of the thesis is to examine the causal effects on Russia's trade following the 2014 sanctions until 2019.

The armed conflict in Ukraine started in 2014 in conjunction with Russia's annexation of Crimea. The EU head of states quickly and strongly condemned the annexation. A statement made by the EU head of states promised that any further advancement into Crimea would carry far reaching consequences in bilateral diplomatic- and economic relations (European Council, 2014). According to Klinova and Sidorova (2019) 51 % of Russia's total exports in 2013 were imported by the sanctioning countries. And four years later, by 2017 the sanctioning countries amounted for 50.1 % of Russia's total export.

The subject of sanctions and their impacts is a well-researched topic. Hufbauer, Schott and Elliott (1990) were the first to investigate sanctions in the economic field. In more recent years, articles to a large extent have been focused on the 2014 sanctions against Russia following the Crimea annexation. Doornich and Raspotnik (2020) and Cholodilin and Netˇsunajev (2016) papers are examples of those. The authors concentrated on the bilateral impacts on trade due to sanctions. Doornich and Raspotnik (2020) found that after two years of imposing sanctions a decrease in trade occurred. However, the trade stabilised in 2016 and started to increase in 2017. Cholodilin and Netˇsunajev (2016) concluded that the sanctions had an impact on the GDP for both the target and the sender countries.

To examine the causal effect of sanctions we use panel data from 85 countries with end period data between 2000 to 2019. The countries were chosen based on three criteria: they did not sanction Russia, were not sanctioned by Russia, and were not heavily sanctioned[1]. The impacts will be examined with a synthetic control method (SCM) and a Difference in difference (DiD) method. Our contribution to the literature is to explain the causal effect sanctions had on Russia's total trade after the Crimea annexation using a SCM and a DiD method. To our knowledge no one has used the SCM with updated data to examine a causal effect of sanctions on the Crimea case. The research question is: Did the 2014 sanctions have a causal effect on Russia's total trade? The null hypothesis is that sanctions did not have a causal impact on Russia's total trade.

The limitations we have chosen is to only examine the total trade impact of Russia. This thesis aims to find a causal effect on the 2014 sanctions on Russia's trade. To examine exports and imports individually would complicate the research while not contributing to answering the research question. Trade of specific goods is also not relevant for the same reason and will therefore not be included in the analysis. Further, other relevant countries such as Belarus, sanction busting, and third country effects will not be examined due to time limitations and the intended scope of the thesis.

The thesis is structured as follows: In section 2 we will give a short overview on the sanctions towards Russia in response to the Crimea annexation. Section 3 presents the previous literature on the topic and sections 4 will cover the theoretical framework where relevant theories will be presented and explained. In section 5 the methods will be presented, and the data, the model and results will be presented in section 6. Section 7 will conclude the thesis, where we analyse the results and present a conclusion of our findings.

[1] Heavily sanctioned countries are countries that are multilaterally sanctioned by the EU or UN.

2. Sanction against Russia

Between March and December 2014, The European Union (EU) together with USA, Japan, Australia, Albania, Iceland, Montenegro, and Ukraine imposed sanctions against Russia as a countermeasure against its annexation of Crimea. On the 6 March 2014, EU's head of state strongly condemned the invasion and urged Russia to withdraw its forces. And Further advancement into Crimea would lead to additional and far-reaching consequences for relations in a broad range of economic areas (European Council, 2022).

As of 20 March 2014, the Council adapted the decision 2014/145/CFSP[2]. Inter alia the Council decided that ongoing talks on replacing the 'Partnership and Cooperation' agreement would be suspended. It was also stated that a diplomatic agreement should be found, and further measures were to be imposed if no agreement were to be found. (European Council, 2014).

Following the downing of Malaysian Airlines Flight MH17 in Donetsk and increasing flow of weapons, equipment and soldiers streaming across the Russian border to Crimea. Another set of sanctions were imposed against Russia. Imports originated from Crimea was prohibited unless granted a certificate of origin by the Ukrainian government (European Council, 2022).

As of 29 July 2014, the EU Council imposed new economic restrictions toward Russia. It was now no longer allowed to buy or sell new bonds, equity, or similar financial instruments with a maturity of more than 90 days issued by a state-owned Russian bank (Council of the European Union, 2014, p.1). An embargo was also placed in Russia to hinder its possibilities to import and export military equipment. The goods affected covered all the items on the EU common military list. Furthermore, a prohibition on export of dual-use goods was imposed where all goods listed on EUs list of dual goods were affected. Finally, exports of goods used in deep water oil exploration and production, arctic oil exploration or production and shale oil projects in Russia were now subject to 'prior authorization by competent authorities. (European Council, 2022).

[2] Concerning restrictive measures in respect of actions undermining or threatening the territorial integrity, sovereignty and independence of Ukraine

The sanctions announced on the 29 of July were further strengthened by the 12 of September. EU nationals and companies are now prohibited issuing loans to five Russian state-owned banks, and the restriction concerning maturity on bonds, equity and similar financial instruments was shortened from 90 days to 30 days. The sanctions on the Russian energy sector were broadened to also include services aimed at the same areas. (European Council, 2022)

After the strengthened sanctions announced on the 12 of September a relatively quiet period followed. Shortly after Russia's invasion of Ukraine on the 24 of February 2022 new sanctions was announced. The sanctions were explained as massive and would bear severe consequences for Russia. As of 2022/06/01 additional 6 packages have been imposed on Russia's military-, technology-, finance-, energy-, and the transport sector.

3. Literature review

In this section previous literature on the topic will be presented. The literature review will begin by giving a brief historical overview on the topic of sanctions.

Economic sanctions have been a way to prevent conflicts and force policy changes for many years. A good example of that is the sanctions that ended apartheid in South Africa. Since the 1980s the U.S. has used sanctions quite generously and had in 2014 about 170 ongoing sanctions. After the year 2000, also the EU ramped up the use of sanctions and started acting more like its western ally U.S. Russia had taken a more passive stance and did not impose sanctions before 2014 as a countermeasure towards sanctioning states. China has under their current leader Xi Jinping imposed sanctions, mostly for diplomatic reasons targeting regime critics (Hufbauer, et al. 2020).

The efficiency of sanctions was empirically examined by Dashti-Gibson, Davis, and Radcliff (1997). They discovered that shorter, multilateral, and financial sanctions had a higher rate of success than unilateral sanction and trade sanctions to reach the aim of the sanctions. Caruso (2003) makes a similar conclusion When examining bilateral trade after sanctions imposed by the U.S. on g7 countries using the gravity model. Caruso found other countries filled the

void between sanctioned countries and the U.S. and explained the phenomenon as "third country effect"[3].

Van Acoleyen (2015) researched the effects of sanctions on bilateral trade between Russia and the EU. Van Acoleyen uses a gravity equation to examine his research question empirically. When the 2014 sanctions against Russia hit, the EU saw an immediate decrease in import and export volume. Doornich and Raspotnik (2020) made a descriptive analysis for the same case. They used data between 2000-2017 to analyse how the sanctions imposed affected the trade flow. Doornich and Raspotnik (2020) found that following the 2014 sanctions a dramatic drop in both exports and imports occurred. In 2015 the import of Russian goods had decreased with 39 %. In 2016 the bilateral trade started to stabilise to then increase in 2017. Doornich and Raspotnik (2020) arguing that the disruption in the bilateral trade was not only because of sanctions, since the oil price saw a steep fall which also impacted the Russian economy.

Korhonen, Simola and Solanko (2018) investigated the impacts of sanctions and counter sanctions against Russia following the Crimea annexation. Korhonen, et al. (2018) found that Russia's GDP decreased in 2014 and 2015. However, like Doornich and Raspotnik, the decrease in GDP could not directly be appointed to the sanctions because of the decrease in oil price

Cholodilin and Netˇsunajev (2016) paper, with the inventive name “Crimea and Punishment” are also examining the impacts of sanctions. They used a vector autoregression model to calculate their results and could conclude that the sanctions had an impact on both the sending and targeted country. Cholodilin and Netˇsunajev found a decrease in trade that are in line with the results presented by Doornich and Raspotnik (2020), Van Acoleyen´s (2015) and Korhonen. et. al (2018).

The only for us known article that investigates and empirically tests the causal effects of the sanctions in the Crimea case are Do and Nguyen (2021). Do and Nguyen used a Difference in Difference method to examine the causal effects of sanctions and counter sanctions have on Russian imports and exports. They found a causal effect on decreasing import and export

[3] When a country fills the void in trade that was caused by sanctions, Caruso (2003).

after sanctions. While Do and Nguyen (2021) use the import and export as separately dependent variables, we will use the sum of these as our dependent variable. In our approach we will use a SCM together with a DiD whereas Do and Nguyen only the DiD. They are also investigating different types of goods in their paper whereas we will focus on the broader impact of sanctions have on Russia's total trade.

4. International trade theories

In this section the theoretical framework will be presented. The section will begin by explaining international trade and conclude on the theoretical framework used in our model.

To understand the motivation and the benefits of international trade, a presentation of the theoretical history on the topic will first be given. These theories will give the fundamental assumptions on why international trade matters, and why imposing sanctions could decrease the wealth for the sending and targeted country.

We will also present the gravity model in this chapter because of the great impact the gravity model has had on the research of sanctions in the economic field. We will not use the gravity model in our analysis and estimation. However, it is still relevant to present because of its inspiration to our choice of variables.

In Adam Smith's famous work Wealth of the nation, Smith criticised mercantilism[4] for lowering the wealth. Smith came up with the theory of absolute advantage, also called the classical model. Smith argued that if countries specialised in goods they have an absolute advantage of producing, a higher wealth will occur. Following that logic goods will originate from a country with an absolute advantage producing that good. Further this causes countries that differ in production benefit the most by trading with each other. David Ricardo asked himself the question: what if both countries have an absolute advantage in the same goods? Ricardo suggested that countries should produce the goods that they have a comparative advantage in. Ricardo's contribution was ground-breaking and is still today a relevant theory when investigating international trade (Husted & Melvin, 2013).

[4] "Mercantilism is an economic practice by which governments used their economies to augment state power at the expense of other countries." (Britannica, 2020, P.1)

In the early 20th century Heckscher and Ohlins developed a new theorem based on the classical model. The Heckscher-Ohlin model (HO theorem) gave answers to the unrealistic assumption in the classical model that labour was the only factor of production. The new assumption they made was to establish that there were two factors of production, both capital and labour (Husted & Melvin, 2013). In the middle of the 20th century Paul Krugman came up with the theory that we today call the new trade theory. The earlier theories of comparative advantage were questioned in the 20th century. Instead of countries with different comparative advantages in different goods and different sets of labour and capital intensities, similar countries had the greatest increase of wealth from trading. That is the opposite scenario compared to the earlier theories that suggest that countries with big differences would gain the most by trading with each other. What Krugman did was to present a model of how intra trade (trade between similar countries) increased wealth (Neary, 2009).

The gravity model is based on the physical law of gravity developed by Isaac Newton. The gravity between two bodies is directly proportional to their masses and inversely proportional to the distance between them. The gravity model that is used for economic calculations aims at the same logic and measures the bilateral trade flow between two countries as the force. A common variable for mass is GDP, the distance variable is the distances between capitals (Abdullahi, Kea, Shahriar & Qian, 2019).

Tinbergen was the first to develop the gravity model used in economics and test it empirically when he wrote his paper "Shaping the world economy" (Tinbergen, 1962). Tinbergen later went on to supervise Linnemann (1966) for his PhD thesis. Linnemann (1966) came up with the now classical gravity equation:

$$Trade_{ij} = \alpha * \frac{GDP_i^{\beta_1} * GDP_j{}^{\beta_2} e^{u_{ij}}}{Distance_{ij}{}^{\beta_3}} \quad (1)$$

Where Trade stands for the bilateral trade between country *i* and *j*. *GDP* is the national income for country *i* and *j* and *Distance* is the bilateral distance between country *i* and *j*.

Taking the logarithm of equation (1) we end up with:

$$\log(\square\square\square\square\square_{\square\square}) = \log(\square) + \square_{1}\log(\square\square\square_{\square}) * \beta_2\log(\square\square\square_{\square}) - \square_3\square\square\square(Distance_{ij}) + \square_{\square\square} \quad (2)$$

β_1 , β_2 and β_3 are the coefficients and $\square_{\square\square}$ is the error term. The use of a loglog equation makes it possible to interpret the coefficients as elasticities. Which means that a percentual change in the product of GDP_i and GDP_j gives us the percentual changes of *Trade,* which is the value of β_1 and β_2. An increase in the *Distance* variable will give us the percentual change in *Trade* with the value β_3. According to the Gravity model the product of GDP_i and GDP_j (size) will be expected to positively relate to bilateral trade and Distance is estimated to be negatively related to bilateral trade. Empirical studies have over the years confirmed that the gravity model fits well with established trade models such as the HO-model and the Ricardian model (Abdullahi, Kea, Shahriar & Qian, 2019).

The first article that researched the correlation between sanctions and bilateral trade using a gravity model was Hufbauer (1997). He examines the impact of sanctions from three separate years (1985, 1990 and 1995) for over eighty countries. He used the fixed variables distance between the country's capitals, common language, common border, and part of the same trade union. He also distinguished the sanction variables into three categories based on the severity of the sanctions: limited, moderate, and extensive. The model is in a log linear form, meaning the coefficients are elasticities. Hufbauers results highlighted that those sanctions had a great impact on the countries involved.

5. Methodological framework

In this section the methodological framework will be presented. The section will begin by presenting the DiD method and SCM model. Following this, potential problems with the models will be briefly touched upon.

5.1 Difference in difference method

The DiD method is constructed to calculate causal effects of an outcome variable given an event taking place. By comparing the outcome in a treated group to a control group, and

calculating the difference before and after, and taking the difference of the differences, give the causal effect of the treatment.

The DiD model was first used by Snow (1854) (referenced in Lechner, 2010) to investigate if the polluted water in London was correlated with deaths in cholera. By collecting water samples down and upstream between two water cleaning companies. The treatment was the fact that some districts had changed their water supply from one year to another. By calculating the difference before and after the treatment (group with new water supply) Snow concluded that polluted water caused deaths in cholera for the households. In the 20th century more sciences adopted the DiD model for their research and even the economic field (Lechner, 2010).

The DiD equation below in equation (3). $ATET$ stands for the average treatment effect on treated, Y denotes the outcome. D is a binary treatment variable where:

$$D = \begin{cases} 1\, treated \\ 0\, not\ treated \end{cases}$$

variable T is a binary variable and displays when the treatment took place for every unit who is affected by the treatment at the given time.

$$T = \begin{cases} 1\, pre - treatment \\ 0\, post - treatment \end{cases}$$

There are two common ways to examine the causal effect of a treatment statistically. First, we have ATE, which stands for the average treatment effect, meaning that the causal effect of the treatment between the two groups is calculated. The second and similar notation ATET stands for the average treatment effect of the treated group, which means the causal average effect for the treated group only. $\theta_t(x)$ are the effects of the different groups $D = 1$ and $D = 0$. Further variable Y_t^d is the value the outcome that would be for variable d in period t. Finally, variable Y is the actual outcome that is observable and X denotes further observable variables (Lechner, 2010).

$$ATET_t = E\left(Y_t^1 - Y_t^0 \middle| D = 1\right) \tag{3}$$

$$ATET_t = E\left[\underbrace{E\left(Y_t^1 - Y_t^0 \mid X = x, D = 1\right)}_{\theta_t(x)} \mid D = 1\right]$$

$$ATET_t = E_{X|D=1}\,\theta_t(x)$$

Using the DiD method, possible biases between the treatment- and control group are eliminated due to the subtraction of the different groups mean before and after the treatment. This is an argument for using the model for our estimation and something that brings validity to our methodological choice. The inference problems that could occur is mostly linked to sampling errors according to Wooldridge (2007).

5.2 Synthetic control method

According to Abadie, Diamond and Hainmueller (2010), SCM aims to detect the effects of a given treatment while providing a protection against extrapolation bias[5]. The SCM works by assigning a weighted average to the control group (donor pool). The weights will give the contribution of each unit to the contrafactual of interest. The unit weights are a positive value between zero and one that together sum to one. The weights also show how similar each unit is to the treated unit. Since the SCM makes it possible to research a treatment without knowing the effects, the model is suited for comparative case studies.

Let's suppose we have some units with one affected by the treatment, the rest are potential donors in the donor pool. The treated unit are used as a reference to find other units that as close as possible match the treated before treatment. The matching process assigns weights to each unit a given set of variables. Each individual unit can be assigned a weighted value between 0 and 1 and the weights together sum to a value of 1. The larger the assigned weight is, the better it corresponds to the treated unit before the treatment. Since the treatment is assumed to not affect the treatment unit before the treatment period. After assigning weights to each unit, the synthetic control unit is composed. The larger weights donate more from the donor pool to the synthetic control unit.

[5] "To project, extend, or expand (known data or experience) into an area not known or experienced so as to arrive at a usually conjectural knowledge of the unknown area" (Merriam-Webster, n.d, P.1) Access date 10/06-22

Hence the SCM will match the countries from the donor pool to a synthetic country that are as similar to the treated unit as possible. The idea is then to compare the synthetic country with the treated country after the treatment period. The difference will give us the causal effect of the treatment (Gault & McClelland, 2017).

5.3 Estimation problems

Interpolation bias can occur when countries with very different characteristics than the treated country are selected in the donor pool. If they were to be weighted the outcome would be biased (Abadie, Diamond & Hainmueller, 2010).

A problem with the synthetic control method is that the method is relatively new, and it is not possible to prove inference in a conventional way. Abadie et al. (2010) explains that in the case of estimating results with the SCM the uncertainty does lie in the outcome value and estimation of the contrafactual unit. This uncertainty can be solved by running a placebo test that can test the statistical inference and see the probability of the effects happening by chance. This will create a quantitative inference that shows all possible outcomes for the variables chosen in the donor pool. If it is possible to detect a difference for the treated unit in the placebo test, the results can be said to be significant.

According to Cheng, Shui-Ki and Yimeng (2018) a problem that can occur when creating the synthetic control unit is that the weighted variables could be affected by the treatment. The SCM lacks the capability to restrict variables that could be affected. That means that the synthetic control unit could contain variables that are treated, and the results would be biased. Cheng et al. (2018) explains that a careful selection of variables added to the donor pool is needed to avoid the results to be biased. This because the SCM cannot detect and restrict this itself.

6. Empirical analysis

6.1 Data

The dataset is composed of 85 countries who are not sanctioned or sanctioning Russia or are heavily sanctioned. The independent variables measuring total export- and import of goods and services are gathered from the World Bank (World bank, n.d). The dependent variable

total trade has been constructed by summing the total- import and export. Finally, we used GDP for every separate country as an independent variable and the data were derived from the United Nations Statistics Division (unstats, n.d) database. All the descriptive data are presented in logarithms.

Table 1. Descriptive statistics

Variable	*Obs*	*Min*	*Max*	*Mean*	*Std. dev.*
ln_GDP	1,700	18.09218	30.29412	24.18644	1.98091
ln_import	1,700	17.44225	28.57224	23.1643	1.86441
ln_export	1,700	16.21919	28.60596	22.97771	2.069947
ln_total_trade	1,700	17.73057	29.28239	23.78598	1.946463

Table 1 show a descriptive statistic summary for the variables in the dataset. The min and max values show the smallest and largest values for respective variable in the dataset. The mean value shows the mean of respective variables, and std dev show the standard deviation.

The variables on sanctions are gathered from Kirilakha, Felbermayr, Syropoulos, Yalcin and Yotov (2021). Kirilakha et al. (2021) covers sanctioning countries, sanctioned countries, type of sanction and reasoning behind the sanction and if given reason succeeded. The selection was made by every country whose name was not a sanctioned state when Russia was sanctioning and vice versa. This ended up with 124 countries and because of bad quality data or missing values 39 countries were removed and the 85 remaining countries made our sample.

6.2 Model

We will first analyse the causal impacts sanctions had on Russia's trade using the SCM and then use a DiD method to compare the outcomes.

The model will calculate the total trade as a dependent variable and GDP for each country and import and export, all measured in dollars as independent variables. The data points are end of period data starting at year 2000 until 2019. The dependent variable is the sum of import and export at every year for all units. To examine the causal effects, we need a synthetic Russia that can describe what the total trade would be without the imposed sanctions. To examine that we will use the Synthetic control method (Abadie, Diamond &

Hainmueller, 2010). The causal effect or effects will be the difference between the treated group (Russia) and the control group (synthetic Russia). Our treatment year starts 2013/12/31, 6 months before the sanctions were imposed. The donor pool of countries was chosen based on three criteria: they did not sanction Russia, were not sanctioned by Russia, and were not heavily sanctioned. The SCM weighs all the donors to obtain the synthetic control group in STATA. We used the synth command to obtain the synthetic unit, and the synth_runner commando to obtain the placebo test and inference from the results.

To examine the best synthetic control group as possible we are using 85 countries that have not been targeted by sanctions in our donor pool. The big sample of potential weights in our synthetic control group makes our data and results more reliable. We are also more likely to find the right matching countries (Gault & McClelland, 2017). The outcome variable is the total trade value. Hence the outcome variable is total export and imports of goods and services summed. The predictors are GDP in U.S. dollars, export- and imports of goods and services for each of the countries in the donor pool. Since the variables all take large values, all variables will be calculated in logarithms to achieve a preferable (smaller) scale for our estimations. This is done to minimise the risk of miscalculation when running the test, and to achieve a more readable output.

6.3 Estimation Results from SCM

When applying the synthetic control method as the main approach, the estimated contrafactual values for our variables is showed. The interesting part is the difference between the treated unit, in our case Russia, and the synthetic control group. The difference will tell us the causal treatment effect the imposed sanctions have on Russia. The model weighted two countries when estimating the synthetic control group. These countries and weights are China with 26.3 percent and Saudi Arabia with 73.7 percent respectively.

Table 2. Synthetic matching

Variables	*Treated*	*Synthetic*
Ln GDP in U.S. Dollars	27.73043	27.42641
Ln exports goods services	26.50684	26.48216
Ln imports goods services	26.15095	26.12635

Table 2 shows the mean results pre-treatment of the synthetic matching. As shown in Table 2 the synthetic control group is consistent with one another. We use exports and imports differently for matching since exporting and importing countries should be affected different under sanctions. Since total trade is import and exports summed, using only total trade countries large exporting countries could be matched with large importing countries. The GDP variable is used to match countries who are similar in economic size. The model's large preference towards Saudi Arabia and a good match in both GDP and exports growth we attribute to both countries' energy industry. Both countries' GDP and exports should closely follow the oil price. However, the great match from the donor pool means characteristics are largely the same as Russia.

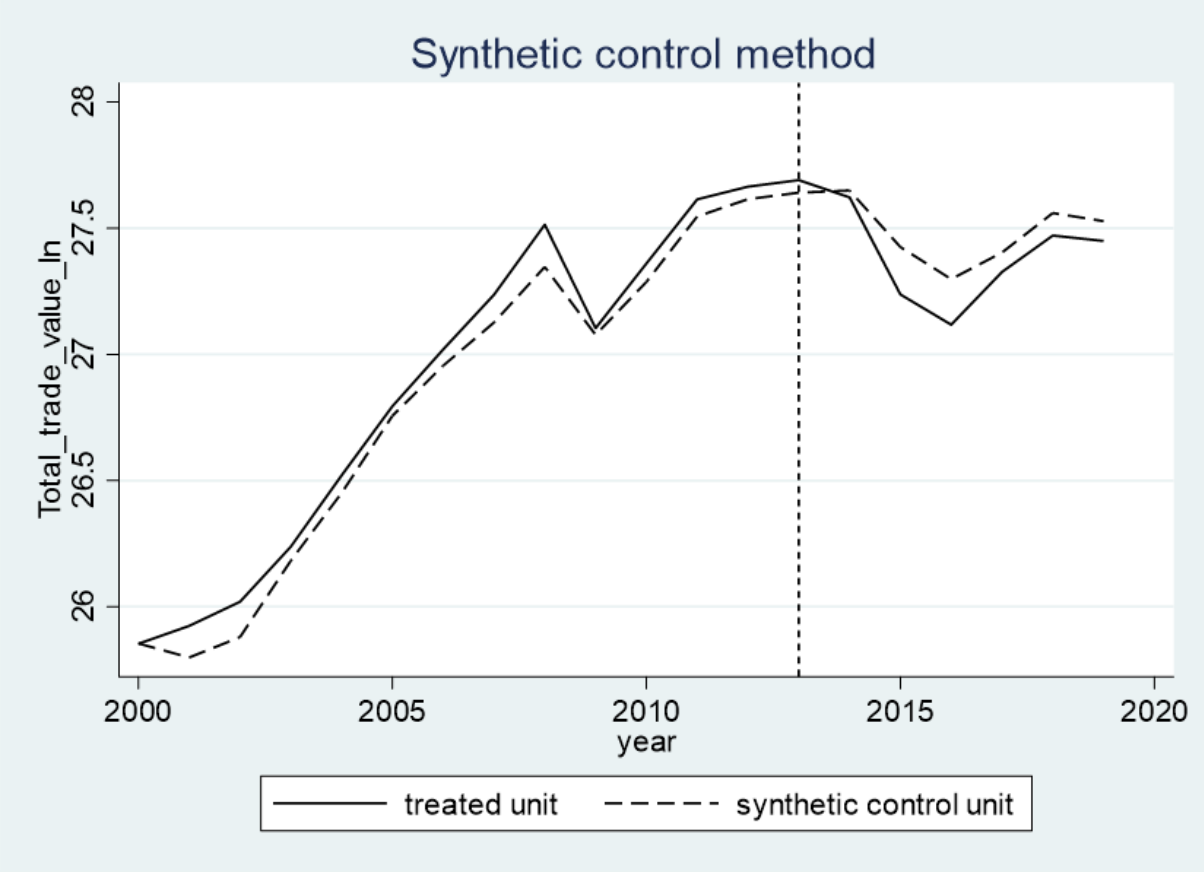

Figure 1. Treated unit and synthetic control unit.

Figure 1 shows the outcome variable, log of total trade for the synthetic control unit (dashed line) and the actual Russia (solid line) for the entire period. The vertical dashed line indicates

the start of the treatment period to the right and end of pre-treatment to the left of it. Since the synthetic control unit is following the actual Russia in a relatively good manner pre-treatment, a perfect contrafactual Russia was not found. Since the lines can be seen following the same trend a 'good enough' contrafactual Russia can be said to be found. Hence it will therefore be used to measure the causal effects post treatment of the treatment.

Our model scored a root mean percentage square error (RMPSE) value of 0.067. The RMSPE show the predictive power of a model. The closer the RMSPE is to zero the better the predictive power of the model which makes the predictive power of the SCM good (Göçken, Özçalıcı, Boru & Dosdoğru, 2016). Table 3 shows the outcome for each year for the treated- and the synthetic unit.

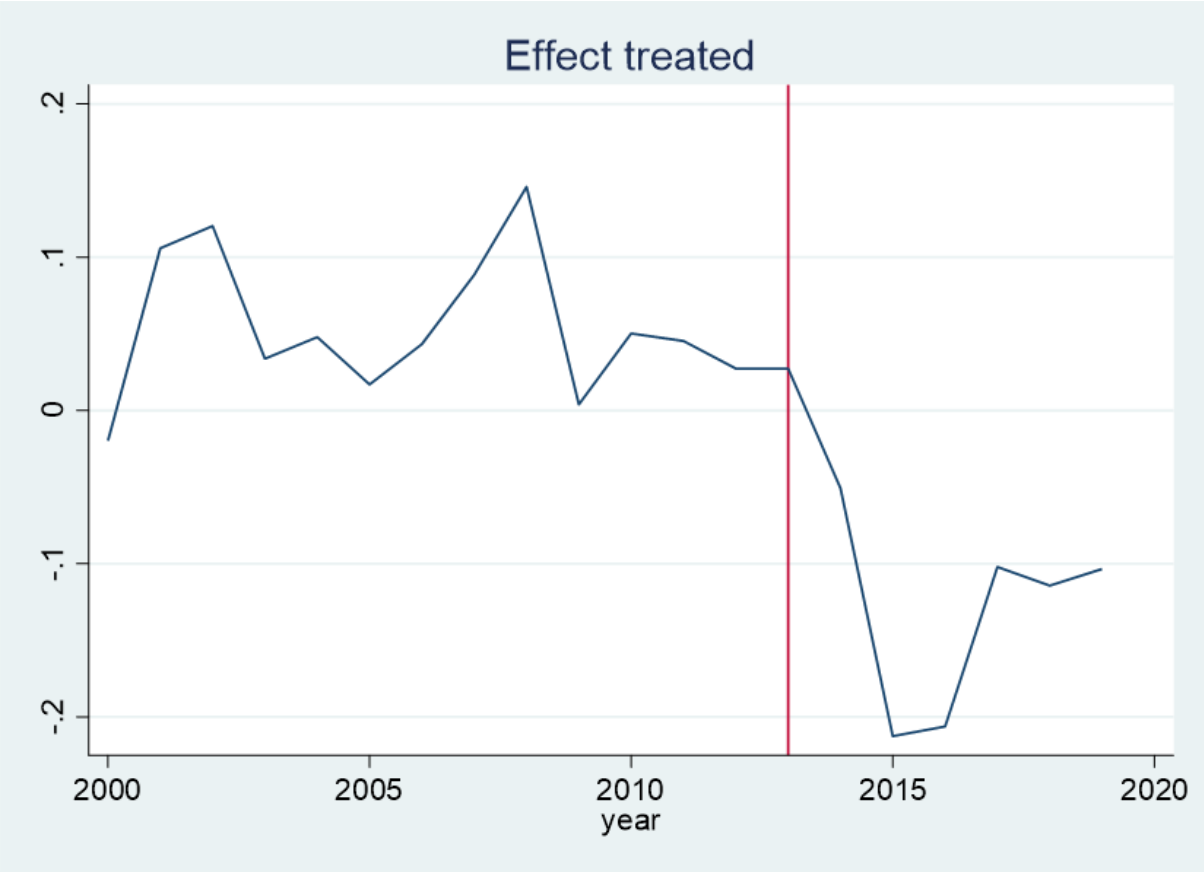

Figure 2 Effect treated

Figure 2 shows the difference between the treated- and the synthetic unit for the outcome variable total trade yearly. The red line indicates where the pre- ends and where post treatment starts. Once the sanctions were implemented the Synthetic unit for the first time

had a larger total trade then Russia. Russia saw a sharp downturn when compared with the synthetic control with a low point at the end period of 2015. However, during 2016, Russia's total trade started to stabilise and by 2017 the difference started to decrease between the synthetic unit and the treated unit. Figure 2 would suggest that there is a relation present between the 2014 sanctions and the loss in total trade the following years. Further this loss was at its largest in between 2014 and 2015 and started to lose its effect in the following years.

Table 3. Synthetic control method difference in billions of dollars.

Year	*Difference*	*Year*	*Difference*
2000	1.019895	**2010**	0.950998
2001	0.899534	**2011**	0.955673
2002	0.886591	**2012**	0.973005
2003	0.966802	**2013**	0.973064
2004	0.953242	**2014**	1.051998
2005	0.983167	**2015**	1.236774
2006	0.957643	**2016**	1.229016
2007	0.915323	**2017**	1.107499
2008	0.864162	**2018**	1.12107
2009	0.996085	**2019**	1.10899

Table 3 shows the difference in total trade in billions of dollars for the treated group and the synthetic control group. The two-unit outcomes for the dependent variable total trade are quite similar over the years before the treatment of sanctions 2014. After the treatment started 2014 the total trade for the synthetic unit becomes larger than Russia's total trade. But general statistically significance on the treatment effect during the treatment period is not found (appendix 2). However, a statistically significant treatment effect was found in 2016 and 2017. During this period the largest difference between Russia and the synthetic unit occurred 2016. During 2016 the synthetic control unit was $exp(0.206) \approx 1.23$ times greater than the actual Russia total trade.

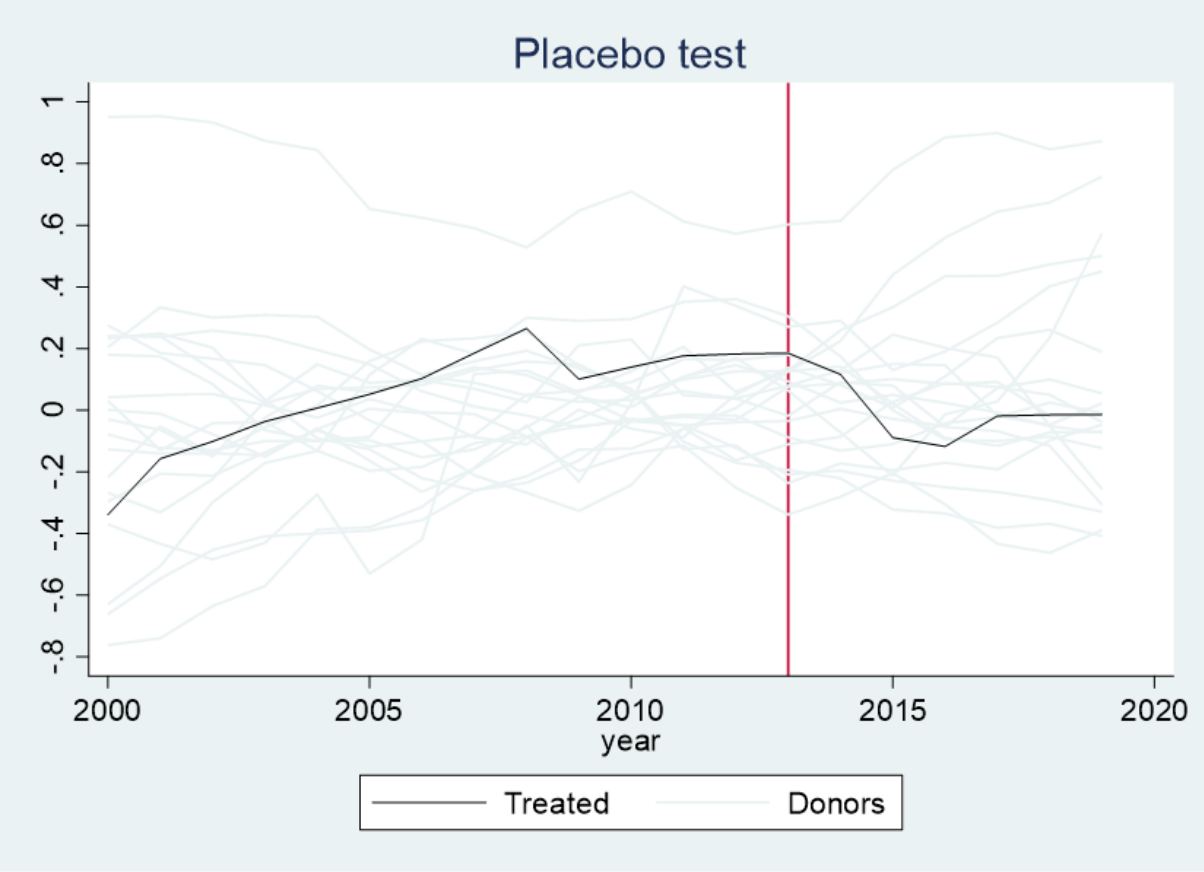

Figure 3 Placebo test

Figure 3 shows a placebo test from 20 randomly chosen donors from the donor pool and Russia's total trade. The number of chosen units was decided to make the graph more readable. We chose to draw these at random to better represent the entirety of the donor pool. The grey line represents the donors, and the black line represents Russia. The placebo test is derived by running the same model for every control unit as if it was treated under the same period. By showing the effects from the donors and the treated unit biases in the dataset can be seen. This is done by comparing all the units and if such bias would be current the outcome variable would follow the same trend. The results from the placebo test shows that such bias does not exist within the selection. This is shown by the difference in Russia's total trade, before and after treatment was in general much larger when compared to the others. Hence a general trend cannot be spotted, and no such bias occurs.

Table 4 Placebo Test

Treated Unit	*RMSPE*	*Treated Unit*	*RMSPE*	*Treated Unit*	*RMSPE*
2	0.15688	**47**	0.4237783	**68**	0.071578
8	0.1772866	**52**	0.3752417	**70**	0.084029
21	0.2161535	**53**	0.1668091	**74**	0.109485
26	0.1125143	**56**	0.0835569	**78**	0.198484
29	0.245774	**59**	0.0812482	**79**	0.176274
35	0.05169	**63**	0.1247922	**80**	0.148494
42	0.2129102	**67**	0.0670825	**82**	0.274466

Table 4 shows the RMSPE for each unit in the random sample, where Russia is represented as unit 67. Table 4 gives evidence of a large spread in RMSPE within the random sample. This difference tells that the predictive variables used differ between the random sample of units. Since Russia scored a RMSPE of 0.067 a great synthetic match for the actual Russia was found. Of the 21 analysed countries, only unit 35 scored a lower RMPSE than Russia. Furthermore, the large spread within the observations hints that there are no biases in the data since other units that scored low are not used as weights (see appendix 1). The unit weights were China, 26.3%, and Saudi Arabia 73.7 percent respectively. Because of similarities between the countries (size and trade partners), the phenomenon of interpolarity bias does not exist. Therefore, the synthetic group can confidently be used as our contrafactual case.

6.4 Difference in difference

To test our results for robustness we will perform a DiD regression, to see if our results will stand in another method. We will then use the outcome from the DiD method and compare it to the outcome of the SCM.

The DiD model uses the same dependent and independent variables as our SCM. Total trade as a dependent variable, import and export of goods and services and GDP in U.S. dollars as independent variables. The data is taken from the same data set as for the SCM model and the treatment is set to the start of 2014. The treated unit is Russia, and the control group is composed of the countries in the synthetic control unit[6], without the weights (Saudi Arabia and China). To be able to make a comparison the countries in the dataset that are not like Russia according to the SCM is dropped. The synthetic control unit will therefore be used as a valid contrafactual. Just like the SCM, all variables are presented in logarithms. The results from the DiD have been derived using the didreg command using stata.

Table 5. Difference in difference results

Ln total trade	*Coefficient*	*Robust std. err.*	*t-value*	*P>t*	*95% conf interval*
ATET-Treatment year Sanctions (1 vs 0)	-0.0009036	0.0037155	-0.24	0.848	-0.0481137 0.0463065

The coefficient in the DiD method is the treatment effect. As shown in table 5 the estimated effect is very small and statistically not different from zero. Even with the SCM the effect was generally not statistically significant. The two methods both estimated a negative treatment effect for the treated unit however too small to be practically significant. Neither method gives significant treatment effect. Hence, we cannot reject the null hypothesis that there is no treatment effect.

[6] We tested for the whole dataset as control group (except Russia) and the results was practically the same as for the synthetic unit group (Abadie et al. 2010).

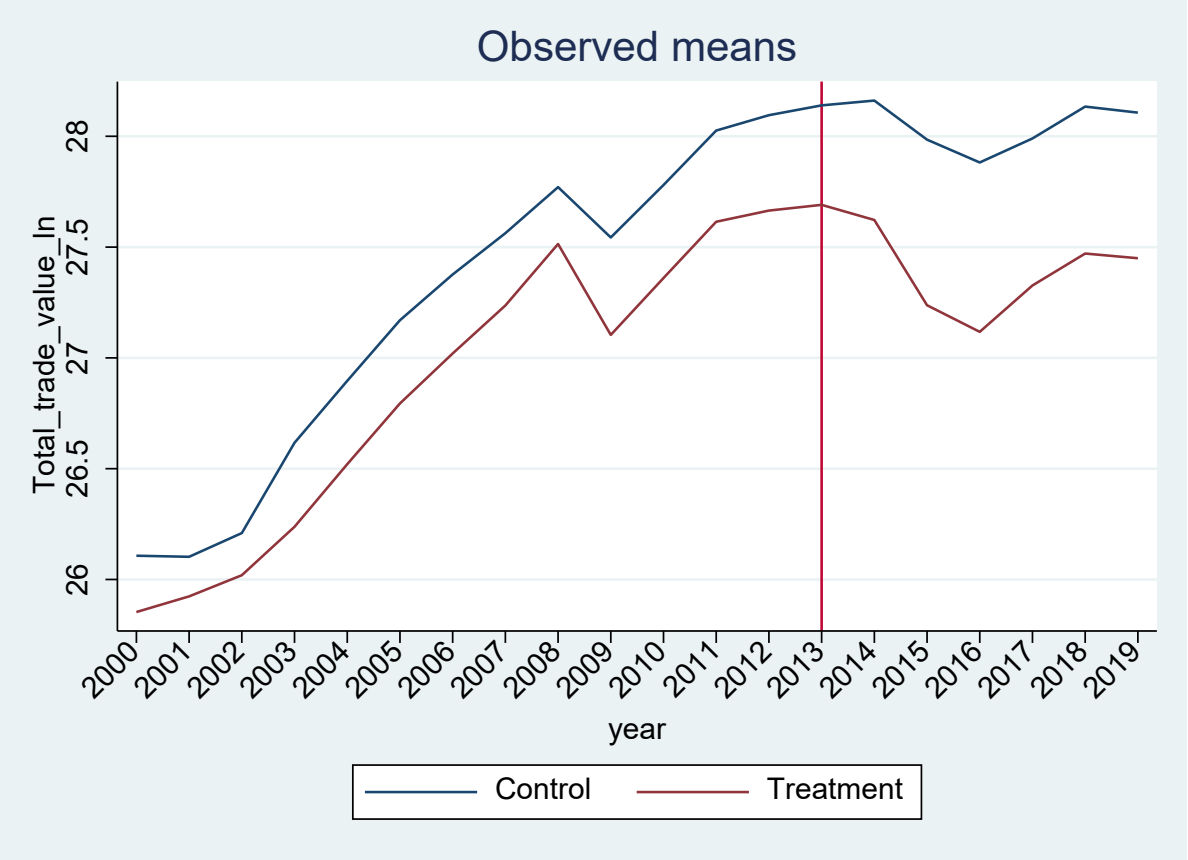

Figure 5. Observed means

Figure 5 shows the observed logarithm of total trade means for the control and the treated group. The blue line is represented by the control group and the red line represented by Russia. From figure 5 it can be concluded that the mean increase in total trade was slightly lower in Russia pre-treatment than in the control and post treatment Russia saw a greater fall. Since the fluctuations in the total trade value for Russia were larger post treatment, a lower coefficient in the DiD regression is expected. The observed means for both the treated unit and the control group pre-treatment can be seen following the same trend. However, a larger fall after the treatment is apparent for the treatment unit. Both the treated and control saw a decrease in total trade 2015, however smaller for the control group. Also, while the total trade was stabilising and eventually trending upwards, the rest of the period the treated and the control follows the same trend.

7. Conclusions

The purpose of our thesis is to examine the causal effect sanctions had no Russia following the annexation of Crimea.

We examined the causal effects of sanctions with the SCM and as a robustness check we also applied the DiD method. The results from the SCM showed that no general significant causal effect neither statistically nor practically was found. The year 2016 and 2017 individually was found to have a statistically significant effect. The largest significant difference in total trade values between synthetic and actual occurs in 2016. During 2016, the synthetic unit is 1.23 times greater than the actual Russia. The DiD did not show any practical- nor statistically significant effect. Since both methods show no causal effects of sanctions on Russia's total trade the null hypothesis can be confirmed.

This can according to us be due to multiple reasons. For example, the sanctions 2014 was to weak or targeted a to narrow slice of goods, making the impacts to not cause enough damage. For sanctions to work as a deterrent, shorter, multilateral, and financial sanctions should be used as Dashti-Gibson, Davis, and Radcliff (1997) suggest. A lesson for policymakers can be taught from the sanctions following Crimea annexation. The sanctions on a general level cannot be said to have a causal effect on total trade. And if such effect is desirable, other means of sanctions should be considered.

Difficulties with examining the impacts of sanctions is to derive a good counter actual case. Since there may be so-called spillover effects or third country effects a possible improvement would be testing for this. Another shortcoming of the study is the difficulty to find not-sanctioned countries. We suggest that trade flows between countries and the sanctioned entity could be more closely examined. Also, the flow of sanctioned goods would make an interesting case for deepening the understanding of third country effects and spill-over effects. This would also make it easier to select countries to the donor pool in a more accurate and unbiased way. The estimation results would then be more correct. We also chose to not examine import and export individually. It is possible that a significant effect is present on those and therefore makes an interesting topic to research further.

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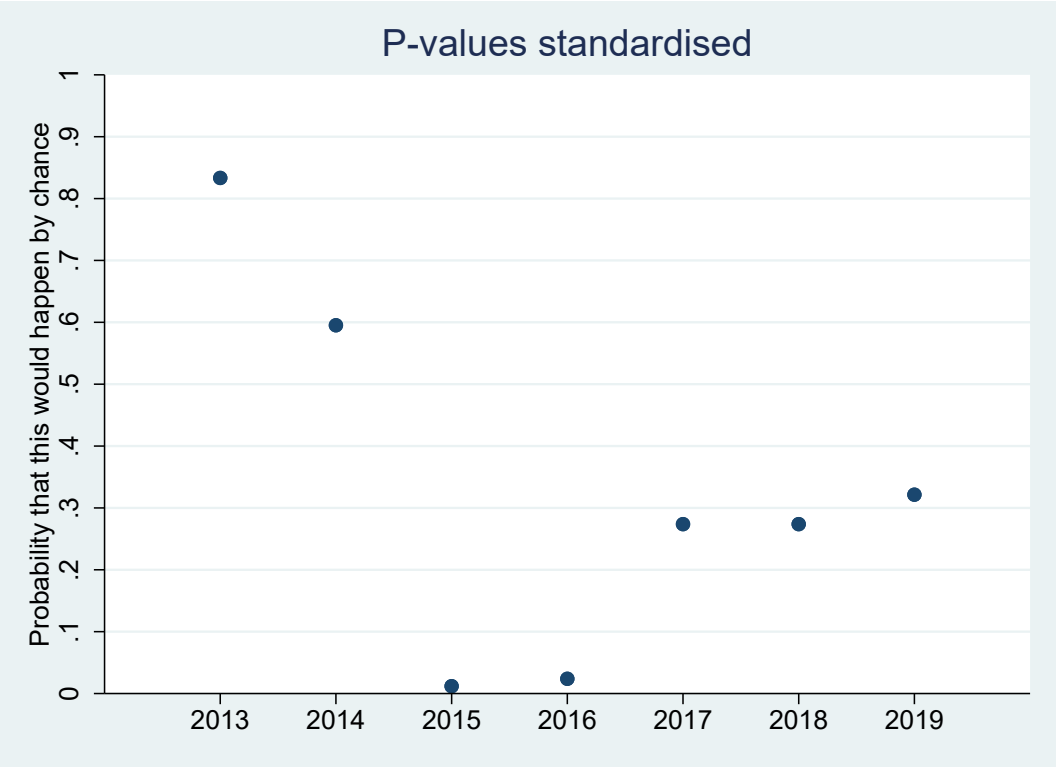
Appendix 1

Country iso3				
ARM	CRI	KAZ	MMR	SAU
AZE	DJI	KEN	MNG	SDN
BEN	DOM	KGZ	MUS	SGP
BGD	ECU	KHM	MWI	SLE
BHS	EGY	KOR	MYS	SLV
BIH	ETH	KWT	NAM	STP
BLR	GEO	LAO	NER	SYC
BLZ	GHA	LBY	NGA	TGO
BOL	GTM	LKA	NIC	THA
BRA	GUY	LSO	NZL	TTO
BWA	HND	MAR	OMN	TUN
CHL	HTI	MDA	PAK	TUR
CHN	IDN	MDG	PAN	TZA
CMR	IND	MDV	PER	UGA
CIV	ISR	MEX	PHL	VNM
COL	JAM	MKD	PRY	ZAF
CPV	JOR	MLI	RUS	ZMB

Appendix 2


P-values standardised
Probability that this would happen by chance
0
.1
.2
.3
.4
.5
.6
.7
.8
.9
1
2013
2014
2015
2016
2017
2018
2019