Masters Thesis: Life changing or little bother? Analyzing the effects of trade sanctions on unemployment and inflation in targeted countries.

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Abstract:

This study investigates the extent to which successful trade sanctions impact unemployment and inflation in targeted countries. Through compiling data from over 205 countries and territories from 1996-2020 a panel fixed effects analysis was completed. The findings indicate that effective sanctions influence unemployment rates by affecting specific economic channels, notably through trade and the stock Foreign Direct Investment (FDI). When sanctions decreased trade the unemployment rate increased in the next period, while divestment from the economy was associated with decreases in unemployment. The other identified potential avenues of received aid and terms of trade were shown not to be impacted significantly by sanctions. Inflation was found not to be impacted by sanctions, even when these were successful in reducing trade and FDI. Limitations to the data do result in failures to external validity in the inflation model. Lastly, it was found that some differences in the severity of sanctions result in changes in the size of the impacts on unemployment.

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I.   Introduction

Think of something "more tremendous than war"[1] (Mulder, 2022), a weapon which "no modern nation could resist.". What is this weapon mentioned by US President Woodrow Wilson? The economic sanction. These were envisioned as a tool to end wars in the wake of the First World War, in a similar way to the atomic bomb after the Second World War. Economic sanctions could stop nations from stepping out of line with the rules-based order. Nowadays, sanctions are used more than ever (Syropoulos et al., 2023), however, referring to them like President Wilson seems unthinkable.

The true succesfulness of sanctions is heavily debated. Recent uses against Russia have been heavily discussed in media across the globe (NRC, 2024; The New York Times, 2024; Financial Times, 2024; CBS News, 2024). An important question about sanctions, which comes up whenever discussed, rose to the forefront of public debate: What are the real impacts these sanctions have on the targeted economy? These were not only raised by the public. Policymakers have and continue to discuss these whenever designing new sanctions. The design of sanctions needs to have real consequences to change a country's behavior. However, unintended consequences may prove detrimental to individuals living in the targeted nation. This is why the need arises to study the broad impacts that sanctions have.

This paper contributes to the discussion among scholars by empirically investigating the impact of trade sanctions on the real economy of nations that are targeted. Rather than looking at economic sanctions as a whole, it will focus on trade sanctions on imports and/or exports. This paper aims to investigate this relationship and find out the following: *To what extent do successful trade sanctions impact unemployment and inflation in the targeted countries?*

The impacts of sanctions on the real economy will be looked at through the average effect sanctions have on the unemployment rate and inflation. These measures were chosen due to their impact on individuals, firms and the government. The importance of these measures is emphasized by them being the measures of the dual mandate which steers the US Federal Reserve.

Delving into existing research related to the question reveals a gap in the knowledge. Existing literature only looks at single-country case studies to answer the question. It does not

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[1] Quote of President Woodrow Wilson

show an average effect of sanctions across countries. Research that looks at average effects covers outcomes like real GDP and poverty level.

The existing literature (Neuenkirch & Neumeier, 2015) finds that sanctions do not directly impact real economic variables. Sanctions are transmitted through different avenues through which they impact the real economy. These mechanisms are referred to as transmission channels. Channels identified by research are the gross trade, inward FDI, received aid and terms of trade of a country. Trade sanctions impact these avenues by *1) halting trade in (certain) goods and services* (Felbermayr et al., 2020), *2) dissuading or preventing firms from doing business in certain countries* (Neuenkirch & Neumeier, 2015), *3) suspending the flow of aid* (Portela & Mora-Sanguinetti, 2022) and *4) altering the composition of imports and exports that flow between nations* (Kelishomi & Nisticò, 2022). Changes in these then can impact the real economy. This occurs by *1) impacting the imported inputs firms use* (Kelishomi & Nisticò, 2022), *2) reducing exports of firms* (Hufbauer et al., 1997), *3) changing the relative prices of imports and exports* (Neuenkirch & Neumeier, 2015), *4) reducing investment into the economy* (Dastgerdi et al., 2018) and *5) halting flows of essential goods to vulnerable communities* (Portela & Mora-Sanguinetti, 2022). An instance of this is that through their reduction to trade and aid between countries, sanctions worsen the poverty gap of the targeted economy (Neuenkirch & Neumeier, 2016).

To answer the research question data was compiled from nine different datasets. The compiled dataset covers over 100 countries over a time span from 1996-2020. This allowed for a panel fixed effects analysis to be completed, with regressions adjusting for year and country-fixed effects.

The results of this analysis show that when sanctions are effective in reducing the gross trade or causing divestment of FDI from the target country, the unemployment rate of the country is affected in the following year. Reducing trade is associated with an increase in unemployment while divestment is associated with a decrease in the unemployment rate. Heterogeneity among sanctions can change the magnitude of these effects due to differences in the severity of the sanctions applied. The avenues of aid received and terms of trade do not have significant impacts on the unemployment rate of the target country under sanctions.

This research finds that the impact of sanctions on the inflation rate is insignificant. The effects of sanctions through the avenues identified are not associated with increases in the

consumer price index. Data limitations due to a lack of transparency from some countries do put an asterisk on the external validity of these findings.

The findings of this paper thus provide useful insights to policymakers and lay the groundwork for future endeavors to dive more deeply into this topic.

The paper is divided as follows. Section II delves into the existing literature on sanctions, their impacts and transmission to the real economy, using these to create hypotheses to look at. Section III explores the data sources and variables used in the research. Section IV dives into the methodology used for this analysis. Section V shares the findings of the analysis and delves into the robustness of the findings. Section VI discusses and summarizes these findings, alongside the limitations that need to be taken into account.

II. Literature Review

Section II evaluates existing literature on concepts related to the research question. First, it delves into the limited existing literature on sanctions' impacts on inflation and unemployment. Next, it expands on this by reviewing the literature on sanctions and their impacts on different aspects of the real economy. It does this with a focus on identifying how sanctions impact the real economy. After identifying the potential channels through which the effects of sanctions are transmitted literature on the relationships these relationships is discussed.

2.1 Sanctions and their influence on inflation and unemployment

An important aspect of the research question is *do sanctions impact inflation and unemployment?* Academic literature on this topic is rather limited. Existing literature has not delved into identifying the average effects of sanctions on these outcomes on a global level. What does exist are country-level case studies. Whether these results have strong external validity is doubtful, often only covering the most severe instances of sanctions. Nevertheless, their findings are still key to understanding the relationship.

Dastgerdi et al. (2018) show that in Iran, the application of heavy sanctions resulted in inflation. These were caused by the impacts they had on trade and investment inflows. Less severe sanctions were not associated with inflation in the Iranian economy, showing that different sanctions have heterogeneous impacts. From their findings, we can conclude that if heavy, sanctions can result in inflation, but whether these results are replicated in other settings is unclear from their findings.

Kelishomi and Nisticò (2022) showed that sanctions in Iran do not just result in inflation, they also lead to unemployment. This employment reduction is greatest in sectors relying on imports for their production processes as the restriction of imports led to a negative shock to productivity. As the sector's productivity fell, layoffs were conducted decreasing employment. The fall in employment was greatest in labor-intensive sectors. It should be noted that sectors with little exposure to international trade were left untouched by this negative effect. To summarise, sanctions in Iran resulted in decreased employment in targeted industries that relied on international trade.

Kim et al. (2023) provide evidence that trade sanctions applied on North Korea, between 2000 and 2015, resulted in a significant increase in market prices. This price inflation was largely due to trade sanctions targeting North Korea's imports. Due to sanctions-induced limitations to importing, manufacturing output fell. For similar reasons as mentioned by Kelishomi and Nisticò (2022), this resulted in increased goods prices. This was especially the case for sectors that were more reliant on imports. Thus, evidence from North Korea suggests that sanctions can have a significant influence on prices, causing inflation.

To conclude, there are cases in which sanctions impact unemployment and inflation significantly. Both see increases, especially in sectors that rely on imports targeted by sanctions. However, the evidence comes from countries targeted by the severest sanctions regimes. It needs to be tested whether the average effect of a sanction has similar significant impacts on these outcomes.

2.2 Sanctions and their influence on the real economy

Sanctions and their impacts on the real economy, referring to aspects tangible to the lives of individuals, are covered in literature across academic disciplines. Most literature on this topic is qualitative or based on single-country case studies (Neuenkirch & Neumeier, 2015). There are fairly few investigations of the average effect of sanctions on aspects of the real economy. The question is not just if, but also *how do sanctions impact the real economy?* An analysis of the existing literature provides evidence of the how, through identifying transmission channels through which sanctions impact the daily lives of individuals.

Hufbauer et al. (1997) were one of the earliest to delve into the economic impacts of sanctions using a larger-scale empirical analysis. Economic sanctions had a significant negative effect on gross bilateral trade (exports + imports). These effects were heterogeneous depending

on the severity of the economic sanctions. Hufbauer et al. (1997) extended their analysis to look at the impact of this reduction of bilateral trade on US exports, employment and wages. This was not an empirical analysis, but theoretical. They suggested that reduced exports due to sanctions would lead to lower average wages in the US. This followed the idea that a decrease in exports during times of full employment results in a switch in production from export focus to domestic focus. These sectors offer lower wages (Richardson and Rindal, 1996). Although their theoretical framework only covered the impact on the sender nation, the same line of reasoning should impact targeted nations.

Neuenkirch & Neumeier (2015) were able to conduct an empirical analysis of the impact of economic sanctions on the real economy. They specifically looked at the impacts of UN sanctions and US sanctions on the real GDP per capita and the growth rate of targeted nations. Using a model with country and time-fixed effects, they looked at the impacts of sanctions enacted between 1976–2012. Neuenkirch and Neumeier found that when economic sanctions were implemented by the UN, target countries would see a significant decrease in the annual growth rate of real GDP per capita by 2 percentage points, alongside an average drop of 25.5% in GDP per capita. US sanctions also had a significant impact, though the magnitude of this effect was half the size. This was the first analysis that showed that sanctions significantly impact the real economy of a sanctioned state through the use of a quantitative econometric assessment.

Neuenkirch and Neumeier (2015) provided some insights into how these sanctions are transmitted to the real economy. Just like Hufbauer et al. (1997) they find changes in trade to be an important transmission channel. Reductions in trade result in switches to domestic markets or force countries to internationally trade with weakened bargaining power (Neuenkirch & Neumeier, 2015). Reduced bargaining power results in worsening the terms of trade, which they suggest could be a separate transmission channel. A reduction in international capital flows is the second identified transmission channel which impacts real economic factors. Reductions in FDI and aid flowing into sanctioned countries occur due to explicit embargoes or through signalling a "loss of reputation" (Neuenkirch & Neumeier, 2015). These can cause a drop in capital flows into the country, which could alter the real economy (Gourinchas & Jeanne, 2006). Nevertheless, while identifying these channels, they do not find empirical evidence of this being the case. Further research does delve into this aspect.

In their following paper, Neuenkirch and Neumeier (2016) investigated the real economic impacts of sanctions by looking at US sanctions' impact on the target countries' poverty gap. Here they explored how sanctions are transmitted into the real economy. They use an entropy balancing method, to analyse the impacts US sanctions enacted from 1982-2011 had on the poverty gap. They found that on average the poverty gap of a country is 3.8 percentage points larger in countries when they are sanctioned. The effects on the poverty gap are long-lasting, increasing over the first 21 years that the sanctions are enacted, significantly longer than the impacts on annual real GDP per capita growth.

Neuenkirch and Neumeier (2016) also find that the sanctions are transmitted to the real economy through a "huge sanction-induced drop in openness [target nation exports and imports] and foreign aid" and that this "is at the root of increased impoverishment.". Sanctions are associated with reductions in trade and reduced foreign aid. However, in their sample sanctions are not associated with significant changes to FDI. This analysis provides some key insights, but due to its descriptive nature is indicative rather than truly conclusive on which channels transmit sanctions to the real economy.

To conclude, existing literature has found that economic sanctions can have a significant negative impact on real economic variables in the targeted countries. Sanctions are shown to impact the GDP per capita, the real growth rate and poverty when succefully applied. There are suggestions these impacts come from reductions in trade, FDI, aid and the worsening of terms of trade. However, the literature has provided limited empirical evidence. Further analysis of these relationships is needed.

2.3 Sanctions and their influence on potential transmission channels

Literature on the impact of sanctions on trade, FDI, aid and the terms of trade provides insight into whether these act as transmission channels. It is important to identify whether this effect exists, but also ask *how do design differences of sanctions change their impact?* Insights on the heterogeneous nature sanctions allow for a more complete answer to the research question. The first channel discussed is trade as the goal of trade sanctions in its simplest form is to limit trade between nations.

2.3.1 Sanction impacts on trade

Reductions in trade due to sanctions are covered extensively in the literature. Sanctions are often successful at significantly reducing trade with the targeted nation (Felbermayr et al.,

2020), but there is large heterogeneity in the magnitude of the decreases. This depends on the form sanctions take.

Felbermayr et al. (2020) emphasize there is great heterogeneity when measuring the impact of sanctions on reducing bilateral trade. Sanctions targeting exports (of the sender to the target) are more effective at reducing trade than import sanctions. When they are used in tandem they are the most effective at reducing trade. The size and significance of the trade reduction also depend on whether the sanctions are complete or partial. Logically, complete sanctions covering all trade resulted in a significantly greater reduction in bilateral trade. Further variety of the effects across different sanctions was shown in a working paper from Felbermayr et al. (2021). They showed the differing impacts of short and long-term sanctions. Sanctions that last longer than five years reduce trade significantly more than shorter ones, due to sanctions taking a long time to be fully enforced.

Next to the scope and timing of sanctions, international cooperation is an important aspect, as emphasized by Syropoulos et al. (2023). They discuss the differences between the impacts of unilateral sanctions, enacted solely by one sender nation, and multilateral sanctions, enacted by multiple sender nations in conjunction, on the same target nation(s). They show unilateral and multilateral sanctions have similarly sized effects on bilateral trade. An important note is that for the targeted country multilateral sanctions "cause significantly more harm to the target country … they are imposed by many countries simultaneously" (Syropoulos et al., 2023). The effect of multilateral and unilateral sanctions is the same, but the overall decrease is greater when a larger block of countries joins in.

To summarize, existing literature has shown that sanctions have significant impacts on (bilateral) trade with the target. This seems to support that sanctions-induced changes in trade could be a channel for further impacts on the economy. Heterogeneity among sanctions can change the effect sanctions have on trade flows.

2.3.2 Sanction impacts on aid.

To identify whether aid is a possible transmission channel through which sanctions impact the real economy, literature is identified that empirically tests their relationship.

Early and Jadoon (2016) analyzed the impacts of sanctions on aid provisions to target nations. When the US enacted sanctions or UN-supported sanctions of other nations, there was no significant decrease in the total aid a country received. This opposes the findings by

Neuenkirch and Neumeier (2015). US sanctions were associated with slight increases in the total aid flow to the country. The reason behind this is that nations jump in to gap to help the nation stay resilient in opposition to the US. Early and Jadoon (2016) fail to take into account the heterogeneity among sanctions, as the majority of trade sanctions do not result in the sanctioning of aid. This is reserved for the most severe cases.

Portela and Mora-Sanguinetti (2022) show that the use of aid suspension as part of sanctions does indeed have significant impacts on the targeted nation. There is a large heterogeneity of this impact depending on the regime. Sanctions that include aid suspensions result in significant reductions in aid received. They emphasize that these sanctions should not be disregarded as often occurs when analyzing the impacts of sanctions.

Research shows that sanctions can have significant impacts on the level of aid a country receives. On average, sanctions do not significantly impact aid flows, but in the most severe cases, the sanctioning of aid results in a decrease in the overall aid a country receives. This shows that although it may not be the case for the majority of sanctions, in the most severe cases their impacts on aid flows could be a channel through which sanctions impact the real economy.

2.3.3 Sanction impacts on FDI.

The descriptive analyses by Neuenkirch and Neumeier, fail to provide evidence of a relationship between sanctions and FDI. However, they provide solid reasoning as to why they expect there to be a relationship. This relationship is delved into by Mirkina (2018).

Mirkina (2018) shows that sanctions have a significant impact on the inward FDI invested in a country. Heterogeneity in sanctions design means the impact differs depending on who implements the sanctions, the severity of the sanctions and the decade in which the sanctions were implemented. Findings illustrate that when severe, sanctions result in a significant decrease in FDI in the targeted country. As a result of sanctions firms are forced or choose to divest from the target country. The size of the effect is most significant in the short run. In the long run, the impact of sanctions on FDI becomes insignificant, as the divestments are recovered by other nations' investors (Kaempfer & Lowenberg, 2007).

In the case of sanctions implemented by the US, the negative impact is not significant in the short run but becomes so in the long run. Again, there seems to be heterogeneity among the impact of sanctions.

To conclude, when severe enough, sanctions do result in reductions in the FDI stock of a country. FDI thus can be a transmission avenue through which sanctions impact the real economy could be hit by sanctions.

2.3.4 Sanction impacts on the terms of trade.

Literature on the impacts of sanctions on the terms of trade is incomplete. There are no empirical papers focussing on this relationship. There is limited theoretical analysis into explaining how sanctions impact the terms of trade.

Becko (2024) delved into the theoretical workings of sanctions as a tool to impact the terms of trade of the sender and the target economy. Becko's models of trade showed that trade restrictions and embargoes led to worsened terms of trade for the targeted country. This country would be forced to lower their export prices and trade against higher prices for imports. The size of this impact depends on the design of the sanctions, such as whether they are multilateral or not.

This shows that in theory the terms of trade should be worsened by sanctions. This means it is a possible avenue through which sanctions impact the real economy. Nevertheless, there exists no empirical evidence of this being the case. This will be tested in section IV, however, further research about the relationship should be conducted.

2.3 Formulation of the hypotheses.

The literature reviewed provides a picture of the existing knowledge about sanctions, their impacts on different aspects of the real economy, the transmission channels of sanctions and the heterogeneity of their design. Based on these findings, hypotheses can be made to answer the sub-questions raised.

Four possible transmission channels have been identified. Literature has identified these as the possible answer to *how sanctions impact the real economy*. Based on the literature the following hypothesis has been created:

H1: The application of sanctions results in a decrease in trade, inward FDI, aid and (worsen) the terms of trade of the targeted countries.

All four channels: trade (Felbermayr et al., 2020), inward FDI (Mirkina, 2018), aid (Portela & Mora-Sanguinetti, 2022) and the terms of trade (Becko, 2024) have evidence that

sanctions have a significant negative impact. Severe sanctions regimes have been shown to have the greatest effects across the board. This is likely to drive the average effect.

Then comes the hypothesis aiming to explain the core of the research question: *do sanctions impact inflation and unemployment?* Based on the first hypothesis, when sanctions result in decreases in the transmission channels it is predicted that:

H2: Trade sanctions result in an increase in inflation and unemployment for the target countries. It does this through its impacts on trade, inward FDI, aid and the terms of trade.

This is based on the findings that these channels impact the real economy (Neuenkirch & Neumeier, 2016) and that in case studies sanctions increase inflation (Dastgerdi et al.,2018) and unemployment (Kelishomi & Nisticò, 2022).

This raises the question of the impacts of heterogeneity. This research will delve into the heterogenous impact severe sanctions have. The severity of sanctions is defined through two aspects: how many years they have been enacted and the size of the regime/coalition enacting the sanctions. From this two hypotheses are built.

H3: The longer sanctions have been enacted on target countries, the larger the impacts that an identical change in the transmission channels has on inflation and unemployment.

When sanctions last longer the country becomes less able to cushion itself from the impacts of the same changes in trade (Febermeyer et al, 2021). It is expected that this holds for all transmission channels. This increased vulnerability leads to the responsiveness of inflation and unemployment to identical changes in the transmission channels as sanctions have been enacted longer.

Delving into the second aspect of sanctions severity, the size of the sanctions regime, it is hypothesized that:

H4: The size of the regime/coalition enacting sanctions on the target country has no impact on the magnitude of the responsiveness to changes in the transmission channels.

Sizes of the sanctions coalition should only impact the total reduction in the transmission channels, but not the responsiveness of inflation and unemployment to identical changes in the channels (Syropoulos et al., 2023). The same change in trade, FDI, aid and terms of trade for the target country should have the same effect on inflation and unemployment.

Section V critically looks at whether these hypotheses hold. In section III the data used in this analysis is elaborated on.

III. Data

This section introduces the dataset used in the empirical analysis. It does this by elaborating on the data sources used to create the dataset, defining the variables used and delving into the characteristics of these variables, alongside some limitations.

3.1 Global Sanctions Database

In order to examine the research question, the global sanctions database is used. This database contains comprehensive information on sanctions enacted between 1950-2022. This includes data about the sanctioner(s) and target(s), whether the sanction was unilateral or multilateral and what type of sanction this was enacted (trade, financial, travel, etc.).

From this database, a subsample was selected to investigate the recent impacts of sanctions. This ranges from 1996 to 2020. The sample covers 25 years, although data constraints mean most analyses cover a smaller period. At a minimum, these will still cover a range of 16 years[2].

A limitation of the analysis that comes from using this database is that it does not cover which specific sectors the sanctions target (Syropoulos et al., 2022). The goal of sanctions often is to damage key industries. Even when effective, this effect may go unnoticed when looking at aggregated data across the economy. Future research should investigate the sectoral effects of (partial) sanctions. Nevertheless, the findings on how sanctions impact the overall economy are insightful but may be missing context from important partial effects.

Although data on sanctions is core to answering the research question, supplemental data is needed to complete the analysis.

3.2 Supplementary databases

The dataset used in this analysis was created by combining the global sanctions database with data collected from eight other databases. From all databases, a subsample was extracted of

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[2] This is the case for the subsample during the analysis of CPI.

variables of interest spanning from 1996 to 2020 where possible. When not possible, the available data within this period is added to the sample. These sources are described below.

Unemployment data was extracted from the database of the International Labor Organisation, which contains employment data from 189 nations spanning from 1991 up to 2024. In the subsample selected from this data, there are cases in which a nation does not report data openly. The ILO estimates of these values are used instead.

The UNCTAD data centre has been used to collect Consumer Price Index data and inward Foreign Direct Investment data. It covers a sample of 209 countries and territories spanning from 1996 to 2020.

The IMF direction of trade statistics database is used for its data on imports and exports of nations across the sample period. From this, annual data on country levels of exports and imports have been selected.

Another dataset used is the OECD official development aid database. It contains data across the sample period of official development aid received from reporting groups. This includes members of the development assistance committee, some non-member countries and multilateral institutions. This is the most complete dataset on development aid. However, data from some countries that provide aid to developing nations are missing, such as Russia. Nevertheless, as this data includes the largest block of aid providers, this dataset gives quite comprehensive insights.

Monetary policy data is collected from the IMF MFS database. This data is rather limited in scope when compared to others. It only contains data from 2001 to 2023. Next to that, it misses information from countries that adhere to different reporting standards or fail to report data. This includes the UK, Iran, Venezuela, Cuba and China, all of which are sanctioned for a part of the sample. External validity issues may arise from dropping these. Section 3.4 delves into this.

The Penn World Table database contains data on productivity and subdivided price level data. The data exists for 183 countries, reporting this annually from 1950 up to 2019. Some of the data is extrapolated by researchers from the University of Groningen. This extrapolated data is a minor limitation of the research.

Data from the Polity Project is used to reflect the institutional characteristics of the country's government. This covers a range from 1800-2018 covering 167 countries. It does not

cover some small nations, lacking data on Pacific and Caribbean island nations. Again, this is a potential limitation to the external validity that must be remembered.

Data on conflicts has been gathered from the armed conflict dataset from the Uppsala Conflict Data Program. This provides data on armed conflicts from 1989 to 2023, between and within states. The states included are internationally recognized sovereign states with a population greater than 250,000 people. Rather than dropping states which are not included in the sample, it is assumed these do not experience conflicts.

Data compiled by the Centre d'Etudes Prospectives et d'Informations Internationales in the CEPII gravity dataset is used for macroeconomic indicators. It contains a comprehensive set of annual country data indicators such as GDP and population.

Data from all these datasets is combined for this research. Due to the available data, the baseline sample spans from 1996-2018 for unemployment (due to data constraints from polity) and 2001-2018 for CPI (due to data constraints from MFS) analyses. Differing definitions of a country and failure to report in existing nations present potential issues to external validity. The variables (constructed) from these datasets are delved into next.

3.3 Defining and summarizing variables

Table 3.1 defines the variables used in the analysis. It notes which databases these variables are extracted from, with links to these databases. Notes included on how variables from the datasets may have been altered.

Table 3.1 Variable definitions and sources

Variable	Definition	Notes	Linked database
CPI	The annual consumer price index of a country. Base year 2013. Reflects changing prices in a nation.	Index created from extracted annual inflation rates.[3]	UNC TAD
Unemployment Rate	The annual unemployment rate of people aged 15-64 within the country.	-	ILO
Sanctioned	A dummy variable which takes the value of 1 if any type of trade sanction is enacted on the country.	-	GSDB
Trade	The total gross trade (exports + imports) of a country. Reported at current prices.[4].	-	IMF DOTS
FDI	A stock value of the inward Foreign Direct Investment in a country. Reported at current prices.	-	UNC TAD
Aid	The net official development aid received by a country reported at current prices. Countries which received no aid were assigned a value of zero.	Negative values (more repayment of previous aid) are changed to zero values.	OECD
Terms of Trade	The average price level of exports divided by the average price level of imports in a country.	-	PWT

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[3] Instead of using the index available in UNCTAD, the CPI was created from inflation rates. This was done as inflation rates were already merged in the database and had no impact on analysis.
[4] Analysis including variables adjusted to real prices has been conducted with no significant differences. Available upon request.

Money Supply	The average money in circulation in the country during the year. In millions of unit of currency.	For EU countries this has been adjusted to currency in circulation within the state.	MFS
Real GDP per Capita	The real GDP per capita of a nation using national-accounts growth rates. Reported in US $.	Real GDP data from PWT and divided by population data from CEPII.	PWT & CEPII
Population	The total population of a country, measured in thousands of people.	-	CEPII
Internal Conflict	A dummy variable. Takes the value of one when there is a conflict with no foreign involvement.	-	UCDP
External Conflict	A dummy variable. Takes the value of one in a conflict when there is a foreign state involved.	-	UCDP
Polity	A score of how democratic or autocratic a country's institutions are. Ranging from -10 (hereditary monarchy) to +10 (consolidated democracy).	-	Polity

Next to defining these variables, another term needs to be defined. A substantial sanction refers to a nation sanctioned by countries which make up more than 2.5% of world GDP minus their own GDP. This is considered a large sanction, with a greater impact (Syropoulos et al., 2023). The value was chosen as it considers the (seven to ten) economically largest nations[5] and similarly sized blocks of smaller countries are likely able to have this greater impact.

Table 3.2 delves into the variables used in research by providing descriptive statistics.

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[5] Source: https://www.worldometers.info/gdp/gdp-by-country/

Table 3.2 Descriptive Statistics of the models dependent, independent and control variables

Variable	Obsv.	Mean	Std. Dev.	Min.	Max.
CPI	4,924	4,670,632	3.15×10^8	0.001	2.21×10^{10}
Unemployment Rate	4,558	8.153	6.003	0.1	38.8
Sanctioned	5,108	0.254	0.435	0	1
Trade	4,920	115,433	333,369	0	4,201,932
FDI	4,858	94,406	396,763	0	1.03×10^7
Aid	5,095	92.531	306	0	4732
Terms of Trade	4,290	0.972	0.117	0.634	1.621
Real GDP per Capita	4,238	18.445	22.011	0.243	316.431
Money Supply	3,078	4,386,420	3.62×10^7	0.603	7.94×10^8
Population	5,036	33,208	129,008	3.370	1,411,100
Internal Conflict	4,903	0.100	0.300	0	1
External Conflict	4,903	0.040	0.195	0	1
Polity	3,686	3.545	6.402	-10	10

Table 3.2 shows that there are 5,108 total observations in the compiled dataset. The 5,108 total observations cover 207 countries and territories across the period 1996-2020. There are 1,296 instances of a country at a point in time experiencing a trade sanction. This is 25.4% of all observations. It becomes clear from the table that the majority of variables have their minimum value sitting at or close to zero. Note that CPI and money supply have large standard deviations and high maximum values. In the case of CPI, these have led to a significantly high mean, likely driven by outliers. These are important observations to take into account in section IV when

creating the empirical model. As noted from the datasets, table 3.2 shows there are a significant number of missing observations. The reasons and potential issues arising from this were mentioned before. These are delved further into in subsection 3.4.

3.4 Limitations to the data

Issues with external validity potentially arise from missing data. If the data is missing completely at random this is not a major issue. If this is not the case and specific countries are dropped from the sample due to underlying differences, results may not cover the average effect sanctions have across the globe. Little's MCAR test has been conducted to see if this data is missing completely at random. This test had significant results with a p-value of 0.0000, meaning that data is not missing at random and there may be underlying issues.

To see how this missing data may impact the research, the descriptive statistics of the data used in the regressions are compared to those of the overall dataset. This can be seen in the appendix in table A.1. For unemployment, the subsample covers the full range of unemployment rates found across the population. The observations dropped from the data do not remove the extremes or significantly change the mean values or standard deviation. As the subsample is representative of the population, the average effect found in the research is representative. Minor external validity issues arise as the minimum population of countries included is 408,000. Whether the effects are valid for the smallest states is unclear, however, not an aspect this research delves into.

For the analysis of CPI, table A.2 does show a potential for more significant issues. The extremes of the consumer price index are dropped in this subsample, which leads to a significantly lower mean value. Since these extremely high CPI values are disproportionately found in countries that are sanctioned, this becomes an issue. It may be that as sanctioned countries with extreme inflation rates are dropped, the role of sanctions in exacerbating this extreme inflation is lost. This lack of data will be referred to as institutional opaqueness, where countries do not report data due to institutional collapses or the choice of their reporting not aligning with global standards. Findings for the effect of sanctions on inflation could be an underestimation of the true average effect, as institutional opaqueness limits the sample to those countries willing and able to share data. Nevertheless, the results still give a good picture of the effects of sanctions on inflation for the large set of countries within the subsample.

To conclude, a comprehensive dataset has been created to analyze the research question. Through compiling data from nine data sources variables have been created to use in the empirical model explained in section IV. There are some limitations to the data, specifically to the external validity of the findings of CPI. Institutional opaqueness leads to the exclusion of countries which may experience the greatest effects due to sanctions.

IV. Methodology

The section describes the empirical method used in order to answer the research question. At first, it will provide an empirical analysis of the transmission channels through which sanctions work potentially. Based on this and the literature on these papers, it selects which channels to include in the model. Then it explains the model used to identify the effects which will be used to answer the research question.

4.1 Sanctions: empirical relationship with potential transmission channels

Throughout the literature review, four possible transmission avenues were identified. Rather than including them based on literature, an analysis is completed based on the data to find existing relationships. To do this, the fixed effects regressions in table 4.1 have been run. This table shows the relationship between a country being sanctioned and the associated change in the level of trade in column (1), FDI in column (2), received aid in column (3) and the terms of trade in column (4).

Table 4.1 Panel fixed effects regression results of the potential transmission mechanism

Variable	(1)	(2)	(3)	(4)
	ln(Trade + 1)	ln(FDI + 1)	ln(Aid + 1)	Terms of Trade
Sanctioned *Dummy*	-0.135***	-0.129	-0.402	-0.001
	(0.051)	(0.131)	(0.348)	(0.007)
Constant	9.203***	8.397***	8.342***	0.972***
	(0.013)	(0.034)	(0.088)	(0.002)
R-squared	0.941	0.913	0.883	0.772
Observations	4,920	4,858	5,095	4,290
Years	1996-2020	1996-2020	1996-2020	1996-2020
Countries	201	199	207	181

Note: All columns contain both country and year-fixed effects. *Italics* represent the type of variable effect found. Standard errors in parentheses and standard errors are clustered. Starts indicate the significance level: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4.1 illustrates that when a country is the target of sanctions this is associated with a decrease in their total gross trade. Trade decreases by 13.5% than in cases in which sanctions are enacted. Hypothesis *H1* predicted this to be the case. It was expected that trade sanctions would negatively impact gross trade. Prior research shows that bilateral trade is reduced when sanctions are enacted between the sanctioner(s) and the sanctioned nation (Neuenkirch & Neumeier, 2015). It turns out that not only the bilateral trade with the target country is reduced, but the overall trade is reduced on average too. For these reasons, the variable trade is included in the baseline regression.

The results in the second column of table 4.1 show that being sanctioned is not significantly associated with a reduction in the stock of inward FDI in the targeted country. This

insignificant result draws into question whether or not all trade sanctions impact foreign direct investment. However, Mirkina (2018) found that when sanctions are severe, their impact becomes significant. For that reason, the results in table A.3 in the appendix have been run. These follow the same methodology as those in table 4.1 but only do this for sanctions categorized as substantial. Column (2) in table A.3 does show a significant relationship between FDI and sanctions. Being sanctioned is strongly associated with a 29.7% lower FDI stock in the country. This suggests that substantial sanctions are associated with divestment in FDI from the targeted country. Hypothesis *H1* is (partially) confirmed, with a significant negative relationship existing between substantial sanctions and FDI stock. Hence, the variable FDI is included in the baseline regression, even if less substantial sanctions do not have a significant impact.

In column (3) of table 4.1 the relationship between a country being sanctioned and the amount of aid it receives is shown to be insignificant. This is also the case for substantial sanctions. According to these findings, the level of official development aid received by a country does not reduce under sanctions as hypothesized in hypothesis *H1*. This aligns with the findings of Early and Jadoon (2016). It seems like the average trade sanction does not target aid, even the more substantial ones. Prior research shows that reductions in aid associated with sanctions can impact the real economy (Neuenkirch & Neumeier, 2016; Portela & Mora-Sanguinetti, 2022). For that reason, the variable aid is included, but the insignificant relationship in the sample should be kept in mind.

The fourth column in table 4.1 shows the relationship between sanctions and terms of trade to be insignificant, with the size of the impact being near zero. Even when focusing on the impacts of substantial sanctions the relationship remains insignificant (table A.3). This goes against the first hypothesis *H1*, as there is no evidence that sanctions reduce the terms of trade. The limited literature about this relationship existing in theory (Becko, 2024) does not hold up in this sample. These results suggest sanctions are not transmitted through the terms of trade directly. Due to the empirical findings and the limits of proof to oppose it, terms of trade are not included in the analysis.

In conclusion, the transmission avenues through which the impacts of sanctions will be analyzed are the variables of trade, FDI and aid. Trade and FDI both have cases in the sample where sanctions significantly impact them. In the sample, there is no evidence of an impact on aid, but it is still included due to its importance in previous literature. The identified avenue of

terms of trade is dropped, as the only evidence of an existing direct relationship between it and sanctions is theoretical. Using these avenues of transmission of sanctions the baseline empirical model can be set up.

4.2 Fixed Effects Model

To estimate the impact of sanctions on the real economic variables a model has been created based on one used by Neuenkirch and Neumeier (2015). Neuenkirch and Neumeier used panel fixed effects models with time and country fixed effects to estimate the impact of sanctions on the real GDP of a targeted nation. The adapted version of this model can be seen in equation (1).

$$(1) \quad y_{i,t} = \beta_0 + \beta_1 \, Sanctioned_{i,t} + \Sigma\beta X_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t}$$

The dependent variable $y_{i,t}$ represents the two real economic variables, $CPI_{i,t}$ and $Unemployment \, Rate_{i,t}$, in country i at time t. The independent variable of interest is the dummy $Sanction_{i,t}$, showing whether sanctions are enacted or not. Controls are represented by $\Sigma\beta X_{i,t}$ with X representing a vector of control variables. β_1 shows the direct effects sanctions have on the outcome variables. This includes the country's change in real GDP per capita, population growth, whether the country is in an internal or external conflict and how democratic or authoritarian the country is. These are chosen for the same reasons as mentioned by Neuenkirch and Neumeier (2015). In the case of inflation the money supply, measured by the money in circulation has been added. The money supply is an important factor in determining short-run inflation (Agayev, 2011). The model controls for country and annual global effects by including country fixed-effects α_i and time fixed-effects γ_t. These will control the regression for unobserved heterogeneity which may bias the findings. The error term is represented by $\varepsilon_{i,t}$. Standard errors are clustered on a country level. This corrects for heteroskedasticity and autocorrelation issues (due to the lags added in equation (3)) in the error term while allowing correlation within observations of the same countries (Rogers, 1993).

This model is expanded to draw more insightful conclusions about the transmission channels through which sanctions work. This expanded version can be seen in equation (2).

(2) $y_{i,t} = \beta_0 + \beta_1\,Sanctioned_{i,t} + \beta_2 Trade_{i,t} + \beta_3 FDI_{i,t} + \beta_4 Aid_{i,t} + \sum\beta(Sanctioned * Channels)_{i,t}$
$+ \sum\beta X_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t}$

The variables of the transmission channels $Trade_{i,t}$, $FDI_{i,t}$ and $Aid_{i,t}$ have been included in the regression, as motivated earlier. These are included rather than the openness of these variables (Neuenkirch and Neumeier, 2015) as the interest lies in seeing how $y_{i,t}$ responds to changes in these variables, rather than the responsiveness to these variables making up a relatively smaller part of GDP.

To estimate the effects sanctions have interaction effects are added to the model. These are portrayed by $\sum\beta(Sanctions * Channels)_{i,t}$. These interaction effects show the interaction between being sanctioned and changes in the transmission channels of Trade, FDI and Aid. The β for the interaction terms will show how, when sanctioned, the dependent variables respond to changes in the transmission channels. They will show the average effect a sanction has through changes in the transmission channels on the dependent variables of the average country. For this, it is important to see if there are differences in these and non-sanction channel parameters. If this is the case it can be interpreted that the effects of sanctions-associated changes are different from regular changes in these channels.

The final model, which represents the baseline model used in section V, is shown in equation (3).

(3) $ln(y_{i,t} + 1) = \beta_0 + \beta_1\,Sanctioned_{i,t} + \beta_2 ln(Trade_{i,t-1} + 1) + \beta_3 ln(FDI_{i,t-1} + 1) + \beta_4 ln(Aid_{i,t-1} + 1) +$
$+ \sum\beta(Sanctioned * Channel) + \sum\beta X_{i,t,t-1} + \alpha_i + \gamma_t + \varepsilon_{i,t}$

Equation (3) shows alterations made to the variables to ease the interpretations of the results and correct for potential endogeneity issues.

All variables which are not categorical have their natural logarithm taken and these are included in the empirical model. In this case, the parameters found, their β, show the elasticity of the variables. This can be interpreted as how a percentage change in the independent variable is

responded to by a percentage change in the dependent variable. If the minimum value of the variables is equal to or near zero (all variables except population), a value of one is added before taking the natural logarithm. This averts issues with natural logarithms of values lower than one.

In order to prevent endogeneity issues in which changes in the dependent variable impact the independent variables, lags are taken. Lags are taken of all independent variables which are not categorical. This should prevent issues with reverse causality as the CPI and unemployment rate in period t do not impact variables like trade in period t-1. For these variables the β needs to be interpreted as how a change in the previous year impacts the dependent variables at time t. Categorical variables like conflicts, sanctions and polity are seen as exogenous (Neuenkirch & Neumeier, 2015).

In section V this baseline regression is applied to find the unknown parameters. These are then interpreted and discussed to see if the hypotheses made in section II hold.

V. Results

As the research question delves into two aspects of the real economy, unemployment and inflation, the baseline analysis has been split into two parts. In the first subsection, the average impacts of on the unemployment rate of the country are delved into. Following that, this is done for inflation. This is then extended by adding robustness checks, in which different severities of sanctions and potential weaknesses of the model are discussed.

5.1 Sanctions and the impact on unemployment

Using the panel fixed effects model described in the previous section, the impacts of sanctions on unemployment in a targeted country are estimated in table 5.1. Findings in column (1) show that when looking at sanctions as a uniform tool the effect on unemployment is insignificant. The view of sanctions as a uniform tool does not see a difference between small and purely token sanctions and large strict sanctions. That is why further columns delve into the effects of sanctions when successful at impacting the transmission channels. Column (2) adds the channels of trade and FDI. Column (3) adds the channel aid, on which sanctions have not been identified to affect this sample. Column (4) is the most complete model, adding the variable polity, which was left out due to it being the limiting factor concerning data. Through this, it can be seen how sanctions (which are successful at altering these avenues) impact unemployment.

Table 5.1 Panel fixed effects regression results for unemployment

Variable	(1) ln(Unemployment Rate + 1)	(2) ln(Unemployment Rate + 1)	(3) ln(Unemployment Rate + 1)	(4) ln(Unemployment Rate + 1)
Sanctioned$_{T-1}$ *Dummy*	-0.019 (0.029)	0.017 (0.149)	-0.125 (0.179)	-0.088 (0.211)
Sanctioned x ln(Trade + 1)$_{T-1}$ *Elasticity*		-0.045** (0.020)	-0.040* (0.022)	-0.055** (0.017)
Sanctioned x ln(FDI + 1)$_{T-1}$ *Elasticity*		0.045*** (0.016)	0.048** (0.015)	0.064*** (0.006)
Sanctioned x ln(Aid + 1)$_{T-1}$ *Elasticity*			0.007 (0.005)	0.005 (0.006)
ln(Trade + 1)$_{T-1}$ *Elasticity*		-0.013 (0.012)	-0.012 (0.018)	-0.009 (0.012)
ln(FDI + 1)$_{T-1}$ *Elasticity*		-0.004 (0.010)	-0.004 (0.010)	-0.009 (0.010)
ln(Aid + 1)$_{T-1}$ *Elasticity*			-0.001 (0.004)	-0.001 (0.005)
ln(Real GDP per Capita + 1)$_{T-1}$ *Elasticity*	-0.110** (0.056)	-0.099* (0.051)	-0.097* (0.051)	-0.129** (0.050)
ln(Population)$_{t-1}$ *Elasticity*	-0.224* (0.132)	-0.259* (-0.132)	0.247* (0.247)	0.175 (0.130)
Internal Conflict *Dummy*	0.074** (0.035)	0.068* (0.035)	0.065* (0.0.35)	0.065** (0.032)
External Conflict *Dummy*	0.110** (0.047)	0.086* (0.046)	0.0.80* (0.045)	0.067 (0.044)
Polity *Categorical*				0.010** (0.005)

Constant	0.038	0.030	0.137	0.756
	(1.110)	(1.205)	(1.215)	(1.234)
R-squared	0.891	0.892	0.892	0.905
Observations	3,986	3,934	3,921	3,282
Years	1997-2019	1997-2019	1997-2019	1997-2018
Countries	168	167	167	153

Note: All columns contain both country and year-fixed effects. *Italics* represent the type of variable effect found. Standard errors in parentheses and standard errors are clustered. Starts indicate the significance level: $* p < 0.1$, $* * p < 0.05$, $*** p < 0.01$.

A 1% reduction in a country's trade when sanctioned is associated with a 0.055% increase in the unemployment rate in the following year. This can be seen in column (4) which represents the most complete model run, which removes the most omitted variable bias. Columns (2) and (3) show a similar effect, although the size is smaller and the parameter barely loses its significance in column (3). This is not considered an issue. The predictions made in the second hypothesis, *H2,* are supported by these findings. Under sanctions, when there is a decrease in trade, the unemployment in a country increases significantly. In other words, there is indeed a significant negative elasticity of the unemployment rate concerning gross trade. This follows the findings by Kelishomi and Nisticò (2022), uncovering a significant relationship in certain employment sectors in Iran. Lower (and worse quality) imports decrease productivity, leading to unemployment. Thus when sanctions result in a reduction of gross trade the unemployment rate in the country rises significantly.

It is critical to see that changes in trade when sanctions are not applied do not significantly impact the unemployment rate. Changes to sanctioned trade are different from regular changes in trade. This is an area that has not been investigated well. Possible explanations could include that sanctions result in larger shocks to trade or that these target the most critical sectors of an economy and not less advantaged sectors.

The elasticity of the unemployment rate with respect to FDI when sanctioned is also significant. However, this effect goes in the opposite direction. Columns (2), (3) and (4) show that a decrease in FDI stock (divestment) causes the unemployment in a country to fall. A 1%

divestment in FDI of a country when sanctioned results in a 0.064% decrease in the unemployment rate in the following year, for the average country. This goes in opposition to what was predicted in hypothesis *H2*, which predicted that divestment would result in increases in the unemployment rate. Although there's no literature on the case for sanctions, research by Gómez-Plana and Latorre (2014) supports these findings. Only in the case when the divestment (of plants) results in closures does the unemployment rate increase (in Spain). In cases where there is a (national) acquisition of the divested plant the unemployment rate decreases. Gómez-Plana and Latorre (2014) argue this is the case because the investment of capital when acquiring the divested firm results in an employment boost. It is reasonable to assume that when there is divestment from an economy due to sanctions, the state or other (national) actors step in. This should be relatively more often than in non-sanction situations. The shock that forces the divestment is political and often does not reduce the value of the investment. This makes it a lucrative target for a (cheap)[6] takeover. With the insignificant finding for an impact of regular changes to FDI, the argument for different types of divestment due to sanctions seems reasonable. Further research into whether divestments under sanctions lead to greater national acquisition would be interesting.

When sanctions successfully impact the aid a country receives, the effect on unemployment is insignificant as seen in column (4). This does not align with what was predicted in hypothesis *H2*, which predicted a strong negative relationship between reductions in aid when sanctioned on the unemployment rate in the next year. It could be because sanctions do not impact the aid received by a country. This is supported by findings in table 4.1 and by Early and Jadoon (2016).

The direct effect of sanctions on unemployment is insignificant for all regressions. This suggests sanctions are transmitted through trade and FDI, which need to be affected by the sanctions to impact the target economy. If sanctions exist in name only and are not enforced there is no impact (Neuenkirch & Neumeier, 2015). What can be drawn from this is that sanctions need to be enforced and large enough to successfully reduce a target country's gross trade and FDI to have a significant impact on unemployment.

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[6] Although there is no literature on this, recent examples in Russia show examples of cheap take-overs during divestment. Renault sold its majority stake in Avtovaz for 1 ruble. Source:
https://edition.cnn.com/2022/08/19/business-food/star-coffee-starbucks-russia/index.html

Changes in economic growth (as measured by real GDP per capita) impact the unemployment rate significantly in column (4). An increase in economic growth in a country will on average result in decreased unemployment for all models. The most complete model shows that a 1% increase in real GDP per capita is associated with a -0.129% decrease in unemployment, following Okun's Law (Ball et al., 2013). The existence of an internal conflict is associated with a significant 0.065% increase in the unemployment rate in a country. External conflicts do not significantly impact the unemployment rate. An explanation for this could not be found in literature, suggesting it may be found in the weaknesses in the data. External conflicts do not always occur on the territory of the involved, unlike internal conflicts. An example is the US, UK and Australia which were involved in the Iraq war, which caused little damage to their economy. The inclusion of non-territorial external conflicts thus could be the reason behind it being insignificant, but this cannot be concluded without further research. Changes in a country's institutional democratic leaning are also significant, although the interpretation of the size is not insightful. Its inclusion is important as without it, there is omitted variable bias. This is seen by comparing the results in columns (3) and (4).

To conclude, the analysis shows that being successfully sanctioned in the prior year significantly impacts the unemployment rate in targeted countries, mainly through reductions in trade and FDI caused by sanctions. While a decrease in gross trade leads to higher unemployment, FDI divestments under sanctions unexpectedly result in lower unemployment. Changes to aid have no significant impact on the unemployment rate, however, there is no evidence that sanctions impact aid in this sample. Future research could explore the nuances of the existing effects, and whether or not the type of changes in trade and FDI are indeed different under sanctions compared to normal circumstances.

5.2 Sanctions and the impact on inflation

To investigate the impacts of sanctions on the consumer price index the analysis shown in table 5.2 has been completed. Delving into the results of column (1), trade sanctions do not significantly impact the CPI index of a country when considered as a homogenous tool. This is similar to what was found for the unemployment rate. Further results provide a different picture than the results of unemployment. In the case of CPI, none of the sanctions-induced changes in the transmission avenues have a significant impact. Neither does the direct effect of sanctions.

Table 5.2 Panel fixed effects regression results for CPI

Variable	(1) ln(CPI + 1)	(2) ln(CPI + 1)	(3) ln(CPI + 1)	(4) ln(CPI + 1)
Sanctioned$_{T-1}$ *Dummy*	0.058 (0.335)	0.027 (0.133)	-0.201 (0.206)	0.005 (0.246)
Sanctioned x ln(Trade + 1)$_{T-1}$ *Elasticity*		0.015 (0.022)	0.027 (0.025)	0.020 (0.030)
Sanctioned x ln(FDI + 1)$_{T-1}$ *Elasticity*		-0.012 (0.018)	-0.011 (0.019)	-0.021 (0.474)
Sanctioned x ln(Aid + 1)$_{T-1}$ *Elasticity*			0.009 (0.007)	0.603 (0.007)
ln(Trade + 1)$_{T-1}$ *Elasticity*		-0.042 (0.052)	-0.042 (0.053)	-0.076 (0.058)
ln(FDI + 1)$_{T-1}$ *Elasticity*		0.002 (0.012)	0.003 (0.011)	0.007 (0.017)
ln(Aid + 1)$_{T-1}$ *Elasticity*			0.006 (0.004)	0.011*** (0.004)
ln(Real GDP per Capita + 1)$_{T-1}$ *Elasticity*	0.120 (0.084)	0.141 (0.097)	0.140 (3.801)	0.245** (0.066)
ln(Money Supply + 1)$_{T-1}$ *Elasticity*	0.335*** (0.065)	0.340*** (0/067)	0.332*** (0.065)	0.272*** (0.066)
ln(Population)$_{t-1}$ *Elasticity*	0.095 (0.150)	0.117 (0.161)	0.130 (0.162)	0.186 (0.168)
Internal Conflict *Dummy*	0.024 (0.030)	0.022 (0.031)	0.018 (0.030)	0.003 (0.031)
External Conflict *Dummy*	0.100 (0.078)	0.101 (0.077)	0.090 (0.069)	0.085 (0.066)

Polity *Categorical*				0.001
				(0.004)
Constant	-0.123	-0.040	-0.126	-0.197
	(1.352)	(1.314)	(1.339)	(1.453)
R-squared	0.809	0.810	0.814	0.837
Observations	2,746	2,719	2,709	2,115
Years	2002-2019	2002-2019	2002-2019	2002-2018
Countries	156	156	135	135

Note: All columns contain both country and year-fixed effects. *Italics* represent the type of variable effect found. Standard errors in parentheses and standard errors are clustered. Starts indicate the significance level: * p < 0.1, * * p < 0.05, *** p <0.01.

Columns (2), (3) and (4) provide evidence that reductions in the level of gross trade do not significantly impact the consumer price index in the next period. Unlike predicted in *H2*, the CPI of the average country does not respond to changes in their gross trade. Not only is this the case under sanctions, but also when sanctions are not applied. This opposes prior country-level findings from Iran (Dastgerdi et al., 2018) and North Korea (Kim et al., 2023). The differences could be due to the effects of dropping countries with institutional opaqueness. Future research into differing effects among these countries should be completed. Nevertheless, what can be concluded is that when applied to countries which adhere to international reporting standards sanctions have not had a significant impact on the consumer price index of the average country.

Table 5.2 shows that just as with reductions in gross trade, divestment in FDI under sanctions does not significantly impact the CPI in the next period. This opposes what was hypothesized in *H2* and prior research into the topic (Dastgerdi et al., 2018). The reason behind the differences with prior literature is likely the same as for trade. This means that the CPI of an average country in the sample does not respond to divestments of FDI in the previous year.

Under sanctions, changes to the aid received by a sanctioned country on the consumer price index are insignificant. Hypothesis *H2* predicted that there would be a responsiveness to changes in aid, which was not the case. Interestingly, in normal circumstances, changes in aid

received do impact the CPI. An increase in aid in the previous period by 1% increases the CPI by 0.011% for the average country. This follows findings by Bhavan (2013) and Hokmeng and Moolio (2015) which showed a positive link between inflation and aid inflows. Differences in the effects seem to suggest that changes in aid under sanctions are different to regular changes. The reason behind this is unclear. This may be due to the sample of countries sanctioned not experiencing major changes in aid (Early & Jadoon, 2016). Again, this is an aspect for future research to delve into.

Summarizing the results for the control variables, conflicts changes to population and changes in democratic levels of institutions insignificantly impact the CPI. The inclusion of democratic levels of institutions is again important to reduce omitted variable bias as seen when comparing results in columns (3) and (4). Increases in the monetary supply increase the CPI in the next period significantly, with a 1% increase in money in circulation resulting in a 0.272% increase in the CPI. This follows the findings by Agayev (2011). The CPI responds by increasing by 0.245% when the real GDP per capita increases by 1% in the previous period.

There are also no significant direct impacts through which sanctions impact the CPI of a country. This means that for the sample used, sanctions on average do not have significant impacts on the CPI of a country. This is the case, whether directly or through the transmission avenues. What should be noted is that the sample is not representative of the entire globe, however, with differences compared to emphasising the potential weaknesses in the external validity of this model.

5.3 Robustness checks

Having identified the baseline impacts, attention shifts to looking at heterogeneity within these average effects. The aspects of the size of sanctions and the length these sanctions have been enacted are discussed in the following sections. Next to that, potential issues with estimation are delved into. Specifically potential problems due to multicollinearity.[7]

5.3.1 Impact of length of sanctions

To see whether the responsiveness of the unemployment rate and the CPI changes according to the length of time the sanctions have been enacted, the robustness tests in table A.4 have been

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[7]Robustness tests across the sample, such as comparing the impacts across different country sizes or when excluding financial hubs, has not been completed. However, these are interesting avenues future research could touch upon.

completed. Columns (1) and (3) show the effects of changes in the first year in the second year. Columns (2) and (4) show the effects of changes in the third consecutive year of sanctions on the fourth year.

The regressions for the impact of the unemployment rate illustrate that the impact a sanction has changes as it lasts longer. A.3 shows that a 1% trade decrease in the first year sanctions are enacted is associated with a 0.038% increase in the unemployment rate in the next year. Meanwhile, a 1% decrease in the third year results in a 0.075% increase in the unemployment rate in the next year. This shows the magnitude of the effectiveness grows over this time.

For FDI a similar increase in magnitude is confirmed, from a 0.055% elasticity in its first year to a 0.098% elasticity in its third year with respect to next year's unemployment rate. The findings suggest that a country becomes more vulnerable and less able to shield itself from the impacts of reductions in trade and FDI (Felbermayr et al., 2021).

The size of the channel of aid increases but stays insignificant. This means hypothesis *H3* is followed for all transmission avenues analysed barring aid. What should be kept in mind is that the size of the reductions of sanctions on transmission channels is smaller as time passes[8], but the responsiveness to changes becomes greater.

For the analysis concerning the CPI, the insignificant impact of the transmission channels continues. All channels see at least a doubling in the size of their effect when comparing results after one and after three years. Nevertheless, as the differences are insignificant the predictions made in *H3* do not hold for any of the transmission avenues. Although this is different than would be expected from the prior literature (Felbermayr et al., 2021), it follows the rest of the findings.

To conclude, the longer the sanctions are enacted the more responsive the unemployment rate becomes to changes in trade and FDI under sanctions. However, it remains unresponsive to changes in aid, just like CPI remains unresponsive to changes in all channels.

5.3.2 Impact of large sanctions regimes

The robustness tests in table A.5 have been conducted to investigate the impact that substantial sanctions have. This includes large economies and multilateral sanctions. These results are compared with the average treatment effects found in the baseline regressions.

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[8] Regression results of data showing this are available upon request.

Column (1) shows minor differences between the impacts substantial sanctions have and the baseline findings in table 5.1. The transmission channel of trade has its parameter increase by 0.006 percentage points greater. This is not a significant difference. It should be noted that the significance of the result becomes just barely insignificant. This is not interpreted as a major issue. FDI under sanctions stays significant and the size differs even less. The channel of aid stays insignificant.

The responsiveness of the unemployment rate to changes the transmission channels is the same for substantial sanctions as in the complete sample. This aligns with what was predicted in hypothesis *H4*, following the findings of Syropoulos et al. (2023). For the robustness test of CPI in column (2) the results for the transmission avenues all remain insignificant. This follows what was hypothesized in *H4*. All controls except for that of real GDP per capita remain significant, but the loss of significance is not an issue as it is a control.

To conclude, a larger block of sanctioning countries does not impact the responsiveness of the real economic variables to sanctions-induced changes to the transmission channels. Nevertheless, a greater regime of sanctions will likely have a greater impact on the unemployment rate as absolute changes in trade and FDI are likely to be greater.

5.3.3 Impact of multicollinearity

Multicollinearity in the models can be a significant challenge to the identification of effects. When the independent variables in a model are highly correlated it becomes challenging to isolate the individual effect of each independent variable on the dependent variable (Daoud, 2017). In order to test for issues with multicollinearity, the variance inflation factor (VIF), of the complete baseline regressions has been calculated.

Both models score a high mean VIF of 22.25 and 33.44. Anything above 10 could be considered potentially worrisome (Daoud, 2017). The biggest issue that the interaction effects of trade and FDI is 22.69, for the standard CPI model. This is high due to the extremely high correlation between the interaction effect for trade and the interaction effect of FDI, of 0.987. This is a cause for concern as it could severely impact the accuracy of the baseline estimation method.

To test whether the high correlation has a significant impact on the estimation of the results, regressions have been run where the variables of trade and FDI have been standardized[9].

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[9] Transformed to be distributed around a mean of 0.

The results can be seen in table A.6. These regressions have mean VIF values of 4.42 and 7.40, significantly lowering the risk that multicollinearity poses, although not removing it completely. The most important conclusion from these regressions is that all the variables which were (in)significant stay (in)significant for both the unemployment rate in column (1) and CPI in column (2). The signs of the significant effects are also the same as in the baseline[10]. There are small changes in the size of these effects, although the differences are not large enough to change any conclusions.

From this, it can be concluded that the impacts of the existing multicollinearity on estimation are small. More importantly, it has an insignificant impact on the conclusions drawn from the models and discussed throughout this paper.

VI. Conclusion

In section V the results have been discussed elaborately. Nevertheless, it is useful to summarize the findings and limitations discussed before concluding the research.

6.1 Discussion

Out of the four transmission channels initially identified, only two were shown to be significant under sanctions. These were trade and FDI. Changes to the level of trade and FDI, while a country was sanctioned, have a significant impact on the unemployment rate of the country in the next period. Decreases in trade due to sanctions were associated with increased unemployment, likely due to decreased productivity in sectors relying on imports (Kelishomi & Nisticò, 2022). Decreased FDI stock under sanctions was associated with decreases in unemployment, likely due to local firms taking over divested ventures (Gómez-Plana & Latorre, 2014).

None of the channels identified were associated with having significant impacts on the consumer price index of a country. As the direct effect of sanctions was also insignificant, it seems that, on average, sanctions are not associated with increases in a country's inflation. This holds for the countries analyzed, however, the sample is not externally valid for all nations. A number of significant nations had to be dropped, which included a disproportionately large number of sanctioned nations experiencing high inflation. There may thus be different effects for countries with institutional opaqueness, which were not willing or able to provide all data needed

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[10] The same methodology has been applied to all robustness test regressions. Available upon request.

for the analysis. This limitation should be taken into account. With access to novel datasets, this could be tested in further research.

Heterogeneity among sanctions was shown to have impacts on the size of the effect when looking at the length sanctions were enacted. The longer sanctions were enacted, the more responsive the unemployment rate became to changes in trade and FDI. As expected the responsiveness to substantial sanctions was the same as the average responsiveness to changes in trade and FDI. The severity of sanctions did not significantly change the size of the effect of channels found to be insignificant.

This includes the channel of changes to receive aid or the terms of trade when sanctioned. Under normal circumstances, changes in aid received do impact the CPI of a country. This effect does not exist under sanctions. This disconnect could be because aid provisions are not affected by trade sanctions (Early & Jadoon, 2016).

Another limitation is that the data used is aggregated at the country level. Were this data available on a bilateral or sectoral level, this would allow for a more comprehensive analysis. Future research with access to data and time to complete such analysis may discover some interesting micro-level effects of sanctions.

The insights into the effects of sanctions on the labor market could also be expanded upon. Due to a lack of data, this research was not able to investigate the impact of sanctions on wages identified by Hufbauer et al. (1997). This is an aspect of the real economy that future research should investigate as there is a lack of research into this (beyond the country level).

From this, the important findings can be concluded, alongside the limits to what can be drawn from the conclusion and how future research can build on these findings.

6.2 Conclusion

The research aimed to answer the question: *To what extent do successful trade sanctions impact unemployment and inflation in the targeted countries?* It can be concluded that, on average, when sanctions are successful at impacting certain transmission channels, they impact the unemployment rate in the following period. The channels are the gross trade and inward FDI stock of a country. Reductions in gross trade are associated with increased unemployment. Divestment of FDI stock is associated with decreased unemployment. Sanctions, even successful, have no impact on the consumer price index of the average country in the next period. Inflation is, thus not an effect of sanctions on the average sanctions. It seems the effects

of sanctions are also not transmitted to the real economy through impacting the aid flows to nations, or their terms of trade of a country. There are some limitations to these findings.

Institutional opaque countries dropped from the analysis included a disproportionate number of sanctioned countries with extreme inflation rates. This brings into question the external validity of the findings of the effects on CPI for these countries. Furthermore, all conclusions are limited to the country level, missing important sub-effects. The issues arising from multicollinearity in the model seem not to impair the analysis.

There are many avenues for future research can continue building on these findings. Some of these are delving into the effect of sanctions on CPI in institutionally opaque countries, discovering important sub-effects on the sectoral level and providing key insights into the effects sanctions have on other aspects of the real economy.

Policymakers must have a complete picture of how sanctions impact the real economy. Unintended consequences could catastrophically impact the lives of individuals. Findings show that sanctions could cause suffering to the populace by creating unemployment. Not only could sanctions unintendedly cause harm to the individuals, but they may also work against the goals unintendedly. Pushing for the divestment of firms from a sanctioned economy may be counteractive. That is if the aim is to cause unemployment in a country. In the case of the recent Russia sanctions, the rapid divestment of firms may be a part of the reason why the overall effects of sanctions seem limited. However, this limited effect also means that sanctions do not always impact the entire real economy, even successfully implemented ones are not associated with inflation increases for a large set of countries.

Successfully designed sanctions are a tool which can impact aspects of the real economy. Although President Woodrow Wilson's description may not have been overstating it when describing this as a weapon. Nevertheless, the research shows that the effects of sanctions could indeed be "more tremendous than war" (Mulder, 2022). When implemented successfully, sanctions can be associated with increases in unemployment on a scale that external conflicts do not come close to. They do this whether intended to, or not.

VII. Bibliography

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VIII. Appendix

Table A.1 Descriptive Statistics of the data from the unemployment rate model.

Variable	Obsv.	Mean	Std. Dev.	Min.	Max.
Unemployment Rate	3,282	7.795	5.735	0.11	37.32
Sanctioned	3,282	0.285	0.452	0	1
Trade	3,282	146,671	380,273	0	4,201,932
FDI	3,282	110,173	451,582	0	$1.03{\times}10^{7}$
Aid	3,282	34.887	53.597	0	53.597
Terms of Trade	3,282	0.982	0..111	0.737	1.621
Real GDP per Capita	3,282	16.891	20.272	0.378	181.211
Population	3,282	43,606	147,775	417	1,402,760
Internal Conflict	3,282	0.128	0.334	0	1
External Conflict	3,282	0.037	0.188	0	1
Polity	3,282	3.847	6.261	-10	10

Note: Variable aid loses its most extreme values. As aid is not impacted by sanctions, this is not discussed.

Table A.2 Descriptive statistics of the CPI model.

Variable	Obsv.	Mean	Std. Dev.	Min.	Max.
CPI	2,115	88.294	26.713	5.873	407.316
Sanctioned	2,115	0.312	0.464	0	1
Trade	2,115	173,309	439,151	48.475	4,201,932
FDI	2,115	126,245	524,387	0	1.03×10^7
Aid	2,115	36.401	52.614	0	627.346
Terms of Trade	2,115	0.969	0.1097	0. 737	1.477
Real GDP per Capita	2,115	18.398	21.590	0.538	181.211
Money Supply	2,115	4,768,418	3.58×10^7	2.264	6.95×10^8
Population	2,115	28,865	49,386	446,175	331,501
Internal Conflict	2,115	0.120	0.325	0	1
External Conflict	2,115	0.040	0.195	0	1
Polity	2,115	4.806	5.685	-10	10

Note: Even though this sample has more sanctioned nations, extreme values from the dropped observations of CPI were disproportionately sanctioned nations. Data is available upon request.

Table A.3 Robustness check for transmission channels

Variable	(1) ln(Trade + 1)	(2) ln(FDI + 1)	(3) ln(Aid + 1)	(4) Terms of Trade
Sanctioned *Dummy*	-0.189***	-0.297**	-0.201	0.002
	(0.060)	(0.144)	(0.399)	(0.008)
Constant	8.919***	8.093***	9.049***	0.977***
	(0.010)	(0.023)	(0.065)	(0.001)
R-squared	0.935	0.915	0.862	0.767
Observations	4,376	4,310	3,707	3,780
Years	1996-2020	1996-2020	1996-2020	1996-2020
Countries	201	199	207	181

Note: All columns contain both country and year-fixed effects. *Italics* represent the type of variable effect found. Standard errors in parentheses and standard errors are clustered. Starts indicate the significance level: * p < 0.1, * * p < 0.05, *** p <0.01.

Table A.4 Robustness check for the impact of sanctions timing on responsiveness of variables

Variable	(1) ln(Unemployment Rate + 1) $S_T = 2$	(2) ln(Unemployment Rate + 1) $S_T = 4$	(3) ln(CPI + 1) $S_T = 2$	(4) ln(CPI + 1) $S_T = 4$
Sanctioned$_{T-1}$ *Dummy*	-0.167 (0.171)	-0.361* (0.215)	-0.190 (0.164)	-0.262 (0.259)
Sanctioned x ln(Trade + 1)$_{T-1}$ *Elasticity*	-0.038** (0.019)	-0.075** (0.031)	-0.003 (0.026)	-0.025 (0.046)
Sanctioned x ln(FDI + 1)$_{T-1}$ *Elasticity*	0.055*** (0.017)	0.098*** (0.028)	0.018 (0.023)	0.044 (0.039)
Sanctioned x ln(Aid + 1)$_{T-1}$ *Elasticity*	0.002 (0.006)	0.014* (0.008)	0.007 (0.005)	0.015* (0.008)
ln(Trade + 1)$_{T-1}$ *Elasticity*	0.002 (0.007)	0.001 (0.007)	-0.070 (0.045)	-0.071 (0.044)
ln(FDI + 1)$_{T-1}$ *Elasticity*	-0.006 (0.010)	-0.006 (0.010)	-0.001 (0.018)	-0.001 (0.018)
ln(Aid + 1)$_{T-1}$ *Elasticity*	0.002 (0.005)	0.002 (0.035)	0.003** (0.003)	0.007** (0.003)
ln(Real GDP per Capita + 1)$_{T-1}$ *Elasticity*	-0.103** (0.049)	-0.089** (0.046)	0.124 (0.096)	0.129 (0.092)
ln(Money Supply + 1)$_{T-1}$ *Elasticity*			0.269*** (0.073)	0.272*** (0.074)
ln(Population)$_{t-1}$ *Elasticity*	0.210 (0.153)	0.224 (0.155)	-0.073 (0.117)	-0.004 (0.115)
Internal Conflict *Dummy*	0.043 (0.031)	0.040 (0.031)	0.001 (0.026)	0.004 (0.027)

External Conflict	0.061	0.056	-0.006	0.002
Dummy	(0.050)	(0.050)	(0.050)	(0.050)
Polity	0.058***	0.016***	-0.001	-0.000
Categorical	(0.005)	(0.005)	(0.004)	(0.050)
Constant	0.161	0.016	2.488**	2.478**
	(1.445)	(1.457)	(1.082)	(1.075)
R-squared	0.932	0.932	0.885	0.884
Observations	2,433	2,424	1,537	1,510
Years	1997-2018	1997-2018	2002-2018	2002-2018
Countries	133	133	111	111

Note: All columns contain both country and year-fixed effects. S_T is the number of years sanctions have been applied at time t. *Italics* represent the type of variable effect found. Standard errors in parentheses and standard errors are clustered. Starts indicate the significance level: * p < 0.1, * * p < 0.05, *** p <0.01.

Table A.5 Robustness check for the impact of large sanction regimes on responsiveness of variables

Variable	(1) ln(Unemployment Rate + 1)	(2) ln(CPI + 1)
Sanctioned$_{T-1}$ *Dummy*	-0.054 0.219	-0.281 (0.272)
Sanctioned x ln(Trade + 1)$_{T-1}$ *Elasticity*	-0.061* (0.032)	-0.001 (0.047)
Sanctioned x ln(FDI + 1)$_{T-1}$ *Elasticity*	0.062** (0.027)	0.021 (0.021)
Sanctioned x ln(Aid + 1)$_{T-1}$ *Elasticity*	0.009 (0.007)	0.011 (0.008)

ln(Trade + 1)$_{T-1}$ *Elasticity*	-0.011 (0.011)	-0.085 (0.060)
ln(FDI + 1)$_{T-1}$ *Elasticity*	-0.013 (0.011)	0.004 (0.018)
ln(Aid + 1)$_{T-1}$ *Elasticity*	0.001 (0.005)	0.009** (0.004)
ln(Real GDP per Capita + 1)$_{T-1}$ *Elasticity*	-0.092* (0.048)	0.196* (0.109)
ln(Money Supply + 1)$_{T-1}$ *Elasticity*		0.287*** (0.075)
ln(Population)$_{t-1}$ *Elasticity*	0.201 (0.139)	0.047 (0.161)
Internal Conflict *Dummy*	0.053* (0.030)	-0.002 (0.030)
External Conflict *Dummy*	0.056 (0.045)	0.067 (0.062)
Polity *Categorical*	0.011** (0.005)	0.001 (0.004)
Constant	0.418 (1.322)	1.167 (1.423)
R-squared	0.921	0.850
Observations	2,855	1,824
Years	1997-2018	2002-2018
Countries	153	135

Note: All columns contain both country and year-fixed effects. *Italics* represent the type of variable effect found. Standard errors in parentheses and standard errors are clustered. Starts indicate the significance level: * $p < 0.1$, * * $p < 0.05$, *** $p < 0.01$.

Table A.6 Robustness check for the impact of multicollinearity on model results

Variable	(1)	(2)
	ln(Unemployment Rate + 1)	ln(CPI + 1)
Sanctioned$_{T-1}$ *Dummy*	-0.056 (0.071)	0.013 (0.071)
Sanctioned x ln(Trade + 1)$_{T-1}$ *Elasticity*	-0.143** (0.066)	0.052 (0.078)
Sanctioned x ln(FDI + 1)$_{T-1}$ *Elasticity*	0.202*** (0.054)	-0.066 (0.064)
Sanctioned x ln(Aid + 1)$_{T-1}$ *Elasticity*	0.005 (0.006)	0.003 (0.007)
ln(Trade + 1)$_{T-1}$ *Elasticity*	-0.023 (0.028)	-0.197 (0.007)
ln(FDI + 1)$_{T-1}$ *Elasticity*	-0.030 (0.033)	0.021 (0.055)
ln(Aid + 1)$_{T-1}$ *Elasticity*	-0.001 (0.005)	0.011*** (0.004)
ln(Real GDP per Capita + 1)$_{T-1}$ *Elasticity*	-0.129** (0.050)	0.245** (0.004)
ln(Money Supply + 1)$_{T-1}$ *Elasticity*		0.272*** (0.066)
ln(Population)$_{t-1}$ *Elasticity*	0.175 (0.130)	0.186 (0.168)
Internal Conflict *Dummy*	0.065** (0.032)	0.003 (0.031)
External Conflict *Dummy*	0.067 (0.044)	0.085 (0.066)

Polity *Categorical*	0.010**	0.001
	(0.005)	(0.004)
Constant	0.596	-0.834
	(1.220)	(1.761)
R-squared	0.905	0.837
Observations	3,282	2,115
Years	1997-2018	2002-2018
Countries	153	135

Note: All columns contain both country and year-fixed effects. *Italics* represent the type of variable effect found. Standard errors in parentheses and standard errors are clustered. Starts indicate the significance level: * $p < 0.1$, * * $p < 0.05$, *** $p < 0.01$.

A.7 List of tables in the thesis