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Title: Did Oil- Related Sanctions Levied on Russia Contribute to Increasing Energy Prices in European Union?

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Abstract

The paper presents the analysis of whether the oil- related sanctions levied on Russia contributed to increasing energy prices in European Union. The analysis has been conducted in a fixed effect setting and accounts for 27 countries of European Union. The data has been analyzed in panel data setting and includes 24 months (from January 2021 to December 2022) which gives the total of 648 observations. The findings show significant negative relationship between the period during and after the announcement of sanctions and dependency rate on Russian oil. I also find significant positive relationship between the period during and after the announcement of sanctions and the energy prices. Moreover, I find significant negative relationship between the dependency rate on Russian oil and the energy prices. In the paper I provide detailed analysis of these results.

1. Introduction

The conflict between Russia and Ukraine began in 2014, but nobody expected that it would find its escalation 8 years later- on 24 February 2022. On this day, Russian president Vladimir Putin announces a "special military operation" that aims to "demilitarize" and "denazify" Ukraine. Following that, Russian troops are ordered into Ukraine and first explosions are heard across the country (Cnn, 2023).

European Union condemn the aggression and unites with Ukraine. Therefore, its response is immediate. Just one day after the invasion, individual sanctions are levied on Russian State Duma and National Security Council, including Vladimir Putin himself. Furthermore, visa facilitation provisions for Russian diplomats are suspended. Four days after the invasion, sanctions gain momentum. Among others, European Union closes its airspace to Russian aircrafts, prohibits transactions with Russian Central Bank and most importantly, on 2 March- bans SWIFT (system that provides safe and secure financial transactions for its members (Seth, 2023) for seven Russian banks. On march 15th and April 8th, two more packages of sanctions are applied, that, among others, close EU ports to Russian vessels, prohibit imports from Russia of iron, steel, coal, wood, cement, seafood and liquor and prohibit exports to Russia of luxury goods and jet fuel (Europa.eu, 2023).

The spotlight of this research is focused on the sixth package of sanctions levied on Russia on June 3rd 2022. This is when a complete ban is imposed on imports of all Russian seaborne crude oil and petroleum products. This being said, the sanction covers 90% of oil imports from Russia. For seaborne crude oil, the existing contracts were permitted for 6 months, while for petroleum products- 8 months (Europa.eu, 2022). Nevertheless, besides the time given for "adaptation", we can observe dramatic drop in oil and petroleum products imports way sooner. According to Eurostat (2023), these imports to EU fell from 11115 thousand tonnes in June, to just 6248 thousand tonnes in December 2022 (See Appendix 1A) and the trend is still sharply falling.

As one could expect, this outright ban had its reflection in the prices of oil. During the months following the invasion, as the supply decreased, the price per barrel increased to its highest since 2008 crisis and 2012 international supply disruptions. Namely, in June 2022, average price per barrel amounted to 123,07 dollars, while in contrast, it was only 89,96 dollars in January 2022 (Business Insider, n.d.).

The increase of the price of oil significantly impacts the energy prices in the context of bills we pay each month. That is because it is a major source of energy used to propel vehicles, heat buildings and produce electricity (U.S. Energy Information Administration, n.d.). This being said, an average EU citizen is the one that can possibly bear the consequences of the restrictions levied on Russian oil. Therefore, this research aims to analyze the possible association between the announcement of sanctions on Russian oil and Customer Energy Price Index (ECPI). Namely, the research question is: "Did oil- related sanctions levied on Russia contribute to increasing energy prices in European Union?", and since whole European Union would provide rather broad outcome, the analysis will cover all of the 27 members separately and highlight the outliers. Timing is also an important factor that in this case will be a year prior the beginning of the war and almost a year thereafter. In order to measure the "influence" or "size" of sanctions, I will focus on imports of oil from Russia as a fraction of total oil imports, from both periods as an indicator of Dependency Rate. "Energy prices" are reflected by Energy Consumer Price Index (ECPI). The study will be conducted in fixed effects setting that will allow to control for each time- invariant country characteristics. The results points towards unanimous negative relationship between the period during and after the announcement of sanctions and the Dependency Rate, indicating that after sanctions have been announced, countries reduced their dependency on Russian oil. Moreover, I find positive relationship between the period during and after the announcement of sanctions and the ECPI, indicating that after the announcement of sanctions, energy prices increased. Lastly, I find negative relationship between the Dependency Rate and ECPI, indicating that countries that became less dependent experienced increase in their energy prices. These findings may help to dispel the doubts whether the war in Ukraine and associated sanctions levied on Russia contributed to extremely high energy prices that Europeans experienced in 2022. As most of the research done focus on the economic costs of sanctions for Russia, this paper will take a different perspective and analyze the economic costs for European Union, making the entire topic more complete and allowing the reader to have unbiased overview.

2. Literature Review

2.1 How do sanctions work from economic point of view ?

To begin with the analysis, we first have to answer the question of what actually sanctions are. According to Cambridge Dictionary definition, an economic sanction is action taken by a country or organization against the economy of another country, such as refusing to trade with it, in order to force it to obey a law or set of rules. In other words, it is a detriment imposed for doing what is forbidden (R. Cooter, 1984). B. E. Carter (2011) underlines more specifically, that "these sanctions might be employed to stop a targeted country's military adventure, destabilize government, or influence or express disapproval about foreign policy considerations involving human rights, terrorism, weapon proliferation or drug" trafficking. Felbermayr, Kirilakha, Syropoulos, Yalcin and and Yotov (2020) distinguish five major categories of sanctions:

1) Trade sanctions,
2) Financial sanctions,
3) Travel restrictions,
4) Arms sanctions,
5) Military assistance.

Although my research focuses only on the first point, we can already observe, that other forms have also been applied to Russia. However, the question is if these sanctions are useful and if they bring the expected results. C. Morgan, Syropoulos and Yotov (2023) found, that impact of sanctions on firms or individuals has been negative and significant. Moreover, sanctions have negative and significant effect on the overall performance of sanctioned state. Therefore, in theory- sanctions seem to be effective. In practice however, this becomes vague.

First, let's have a look at free trade scenario. According to Hecksher-Ohlin model, a country will export the good that uses its abundant factor intensively. In case of Russia, oil is an abundant factor that is used intensively. This being said, Stolper-Samuelson theorem states that this practice has distributional consequences. Namely, the returns to the owners of the abundant factor increase, while the returns to the owners of a scarce factor decrease. In case of Russia, the owners of the abundant factors were the owners of the oil- industry companies such as Gazprom. In other words, in a free trade scenario, these owners gain as they export intensively produced oil. Now let's have a look at the scenario involving sanctions that have

been applied. The embargo will certainly decrease the returns to the owners of abundant factors, since some portion of the target market disappears. Therefore, these owners lose and this was the main idea of punishing Russia. Nevertheless, sanctions applied in practice usually differ. We cannot underestimate the possible mitigation of the sanctions harmfulness which is "trade deflection". What this term means is that since a country cannot access one market, it focuses on a different market. Therefore, since Russia cannot export to European Union anymore, it shifted its exports towards China and India (Baniya, 2023). This phenomenon was also described by C. Morgan, Syropoulos and Yotov (2023). Authors underline, that in order to mitigate adverse effects, sanctioned countries usually redirect international trade and investments flows towards third countries, which creates so- called "shield". Last but not least, European Union will also bear the consequences of the sanctions, since it loses its main supplier of the oil. This gives an opportunity to domestic suppliers, because now they can exercise market power and drive up the prices. S. Perdana, M. Vielle and M. Schenckery (2022), point out that "current EU embargo on Russian oil will have adverse supply effects, substantially increasing energy prices and welfare costs for the EU resident". That being said, can we say that the sanctions were successful? Partially- yes, but there are always two sides of the coin. To understand, how these sanctions affect prices in case of Russia- Ukraine war, we can refer to the example of the self- imposed US embargo that was applied in December 1807. D.A. Irwin (2005) shows that this embargo had dramatic impact on prices in The United States, driving down the domestic prices of exported goods and driving up the domestic prices of imported goods. Over two hundred years later, we can observe very similar situation. Cutting off from Russian imports (which can be also described as EU self- embargo) seem to drastically increase prices of imported goods in European Union -in this case oil. However, this theory implies, that oil prices in Russia should fall, but this never happened. The reason for this is that since both EU and Russian economies are "large", sanctions affect global prices of oil (See Appendix 1B for global price per barrel). M. Khudaykulova, H. Yuanqiong and A. Khudaykulov (2022) indeed suggest, that international restrictions led to global oil price increase and fall of production. In other words, sanctions seem to increase global energy prices which includes both EU and Russia.

2.2 How effective were sanctions in the past conflicts ?

One of the most famous examples of sanctioning in the past is the arms embargo levied on South Africa by The United Nations in 1977 as a response to the policy of apartheid. Namely, the UN banned the export of all arms and related material of all types to South Africa, including, among others, the sale or transfer of weapons, ammunition, military vehicles, and equipment. Therefore, South Africa was forced to produce its own weapons, reducing their dependence on outside suppliers. Ironically, the country soon became one of the world's top exporters of arms and gained worldwide reputation. To make matters worse, black South Africans were still excluded from the benefits of the economy and still did not have political rights (Wessels and Marx, 2008).

Another famous example was the embargo levied on Cuba by The United States in 1962, mainly motivated by threatening behavior of Fidel Castro and his communist government. In this case, the embargo turned out to have a great impact, but on both economies. Cuban citizens as well as government were hit directly, as the United States was its main trading partner and investor. Tourism has been reduced drastically and the main export good of Cuba- sugar, was no longer imported by the US. However, similarly to current war in Ukraine, we also observed here a trade deflection. Havana became dependent on Moscow instead, and started exchanging sugar for crude oil which was significantly offsetting the economic costs of sanctions for Cuban government. On the other hand, the United States was not necessarily better off as companies that were closely involved in trade with Cuba, lost their source of income (Haass, 1998).

Lastly, the effectiveness of sanctions can be shown on the example of the embargo that was applied to Iran by the United States which was the consequence of holding 52 Americans hostage after Iranian Revolution in 1979. Trade and financial related sanctions significantly hit the Iranian economy while "not" so significantly the US economy. The reasoning behind it is relatively simple. Namely, the United States is a large country, not dependent on one supplier, and therefore, with more elastic trade curves. That being said, these sanctions are considered as successful (costs incurred to Iran were estimated to 1,1% of its GDP). However, similarly to Cuban sanctions- companies involved directly in the trade with Iran- suffered. Nevertheless, the effect was only drastically harmful in the short run as Iran was not prepared for the shock to its import- export market. After some time, the Iranian economy adapted to

new situation and started cooperating with other countries making the overall effect of the sanctions minimal (Torbat, 2005).

2.3 What are the early-literature findings and predictions after War in Ukraine ?

Although, the War in Ukraine is very up to date, and related events occur now, some of early research has been already done. First speculations and forecasts were presented by I. Liadze, C. Macchiarelli, P. Mortimer- Lee and P. Sanchez Juanino (2022). Authors put emphasis on high dependency of European Union on Russian energy. They point out, that EU energy dependence rate shows, that the EU relies upon imports to meet more than 60% of its energy needs. Based on a simulation, authors predict that when sanctions will enter into force, the oil price will significantly increase. This indeed happened, but- at least not yet- hasn't reached the 140 dollars per barrel as in 2008. Therefore, we observe income transfer from consumers to producers. However, this is not the end of the consequences of energy price hikes. The study prepared by B. P. P. Novianto (2022), also shows that oil and gas sector is hit the most and directly. Namely, because of sharp price increases per barrel, fuel costs in Europe quadrupled to around €2 per liter and the inflation skyrocketed.

That being the case, to what extent can these sanctions be costly? M. Chepeliev, T. W. Hertel and D. van der Mensbrugghe (2022) suggest, that short- run implications can be significant. Households' real income could drop by 0,7%- 1,7%, with energy prices growing by as much as 11%. However, they also point out that after initial period, the costs of the sanctions will become more modest (0,04% slowdown in the annual growth rate of real income over 2022-2030) and the sanctions themselves may even lead to co- benefits such as reductions of CO2 emissions and other air pollutants. Similar suggestion is made by M. Finley and J. Krane (2022), who advice, that despite in the long- run sanctions can make sense, policymakers should remain cautious as for now, oil is still the largest source of energy in the world and any disruptions can be very costly. For this reason, M. Grzegorczyk, N. Poitiers, P. Weil and G. B. Wolff (2022), suggest that the EU should design support policies for the most affected countries to make sanctions against Russia more credible. Later we will indeed see, that because of its high dependency, Bulgaria and Croatia will be exempted from the sanctions package introduced on June 3rd 2022 (Europa.eu, 2022). See Appendix 1C to see how dependency rate changed for those countries over time (U.S. Energy Information Administration, n.d.).

For better overview, Y. Chen, J. Jiang, L. Wang and R. Wang (2023) attempted to compare possible losses in EU and Russia. What they found out, is that after applying sanctions, both sides will be damaged, however Russia significantly more. The economic loss for EU reaches 1,488% while for Russia 4,8%. Additionally, Russian counter-sanctions will also have direct impact on EU. Authors agree with the abovementioned studies, that EU's energy ban on Russia will directly affect its energy security. In the short and medium run, it will be difficult for the EU to find an appropriate energy supply organization to replace Russia. Moreover, they say that the diversion effect of energy trade will lead to rapid increase in energy prices, affecting the welfare and social and political stability of EU countries. Similar comparison of potential loses between the two parties has been made by C. Rühl (2022), who has shown that sanctioning Russia would incur additional import cost for G7 (The Group of Seven- Canada, France, Germany, Italy, Japan, the United Kingdom and the United States) of 0,6% of GDP per annum, while Russia would lose the revenue of about 5% of GDP. Lastly, N. Hosoe (2022) mentions that if European countries would apply 100% tariff, the loss of GDP would be 0,2%, while in contrast for Japan, only 0,05%. This however, would be enough to trigger 3% reduction in energy consumption and 3–4% energy price increase in Japanese towns. Concluding, either way both parties lose in this trade war.

Another interesting work is presented by C. W. Su, M. Qin, H. Chang and A. Tăran (2023). Their paper however focuses on the gaseous form of oil- natural gas. They show, that after imposing sanctions on Russia by EU, Russia responded with discontinuing natural gas exports to Europe (as cited in Qureshi et al., 2022) and following that, European natural gas price (ENPG) increased to 42,39 dollars per million British thermal units in March 2022 with an increase of 55,67% from February. This being said, M. Mamonov, A. Pestova and S. Ongena (2022), notice that price for natural gas was partly charged to citizens around sthe world and increased from €20/MWh in 2021 to about €180/MWh in mid-July 2022.

Very compelling theoretical study has been prepared by D. Gros (2022). Author analyzed the potential difference in effects between complete embargo and optimal tariff. What turned out, is that the optimal tariff of around 30% would not only reduce Gazprom's (which has a monopoly on exports of gas from Russia) revenue to one half but also significantly improve European terms of trade. Nevertheless, Gros concludes that it would negatively impact energy prices, i.e., they would increase, but in defense of the model, he also says that any quantitative restriction levied on Russia would have led to the same result. Moreover, complete embargo would drive up prices even higher. The same point of view is presented by

Hausmann et al. (2022). In their research, authors find out that the most efficient way to punish Russia and reduce spillovers is to apply import tariff (instead of embargo), that can be used flexibly to control the degree of economic pressure on Russia.

3. Data

In order to conduct the research, i.e. to see whether oil- related sanctions contributed to increasing energy prices in EU, the following data has been collected for each of the 27 EU countries:

1. Energy Consumer Price Index (ECPI). The unit of measure is an index whereas 100 (index) = 2015 (year). The data has been collected for each month from January 2021 to December 2022 (which gives 24 periods in total). The data has been retrieved from Eurostat Database,
2. Dependency Rate on Russian oil (D_Rate), expressed as percentage, and has been calculated using following formula:

$$\frac{Oil\ Imports\ from\ Russia}{Total\ Oil\ Imports}$$

   For Oil Imports from Russia and Total Oil Imports, the unit of measure is thousand tonnes. The data has been collected for each month from January 2021 to December 2022 (which gives 24 periods in total). The data has been retrieved from Eurostat Database,
3. Gross Domestic Product (GDP). The unit of measure is million EUR. The data has been collected for each quarter from January 2021 to December 2022 (which gives 8 periods in total). The data has been retrieved from Eurostat Database. The variable has been expressed as natural logarithm.

   The descriptive statistics table is as follows:

Table 1: Descriptive statistics

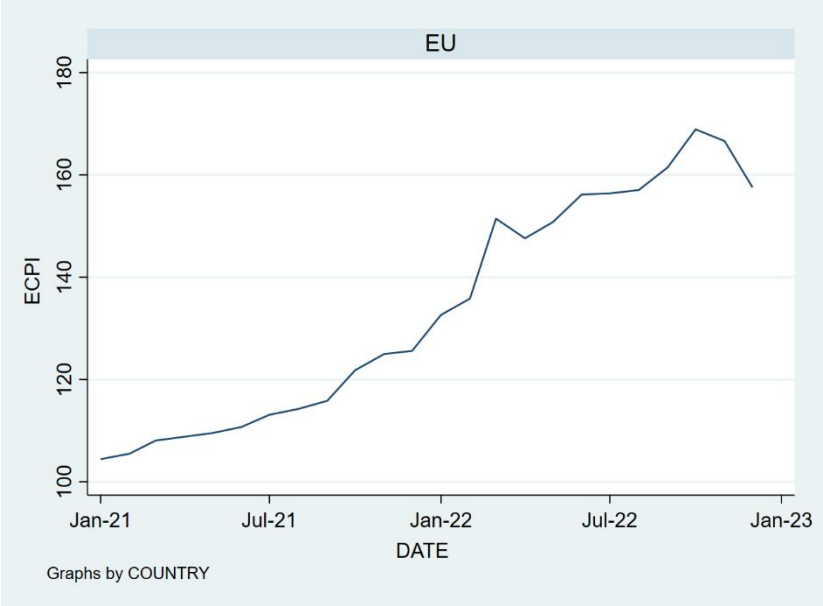
Variable	Obs	Mean	Std. Dev.	Min	Max
ECPI	648	131.413	28.943	93.98	265.43
D Rate	648	.206	.22	0	.896
lnGDP	648	10.918	1.419	8.165	13.822

Note: 648 observations as there are 27 countries recorded in 24 periods. As lnGDP has been collected quarterly, it is assumed, that the lnGDP is constant across each 3 months for each country. For example, if lnGDP is equal to X for first quarter of 2021, it is equal to X for January, February and March 2021.

For a clear overview, 2 figures were created for average trends for all 27 EU countries:

EU Average

Figure 1. Energy Consumer Price Index (ECPI) for 27 European Union countries- average.



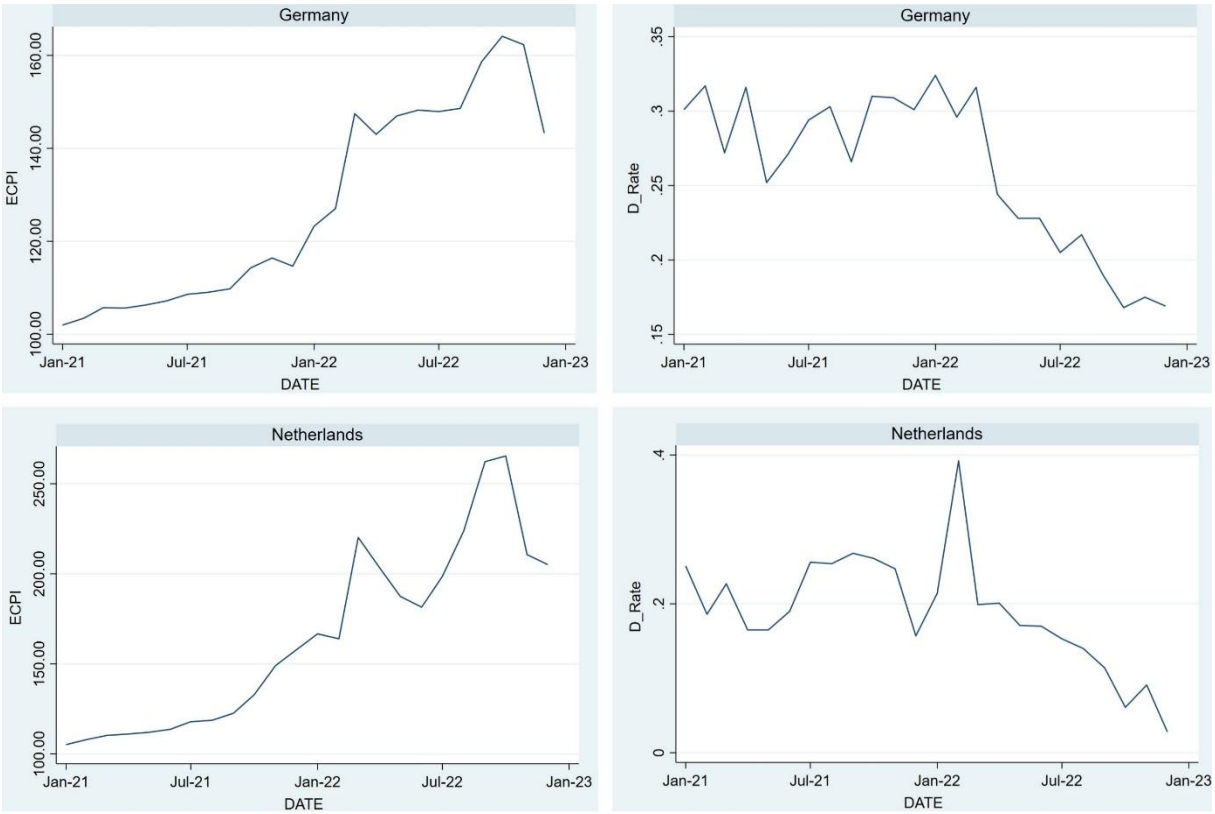
Note: X- axis represents the date, while y-axis represents the ECPI where 2015 = 100. We can observe increasing trend over past two years with visible surges around February (when the war started) and around August/September when some countries already started applying sanctions.

Figure 2. Dependency Rate (D_Rate) on Russian oil for 27 European Union countries- average.

Note: X- axis represents the date, while y-axis represents the dependency rate (D_Rate) as a fraction (percentage). We can observe fairly constant trend before February 2022 and a massive drop thereafter, followed by more drops around August/September 2022 and November/December 2022.

I also provide figures for 2 largest importers of Russian oil - Germany and the Netherlands, as they are likely to impact the average significantly.

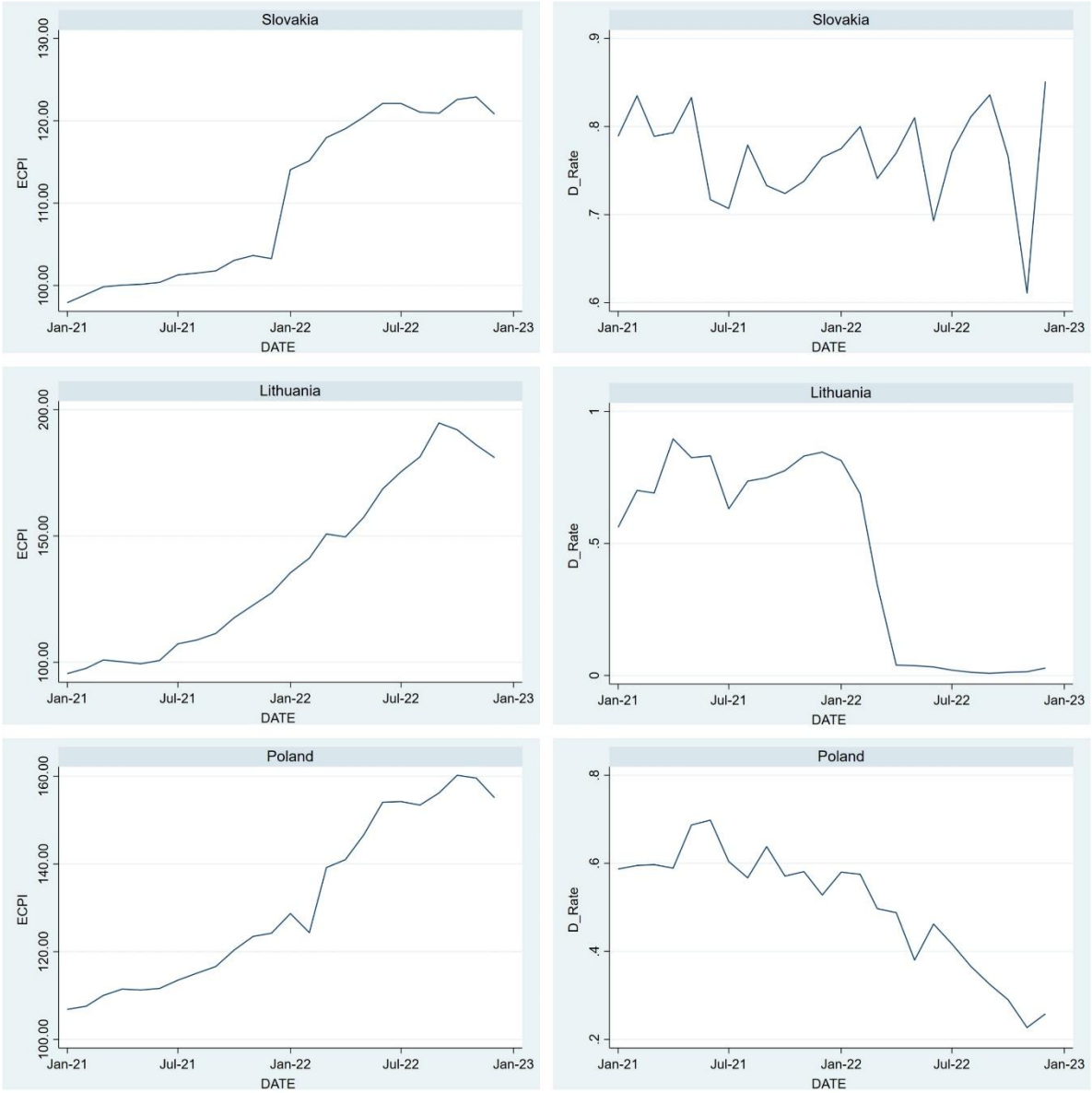
Figure 3. Energy consumer price index (ECPI) and Dependency Rate (D_Rate) for Germany and the Netherlands.



Note: The left column presents the ECPI for each country, the right column presents the Dependency Rate (D_Rate) for each country. X- axis represents the date for each graph, while y- axis represents either ECPI or Dependency Rate (D_Rate). As before, ECPI is shown as an index where 2015 = 100, and Dependency Rate (D_Rate) is shown as a fraction (percentage). Regarding ECPI, we can observe similar- increasing trends for both countries Again, there are visible surges around February 2022 and August/September 2022. The Netherlands seems to have more sensitive trend reactions. Regarding Dependency Rate (D_Rate), we can observe similar- decreasing trends, but only after February 2022. Before, the trends are rather constant with minor surges. The Netherlands seems to have more extreme trend reactions.

Moreover, I provide figures for 3 most dependent countries on Russian oil - Slovakia, Lithuania and Poland:

Figure 4: Energy consumer price index (ECPI) and Dependency Rate (D_Rate) for Slovakia, Lithuania and Poland



Note: The left column presents the ECPI for each country, the right column presents the Dependency Rate (D_Rate) for each country. X- axis represents the date for each graph, while y- axis represents either ECPI or Dependency Rate (D_Rate). As before, ECPI is shown as an index where 2015 = 100, and Dependency Rate (D_Rate) is shown as a fraction (percentage). Regarding ECPI, we can observe similar- increasing trend for each country, however the surges differ slightly in size and timing. Regarding Dependency Rate (D_Rate), we can observe decreasing trends for Lithuania and Poland after February 2022. The trend for Slovakia is rather chaotic. There is a massive decrease around August/September 2022, but unlike other countries, the Dependency Rate increases sharply around November 2022.

4. Methodology

In order to estimate the effect of oil- related sanctions levied on Russia on the energy prices in European Union, I will account for each country from the European Union individually by applying the fixed effect setting with standard errors. This setting allows to account for all time- invariant country characteristics and therefore- reduce the bias. I account for the periods before and after the application of sanctions to inspect whether the timing had its impact. Furthermore, I control for GDP of each country and the time trend. Each of the finding will be split into the estimation without fixed effects, with fixed effects, and with fixed effects controlling for time trend, standing for scenario 1, 2 and 3 respectively. In all of the equations, index g = 1, …, 27 standing for country and index t = 1, …, 24 standing for time. Term "c" stands for country fixed effect.

The regression equations are as follow:

1. In order to find the association between the announcement of sanctions and the Dependency Date (without and with fixed effects):

$$D\_Rate_{g,t} = \beta 0 + \beta 1 * after_{g,t} + \beta 2 * lnGDP_{g,t} + \varepsilon_{g,t}$$

$$D\_Rate_{g,t} = \beta 0 + \beta 1 * after_{g,t} + \beta 2 * lnGDP_{g,t} + \varepsilon_{g,t} + c_g$$

$$D\_Rate_{g,t} = \beta 0 + \beta 1 * after_{g,t} + \beta 2 * lnGDP_{g,t} + \beta 3 * trend_{g,t} + \varepsilon_{g,t} + c_g$$

2. In order to find the association between the announcement of sanctions and Energy Consumer Price Index (without and with fixed effects):

$$ECPI_{g,t} = \beta 0 + \beta 1 * after_{g,t} + \beta 2 * lnGDP_{g,t} + \varepsilon_{g,t}$$

$$ECPI_{g,t} = \beta 0 + \beta 1 * after_{g,t} + \beta 2 * lnGDP_{g,t} + \varepsilon_{g,t} + c_g$$

$$ECPI_{g,t} = \beta 0 + \beta 1 * after_{g,t} + \beta 2 * lnGDP_{g,t} + \beta 3 * trend_{g,t} + \varepsilon_{g,t} + c_g$$

3. In order to find the association between the Dependency Rate and Energy Consumer Price Index (without and with fixed effects):

$$ECPI_{g,t} = \beta 0 + \beta 1 * D\_Rate_{g,t} + \beta 2 * lnGDP_{g,t} + \varepsilon_{g,t}$$

$$ECPI_{g,t} = \beta 0 + \beta 1 * D\_Rate_{g,t} + \beta 2 * lnGDP_{g,t} + \varepsilon_{g,t} + c_g$$

$$ECPI_{g,t} = \beta 0 + \beta 1 * D\_Rate_{g,t} + \beta 2 * lnGDP_{g,t} + \beta 3 * trend_{g,t} + \varepsilon_{g,t} + c_g$$

Where:

1) ECPI is Energy Consumer Price Index,
2) D_Rate is the Dependency Rate on Russian oil,
3) After is the variable that takes value of 1 during and after the month of announcement of sanctions (June 2022) and takes value of 0 before the announcement,
4) GDP is the Gross Domestic Product,
5) Trend is the time trend.

Moreover, I will perform sensitivity analysis to see whether more dependent countries on Russian oil, will have larger changes in their ECPI regarding the announcement of sanctions. In order to do it, I will assume that "dependent" country has a dependency rate larger than 30% for a given period and "very dependent" country has a dependency rate larger than 50% for a given period. "Dependent" country also includes "very dependent" country.

Furthermore, I will analyze whether the timing of announcement of sanctions had its effects. I will assume that the sanctions are announced in December 2021 (shortly before the invasion) and in June 2021 (1 year prior to the actual announcement).

Last but not least, I will see if the interaction between Dependency Rate and the period during and after the announcement of sanctions impacted the size of a change in ECPI.

The analysis has some limitations. The fixed effects method that is applied, does not account for time- varying country characteristics. These are captured in the error term in the equations. Therefore, the omitted variable bias is present and the research does not have causal interpretation. Nevertheless, it still shows the association that provides insights to the research.

5. Results

The results present the association between the announcement of sanctions (after) and the Dependency Rate (D_Rate), controlling for Gross Domestic Product (lnGDP) and the time trend (trend). The regression results present as follows:

Table 2: Regression estimates of the introduction of sanctions (after) on the Dependency Rate (D_Rate).

VARIABLES	(1) D_Rate	(2) D_Rate	(3) D_Rate
after	-0.0764***	-0.0579***	-0.0408***
	(0.0101)	(0.0125)	(0.0153)
lnGDP	-0.0287	-0.162***	-0.0616
	(0.0244)	(0.0586)	(0.0783)
trend			-0.00258*
			(0.00134)
Constant	0.542**	1.987***	0.923
	(0.268)	(0.637)	(0.844)
Observations	648	648	648
R-squared		0.115	0.120
Number of countryid	27	27	27

*Note: Left column presents the results without fixed effects, middle column presents the results with fixed effects, right column presents the results with fixed effects but also controlling for the time trend. Constant term stands for the estimation if treatment variable is equal to 0. R-squared indicates what portion of the variation of a dependent variable is explained by independent variable. Number of countryid stands for number of countries that were analyzed. Standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1*

In order to analyze the results, we have to consider 3 scenarios- first, when the regression does not have fixed effects setting, second, when the regression has fixed effects setting and third, when the regression has fixed effects setting but also controls for time trend. I assume, that fixed effects setting controlling for time trend creates the most accurate estimation.

First scenario: We can see negative relationship between the period during and after the announcement of sanctions and the Dependency Rate (D_Rate). Namely if the Dependency Rate is measured during and after the announcement of sanctions, it decreases by 7.64% on average compared to the period before the announcement. Besides, we can see negative relationship between the lnGDP and Dependency Rate- when lnGDP increases by 1 million EUR, the Dependency Rate decreases by 2.87% on average. Coefficient “after” is statistically

significant at 0.01 significance level, “lnGDP” however, is not statistically significant at any significance level.

Seconds scenario: In this scenario we can observe changes in the coefficients as some portion of the effects is captured by time- invariant country characteristics. We can also notice negative relationship between the period during and after the announcement of sanctions and the Dependency Rate. In this case, if the Dependency Rate is measured during and after the announcement of sanctions, it decreases by 5.79% on average compared to the period before the announcement of sanctions. Besides, we can notice negative relationship between lnGDP and Dependency Rate- when lnGDP increases by 1 million EUR, the Dependency Rate decreases by 16.2% on average. Both coefficients are statistically significant at 0.01 significance level.

Third scenario: The negative relationship between the period during and after the announcement of sanctions and Dependency Rate is still visible, however smaller. If Dependency Rate is measured during and after the announcement of sanctions, it decreases by 4.08% on average. The negative relationship between lnGDP and Dependency Rate also remains- when lnGDP increases by 1 million EUR, the Dependency Rate decreases by 6.16% on average. Coefficient “after” is statistically significant at 0.01 significance level, “lnGDP” however, is not statistically significant at any level. Moreover, coefficient “trend” is statistically significant at 0.1 significance level.

As we now know, that the announcement of sanctions is associated with reduction of the dependency on Russian oil, we can now see, how this announcement of sanctions impacted the energy prices in EU. The results present the association between the announcement of sanctions (after) and the Energy Consumer Price Index (ECPI), controlling for Gross Domestic Product (lnGDP) and the time trend. The regression results present as follows:

Table 3: Regression estimates of the introduction of sanctions (after) on the energy prices (ECPI).

VARIABLES	(1) ECPI	(2) ECPI	(3) ECPI
after	37.59***	24.33***	5.494***
	(1.573)	(1.872)	(1.903)
lnGDP	8.013***	103.6***	-6.622
	(2.077)	(8.808)	(9.745)
trend			2.844***
			(0.167)
Constant	32.97	-1,006***	166.6
	(22.79)	(95.81)	(105.0)
Observations	648	648	648
R-squared		0.588	0.719
Number of countryid	27	27	27

*Note: Left column presents the results without fixed effects, middle column presents the results with fixed effects, right column presents the results with fixed effect, but also controlling for the time trend. Constant term stands for the estimation if treatment variable is equal to 0. R-squared indicates what portion of the variation of a dependent variable is explained by independent variable. Number of countryid stands for number of countries that were analyzed. Standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1*

First scenario: We can observe positive relationship between the period during and after the announcement of sanctions and the ECPI. Namely, if the ECPI is measured during and after the announcement of sanctions (June 2022), it increases by 37.59 units on average compared to the period before the announcement. We can also observe the positive relationship between the lnGDP and ECPI- when lnGDP increases by 1 million EUR, ECPI increases by 8.013 units on average. Both coefficients are statistically significant at 0.01 significance level.

Second scenario: As in the first scenario, we can observe positive relationship between the period during and after the announcement of sanctions and the ECPI. Here however, if the ECPI is measured during and after the announcement of sanctions (June 2022), it increases by 24.33 units on average compared to the period before the announcement. As previously, we can observe the positive relationship between lnGDP and ECPI- when lnGDP increases by 1 million EUR, ECPI increases by 103.6 units on average. Both coefficients are statistically significant at 0.01 significance level.

Third scenario: We can still observe positive relationship between the period during and after the announcement of sanctions and the ECPI, however significantly smaller. If the ECPI is measured during and after the announcement of sanctions, it increases by 5.494 units on average. It seems like controlling for time trend captures significant portion of the bias. When it comes to lnGDP, we can observe negative relationship with ECPI- if lnGDP increases by 1 million EUR, ECPI decreases by 6.622 units on average. Coefficient "after" is statistically significant at 0.01 significance level, lnGDP however, is not statistically significant at any significance level. Coefficient "trend" is statistically significant at 0.01 significance level.

Finally, as we know that the announcement of sanctions is negatively associated with the dependency on Russian oil and positively associated with energy prices in EU, we can see what is the association between the dependency rate and energy prices themselves. The results present the association between the the Dependency Rate (D_Rate) and the Energy Consumer Price Index (ECPI). The regression results present as follows:

Table 4: Regression estimates of the dependency rate (D_Rate) on the energy prices (ECPI).

	(1)	(2)	(3)
VARIABLES	ECPI	ECPI	ECPI
D_Rate	-69.95***	-45.39***	-27.16***
	(7.417)	(6.446)	(4.890)
lnGDP	13.88***	162.9***	-8.097
	(2.496)	(7.566)	(9.579)
trend			2.998***
			(0.136)
Constant	-5.638	-1,638***	187.9*
	(27.65)	(83.01)	(103.3)
Observations	648	648	648
R-squared		0.514	0.729
Number of countryid	27	27	27

*Note: Left column presents the results without fixed effects, middle column presents the results with fixed effects, right column presents the results with fixed effects, but also controlling for the time trend. Constant term stands for the estimation if treatment variable is equal to 0. R-squared indicates what portion of the variation of a dependent variable is explained by independent variable. Number of countryid stands for number of countries that were analyzed. Standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1*

First scenario: We can observe negative relationship between Dependency Rate (D_Rate) and the ECPI. If the Dependency Rate increases by 1 unit, ECPI decreases by 69.95 units on average. However, since Dependency Rate is measured as a fraction, the correct interpretation

has to be presented in terms of percentage. Therefore, if the Dependency Rate increases by 1%, the ECPI decreases by 0.6995 units on average. In this case we can see a positive relationship between lnGDP and ECPI- when lnGDP increases by 1 million EUR, ECPI increases by 13.88 units on average. Both coefficients are statistically significant at 0.01 significance level.

Second scenario: We can also observe negative relationship between the Dependency Rate and ECPI. If the Dependency Rate increases by 1 unit, ECPI decreases by 45.39 units on average. As previously, I will interpret this in terms of percentage. Therefore, if Dependency Rate increases by 1%, ECPI decreases by 0.4539 units on average. In this scenario, we can also see positive relationship between lnGDP and ECPI- when lnGDP increases by 1 million EUR, ECPI increases by 162.9 units on average. Both coefficients are statistically significant at 0.01 significance level.

Third scenario: We still observe negative relationship between the Dependency Rate and ECPI, again, significantly smaller. If Dependency Rate increases by 1 unit, the ECPI decreases by 27.16 units on average. As previously, I will interpret this in terms of percentage. Therefore if Dependency Rate increases by 1%, ECPI decreases by 0.2716 units on average. Unlike other scenarios, we can observe negative relationship between lnGDP and ECPI- when lnGDP increases by 1 million EUR, ECPI decreases by 8.097 units on average. Coefficient "D_Rate" is statistically significant at 0.01 significance level, lnGDP however, is not statistically significant at any significance level. Coefficient "trend" is statistically significant at 0.01 significance level.

6. Sensitivity analysis

6.1 Different dependence on Russian oil

This sensitivity analysis checks, whether more dependent countries have been impacted differently than less dependent countries. The dependency has been split into 3 categories: dependency rate does not matter, dependency rate is greater than 30% (dependent country) and dependency rate is greater than 50% (very dependent country).

Table 5: Regression estimates of the introduction of sanctions (after) on the energy prices (ECPI) for different dependency rates.

VARIABLES	(1) ECPI	(2) ECPI	(3) ECPI
after	5.494***	3.041	-3.883
	(1.903)	(3.773)	(2.903)
lnGDP	-6.622	-0.352	-6.439
	(9.745)	(17.39)	(15.14)
trend	2.844***	2.427***	2.036***
	(0.167)	(0.314)	(0.250)
Constant	166.6	100.3	163.3
	(105.0)	(184.8)	(157.4)
Observations	648	156	80
R-squared	0.719	0.635	0.703
Number of countryid	27	14	7

*Note: Sensitivity analysis has been performed in the fixed effects setting, controlling for the time trend. Left column presents the result for every country, middle column presents the results for dependent and very dependent countries, right column presents the results only for very dependent countries. Constant term stands for the estimation if treatment variable is equal to 0. R-squared indicates what portion of the variation of a dependent variable is explained by independent variable. Number of countryid stands for number of countries that were analyzed. Standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1*

The findings of the sensitivity analysis turned out to be very interesting. Namely, if a country becomes more dependent, the increase in ECPI is smaller when measured during and after the announcement of sanctions. If we account for all countries, the announcement of sanctions increases the ECPI by 5.494 units on average (as found before). If we account for dependent and very dependent countries (Dependency Rate is greater than 30%), the increase is 3.041 units on average. If we account only for very dependent countries (Dependency Rate is greater than 50%), we even see a decrease at 3.883 units on average. We can also observe interesting change in the effect of lnGDP on the ECPI on different dependency levels. When lnGDP increases by 1 million EUR, the ECPI decreases by 6.662 units on average for all of the countries, and by 6.439 units on average for very dependent countries. The coefficient "after" is only statistically significant when we account for all the countries- namely at 0.01 significance level. "lnGDP" is not statistically significant at any significance level. "trend" is statistically significant at 0.01 significance level.

These results may seem counterintuitive, since we should expect more dependent countries to have larger increase in ECPI - not smaller. However, this is not the case. To understand this properly, we have to first look at the relationship between the Dependency Rate and ECPI (See Table 4). Here, we can clearly observe negative relationship that indicates, that if a country becomes less dependent, its ECPI should increase. In other words, countries that were reducing their dependency on Russian oil, should expect its energy prices to increase. This can be also seen on the figures provided in Data section. Now we can interpret the sensitivity analysis from this perspective. Namely, if a country is very dependent, it means that it has not reduced its oil imports from Russia, allowing for milder effect on ECPI during and after the announcement of sanctions. Therefore, countries that have reduced oil imports from Russia significantly (reduced their dependency, in other words), experienced larger increase in ECPI compared to countries that have not. Surprisingly, countries that remained very dependent (Dependency Rate above 50%) experienced a decrease in the energy prices after introduction of sanctions.

Concluding this sensitivity test, we can observe that countries that remained very dependent on Russian oil during and after the announcement of sanctions, experienced decrease in their energy prices. On the other hand, countries that decided to reduce their dependency during and after the announcement of sanctions, experienced increase in their energy prices.

6.2 Different timing of the announcement of sanctions

This sensitivity analysis checks whether the timing of the announcement of sanctions is associated with the change in the ECPI. The variable "after2" has been created which now assumes that the sanctions has been announced in December 2021 (shortly before the Russian invasion) and "after3" which assumes that the sanctions have been announced 1 year prior the actual announcement (June 2021).

Table 6: Regression estimates of the introduction of sanctions (after, after2, after3) on the energy prices (ECPI) for different introduction timing.

VARIABLES	(1) ECPI	(2) ECPI	(3) ECPI
after	5.494***		
	(1.903)		
lnGDP	-6.622	19.89*	0.000344
	(9.745)	(10.78)	(9.972)
trend	2.844***	2.035***	3.319***
	(0.167)	(0.245)	(0.151)
after2		12.59***	
		(2.363)	
after3			-5.685***
			(1.905)
Constant	166.6	-117.5	94.19
	(105.0)	(115.9)	(107.4)
Observations	648	648	648
R-squared	0.719	0.728	0.719
Number of countryid	27	27	27

*Note: Sensitivity analysis has been performed in the fixed effects setting, controlling for the time trend. The left column presents the results that stand for actual announcement of sanctions (June, 2022), middle column presents the results for artificial announcement of sanctions as if they were announced in December 2021, right column presents the results for the artificial announcement of sanctions as if they were announced in June 2021. Constant term stands for the estimation if treatment variable is equal to 0. R-squared indicates what portion of the variation of a dependent variable is explained by independent variable. Number of countryid stands for number of countries that were analyzed. Standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1*

As we could see before, if the ECPI is measured during and after the actual announcement of sanctions (June 2022), it increases by 5.494 units on average. However, if we assume that the sanctions were announced in December 2021, this increase is 12.59 units on average. The higher coefficient that stands for this artificial announcement compared to the actual one can be most likely explained by the anticipation of the upcoming war. The tensions were already very high. On the other hand, if we look at the artificial announcement in June 2021, we can observe a decrease of 5.685 units on average. This decrease in energy prices that most likely can be explained by lower tensions. At that time, many countries did not perceive possible war as actual threat and the dependency on Russian oil was way higher than in June 2022. All coefficients “after” and “trend” are statistically significant at 0.01 significance level. ”lnGDP” is only statistically significant in the scenario where sanctions are announced in December 2021- namely at 0.1 significance level.

Concluding this sensitivity test, if the sanctions were announced in December 2021, the ECPI would increase even higher compared to actual effect of the announcement of sanctions on the ECPI, due to tangible signals of the war and its possible effect on energy prices. However, if we go further back in time and the sanctions are announced in June 2021, we can observe a decrease in ECPI due to weakly visible signals, or even doubt that the war can actually take place.

6.3 Accounting for interaction between Dependency Rate and the period during or after the announcement of sanctions

What happens, if we include interaction between the Dependency Rate and the period during and after the announcement of sanctions?

Table 7: Regression estimates of the introduction of sanctions (after), and the Dependency Rate (D_Rate) on the energy prices (ECPI), accounting for the interactions between the Dependency Rate (D_Rate) and the introduction of sanctions (after).

VARIABLES	(1) ECPI	(2) ECPI	(3) ECPI
after	36.10***	24.03***	5.236**
	(2.083)	(2.195)	(2.133)
D_Rate	-31.84***	-30.06***	-24.85***
	(6.188)	(6.133)	(5.088)
DRate_After	-6.889	-9.804	-4.751
	(7.921)	(7.292)	(6.047)
lnGDP	7.776***	98.92***	-7.692
	(2.037)	(8.667)	(9.570)
trend			2.771***
			(0.165)
Constant	42.86*	-949.0***	184.6*
	(22.44)	(94.45)	(103.2)
Observations	648	648	648
R-squared		0.608	0.732
Number of countryid	27	27	27

*Note: Left column presents the results without fixed effects, middle column presents the results with fixed effects, right column presents the results with fixed effect, but also controlling for the time trend. Constant term stands for the estimation if treatment variable is equal to 0. R-squared indicates what portion of the variation of a dependent variable is explained by independent variable. Number of countryid stands for number of countries that were analyzed. Standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1*

When we compare the regression results with Table 3 and Table 4, it seems that including interaction between the Dependency Rate and the period during and after the announcement of sanctions, doesn't change the coefficients significantly . For example, let's have a look at the third column in previous models (Table 3 and Table 4). When we do not control for interaction term in Table 3, the increase in the ECPI is 5.494 units on average compared to 5.236 units on average, when we include the interaction term. When we do not control for

interaction term in Table 4, 1 unit increase in the Dependency Rate, decreases the ECPI by 27.16 units on average, compared to decrease of 24.85 units on average when we include the interaction term. As previously the Dependency Rate has to be shown in terms of percentage. Therefore 1% increase in the Dependency Rate decreases the ECPI by 0,2716 and 0.2485 units on average. The interaction coefficients suggest, that if the Dependency Rate increased by 1% during and after the announcement of sanctions, the ECPI slightly decreased. These coefficients however, are statistically insignificant and point towards minor influence of dependency on Russian oil during and after announcement of sanctions on energy prices.

7 Conclusion

Summarizing, I found evidence for negative relationship between the period during and after the announcement of sanctions and the Dependency Rate, positive relationship between the period during and after the announcement of sanctions and the ECPI and negative relationship between the Dependency Rate and ECPI. Therefore, countries indeed reduced their dependency on Russian oil after June 2022 and indeed observed increased energy prices. Countries that remained dependent, managed to keep the increase in ECPI milder, compared to the countries that decided for more radical steps and cut off the imports. Countries that remained very dependent even experienced decrease in their energy prices. Moreover, controlling for time trend seems to capture huge portion of the bias, indicating, that energy prices have been increasing anyways before the announcement of sanctions. These sanctions however, enlarged this increase slightly.

The results turned out to be in line with intuition and previous research made on this topic. Increasing energy prices in European Union seem to be at least partly reflected by sanctions levied on Russia. In other words, answering the research question- yes, oil- related sanctions levied on Russia indeed contributed to increasing energy prices in European Union. Namely, we observed, that after the announcement of sanctions, countries reduced their dependency on Russian oil by over 4% on average. When it comes to energy prices, if the Energy Consumer Price Index is measured during and after the announcement of sanctions (June, 2022), it increases by over 5 units. This becomes striking, when we realize how much of a difference these sanctions generate, since countries' ECPI for most of the months, hovers between 100 and 150 units. The negative relationship between the Dependency Rate and ECPI also confirms our speculations. We expected countries that became less dependent to experience higher energy prices and this association has also been shown.

Seeing the evidence, the question that may arise is if these oil- related sanctions were beneficial for European Union at all. After all, some of the countries reduced their dependency to complete 0. In order to answer this, we have to distinguish two main perspectives- economic and ethical. From economic point of view, this approach was definitely harmful for both European Union and its citizens. The energy prices skyrocketed, which was also reflected by record- breaking inflation. However, we have to keep in mind the specific nature of sanctions as instruments. They never meant to benefit own economy. The "game" of sanctions is rather "who loses more", instead of "who wins and who loses". This is

when ethical perspective gains on importance. Seeing all the brutality of Russian soldiers, increasing casualties and burning cities, European Union had to react, even at its own cost. This is what justifies the sanctions. The only way European Union could try to stop Russia from further invasion without physical involvement of armies, was to hit its economy as hard as possible. Many people, including economists, already anticipated the possible energy price hikes after application of sanctions. Yet, we still decided to do so and I believe, that our "sacrifice" was a fair price for at least an attempt to mitigate the horror that takes place in Ukraine these days.

8 Appendix

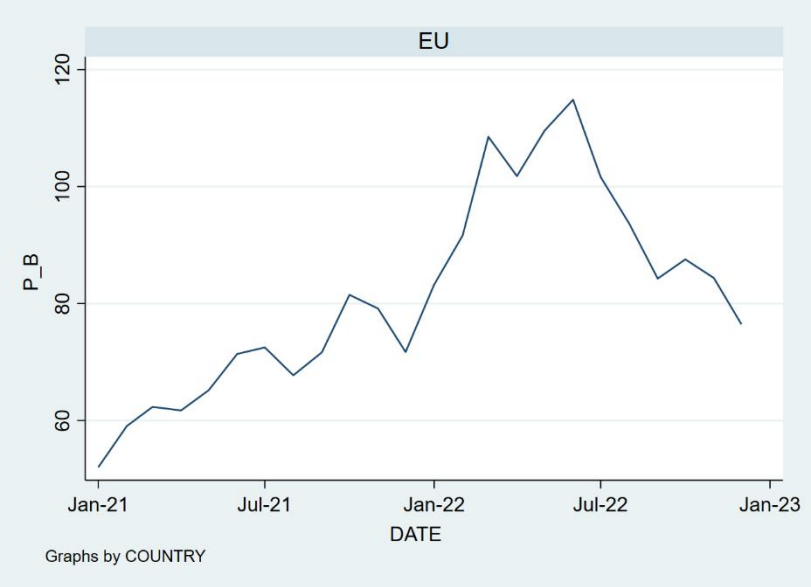
1A.

Figure 5. Oil imports from Russia to 27 European Union countries- average.

Note: X- axis represents the date, while y-axis represents the imports in thousand tonnes. We can observe a massive drop in oil imports after February 2022.

1B.

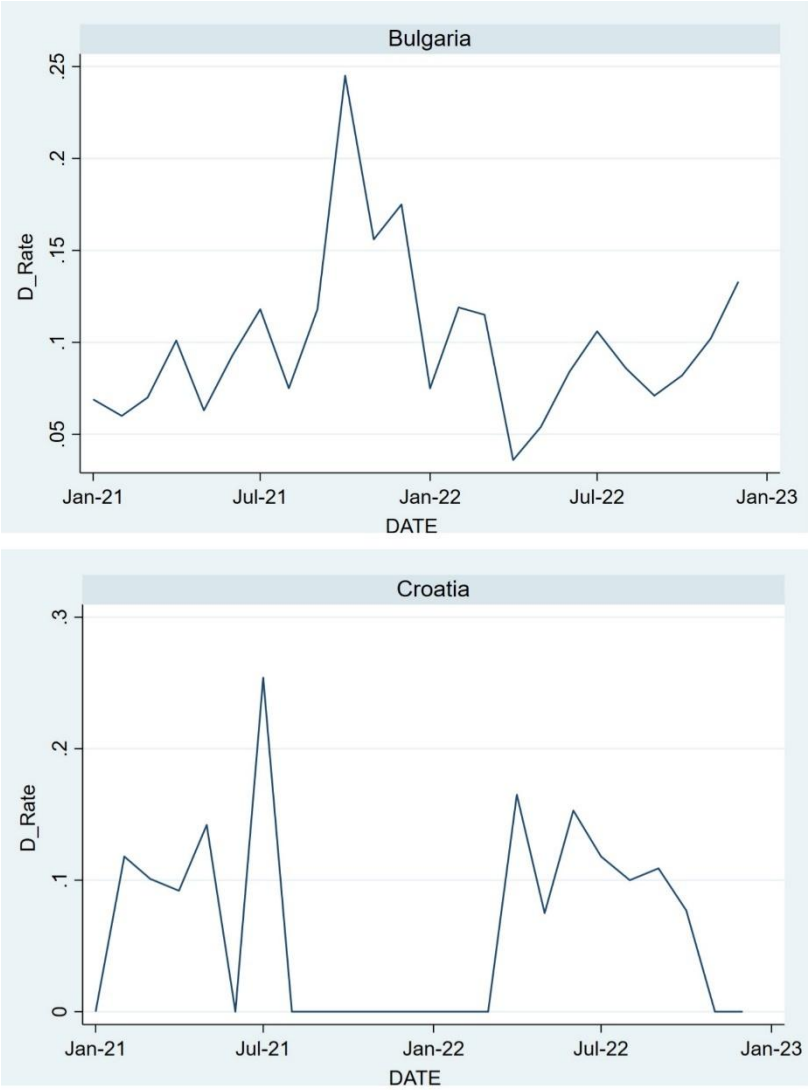
Figure 6. Global Price per Barrel.



Note: X- Axis represents the date, while y-axis represents the price per barrel in dollars. We can observe constant increase during the period from January 2022 to around July 2022, where the price has its peak.

1C.

Figure 7: Dependency Rate (D_Rate) for Bulgaria and Croatia



Note: X- axis represents the date, while y- axis represents the Dependency Rate (D_Rate) as a fraction (percentage). As we can observe, the trends for those countries do not imply any unanimous decrease after February 2022 as they were exempted from the sanctions. In fact, we can observe an increase in the Dependency Rate (D_Rate) for Croatia after February 2022. For Bulgaria, the trend is rather vague, but unlike most of the EU countries, there is a significant increase around March 2022.

9 References

Baniya, S. (2023). Russian oil exports are at a post-invasion high. But which countries are buying? *Euronews*. https://www.euronews.com/2023/05/31/russian-oil-exports-are-at-a-post-invasion-high-but-which-countries-are-buying-it

Business Insider (n.d.) *Crude Oil Price Today | WTI OIL PRICE CHART | OIL PRICE PER BARREL | Markets Insider*. https://markets.businessinsider.com/commodities/oil-price

Carter, B. E. (2011). Economic sanctions. *Max Planck Encyclopedia of Public International Law*, *3*.

Chen, Y., Jiang, J., Wang, L., & Wang, R. (2023). Impact assessment of energy sanctions in geo-conflict: Russian–Ukrainian war. *Energy Reports*, *9*, 3082-3095.

Chepeliev, M., Hertel, T. W., & van der Mensbrugghe, D. (2022). Cutting Russia's fossil fuel exports: Short-term pain for long-term gain. *Available at SSRN*.

Cnn. (2023, March 21). Russian invasion of Ukraine: A timeline of key events on the 1st anniversary of the war. *CNN*. https://edition.cnn.com/interactive/2023/02/europe/russia-ukraine-war-timeline/index.html

Cooter, R. (1984). Prices and sanctions. *Colum. L. Rev.*, *84*, 1523.

Europa.eu. (2023). EU response to Russia's invasion of Ukraine. https://www.consilium.europa.eu/en/policies/eu-response-ukraine-invasion/

Europa.eu (2022). Russia's war in Ukraine: EU adopts sixth package of sanctions against Russia. https://ec.europa.eu/commission/presscorner/detail/en/IP_22_2802

Eurostat (2023). GDP and main components (output, expenditure and income). https://ec.europa.eu/eurostat/databrowser/view/namq_10_gdp/default/table?lang=en

Eurostat (2023). Harmonized Index of Consumer Prices- monthly data. https://ec.europa.eu/eurostat/databrowser/view/EI_CPHI_M__custom_6062757/default/table?lang=en

Eurostat (2023). Imports of oil and petroleum products by partner country- monthly data. https://ec.europa.eu/eurostat/databrowser/view/NRG_TI_OILM__custom_6056126/default/table?lang=en

Felbermayr, G., Kirilakha, A., Syropoulos, C., Yalcin, E., & Yotov, Y. V. (2020). The global sanctions data base. *European Economic Review*, *129*, 103561.

Finley, M., & Krane, J. (2022). Reroute, reduce or replace? How the oil market might cope with a loss of Russian exports after the invasion of Ukraine. *Baker Institute for Public Policy, Rice University, Working Paper, online at: https://www. bakerinstitute. org/media/files/files/5090f474/wp-ukrainerussiaoil-030822. pdf (last accessed on April 30, 2022)*.

Gros, D. (2022). *Optimal tariff versus optimal sanction: The case of European gas imports from Russia*. European University Institute.

Grzegorczyk, M., Poitiers, N., Weil, P., & Wolff, G. B. (2022). The risks for Russia and Europe: how new sanctions could hit economic ties. *Bruegel-Blogs*, NA-NA.

Haass, R. (Ed.). (1998). *Economic sanctions and American diplomacy*. Council on Foreign Relations.

Hausmann, R., Ockenfels, A., Schetter, U., Tagliapietra, S., Wolff, G. B., & Zachmann, G. (2022). *Cutting Putin's energy rent:" smart sanctioning" Russian oil and gas* (No. 05/2022). Bruegel Working Paper.

Hosoe, N. (2023). The cost of war: Impact of sanctions on Russia following the invasion of Ukraine. *Journal of Policy Modeling*, *45*(2), 305-319.

Irwin, D. A. (2005). The welfare cost of autarky: evidence from the Jeffersonian trade embargo, 1807–09. *Review of International Economics*, *13*(4), 631-645.

Khudaykulova, M., Yuanqiong, H., & Khudaykulov, A. (2022). Economic consequences and implications of the Ukraine-russia war. *International Journal of Management Science and Business Administration*, *8*(4), 44-52.

Liadze, I., Macchiarelli, C., Mortimer-Lee, P., & Juanino, P. S. (2022). The economic costs of the Russia-Ukraine conflict.

Mamonov, M., Pestova, A., & Ongena, S. (2021). *" Crime and Punishment?": How Russian Banks Anticipated and Dealt with Global Financial Sanctions*. Centre for Economic Policy Research.

Morgan, T. C., Syropoulos, C., & Yotov, Y. V. (2023). Economic sanctions: Evolution, consequences, and challenges. *Journal of Economic Perspectives*, *37*(1), 3-29.

Novianto, B. P. P. (2022). European Union Sanctions Against Russia as Impact of Russia-Ukraine Conflict. *International Journal of Multicultural and Multireligious Understanding*, *9*(6), 501-510.

Perdana, S., Vielle, M., & Schenckery, M. (2022). European Economic impacts of cutting energy imports from Russia: A computable general equilibrium analysis. *Energy Strategy Reviews*, *44*, 101006.

Qureshi, A., Rizwan, M. S., Ahmad, G., & Ashraf, D. (2022). Russia–Ukraine war and systemic risk: who is taking the heat?. *Finance Research Letters*, *48*, 103036.

Rühl, C. (2022). Energy sanctions and the global economy: mandated vs unilateral sanctions. *International Economics and Economic Policy*, *19*(2), 383-399.

Seth, S. (2023). What Is the SWIFT Banking System? *Investopedia*. https://www.investopedia.com/articles/personal-finance/050515/how-swift-system-works.asp

Su, C. W., Qin, M., Chang, H. L., & Țăran, A. M. (2023). Which risks drive European natural gas bubbles? Novel evidence from geopolitics and climate. *Resources Policy*, *81*, 103381.

Torbat, A. E. (2005). Impacts of the US trade and financial sanctions on Iran. *World Economy*, *28*(3), 407-434.

U.S. Energy Information Administration (EIA). (n.d.). *Petroleum and other liquids* - https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RWTC&f=M

U.S. Energy Information Administration (EIA). (n.d.). *Use of oil*. https://www.eia.gov/energyexplained/oil-and-petroleum-products/use-of-oil.php

Wessels, A., & Marx, L. (2008). The 1977 United Nations mandatory arms embargo against South Africa: a historical perspective after 30 years. *Journal for Contemporary History*, *33*(1), 70-86.