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Sanctions and Trade Diversion: How Can Sanctions Cause Nations to Divert Their Trade to Others? A Case-Study on Belarus

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Abstract

This paper investigates if the imposition of trade sanctions onto a nation leads to the sanctioned nation diverting trade from the sanctioning countries to non-sanctioning ones. Specifically, it does this by examining the effect of the 2011 sanctions on the Belarusian chemical and petrochemical industries, and whether this caused the nation to divert trade to non-sanctioning countries. This effect was examined through the use of a difference-in-difference regression and two multiple linear regressions, with trade data on the value of Belarusian chemical and petrochemical exports to both sanctioning and non-sanctioning countries being used. From these regressions, it was determined that there was not a significant level of trade diversion from sanctioning to non-sanctioning countries occurring.

The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics, or Erasmus University Rotterdam

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Introduction

Globalization has had many consequences. One of those is the increasing connection of countries, both diplomatically and economically. This is particularly true in the case of international trade, which plays an important economic and geopolitical role in the world today. Trade allows for the consumers of a country to have access to goods and services that are normally unavailable or very expensive in their own country. From an economic standpoint, international trade has had growing importance in the world during the past few centuries, as it makes up a large share of the gross domestic product (GDP) of many nations, and close to 52% of global GDP as of 2020. Inevitably, as trade's economic importance has grown, so to has its political importance. International trade is often used as a tool to bring allied nations closer together. Examples of this include the European Free Trade Association and the United States-Mexico-Canada Agreement, which facilitate free trade, that is trade without barriers such as tariffs or quotas, amongst the participating nations.

While it has been used to bring nations closer together, trade, or rather restrictions on trade, have also been used as a tool of international relations. These restrictions are often imposed in response to a nation's aggression towards other nations, violations of international law and/or national security, human rights abuses, and undermining of democracy. These are known as sanctions. Sanctions that target trade are known as trade sanctions, and often involve the restriction or in some cases, the complete ban of trade in a certain product or industry from the sanctioned nation to sanctioning nations. The purpose of these sanctions is often to inflict economic harm to the sanctioned nation, to the point that they change to more acceptable behaviour. This can happen as sanctions can constitute a trade shock. A trade shock is a sudden change in the demand or supply of traded goods. Shocks can be negative, as they can hamper a country's ability to make revenue through the trade of goods, as well as limiting their ability to purchase goods from abroad. This can have adverse effects on the industries and consumers within a nation, due to heightened prices, decreased revenue, and less choice of goods. However, this gives incentives to sanctioned nations to try and avert the worst impacts of the sanction, as they may be unwilling to bow to economic pressure. This obviously leads to the questions as to

how sanctioned nations can try and circumvent sanctions, and to what extent does this hinder the effectiveness of sanctions.

When looking at how countries try to circumvent sanctions, it is useful to examine changes in trade before and after a country becomes sanctioned. Namely, a sanctioned may try to divert trade away from sanctioning countries to friendlier nations as a way to mitigate the impact of sanctions. One such country that has had many sanctions placed on it in the recent past is Belarus. The regime of the current Belarusian President, Alexander Lukashenko, has often been in contention with the international community, particularly the Western democratic powers, over the undermining of democracy within the country. This has led to Belarus being extensively sanctioned, with its two largest sectors in its economy, the chemical and petrochemical industries, being prime targets. For this report, we will be investigating the Belarusian response to the sanctions placed on these industries in 2011, which were imposed in the wake of the fraudulent 2010 Belarusian presidential election. This leads to the research question of this report: To what extent did sanctions imposed on the Belarusian chemical and petrochemical industry in 2011 cause trade diversion from sanctioning nations to non-sanctioning nations? This question is socially relevant due to its policy implications for policymakers in sanctioning countries. If it is found that sanctioned countries, even one that is not an economic superpower like Russia, can circumvent the effects of sanctions by diverting trade, then this would reduce the effect of sanctions, meaning that more or different measures may have to be taken to inflict sufficient economic damage. This is particularly important today due to countries like Russia being sanctioned for its unprovoked invasion of Ukraine, and Belarus being further sanctioned for its support of Russia in the conflict. This question is scientifically relevant, as research on these sanctions in particular has been limited to predictions on the effect of these sanctions, rather than analysing the actual effect of the sanctions themselves. Additionally, the results of this paper could be used to predict the effect of similar sanctions in the future.

This paper will have the following structure. Firstly, a review of the relevant literature on this topic will be done. Secondly, there will be explanation of the data and methodology of this paper. Thirdly, the data analysis will be undertaken, which will include a descriptive

statistics analysis, as well as a presentation and explanation of the regression results. Finally, a discussion of the results will be done, followed by the concluding remarks.

Literature Review

For this section a review of the relevant literature on the topic will be done. This review will be done to gain an understanding on what previous research has been done on the topic, and what gaps remain. This review will cover the nature of trade shocks, the effects of sanctions, and trade diversion.

Trade Shocks

The effects of trade shocks have been a well-covered topic by academic researchers. Particularly, much research has been done into the effect of terms-of-trade shocks on the business cycles of emerging and developing economies. Here there has been some divergence in findings. On one hand, research done by Mendoza (1995) and Kose (2002) found that terms-of-trade shocks are responsible for between 30% and 50% of variance in macroeconomic output. On the other hand, more recent research done by Schmitt-Grohé and Uribe (2018) has put this figure closer to 10%. This discrepancy has been attributed to by Di Pace et al. (2020) to be a disconnect between theory and empirical evidence. They explain that this discrepancy arises from the fact that in reality term-of-trade shocks are not all alike. Due to the fact that developing countries have very different export and import sectors, there is an asymmetric response between rises in export prices and decreases in import prices. Specifically, changes in export prices elicit greater responses in macroeconomic variables than changes in import prices. Hence, this can have detrimental effects on developing economies, particularly those that are heavily reliant on commodity exports. Additionally, they are able to conclude that terms-of-trade shocks account for up to 40% of output fluctuations, with changes in export prices being on average twice as important in influencing business cycles than changes in import prices.

Other research on the effects of trade shocks has focused on real world examples. Rodrik (1992) looked at the effect of the collapse of the Soviet Union in 1991 on the real GDPs on three Eastern European countries, Poland, Hungary, and Czechoslovakia. He argues that there were three shocks involved, a terms-of-trade shock, a market-loss effect, and the loss of an import subsidy. Under this framework he was able to calculate that these three

shocks resulted in all of the loss GDP of Hungary, 60% of loss GDP for Czechoslovakia, and 25% of loss GDP for Poland. Another study was done by Caliendo et al. (2019) which was focused on the effect of the rise of China's import competition on US households between 2000-2007. They found that there was a loss of 0.55 million manufacturing jobs within the United States (US) that could be attributed to increased Chinese import competition during this time. While the US gains overall, these gains are varied across the labour market due to trade and migration factors. From these examples it seems there are significant negative real-world effects of trade shocks. This is backed up by other researchers such as Douch et al. (2018) who studied the trade effects of the results of the Brexit referendum in 2016, and Hayakawa and Mukunoki (2021) who examined the impact of Covid-19 on the trade of importing and exporting countries.

The causes of trade shocks have also been subject to much research. Krpec and Hodulak (2019) link conflict to being a chief cause of trade shocks through studying the effects on trade of World War II, World War I, and the Napoleonic Wars. This can be from direct effects, such as collateral damage to infrastructure and displacement of people hurting the country's ability to produce, export, and import goods. It can also be from measures that are imposed on an aggressing nation, such as trade blockades embargoes, and sanctions, which hinder or discourage countries from trading with involved nations. Other researchers, such as Krugman et al. (1995) and Autor et al. (2016) have cited the emergence of new economic powers in the world as being the cause of trade shocks. In particular both cite the example of China, whose opening up to international trade and growth to being an economic superpower has acted as a positive trade shock, with there being a sudden growth in trade instead of a disruption. Baldwin (2009) also examined the drop-off in world trade after the Great Recession in 2009, and determined that the main cause of this was falling commodity prices and the collapse of production and exportation of manufacturing goods. Additionally, demand for intermediate goods (chemicals, steel, parts and components, etc.) also fell due to there being less demand for durable and postponeable goods.

Overall, the literature on the topic of potential causes and effects of trade shocks is quite extensive. In the context of this paper, sanctions are acting as the instigator of the trade shock. This findings of Krpec and Hodulak (2019) would be applicable in this case. While

this topic is not directly related to a military conflict, as Belarus was not actively involved in a war at the time, the punishment for undermining democracy could be viewed as a sort of political conflict, which prompted the sanctions on the Belarusian economy. Additionally, as these sanctions targeted the chemical and petrochemical industries, which produce many intermediate goods, there could be a sharp decrease in demand for these goods, which was cited by Baldwin (2009) as being a cause for trade shocks. As for the effects, findings by Di Pace et al. (2020) suggested that developing economies suffer greatly from the effects of terms-of-trade shocks. As Belarus is a developing economy and the sanctions imposed on it likely causing an increase in export prices, this would suggest that the Belarusian economy should be damaged. This notion was backed up by other literature, however, there was not significant literature on the potential effects that trade shocks would have on trade diversion.

Sanctions

There is much literature on the possible effects of sanctions, particularly in the case on whether sanctions are an effective tool in invoking change in the target country's behaviour. Eaton and Engers (1990) investigated this by constructing a model where the target selects a level of activity that affects both its and the sender's utility in opposite directions, and the sender selects a level of sanctions that affect the utility of both the target and the sender adversely. From this model, they are able to determine that the effectiveness of sanctions is contingent on the compliance of the target. If the sanctions or the threat of the sanctions do not elicit a high enough cost on the target, then the target is non-compliant, meaning that sanctions are less effective. Allen (2005) also looks at the determinants of the success and failure of economic sanctions. She determines that domestic political concerns for both the sanctioned and the sanctioning countries play a role in the success or failure of sanctions. Both have to undergo the costs of either maintaining or enduring sanctions, and this can lead to either side conceding if these costs become too great. Additionally, the regime of the governments in power also matters. A non-democratic target is likely to hold out under sanctions for longer, as they have little chance of suffering electoral consequences than a democratic target. This is backed up by findings from Lektzian and Souva (2007) who argue that for sanctions to work, they need to target the winning coalition, that is the group of people who keep the current regime in power, of the target

country. This is harder to do when targeting non-democratic countries, as the winning coalition for autocratic leaders tends to be smaller, and harder to hurt with sanctions. This leads to sanctions being harder to effectively implement, although there are still possibilities of success. McGee (2004) takes a more negative view, by examining the effectiveness of American sanctions on Iraq and Cuba. Specifically, he states that sanctions have not led to regime change in 40 years in Cuba, or any policy change in the desired direction. One of the key reasons for this is that the Cuban economy has been able to adapt over time to its new economic conditions by finding new trading partners, and establishing better economic relations with non-sanctioning nations.

There is also considerable literature that focus on trade sanctions specifically. Lindsay (1986) explored how trade sanctions can be used to achieve a broad set of goals, rather than just changing the targeted country's behaviour. These goals are compliance, subversion, deterrence, international symbolism, and domestic symbolism. He finds that trade sanctions often fail when it comes to the goals of compliance, subversion, or deterrence. This is because the imposition of trade sanctions often causes the sanctioned country to strengthen economic ties with other nations, who are often also the enemy of the sanctioning country. Additionally, trade sanctions can actually increase domestic support for the regime of the targeted country, due to a rally-around-the-flag effect, which hurts the effectiveness of the sanctions. Other work done by Caruso (2003) and Felbermayr et al. (2020) confirm that trade sanctions have significant, negative effects on trade, with Felbermayr et al. (2020) further finding that complete trade sanctions are more effective in reducing the target country's trade than trade sanctions that only target some sectors of the target's economy, and can therefore still be a useful tool for foreign policy.

There has also been research done on the potential impact of EU sanctions on Belarus, which is the main focus of this paper. Portela (2011) discussed the evolution of the EU's stance towards Belarus in response to growing authoritarianism in the country. She notes that the EU has been imposing sanctions on Belarus since 1996 and have been escalating ever since. However, there was a period of EU-Belarus rapprochement in 2006-2009. She explains that Belarusian economic rationale was at the heart of this rapprochement, as the raising of Russian energy prices in 2006 threatened the standard of living in the country, and hence support for the Lukashenko regime. This rapprochement led to a softening of

sanctions on the EU's part, however this was reversed after this period once economic ties with Russia were improved. Hadfield et al. (2012) specifically looked at the potential impact of the 2011 sanctions on Belarus. They warn that there is a strong possibility that, while EU sanctions will likely have a significant negative impact on the Belarusian economy, it may cause the country to turn to others, namely Russia. They state that Belarus may divert trade to Russia to make up for the shortfall caused by EU sanctions. Additionally, they are doubtful that the sanctions will have much success in changing the regime in Belarus, and that it would be more effective for the EU to target the business and political elite within the country directly.

It is evident that much of the literature on sanctions has to do with the success or failure of sanctions. This is important in the context of this paper, as trade diversion is one way that sanctions can fail, which was something that was cited as a possibility in the Belarusian case by Hadfield et al. (2011), and was already documented in other cases by McGee (2004). If Belarus Additionally, Allen (2005) and Lektzian and Souva (2007) both highlighted the difficulty of sanction success in the case of targeting non-democratic countries. This has implications for this paper, as Belarus is a non-democratic country, meaning that the likelihood of sanction success would be lower. However, the findings of Caruso (2003) and Felbermayr et al. (2020), which suggest that trade sanctions have significant negative impact on the levels of trade from the sanctioned nation, could be more supportive of the effectiveness of sanctions. However, as the sanctions on Belarus in 2011 were partial sanctions, only targeting the Belarusian chemical and petrochemical industries, then it is less likely that this dropoff in trade occurred.

Trade Diversion

Much of the literature on trade diversion concerns the possible causes of trade diversion. Dai et al. (2014) analysed data from 64 free trade areas (FTAs) from the period 1990-2002 and determined that the creation of free trade areas leads to trade diversion away from non-member countries towards member countries of the FTA. In a similar manner, Magee (2008) also found that regional trade agreements can lead to large levels of trade creation and diversion, however this is most noticeable with countries that sign agreements with countries that are large and nearby. For a specific example, Fukao et al. (2003) looked at whether the creation of NAFTA led to trade diversion. They found strong evidence in some

industries, such as textiles and apparel, that trade diversion had taken place, however in others, such as automobiles, this was not the case.

On the possibility that sanctions can lead to trade diversion, Frank (2017) constructed a model where sanctions act as a negative trade agreement, where the imposition of sanctions results in an infinitely high tariff between two countries. From this model, he establishes that sanctions lower the value of trade, however by as much as previous literature had suggested, and that the coefficient for trade diversion remained insignificant in his model, implying that trade diversion was not taking place. Fritz et al. (2017) looks specifically at whether countries can dodge sanctions by diverting trade with the case of Russia after it was sanctioned for its invasion of Crimea. They find that both the EU and Russia have partly diverted trade flows to other countries and markets due to the worsening economic and political relationship between the two. In Russia's case, circumvention of the sanctions by trade diversion started almost immediately after their implementation in 2014. Additional analysis by Volchkova and Kuznetsova (2019) found that Belarus was one of the main beneficiaries of this trade diversion. In some cases, such as with Belarusian importers of dairy products, there were gains of up to 90% due to trade diversion.

For this report, the literature on trade diversion holds much importance. Much of the literature studied was focused on the potential causes of trade diversion. The work by Frank (2017), Fritz et al. (2017), and Volchkova and Kuznetsova (2019), helped to link sanctions to trade diversion. However, there were diverging findings, with Frank (2017) not finding trade diversion in his model, while Fritz et al. (2017) and Volchkova and Kuznetsova (2019) did find trade diversion taking place. The findings of Fritz et al. (2017) and Volchkova and Kuznetsova (2019) are particularly important as they deal with Russia and Belarus. The fact that trade diversion from Russia to Belarus was found to take place after sanctions were imposed would seem to indicate that Belarus could do the same if they were the target of trade sanctions.

Data and Methodology

Data

Data for this report will consist of export data for the Belarusian chemical and petrochemical industry from 2007-2021. Specifically, this will be the annual value of the

exports of Belarusian chemical and petrochemical products to the sanctioning nations and non-sanctioning nations for this time period. The sanctioning nations will include the EU nations, Switzerland, the United States, the United Kingdom, Norway, Canada, Australia, and New Zealand, and the non-sanctioning nations will be everyone else. The data will come from the website [wits.worldbank](https://wits.worldbank.org), which provides historical trade data for countries as well as dividing by industry and product type. 2007 is the furthest back that data is available. This time period will allow for the effect of the imposition of sanctions to be observed, as the sanctions came into force in 2011. Hence, there should be an effect for before and after the sanctions are imposed, which will be shown in the regression results.

Data on sanctions for this report will come from the Global Sanctions Database (GSDB), which is published every year through a joint project of the Hochschule Konstanz University of Applied Sciences, the Drexel University School of Economics, and the Austrian Institute of Economic Research. The GSDB compiles information on sanctions during the time period of 1950-2020, and consists of three specific dimensions. First is the type of sanctions, second is the political objective of the sanctions, and third is the degree success of the sanctions. Additionally, the GSDB covers what countries have been sanctioned during which years, and by who. The main variable of interest from the GSDB that will be looked at will be the whether the sanctions were imposed on Belarus or not. This will be a binary variable (0=sanctions not imposed on Belarus for that year, 1=sanctions imposed on Belarus for that year), and the analysis will be looking at the causal effect of this variable on diversion of trade. Additionally, data on the GDP growth and unemployment of each country will be used as controls to show the general economic conditions of each country for that year. This will come from the World Bank.

Methodology

To analyse the data for the first hypothesis, we will use a difference in difference analysis. The regression for this analysis is shown below:

$$\ln(exports_{ct}) = \alpha + \beta \times (sanction\ year_t \times sanctioning\ country_c) + \delta \times controls_{ct} + \gamma \times year\ fixed\ effects_t + \rho \times country\ fixed\ effects_c + error_{ct}$$

In this regression, c denotes the country that Belarus is exporting to and t denotes the year. The sanction year represents the period before or after the sanctions were imposed on

Belarus, with 0=before the sanctions were imposed and 1=after the sanctions were imposed. The sanctioning country represents whether the country sanctioned Belarus, with 0=the country has not sanctioned Belarus and 1=the country has sanctioned Belarus. The term sanction year x sanctioning country is the interaction term between the two. The controls will be the GDP growth and unemployment rate of each country for the particular year. The coefficient of the interaction term, β , represents the treatment effect of the regression, or in this case the effect of sanctions on the independent variable. The independent variable is the natural logarithm of the value of Belarusian chemical and petrochemical exports. The use of the natural logarithm helps to normalize the value of exports variable, as it does not exhibit a linear relationship in the data. In the final regression the coefficients for country fixed effects and year fixed effects will be omitted due to collinearity.

The first hypothesis of this report is that the imposition of sanctions will have an overall negative treatment effect on the value of Belarusian chemical and petrochemical exports. For this hypothesis to not be rejected, the β coefficient of the difference-in-difference regression will have to be statistically significant and negative.

The reason why difference-in-difference is being used is that the treatment, whether a country sanctions Belarus or not, is determined at the aggregate, rather than the individual level. This allows for an estimation of the impact of a certain policy change on an international level. Difference-in-difference is particularly useful for finding a general evaluation of a policy change, which is the aim of this paper. In this case, this report is evaluating the impact of the imposition of sanctions on Belarusian exports. The regressions used will allow us to estimate what, if any, the causal effect of these sanctions is on the exports to the sanctioning and non-sanctioning countries. The use of difference-in-difference will allow for an estimation of the impact of these sanctions, if there proves to be a causal effect. This should allow for the first hypothesis, that the imposition of sanctions had a negative impact on Belarusian chemical and petrochemical exports to be rejected or not rejected, which will help to resolve the research question.

For the second hypothesis, that the imposition of sanctions will cause a significant decrease in Belarusian chemical and petrochemical exports to sanctioning countries and a significant increase in exports to non-sanctioning countries, multiple linear regression will be used.

Two regressions will be used, one for sanctioning countries and one for non-sanctioning countries. The main variable of interest will be the binary variable of whether the country had imposed sanctions on Belarus for that year, with 0 meaning that the country has not and 1 meaning that the country has. The regression that will be used is shown below:

$$\ln(exports) = \alpha + \beta \times \text{sanctions imposed} + \gamma \times \text{controls} \\ + \delta \times \text{Country Fixed Effects} + \theta \times \text{Time Trend} + \text{error}$$

The coefficient β will show the effect of the sanctions. The controls of GDP growth and unemployment for each country during the year in question will be used. Additionally, country fixed effects will be present in the regression. The coefficient for this will be omitted in the final results due to collinearity. A time trend will also be included in the model. This trend will help to show the evolution of the outcome variable over the period studied. For the hypothesis to not be rejected, β will have to be significant and negative for sanctioning countries and significant and positive for non-sanctioning countries. If this is the case, then this will indicate that trade diversion is taking place, which will help to resolve the research question.

The reason why multiple linear regression is being used, is that it allows for interpretation of the coefficients, in this case β , as a possible causal effect. If the coefficient is found to be statistically significant, then it can be meaningfully interpreted as a causal effect of the variable of interest, in this case the imposition of sanctions on Belarus. Additionally, multiple linear regression allows for the controlling of observables, which helps to reduce omitted variable bias which may adversely affect the accuracy of the results.

Descriptive Statistics Analysis

For this section a descriptive statistics analysis will be done on the data. This will be done for the value of Belarusian chemical and petrochemical exports to sanctioning and non-sanctioning countries. The results of this analysis can be found in Table 1 in the Appendix.

From Table 1, we can immediately observe several notable things. Firstly, the mean of the value of Belarusian chemical and petrochemical exports to sanctioning countries is higher than the mean for non-sanctioning countries, at 42854.33 thousand USD and 26507.60 thousand USD respectively. This is surprising, as it would be expected that countries that

sanctioned Belarus would have less trade than countries that have not. However, there are a few possible reasons for this. One is that the countries that are sanctioning Belarus likely had higher levels of trade with Belarus to begin with. As mentioned before, the EU and other European countries were the part of the main instigators of sanctions on the countries. These countries have had a history of trade with Belarus, particularly in the chemical and petrochemical industries, due to their geographical proximity and economic ties with the country. As many non-sanctioning countries do not have this economic history with Belarus, due to being geographically further away from the country or having not established close economic ties, this may mean that sanctioning countries have far greater trade with Belarus before the imposition of sanctions, which could result in a higher mean. Another reason could be that many of the non-sanctioning nations are countries that Belarus does not have much trade with. The majority of the non-sanctioning nations are located Asia, Africa, and South America. While Belarus may have relations with these countries, it is unlikely that it would have established significant trade links with these countries. This is particularly true with the chemical and petrochemical industries, which require significant resources and infrastructure to transport and receive. This makes transporting these products over long distances very costly, which may make it more difficult for there to be high levels of trade between Belarus and many non-sanctioning nations.

Secondly, another interesting result of the analysis is that the standard deviation of sanctioning countries was far greater than the corresponding value for non-sanctioning countries. These values were 128209.10 thousand USD and 96215.63 thousand USD respectively. This indicates that the spread of the data for sanctioning countries was far greater than the spread for the non-sanctioning countries. This could be an indication of the effect of the sanctions, as it could be that the sanctioning countries received high levels of exports from Belarus before the sanctions were imposed and then had these levels reduced after imposing sanctions. Supporting this is the fact that the sanctioning countries have a higher maximum value of exports of 1822617.00 thousand USD than the non-sanctioning countries, which have a maximum value of 1211980.00 thousand USD. Since both sanctioning and non-sanctioning countries have the same minimum value of 0.10 thousand USD, these values could be an indication of a reduction in Belarusian exports to sanctioning

countries, which would lead to there being a larger standard deviation for sanctioning countries. However, this is not sufficient evidence yet for diversion of trade from sanctioning nations to non-sanctioning nations. For this the regression analysis will be required.

Overall, the descriptive statistics analysis does not provide enough evidence to conclusively resolve the research question. On one hand, the larger standard deviation for the sanctioning countries could be an indication of that the sanctions caused there to be a reduction in Belarusian exports to those countries, thereby causing a larger spread in the data. On the other hand, the fact that the sanctioning countries exhibited a greater mean value of exports received from Belarus than non-sanctioning countries runs counter-intuitive to the effect of sanctions on trade. While there are possible reasons to explain this discrepancy, such as Belarus having closer economic ties to the sanctioning countries due to them being closer, there is not enough evidence from the descriptive statistics analysis alone to draw a firm conclusion. Further analysis from the regression results will be needed.

Regression Results

In this section, the regression results will be presented and analysed. This will be done to examine the relationship between the value of Belarusian chemical and petrochemical exports to sanctioning and non-sanctioning countries, and whether sanctions were implemented for each year investigated. The two hypotheses being tested are that the imposition of sanctions will have an overall negative effect on the exports of Belarusian chemical and petrochemical products, and that there will be a significant decrease in exports to sanctioning countries and a significant increase in exports to non-sanctioning countries. The use of a difference-in-difference regression and multiple linear regression will allow us to determine whether there is a causal effect of the imposition of sanctions on Belarus on exports in chemical and petrochemical products, and what this effect is if it exists. From this we should be able to reject or not reject the hypotheses and draw a conclusion to the research question. The regression results can be found in Table 2 and Table 3 in the Appendix.

Analysis of Results

From Table 2, there are several things that are immediately evident. Perhaps most importantly, the interaction term, which shows the treatment effect of the imposition of sanctions, had a coefficient of 0.58. This indicates that the imposition of sanctions on the Belarusian chemical and petrochemical sectors had actually increased Belarusian exports by 58%. Obviously, this is opposite of what would have been expected when sanctions were imposed, and makes it seem that the sanctions were not effective in curtailing Belarusian trade. There are several possible explanations as to why this may be the case. In response to the sanctions, Belarus could have offset the drop in trade with the sanctioning nations by increasing trade with non-sanctioning nations, particularly with its close allies, such as Russia and Kazakhstan. If Belarus was at the same time able to increase its overall chemical and petrochemical production, then that would help to explain why it seems the imposition of sanctions led to an increase in Belarusian exports. Another possible explanation is that the sanctions were not properly implemented or enforced by the sanctioning nations. This would dilute the damaging effect of the sanctions, and mean that Belarusian chemical and petrochemical firms would still be able to export to the sanctioning nations. Additionally, if there were loopholes or exceptions in the sanctions that were able to be exploited by Belarusian chemical and petrochemical firms, then that would make it less likely that the sanctions would lead to a decrease in Belarusian exports. Another reason may be that the model itself is not a good explainer of the data. Only the unemployment control showed statistical significance in the regression, while the rest did not. This indicates that the model is not adequately explaining the data. There are a large number of observations, at 1655, which means that issues with the regression may lie with omitted variable bias. It is probable that there are more differences between the sanctioning and non-sanctioning nations that need to be accounted for in the regression.

In terms of the first hypothesis, which was that the imposition of sanctions would lead to an overall negative effect on the value of Belarusian exports to sanctioning and non-sanctioning countries, the evidence from the regression suggests that this hypothesis must be rejected. The coefficients of the model did not have a high level of statistical significance and the treatment effect seemed to suggest that the sanctions caused an increase of Belarusian exports if anything. While this does not definitively rule out trade diversion taking place, particularly if Belarus managed to increase trade to non-sanctioning nations to

more than offset the loss of trade to sanctioning nations, it does seem to indicate sanction ineffectiveness. Further analysis of the multiple linear regression results and the second hypothesis will be needed to definitively draw a conclusion to the research question.

From Table 3, we can see the results for the multiple linear regression for both sanctioning and non-sanctioning countries. For sanctioning countries, the coefficient for the main variable of interest, whether Belarus had been sanctioned or not, is 1.24. This suggests that the imposition of sanctions actually leads to an increase in the value of Belarusian chemical and petrochemical exports by 124%. This once again stands in contrast to what would be normally expected when sanctions are imposed, as this coefficient suggests that an increase in exports occurred rather than a decrease. This result was even found to be statistically significant at the 1% level. Similar to the results of the difference-in-difference regression, it could be that there is an issue with the actual implementation and enforcement of the sanctions, which is meaning that they are not succeeding at reducing trade with Belarus. Additionally, it could also be possible that the restriction of Belarusian chemical and petrochemical products is making these products more expensive. If there are still exceptions or loopholes in the sanctions, then Belarusian firms may have an incentive to increase production to make more revenue, and still sell to the sanctioning countries. A similar situation today can be seen with EU sanctions on Russian energy, which have increased energy prices, and led to higher revenues for Russian energy companies. Supporting the fact that the sanctions themselves are not having the desired impact, is the time trend which has a coefficient of -0.01. This shows that there is little change in Belarusian exports to sanctioning countries, although this value was not found to be statistically significant. Another possibility is that, once again, the model itself is not adequately explaining the data well. While all the main variable of interest has statistical significance, the rest do not. This is most likely due to the difficulty in controlling for all potential differences between the different countries. Consequently, it appears that the model is a poor fit for explaining the data. This puts in doubt any potential causal link between the imposition of sanctions on Belarus and exports to sanctioning countries.

For the regression for non-sanctioning countries, the results put the potential causal link in even more question. The coefficient for whether sanctions were imposed on Belarus is 0.94. This indicates that the imposition of sanctions on Belarus is associated with an

increase of 94% in exports of chemical and petrochemical products to non-sanctioning countries. This is more in line with what is expected if trade diversion is taking place. However, when taken in combination with the results from the regression for sanctioning countries, this does not seem to be the case. Additionally, the model for non-sanctioning countries appears to also have low confidence, as most of the coefficients do not have statistical significance. This could be because most non-sanctioning countries are nations that Belarus is less likely to trade with regardless of sanctions. Many of the non-sanctioning nations are further away and have less diplomatic and economic ties with the country, making trade more costly and more difficult. This would make trade diversion on a large scale less likely, even with the imposition of sanctions. The time trend was also shown to be -0.06, which is the opposite of what would be expected if trade diversion was taking place, since it is negative. Additionally, similar to the other regression there is likely to be the problem of omitted variable bias, as not all possible differences between countries were accounted for in the regression

The second hypothesis stated that the imposition of sanctions would result in a significant decrease in Belarusian chemical and petrochemical exports to sanctioning countries and a significant increase in exports to non-sanctioning countries. From the available evidence this hypothesis will have to be rejected. Neither model definitively proved that this was occurring, and even seemed to suggest that the opposite was happening. Additionally, both regressions had low confidence, with most variables not being statistically significant, which throws into doubt whether a causal link could be meaningfully interpreted.

Discussion

Sanctions and Trade Diversion

From the results it seems that Belarusian trade diversion from sanctioning to non-sanctioning nations is not taking place on a significant scale. The difference-in-difference regression did not show a significant negative impact of the sanctions on the value of Belarusian exports, and the multiple linear regressions also had low confidence in determining if there was an increase or decrease in the value of Belarusian exports to sanctioning and non-sanctioning nations. Due to these results both of the initial hypotheses had to be rejected, which suggests that trade diversion is not taking place. In the context of

sanction effectiveness, this presents a mixed picture. On one hand if trade diversion is not taking place, then it is less likely that Belarus is circumventing the damaging effects of sanctions. On the other hand, if there is not a meaningful impact of the sanctions, which is what the results here seem to imply, then there could be problems with the implementation and enforcement of these sanctions. This is important today, as Belarus is under even more severe sanctions due to its support of Russia's invasion of Ukraine. If the sanctioning powers want to get their desired outcome, and there is no trade diversion as the results here seem to suggest, then they will likely need to focus on the implementation and enforcement of their sanctions.

Limitations

Firstly, there is a probability of omitted variable bias in all three regressions. It is not possible to control for all the pre-existing differences between the countries studied. These differences could include the proximity of the country to Belarus, trade agreements with Belarus, among others. By not controlling for these, the regression results may have reduced accuracy and reliability as evidenced by the low confidence in the two multiple linear regressions. Secondly, the number of countries in the non-sanctioning group meant that there were most likely many nations that would have traded little with Belarus, regardless of sanctions. This means that it is possible that the effect of the sanctions could not be captured by the regression, as they would have little to no effect on the trade with these nations. Finally, the sanctions on Belarus were only partial rather than total sanctions. As mentioned by Felbermayr et al. (2020), total sanctions are more effective in reducing the target's levels of trade. As the sanctions on Belarus only targeted the country's chemical and petrochemical sectors, then it is less likely that a drop off in trade would be observable.

Extensions

For future research, it could be useful to look at other countries that were sanctioned to see if there was any observable trade diversion. While it was not found in the case of the 2011 sanctions on Belarus, studying other countries could provide more information on if sanctioned countries are able to circumvent the economic effect of sanctions. These can be nations such as Cuba, Iran, Syria, Russia, North Korea, etc. Another possible extension could be to look at other sectors than the chemical and petrochemical industries that have been

sanctioned, to see if trade diversion in these sectors had occurred. These could include luxury goods, agricultural products, weapons, etc. This could be useful, particularly if some sectors have lower costs required to divert to other countries. This would make it more likely for trade diversion to be observed if it is happening after sanctions. A final extension could be to see if there is trade diversion as a result of another trade shock, other than sanctions. For example, one could look at the effect on trade after a country suffers a natural disaster or widespread military conflict. This would be different from this report, as this would focus more on how other countries divert trade away from the affected nation, rather than how the affected nation diverts trade away from other countries.

Conclusion

Recall that the original research question was: To what extent did sanctions imposed on the Belarusian chemical and petrochemical industry in 2011 cause trade diversion to non-sanctioning? From the results of this paper, it would seem that there was no significant trade diversion because of the 2011 sanctions. None of the three regressions done in this report had high enough confidence to link the imposition of sanctions to changes in the value of Belarusian chemical and petrochemical exports to either sanctioning or non-sanctioning nations. This suggests that the sanctions had little tangible impact on the Belarusian chemical and petrochemical industries. This obviously has implications for the effectiveness of these types of sanctions. While it is good that it seems that Belarus is not avoiding sanctions through trade diversion, the relative lack of impact will be concerning. As Belarus remains sanctioned to this day due to its support of Russia's invasion of Ukraine, it is evident that more will have to be done to ensure that sanctions have the desired effect. This may include proper implementation and enforcement of these sanctions, or more encompassing sanctions. As the Western democracies continue to employ sanctions against aggressive and autocratic nations in the future, they will have to remain vigilant to ensure that these sanctions can still be effective tools of international relations. This is how sanctions can affect trade diversion.

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Appendix

Table 1: Descriptive Statistics of Value of Belarusian Chemical and Petrochemical Exports to the Sanctioning and Non-Sanctioning Countries for the Years 2007-2021

	Value of Exports to Sanctioning Countries (Thousands USD)	Value of Exports to Non- Sanctioning Countries (Thousands USD)
Mean	42854.53	26507.60
Standard Deviation	128209.10	96215.63
Minimum	0.10	0.10
Maximum	1822617.00	1211980.00

Notes: Table 1 shows the mean, standard deviation, minimum, and maximum values for the values of Belarusian chemical and petrochemical exports to sanctioning and non-sanctioning countries for the years 2007-2021. All values have been rounded to two decimal places.

Table 2: Difference-in-Difference Regression Results for the Effect of the Imposition of Sanctions on the Belarusian Chemical and Petrochemical Industries on the Value of Belarusian Exports to Sanctioning and Non-Sanctioning Countries for the Years 2007-2021

Variable	
Interaction Term	0.58 (0.39)
GDP Growth	0.00 (0.02)
Unemployment	0.05* (0.03)
Constant	6.58 (0.44)
R²	0.01
Number of Observations	1655

Notes: Table 2 shows the difference-in-difference regression results for the effect of the imposition of sanctions on Belarusian chemical and petrochemical exports to both sanctioning and non-sanctioning countries. The natural logarithm of the value of Belarusian chemical and petrochemical exports is the independent variable. In the regression country fixed effects and year fixed effects are used. The Interaction Term is the dependent variable. GDP growth and unemployment are control variables. The values in the table represent the coefficient, with the values in parenthesis representing the standard errors. * means that the coefficient is significant at 10% significance level, ** at 5%, and *** at 1%. All values have been rounded to two decimal places.

Table 3: Multiple Linear Regression Results for the Relationship Between the Value of Belarusian Chemical and Petrochemical Exports to Sanctioning and Non-Sanctioning Countries and the Imposition of Sanctions on Belarus for the Years 2007-2021

Variable	Export Destination	
	Sanctioning Nations	Non-Sanctioning Nations
Sanctions Imposed	1.24*** (0.34)	0.94*** (0.23)
GDP Growth	-0.03 (0.02)	-0.02 (0.02)
Unemployment	0.05 (0.06)	-0.02 (0.06)
Time Trend	-0.01 (0.05)	-0.06* (0.03)
Constant	18.53 (94.51)	128.28 (61.73)
R²	0.00	0.00
Number of Observations	569	1071

Notes: Table 3 shows the results of the multiple linear regression of the relationship between the natural logarithm of the value of Belarusian chemical and petrochemical exports to sanctioning and non-sanctioning nations as the independent variable and whether Belarus was sanctioned or not as the dependent variable. GDP growth and unemployment are control variables. Country fixed effects are present in the model. The time trend is included to show the evolution of the outcome variable over time. The values in the table represent the coefficient, with the values in parenthesis representing the standard errors. * means that the coefficient is significant at 10% significance level, ** at 5%, and *** at 1%. All values have been rounded to two decimal places.