

# **A survival analysis of trade sanctions. A look at sanctions over the past 70 years**

Preliminary - work in progress

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Comments welcome

Maximilien Goux

University of Halle-Wittenberg

Martin Klein

University of Halle-Wittenberg

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## **Abstract**

Trade sanctions are a standard tool governments use to achieve a specific political or strategic goal. In this study, we conducted a survival analysis of trade sanctions over the past seventy years to understand their effectiveness. Our analysis shows that not all sanctions are equally effective in pressuring target countries to change their behavior, especially sanctions concerning democracy standards are more often successful than sanctions concerning terrorism. Additionally, we found that sanctions are often challenging to implement and enforce. Countries find often ways to evade them. Overall, our study provides evidence of which sanction objectives and types are more likely to succeed and which sanctions are not the best policy tool.

Keywords: GSDB, Trade Sanctions, Survival Analysis

JEL Classification: F51

Corresponding author: Maximilien Goux, Martin Luther University of Halle-Wittenberg, Department of Economics, Große Steinstraße 73, D - 06099 Halle (Saale), Germany. Tel.: +49 345 55 23327; Fax: +49 345 55 23327. Email: [maximilien.goux@wiwi.uni-halle.de](mailto:maximilien.goux@wiwi.uni-halle.de) *Acknowledgements:*

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# 1 Introduction

Sanctions are a commonly used political tool for addressing international conflicts. In the past, much research has been conducted to determine whether sanctions effectively achieve their intended outcomes for the imposing country. The first investigation of the United Nations embargo against Rhodesia showed that sanctions might not effectively achieve their goals (see (Galtung, 1967)). (Hufbauer et al., 2007) confirmed this first analysis using a sanctions dataset, finding that only around 36% of the sanctions achieved their intended goals. However, more recent research has focused on characteristics which may increase the chances of a sanction's success. For example sanctions imposed against allies (see (Allen, 2005, 2008; Drezner, 1999)), against democratic countries (see (Bapat et al., 2013)) or against countries experiencing political upheaval (see (Bolks and Al-Sowayel, 2000; Brooks, 2002; Lektzian and Souva, 2007)) are more likely to succeed. However, the research on this topic is inconsistent, and some studies have found no relationship between the success of a sanction and these criteria (see (Drury, 1998; Krustev and Morgan, 2011)).

This paper aims to identify additional factors that influence the effectiveness of sanctions beyond those already identified in the literature. We will focus on the objectives of sanctions and the types of sanctions to see if the success of a sanction can be predicted at the start. To address this gap in the research, this paper considers two main challenges. First, it is essential to include the critical characteristics of sanctions that have already been studied. Additionally, we will focus on the different objectives and types of sanctions. Previous research has not emphasized these two characteristics, but rather focuses on the relationship between the imposing and target countries, and factors such as democracy, trade, and GDP. We will include these three factors as control variables in our analysis. The second challenge we face is that there are various possible outcomes for a sanction. A sanction may end in complete success, partial success, failure, or settlement through negotiation. We will focus on sanction ending in complete success, representing the de-

sired outcome of a sanction. However, we must also consider the other potential outcomes of a sanction. Therefore, we will use the comparative risk analysis as our empirical method. This method includes all different possible outcomes in the analysis and not only the complete success outcome.

For this analysis we use the 2021 version of the Global Sanction Database (GSDB), it provides the necessary data on sanctions for this analysis. The GSDB has an advantage over other databases, such as the Hufbauer Schott and Elliot database (HSE), as it covers more sanction cases (1101 compared to 204 in the HSE) or the Threat and Imposition of Economic Sanctions (TIES) database, which is similar in size to the GSDB with around 1412 sanction cases, but includes only sanctions up to 2005, while the GSDB has more recent sanctions up to 2019 and, unlike the TIES, includes non-economic sanctions as well (see [\(Felbermayr et al., 2020\)](#)).

This paper contributes to the existing literature by focusing on the various objectives and types of sanctions and how they can impact the success of a sanction. Additionally, we use comparative risk analysis, which has not previously been employed in analyzing sanctions, and a relatively new database as a source. Our main finding is that the success of sanctions differs between the different objectives and types. As a result, we would emphasize sanctions as a political tool only for specific objectives and not as a general tool for all political goals.

The remainder of this paper is structured as follows. Section 2 provides a brief literature review and in section 3 we describe the GSDB database in detail. Section 4 presents the methodology for our analysis and section 5 describes how we use and extend the GSDB for the comparative risk analysis. In section 6 we present our main result and the discussion, leading to our conclusion in section 7.

## 2 Institutional Background

### 2.1 Literature Review

Economic sanctions are imposed by individual states or supranational organizations such as the United Nations (UN) or European Union (EU) on other states or organizations as a way of influencing their political or economic behaviour (see (Schneider, 1997)). The practice of imposing sanctions dates back to ancient Greece. Individual Greek cities set trade barriers on each other to weaken the opponent city. In the 20th century, sanctions became more significant due to the increasing international economic interdependence, making economic sanctions a powerful means of exerting pressure on a country. The first economic sanction imposed by the League of Nations (the predecessor organization of the UN) was an arms embargo against Bolivia and Paraguay during the Chaco War in 1932 (see (Fenwick, 1934)). It is believed that this sanction helped bring the warring parties to the negotiating table and increased their willingness to make peace (see (Schneider, 1997)). During the Cold War era after second World War many sanctions were imposed against the other bloc, mainly by individual countries. After the Cold War and the resulting lifting of the UN's paralysis, numerous sanctions were adopted by the UN. However, in addition to the UN, individual states also impose sanctions on other states when there is no consensus on an issue at the supranational level. The US imposes the most sanctions of any country in the world.

It is important to note that the imposition of a sanction does not guarantee its success. The success of a sanction may depend on several factors. Domestically, economic losses resulting from lost imports and exports and welfare losses can increase pressure on the government to meet the sanction requirements. In terms of foreign policy, international isolation can be a positive factor in the success of a sanction. On the other hand, a victim mentality may arise within the target

country, in which the population does not blame their own government for the economic hardship but blames the countries or organizations that imposed the sanction. This can lead to greater cohesion within the country and greater advocacy for the regime being sanctioned. Additionally, in foreign policy, there may be opportunities to increase cooperation with countries subject to sanctions (see (Galtung, 1967)). On average, only about 34% of all sanctions are successful (see (Hufbauer et al., 2007)). (Pape, 1998) have even found lower success rates.

Previous research has analyzed individual factors that may contribute to the success of a sanction. One such factor is the high political costs that the target country faces due to the sanction. The higher these costs, the more likely the country will be willing to fulfil the objectives of the sanction. In the first place, this theory is based on only three case studies (see (Blanchard and Ripsman, 1999)). (Bapat et al., 2013) support this idea, with the addition that a country that is more involved in international politics and economy is more likely to be affected by a sanction. It is also important to target the right individuals with sanctions rather than imposing them on an entire country (see (Morgan and Schwebach, 1996; Cortright and Lopez, 2002)). Another factor that may influence the success of a sanction is the relationship between the two parties involved. If the two countries are allies or have a good relationship, a sanction by one country may be more likely to be successful (see (Allen, 2005, 2008; Drezner, 1999; Jing et al., 2003)). However, (Drury, 1998) and (Krustev and Morgan, 2011) cannot verify this result in their analysis.

Another factor is the democratic level of a country. There is widespread agreement that democratic countries, in particular, are more likely to comply with sanctions than autocratic countries, as are countries that have experienced internal unrest (see (Brooks, 2002; Bolks and Al-Sowayel, 2000; Lektzian and Souva, 2007)). Another critical factor in the success of a sanction is the country imposing it. Sanctions imposed by a group of states are more likely to be successful than those

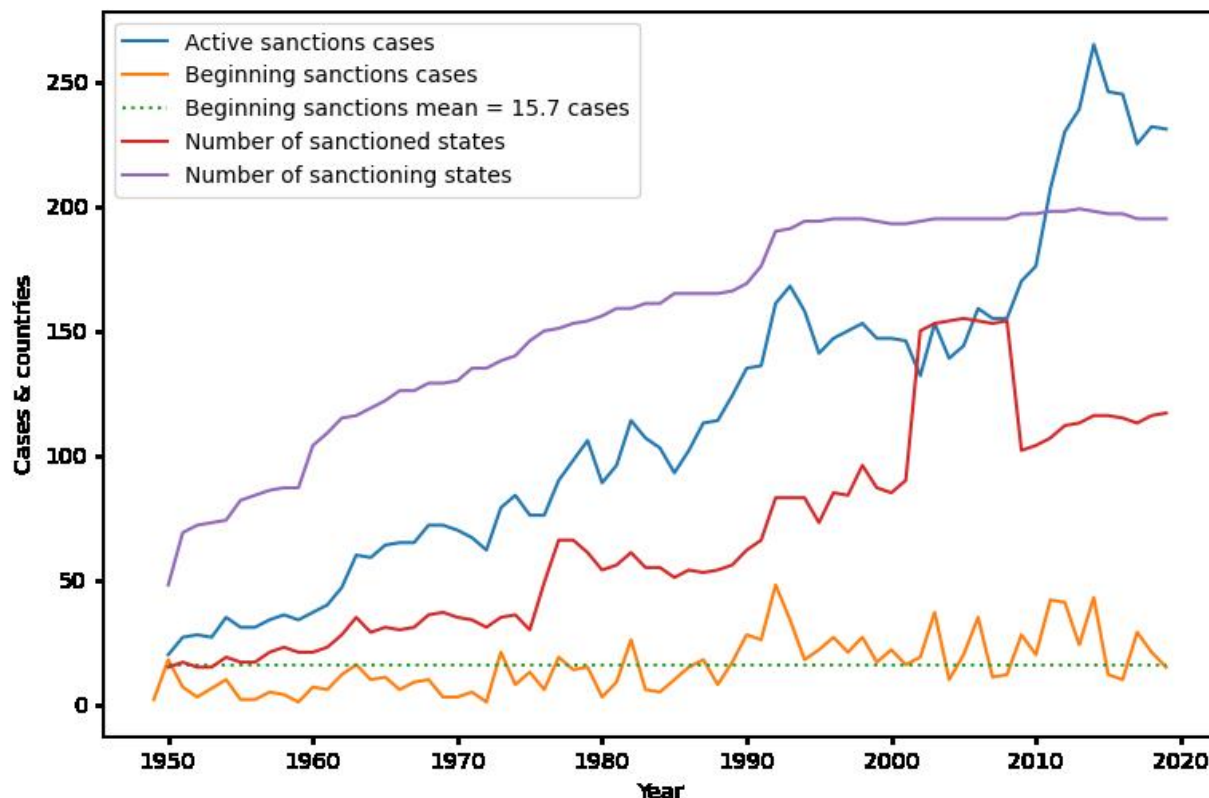
set by individual states (see (Bapat and Morgan, 2009; Kaempfer and Lowenberg, 1999; Martin, 1993; Miers and Morgan, 2002)). Previous studies have also identified the duration of the sanction as a crucial factor. In the first few years, when there is still strong unity among the imposing countries, the effects on the targeted economy are significant, (Nelson, 2017) noting high capital flight and (Marinov, 2005) a deteriorating general market situation in the first years of a sanction. After this initial period, the economy may adjust to the market restrictions imposed by the sanctions, improving the unfavourable market situation (see (Dizaji and van Bergeijk, 2013)). At the same time, the unity of the sanctioning countries decreases the longer a sanction lasts and the desired effect fails to materialize (see (Bond et al., 2015) (Moret et al., 2016)). It's even possible, that sanctions may negatively affect the imposing country (see (Smeets, 2018)).

Overall, there is already a substantial body of research that examines the different factors that contribute to the success of sanctions, including recent studies on ongoing disputes between the US, the European Union, Russia, Iran, and other countries. The studies have demonstrated that there is no agreement that sanctions are successful or which conditions lead to the success of a sanction. Nonetheless, we will build upon the most commonly identified success factors in our analysis.

### 3 Descriptive statistics for GSDB data

We begin by presenting several basic statistics for the data in GSDB.

Figure 3.1: Annual counts of sanctions and affected countries



Source: GSDB V2

Figure 3.1 provides information on the number of sanction cases per year, the number of countries sanctioning and being sanctioned, and the duration of cases from beginning to end. Active sanctions cases per year began or are beginning in that year and have not ended or are just ending. We see a steady rise in sanctions, from small numbers in the fifties to more than 200 active cases at the end. A particularly steep increase is observed from the year 2000 onward. New sanction cases partly drive the dynamics of active sanction cases each year. The number of new cases fluctuate around an overall mean of 15.7 cases per year. Starting from 1990, we observe a marked increase, so that new cases are above the average from then onward, while they are below the average during the years before that. Another factor driving the number of active sanction cases is the duration of cases from beginning to end. The number of active sanctions cases stagnated in

the mid-1990s, even though the number of new cases per year rose. More detail on case duration will be provided below.

The number of countries involved in sanction cases roughly increases with the number of issues. On the sanctioning side, we observe that, by 1990, the number of countries involved in at least one sanctioning case per year had reached approximately 200. From then on, it has remained close to this level. As we will show below, the reason for this is the rise of multilateral sanctions from 1990 onward<sup>1</sup>. This means that, from 1990 onward, most countries were directly or indirectly involved in at least one sanctions case per year on the sanctioning side.

The number of sanctioned countries is fewer than that of sanctioning countries and has shown an increasing trend over the years. However, there is a notable exception between 2002 and 2008. This "hump" is related to the US sanctions against signatories of the International Criminal Court (ICC) Rome Statute.<sup>2</sup>

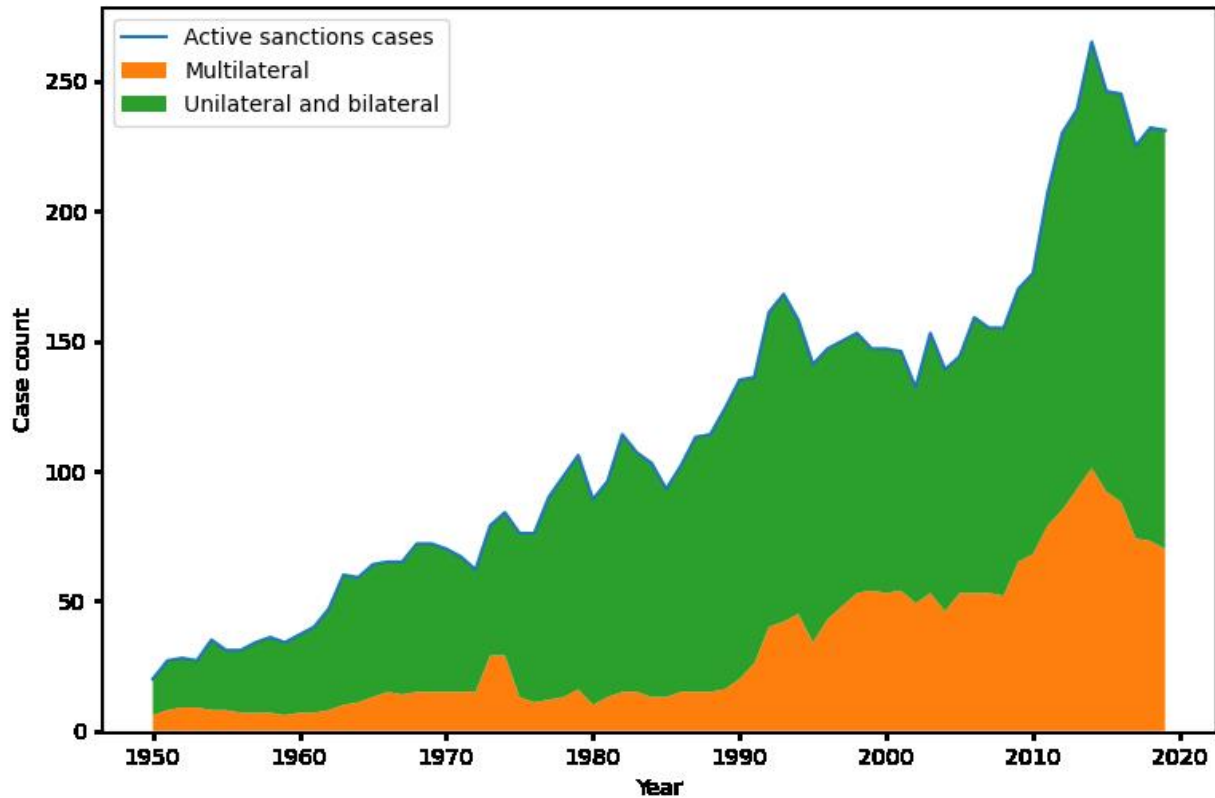
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<sup>1</sup>When a sanction is issued by the UN, all UN member countries are involved, except the country the sanction is imposed against. The number of imposing countries is roughly equal to the number of UN member countries.

<sup>2</sup>In 2002, the US Congress passed the American Service-Members' Protection Act, which prohibits the United States from providing military aid to countries that had ratified the ICC.



Figure 3.2: Multilateral Sanctions in Total Sanctions Cases



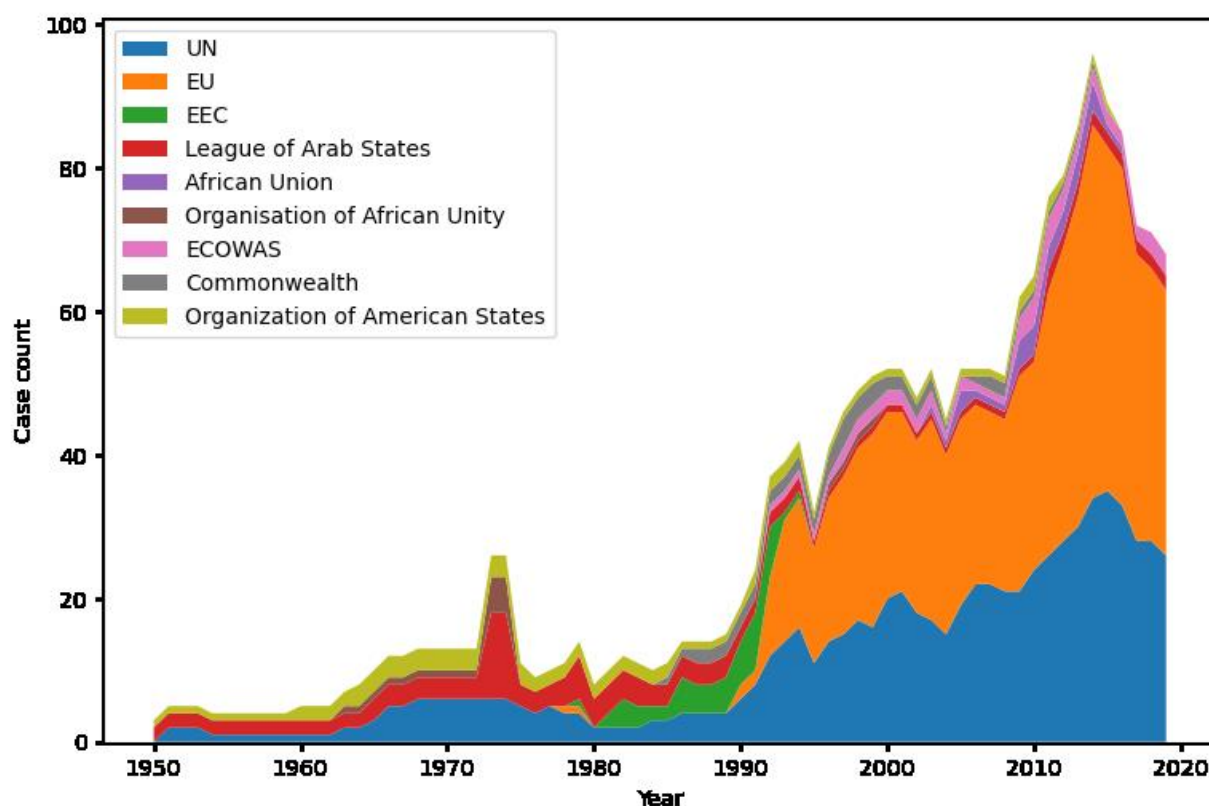
Source: GSDB V2

Figure 3.2 divides the total annual case count into two parts. The bottom part counts only those sanctions cases where an international organization is listed as the sole sanctioner. Sanctioning cooperation between, say, the UN and EU does not occur, only in cases with the UN or EU acting alone. We can see that the share of multilateral sanctions is growing, but unilateral and bilateral sanctions still have a larger share.

Table 5 and Table 6 provide lists of international organizations and other non-state entities in GSDB on the sanctioning and Table 7 and Table 8 on the sanctioned sides. The tables show that international organizations are frequently involved on the sanctioning side but rarely on the sanctioned side. The main reasons non-state entities become the target of international sanctions are terrorism and territorial conflicts. The tables also show that the USA in particular imposes

sanctions, but is rarely affected by sanctions itself. Iran and Fiji were sanctioned the most, with 29 cases each.

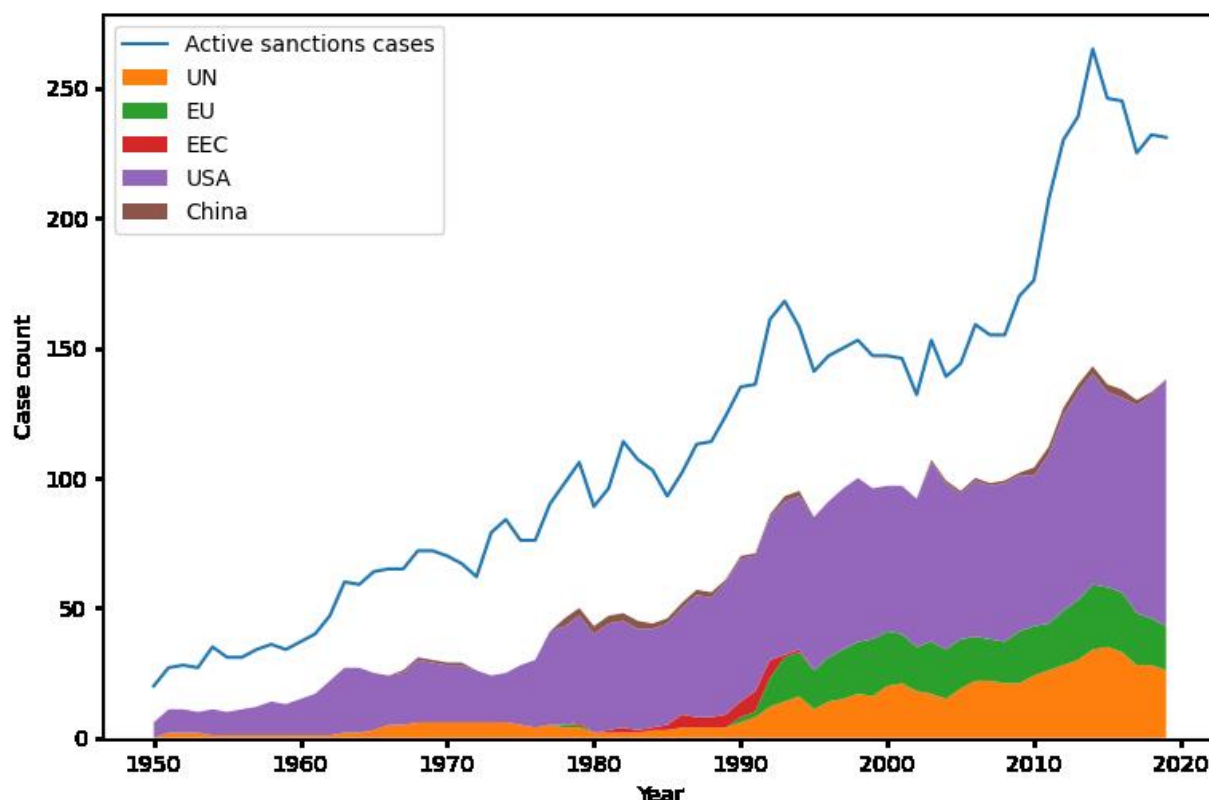
Figure 3.3: Non-state entities involved in sanctions cases



Source: GSDB V2

Figure 3.3 provides more detail on the evolution of multilateral sanctions through the years. Until 1990, they remained modest, except for the Arab oil embargo against the USA and other countries in the wake of the Yom Kippur War of 1973. The sharp rise of multilateral sanctions after 1990 is due to two international organizations, namely the United Nations and, even more pronounced, the European Union. So the transition from the EEC to the EU was accompanied by a substantial increase in European sanctioning activities.

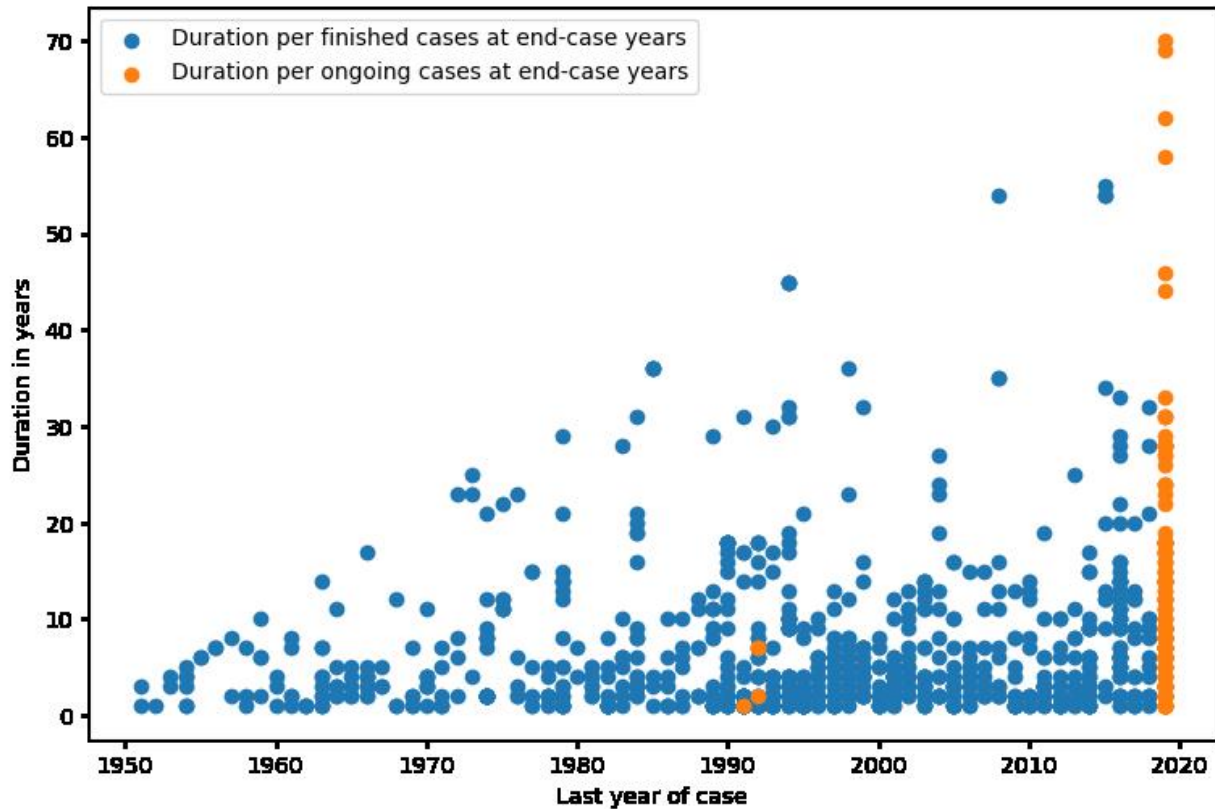
Figure 3.4: Number of sanctions cases involving major players



Source: GSDB V2

Although the EU is now a large issuer of international sanctions, it is not the largest. Figure 3.4 shows the “top players” in international sanctions. The selection of sanctioning states and organizations is limited to four: the EU and UN as international organizations, the United States and China as states. More than half of sanctions cases active in recent years were issued by the EU, UN, or United States. China does have some sanctioning activity, but it is still a tiny player compared to the other three.

Figure 3.5: Duration of sanctions cases per last years of cases

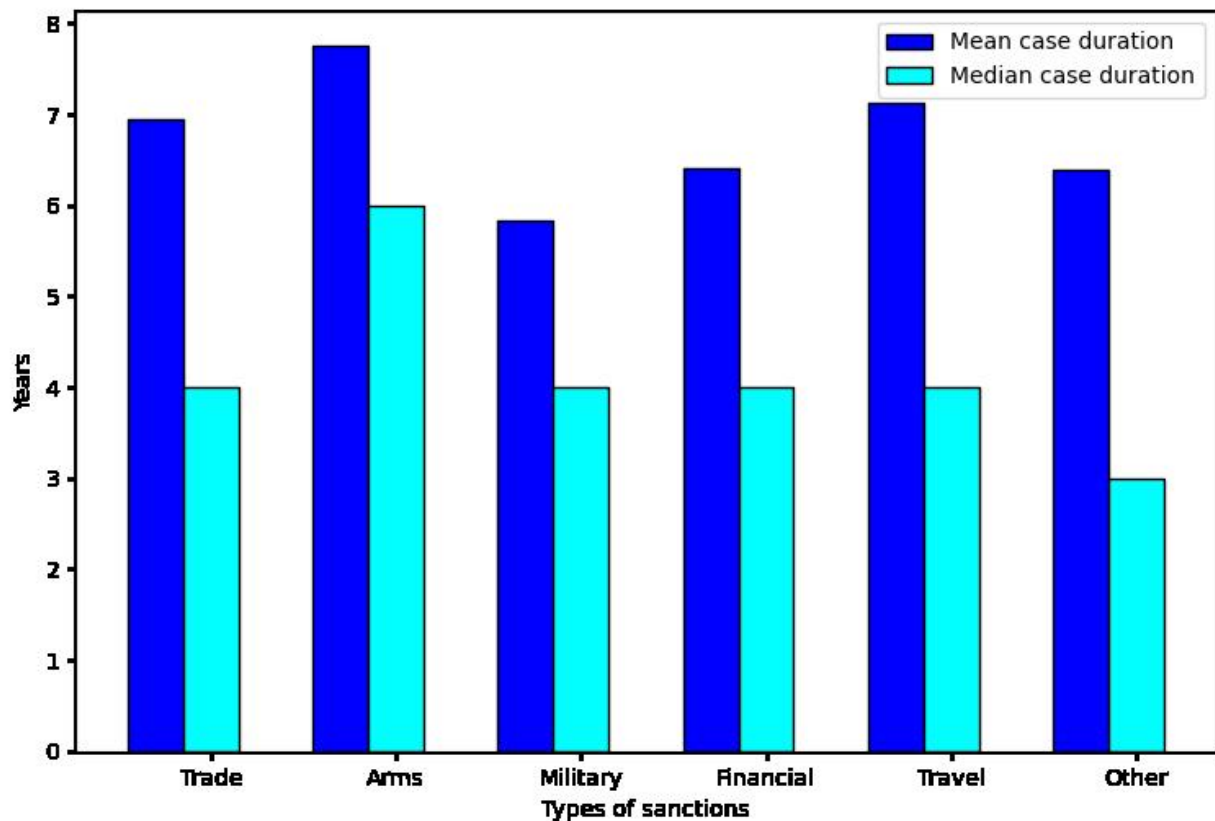


Source: GSDB V2, case-oriented file

Now we look at the duration of sanctions, beginning with Figure 3.5, which shows how long sanctions cases lasted, as seen from the year when they ended or for all active cases until 2019. All active cases are right-censored in our data set. The blue dots show the time per case marked as finished (successful or not), and the orange dots represent right-censored active cases. There were three active cases ending in the mid-1990s. In this three cases the sanctioning party disappeared or transferred to a new organization. In the GSDB, all other active cases are marked with 2019 as their end year, which is why the corresponding dots are clustered at the right edge. The diagram illustrates that the case duration vary greatly, with many cases ending quickly but a few lasting many decades.

Finally, Figure 3.6 shows minor differences between mean and median case duration for different types of sanctions. Arms sanctions tend to last the longest, both by mean and median.

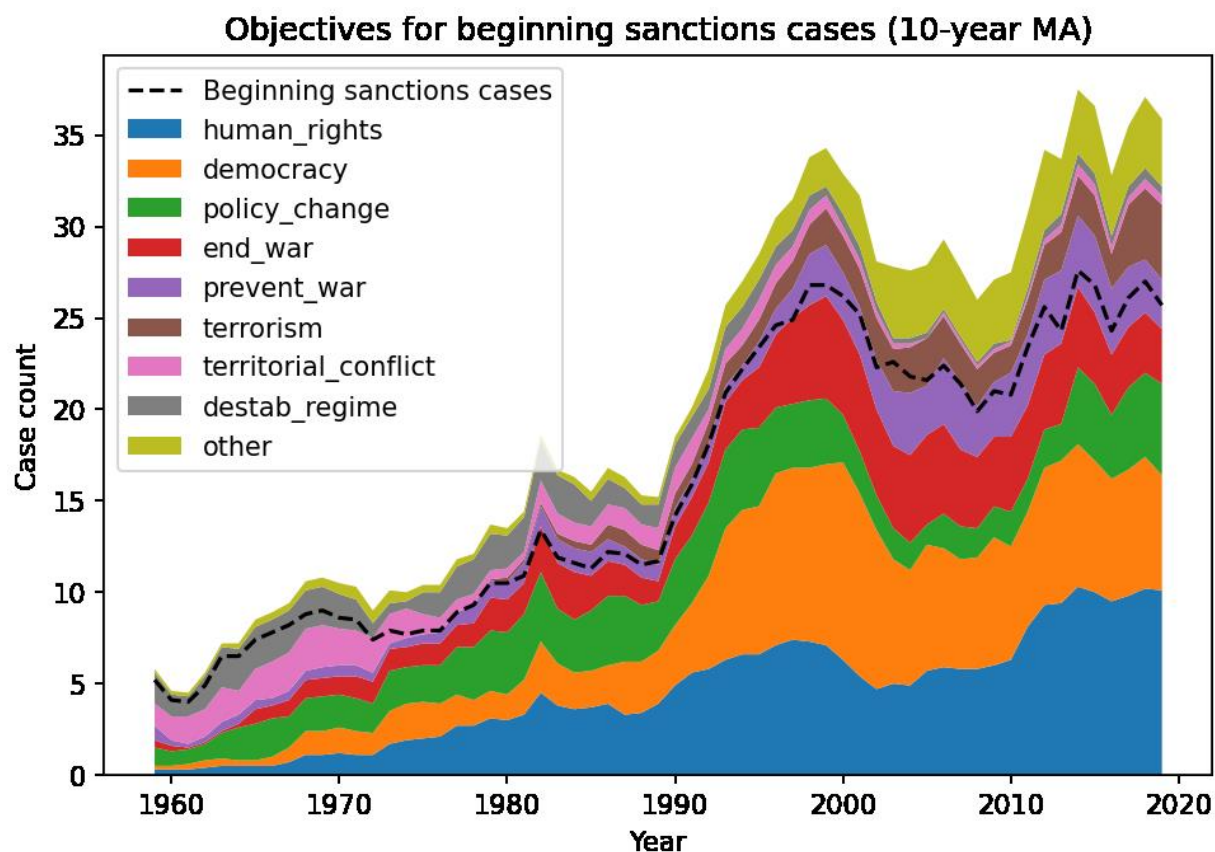
Figure 3.6: Case duration for different types of sanctions



Source: GSDB V2

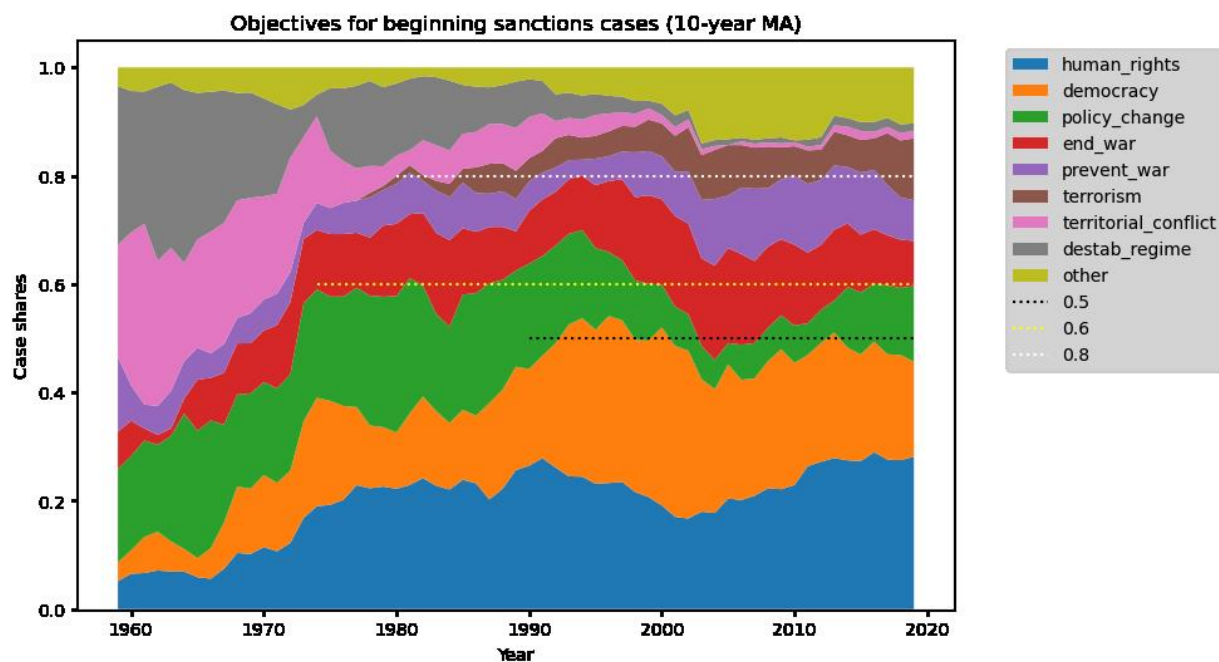
The GSDB also provides information about the objectives of the sanctions. Figure 3.7 combines the number of sanctions cases beginning each year (the black dashed line) with their objectives (the coloured areas). The number of objectives exceeds the number of cases because cases can have multiple objectives. This seems to have been the exception in the early years but has become more familiar with the years. As shown in Figure 3.1, there is a substantial increase in sanctions cases after 1990 with a corresponding rise in stated objectives. Nevertheless, this increase is connected with three sanctions objectives: human rights, democracy, and ending the war. The figure almost suggests a regime shift, with sanctions regimes before and after 1990 different in numbers and objectives.

Figure 3.7: Objectives for beginning sanctions cases



Source: Own estimation on the GSDB

Figure 3.8: Objectives for beginning sanctions cases (shares)



Source: Own estimation on the GSDB

Figure 3.8 further highlights this point. It presents the same data as the previous figure but only shares of stated objectives in the annual totals. Figure 3.8 suggests another regime shift in addition to the one around 1990, namely an earlier one occurring approximately in the mid-1970s. Both regime shifts are evident in shifts of objectives and in a concentration of sanctions cases on a few objectives. The dotted lines on the figure summarize three stylized facts.

- From the early or mid-1970s onward, approximately 60 per cent of all new annual sanctions cases state one of three objectives: human rights, democracy, or policy changes.
- From 1980 onward, 80 per cent of beginning sanctions cases are connected to five objectives, i.e. the previous three-plus, the two objectives of ending or preventing war.
- From 1990 onward, 50 per cent of all new sanctions cases are focused either on human rights or on democracy.

Finally, we note that countering terrorism as an objective of sanctions began in the 1980s and continues on a steady upward trend from there. At the end of the available years, it has risen to fourth place among the objectives listed in GSDB.

## 4 Estimation Strategy - Comparative Risk Analysis

In the previous descriptive analysis of the GSDB, we found that the duration of sanctions in the database varied depending on the type of sanction (trade, weapons, military, finance, travel and other) (see Figures 3.6 and 3.7). Weapon sanctions tended to last longer than the other types of sanctions. We aim to delve deeper into these findings using the comparative risk analysis a type of survival analysis. In the first step, we use comparative risk analysis to consider the average duration of sanctions in the event of success or failure. We aim to determine how many years it is most likely that a sanction will be successful, or after what period it is unlikely that a sanction will produce the desired result. In the second step, survival analysis allows us to calculate the probability of a sanction's success based on its type (trade, weapons, military, finance, travel, etc.), its objectives (ending a war, combating terrorism, resolving a territorial conflict, protecting human rights, changing policy, promoting democracy, destabilizing a regime, preventing war, etc.), the actors involved (e.g. the UN, the EU, etc.), and other factors such as GDP, democratic index, and trade openness. These results are primarily useful for determining the best type of sanction for achieving specific results and for identifying objectives that are relatively unlikely to be achieved through sanctions.

We use comparative risk analysis to estimate the effect of the mentioned variables on the hazard rate of sanctions ending in total success. Comparative risk analysis is based on survival analysis, which determines the expected length of time a subject will survive until a specific event occurs. In contrast to survival analysis, comparative risk analysis considers the possibility that different events may cause the subject to be excluded from observation. In our case, the occurrence of interest is "total success", defined as a sanction being successful if the recipient has achieved the objectives set by the sender. The sender has determined that the objectives have been met.<sup>3</sup> The

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<sup>3</sup>An example of a sanction ending with total success is the sanction which the US imposed on Haiti in 1991 (as stated in the Department of State Suspension Notice). These sanctions were put in place to pressure the coup plotters



competing events are partial success<sup>4</sup>, failure<sup>5</sup> and negotiation settled<sup>6</sup>.

We apply the model of (Fine and Gray, 1999), which uses the Cox proportional hazard function for our analysis of sanctions over the past 70 years. The model is based on a cumulative incidence function in the comparative risk analysis. The cumulative incidence function consists of two products:

1. The expected hazard at time  $t_f$  for the event, in our case "total success":

$$\hat{h}_c(t_f) = \left( \frac{m_{ct_f}}{n_{t_f}} \right) \quad (4.1)$$

Where  $m_{ct_f}$  denotes the number of events for risk  $c$  at time  $t_f$  and  $n_{t_f}$  denotes the number of sanctions at that time.

2. The estimated survival probability over all previous periods until the event

$$\hat{S}(t_{f-1}) \quad (4.2)$$

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to allow former President Jean-Bertrand Aristide to return to office. Once Aristide returned to office, the US lifted the sanctions.

<sup>4</sup>Partial success is determined when the sanctioned country partially accepts the requests from the sanctioning country. An example is the US sanction against Ecuador in 1995. After a violent border conflict between Ecuador and Peru, the US imposed arms sanctions against both countries. In the same year, the US lifted the sanctions because international observers were deployed in the region.

<sup>5</sup>A sanction is considered to have failed if the reasons for implementing it do not improve or even become more pressing. However, a sanction may also be deemed a failure if it is terminated before its intended goals are achieved. An example is the US sanction against Indonesia after the Indonesian military killed 1500 civilians in occupied East Timor. Despite this sanction lasting for six years, the US eventually lifted them to resume selling weapons and providing training to the Indonesian military. However, Indonesia did not make significant progress in meeting the goals set by the sanction.

<sup>6</sup>A sanction ends with negotiations being settled when both conflicting parties agree to resolve the conflict through negotiations. An example is the EU sanction against Eritrea and Ethiopia in response to the war between the two countries in 1998. In 2001, the EU decided that Eritrea and Ethiopia were expected to start peace talks. However, as this has not yet resulted in complete peace to date, the sanctions have not yet been declared as success or fail.

, which includes all survival functions until the event occurs at time  $t_f$ . A sanction case must have survived all possible events before  $t_f$  to be eliminated at time  $t_f$  with the event of "total success". By these two products 4.1 and 4.2, it is possible to calculate the estimated incidence probability:

$$\hat{I}_{ts}(t_f) = \hat{S}(t_{f-1}) * \hat{h}_c(t_f) \quad (4.3)$$

The probability of a sanction being eliminated due to the event "total success" is the product of outlasting the previous periods and the cause-specific hazard at time  $t_f$ .

Thus, the cumulative incidence function (CIF) is the addition of all incidences (from  $t_f$  with  $f'=1$  to  $t_f$  with  $f'=f$ ) over all possible events:

$$CIF_c(t_f) = \sum_{f'=1}^f \hat{I}_{ts}(t_f) = \sum_{f'=1}^f \hat{S}(t_{f-1}) * \hat{h}_c(t_f) \quad (4.4)$$

Compared to the 1- Kaplan Meier estimate, the CIF 4.4 is equal to 1-KM when there are no competing events. However, when there are multiple competing events, as in our case, the result of the CIF is always less than 1-KM. Moreover, an advantage of the CIF is that the sum of all CIF for the different events equals the total hazard. The Fine and Gray model uses the CIF to transfer the Cox proportional hazard model for several competing events. Fine and Gray treat the CIF as a sub-distribution function for this purpose. We express the sub-distribution function for the event of the total success of a sanction as:

$$h_{c,CIF}(t) = \lim_{\Delta \rightarrow 0} \frac{Pr(t < T_c < t + \Delta t | T_c > t \cup T_{c'} \leq t, c' \neq c)}{\Delta t} \quad (4.5)$$

Function 4.5 estimates the hazard for the event  $c$  at time  $t$  based on the risks remaining at time  $t$  after all previously occurring event types have been considered, including competing events. This results in the CIF-based hazard model:

$$h_{c,CIF}(t) = h_{0c,CIF}(\exp \left[ \sum_{i=1}^P \gamma_i X_i \right]) \quad (4.6)$$

This model satisfies the proportional hazard assumption for the sub-population. The gammas in the model evaluate the effect of the covariates on the risk of dropping out due to total in the presence of competing events (partial success, failure, and negotiation settled). If the effect of the covariates is greater than 1, it increases the risk of dropping out due to total success, and if it is less than 1, it decreases the risk. It is important to note that, for the sender, an increase in hazard is desirable, while a decrease in risk means that a sanction is less likely to lead to total success.

## 5 GSDB sanctions dataset for our analysis

For our analysis of sanctions over the past 70 years, we use the second version of the Global Sanctions Database (GSDB), which was developed through collaboration between the University of Applied Sciences in Konstanz, the LeBow College of Business at Drexel University, and the Kiel Institute for the World Economy. This database includes information on 1,101 sanctions

from 1950 to 2019. The GSDB provides information on the targeted state or non-state entity, the imposing state, group of states or multinational organization, the start and end years of the sanctions, the types of sanctions, the objectives of the sanctions, and a classification of their success. Finally, it also includes a category of ongoing and terminated sanctions cases.

As mentioned above, the GSDB distinguishes different types of sanctions, including trade, financial, military, arms, travel, and other sanctions. Examples of "other sanctions" are the expulsion of Eritrea from the African Union or Turkey's port bans against Cyprus in 1987 (see (Felbermayr et al., 2020)). The GSDB also distinguishes between various objectives for sanctions, such as promoting democracy, destabilizing a regime, ending or preventing war, protecting human rights, changing policy, resolving territorial conflicts, combating terrorism, and an "other" category for objectives that do not fit into one of the other categories. There are five different statuses that a sanction can have according to the GSDB: ongoing, total success, partial success, failure, and negotiation settled (see (Felbermayr et al., 2020)). However, in our analysis, we consider only the status of total success as a success. Partial success indicates that the objective was not fully met. We include partial success, failure, and negotiation settled as competing risk events in the analysis.

To analyze the data, we first split individual sanctions with multiple objectives into separate observations. The GSDB includes the status of each objective individually, so it is possible that one objective was met while another was not. It is essential to split the sanctions by objectives in order to determine their effect on complete success. After this splitting, we have 1452 observations in our data set from the initial 1101 cases. In the second step, we generate dummy variables for each type and objective of sanctions, resulting in 15 dummy variables (see Table 1).

#	Name of the dummy variable	=1
sanctions types		
1	arms	if sanction typ = arms
2	trade	if sanction typ = trade
3	military	if sanction typ = military
4	travel	if sanction typ = travel
5	financial	if sanction typ = financial
6	other	if sanction typ = other
sanctions objectives		
1	democracy	if sanction objective = democracy
2	terrorism	if sanction objective = terrorism
3	end war	if sanction objective = end war
4	human rights	if sanction objective = human rights
5	destabilize regime	if sanction objective = destab regime
6	territorial conflict	if sanction objective = territorial conflict
7	prevent war	if sanction objective = prevent war
8	policy change	if sanction objective = policy change
9	other sanction objective	if sanction objective = other

Table 1: List of sanction typ and sanction objective dummy variables

Furthermore, we categorize the sanctions based on who is imposing them. We distinguish between sanctions imposed by the US, EU, UN, and other country alliances. These four countries/groups are the countries imposing the most sanctions (see Table 5). Additionally, we include a variable indicating whether multiple sanctions are active against a country simultaneously. It is reasonable to assume that the more sanctions are active against a country, the greater the pressure on the country to lift them.

In the third step, we enhance our data set with additional information on GDP, a democracy index, and trade openness. GDP data is important for understanding the economic context in which sanctions occur and examining their economic impact. The GSDB sanctions database covers countries from 1950 to 2019. However, GDP data for this range of countries and this extended period is not readily available as one data set. Therefore, we construct our own data set with GDP data for the period from 1950 to 2019, which we refer to as the IPW data set. The sources for this

data set are:

- The latest available data from the IMF's World Economic Outlook database (WEO database).
- The latest available data from Penn World Tables, currently available in Version 10 (PWT 10.0)
- Data compiled by a team at the Institute for Health Metrics and Evaluation (IHME) at the University of Washington, which provides comprehensive time series of GDP per capita for 210 countries from 1950 to 2015.<sup>7</sup>

The IPW data set was created by combining data from these three sources. We provide detailed information in the appendix C.

For the Democracy Index, we use data from the Center for Systemic Peace (CSP). This dataset contains information on each country's Democracy Index, broken down by year. Previous research has suggested that sanctions against democratic governments may be more likely to be successful than sanctions against autocracies. The Democracy Index by the CSP assigns a score from -10 (complete autocracies) to +10 (complete democracies) to each country for a given year.

We obtain data on trade openness from the World Bank. Trade openness is the sum of a country's imports and exports relative to its GDP. It reflects the integration of a country in the global economy and, mainly, how dependent its domestic economy is on imports and exports. Sanctions against a country with a high level of trade openness may be more successful than sanctions

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<sup>7</sup>This data set is publicly available for download, with the methodology summarized in the accompanying article. James, S.L., e.a., 2012, Developing a comprehensive time series of GDP per capita for 210 countries from 1950 to 2015, *Population Health Metrics* 2012, 10:12. URL: <http://www.pophealthmetrics.com/content/10/1/12>. This data set draws on other resources, notably also the WEO database and Penn World Tables. For earlier years, where these sources provide no information, it also uses other sources, particularly the historical data on economic activity compiled by Angus Maddison. (Cf. the web page of the Maddison project for more information: <https://www.rug.nl/ggdc/historicaldevelopment/maddison/>)

against a self-sufficient country. From this additional information, we created several variables based on the GDP, the democracy index, and trade openness of the targeted countries at the start of a sanction (see Table 2). We implemented an additional variable, which indicates whether there was a change in democracy in the targeted country during the sanctions period. If the Democracy Index score at the start of the sanctions is lower than at the end, we assume there was at least some positive democratic change during the sanctions period.

#	Name of the dummy variable	=1
1	high GDP country	if GDP normalized > 2
2	low GDP country	if GDP normalized < 0.55
3	high trade openness country	if trade openness > 100
4	low trade openness country	if trade openness < 50
5	democratic country	if politic score > 16
6	autocratic country	if politic score < 4
7	positive democratic change	if politic score at begin < politic score at end
8	no data on trade openness	if no data on trade openness is available
9	several sanctions same time	if several countries imposed sanctions against one country in the same time period
10	US	if the US imposes the sanction
11	EU	if the EU imposes the sanction
12	UN	if the UN imposes the sanction
13	other alliances	if an other country alliances imposes the sanction

Table 2: List of additional dummy variables

In our analysis we construct different models using these variables to assess the robustness of our results concerning these factors.

## 6 Main results: comparative risk analysis

### 6.1 Differences in sanction objectives

As mentioned in section 5 we split the 1101 sanctions by different objectives, it results in 1452 observations. Of these 1452, 516 (36%) ended in complete success, 198 (14%) ended in partial success, 319 (22%) failed, 81 (6%) ended with negotiations started, and the remaining 338 (23%)

remain in effect. In Table 3, we show the percentage of the sanctions types and objectives in the data set of the 1452 sanctions. The most frequent sanctions type is the financial sanction type with 51%. The most frequent sanction objective is the human rights objective followed by the democratic objective.

#	Name of the dummy variable	percentage
sanctions types		
1	arms	23%
2	trade	35%
3	military	20%
4	travel	22%
5	financial	51%
6	other	17%
sanctions objectives		
1	democracy	20%
2	terrorism	6%
3	end war	12%
4	human rights	22%
5	destabilize regime	6%
6	territorial conflict	5%
7	prevent war	8%
8	policy change	14%
9	other sanction objective	8%

Table 3: Sanctions types and sanctions objectives in %

Regarding the types of sanctions, we see that a single sanction can consist of various types of sanctions, while half of the sanctions consist of financial sanctions. However, a single sanction can only have one objective, as we divided the data set based on objectives. The most common objectives are democracy and human rights. sanctions

Table 4 illustrates the percentage of the included dummy variables. Most countries under sanctions have below-average GDP and either has low trade openness or no data is available on trade openness at the start of a sanction. In contrast, there is no clear trend regarding democracy scores among the sanctioned countries. Only 12% of the sanctions are against democratic counties and 39% against autocratic countries, but most sanctions have been imposed on countries that do not fit into either spectrum. It is also worth noting that several sanctions are often active against a



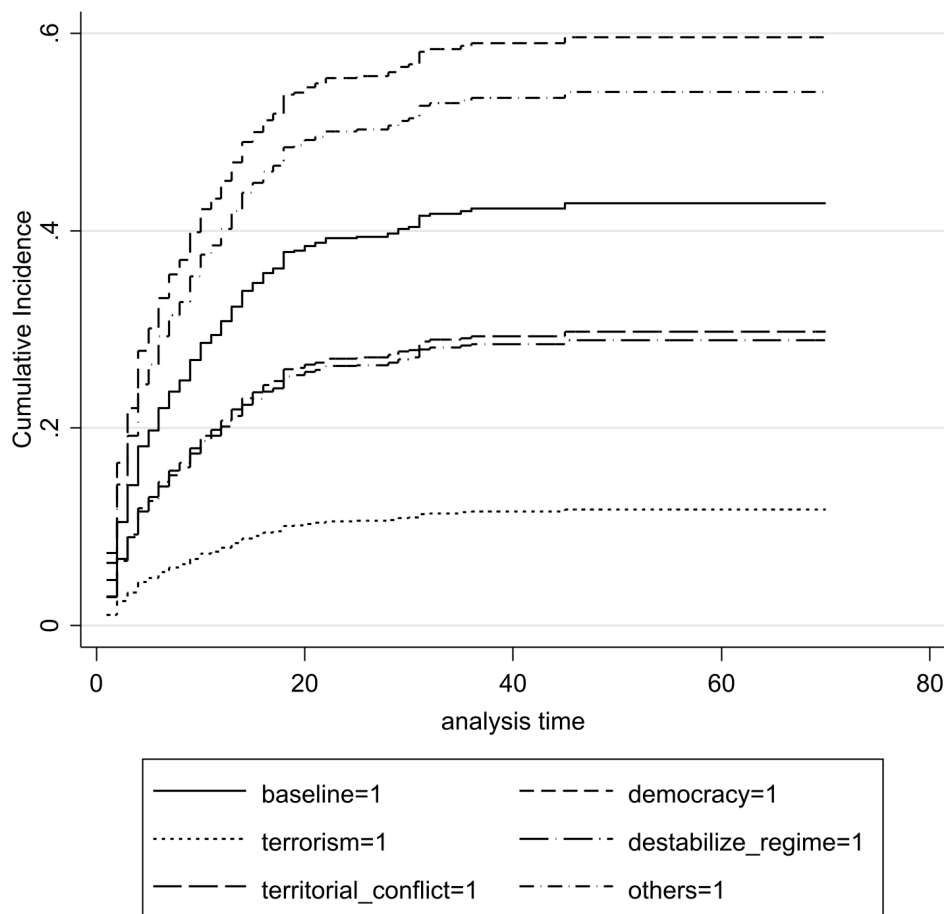
#	Name of the dummy variable	percentage
1	high GDP country	22%
2	low GDP country	46%
3	high trade openness country	7%
4	low trade openness country	35%
5	democratic country	12%
6	autocratic country	39%
7	positive democratic change	31%
8	no data on trade openness	32%
9	simultaneous sanctions	87%
10	US	33%
11	EU	12%
12	UN	8%
13	other alliances	5%

Table 4: Additional variables in percentage

single country simultaneously in the data set. Regarding the countries imposing the sanctions, the United States stands out as the most frequent one, being responsible for one-third of all sanctions during the observation period.

In modelling our results, we address the objectives of the sanctions to examine whether certain objectives are more likely to lead to successful completion than others. Since each sanction is assigned an objective, our data set lacks a suitable control group. Therefore, we first perform a log-rank test of the individual objectives to check whether the success probabilities of the individual objectives differ significantly from the average of all sanctions. The results of the log-rank test, shown in Table 10 in the appendix 6, indicate which objective does differ from the average. As a result we include only the objectives: democracy, destabilization of a regime, territorial conflict, terrorism, and others in our model, because the probability of the chi-squared test is less than 10%. Thus, the remaining sanctions with the objectives of ending a war, human rights, policy change, and preventing war serve as our control groups.

Figure 6.1: Cumulative incidence function on sanctions objectives (Model 1) ending with complete success



Source: own estimation

In the first model in Table 9, we consider the various objectives of sanctions and which objectives are more likely to achieve complete success in the past and which are not. Figure 6.1 shows that some objectives are more successful than others. Specifically, sanctions aimed at promoting democracy are much more likely to result in complete success compared to our control group, the baseline model. Additionally, sanctions with the objective of "others" are more successful. Our analysis cannot determine why these sanction objectives are much more likely to achieve complete success than others, but one reason could be that the sanctions with these objectives are more manageable for the targeted country.

The "others" objective of sanctions indicates that the country imposing the sanction has designed it to address a specific problem. For the sanctioned country, it is likely easier to fulfill this objective, as it is better tailored to the country and the problem. In contrast, sanctions with the "democracy" objective are often imposed after a specific event, such as a military coup or an undemocratic upheaval against an elected president. The aim of these sanctions is to hold democratic elections in the sanctioned country. This was the case with the 2006 sanctions on Fiji or the 1973 sanctions on Chile. The sanctions against Chile ended successfully following Patricio Aylwin's electoral victory over dictator Augusto Pinochet. However, the Fiji sanctions case shows that a change of government is not necessarily the outcome of a successful "democracy" sanction. The military chief, Frank Bainimarama, remained in power after the 2014 election. However, since international observers were admitted to the election and classified it as free and fair, many countries saw no reason to uphold the sanctions against Fiji.

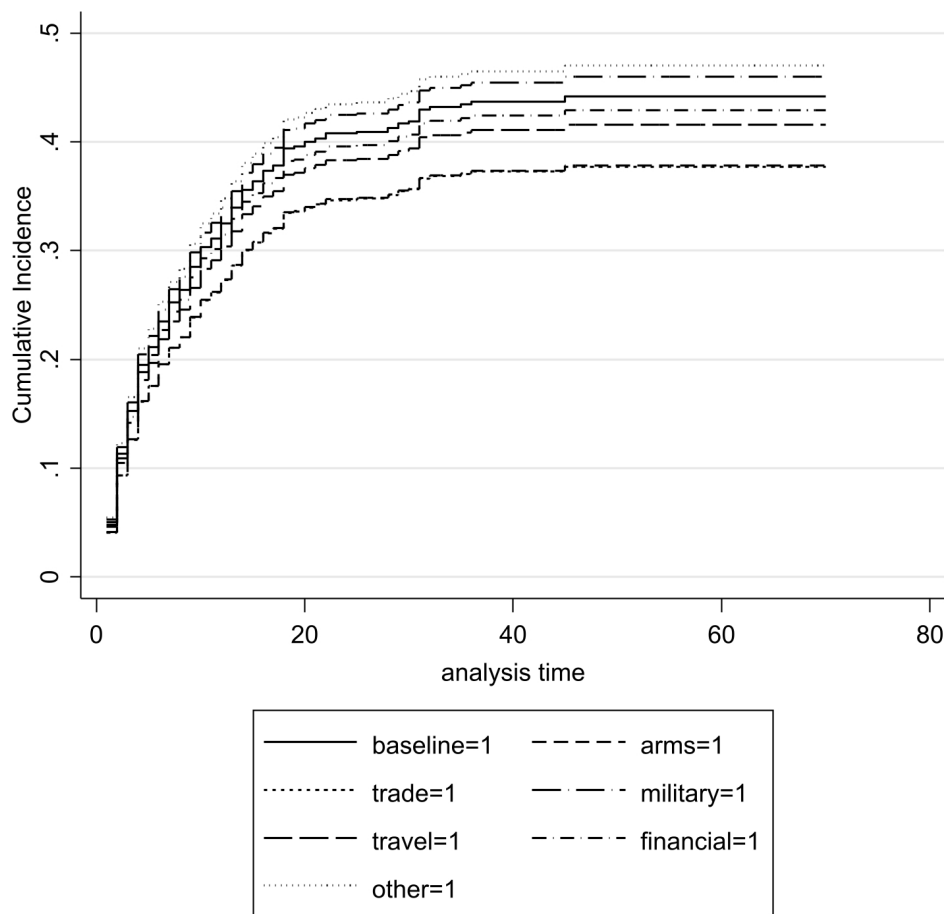
In contrast, total success is less likely for the objectives of "destabilizing a regime", "territorial conflicts", and especially "terrorism". The objective of "terrorism", in particular, is conspicuously underperforming. Sanctions aimed at "terrorism" objectives appear to have very little chance of success. One reason could be the large ideological differences between the sanctioning and the sanctioned country. For example, the 1978 US sanctions on Libya accused Libya of state terrorism and Libya of supporting attacks in Scotland in 1988 and Berlin in 1986. In 2004, the sanctions were cancelled due to a signed nuclear non-proliferation treaty, although the US continued to accuse Libya of state-sponsored terrorism. It would be difficult to persuade the Libyan government to give in, as this would be tantamount to deviating from their *raison d'être*. The goal of "terrorism" is also often used in sanctions against terrorist organizations such as the Taliban, Al Qaeda, or the Islamic State. In these cases a complete success is unlikely. Other objectives that are less likely to be completed with total success than the control group are "territorial conflicts" and

"regime destabilization". These objectives rarely lead to total success due to deep-rooted territorial conflicts between two countries, and the governments of the sanctioned countries knowing that their populations support them. Therefore, they experience less internal pressure to reach these goals of the sanction. In many cases, the two conflicting sides also impose sanctions on one another due to their territorial dispute, in which case, neither party is willing to concede.

The "destabilization of a regime" sanctions were often used to justify imposing sanctions on the other bloc during the Cold War. For example, sanctions were imposed on China in the early 1950s and Vietnam after the Vietnam War. However, these sanctions were mostly unsuccessful because governments would question their legitimacy if they changed their form of government due to a sanction. However, there are examples of the objective of "destabilizing a regime" showing that countries can be persuaded to give in by applying the appropriate sanction type (see Table 12 model (9) and (11)). Arms sanctions, and military sanctions, appear to increase the probability of sanctions destabilizing a regime. The 1977 US sanction against Ethiopia is an example of arms and military sanctions with the objective to destabilize the regime. It is unclear how much this sanction contributed to the regime's defeat against rebels, but the US did achieve its objective of destabilizing the regime and ended the sanctions once the new government was in place.

In the first extension, we focus on the different types of sanction 9 (2). Figure 6.2 shows that most of the different sanction types differ barely from the average cumulative incidence for the total success of a sanction. Only travel and trade sanctions seem less effective than the average cumulative incidence. Including the sanction types in our first model, our results remain robust for the objectives (see Table 9 in appendix 6). Of the sanction types, only the type "trade" is significant. They appear to reduce the probability of sanctions success. This is because trade sanctions usually only sanction specific product groups, so they are less harsh compared to other

Figure 6.2: Cumulative incidence function on sanctions types



Source: own estimation

types of sanctions. Even though all other types are insignificant in this model extension, we keep all types in the further models.

We successively extend our model in the following steps. In the third model we include a year variable for the start of a sanction.<sup>8</sup> With the help of this variable we want to control for a potential time trend. Furthermore, we add a dummy variable for simultaneously active sanctions against one country. With the help of this variable we are able to test the assumption that several sanctions simultaneously can increase the success of the sanctions. Finally, we also control for the effect of different sanctioning parties, restricting ourselves to the most frequently sanctioning

<sup>8</sup>This year variable is based on the year 2019, the final year of our data set, as equal to zero. 1 is added to the variable for each year that is in the past.

countries and organizations (the US, the UN, the EU, and other country alliances).

The result of this model extension shows that UN sanctions and sanctions by country alliances (non-EU) are more promising to end with total success than sanctions from the control group (including individual countries and loose coalitions of states for individual sanctions). Previous work has found that sanctions from a broad alliance and powerful states are more promising than individual countries. UN sanctions are the most significant sanctioning power that a sanction can have. For countries that see themselves exposed to a UN sanction, it is difficult to resist the sanction. We can confirm this assumption in our analysis.

Sanctions imposed by country alliances, e.g. the AU or Mercosur sanctions (non-EU), also seem to effect the sanctions' success positively. An example is the African Union's sanctions against the Central African Republic. The AU sanctioned the Central African Republic in 2003 and 2013, and both sanctions ended in total success. An essential factor in the success of sanctions by country alliances may be their proximity to the sanctioned country (both geographically and culturally). These country alliances probably have more influence on the sanctioned country especially on the government. This pressure favours the success of a sanction.

In contrast, there is no significant effect of EU and US sanctions. Perhaps what these sanctions lack is precisely why sanctions by alliances of countries are often successful, the cultural and physical proximity of the sanctioned country and the sanctioning country. The EU and the US often sanction countries from more distant regions. However, both the US and the EU bring a specific sanctioning power through their overall economic strength. Nevertheless, the influence of the EU and the US in countries outside their hemisphere appears to be more negligible. The year variable and the simultaneous sanction variable do not seem to have any effect. Therefore,

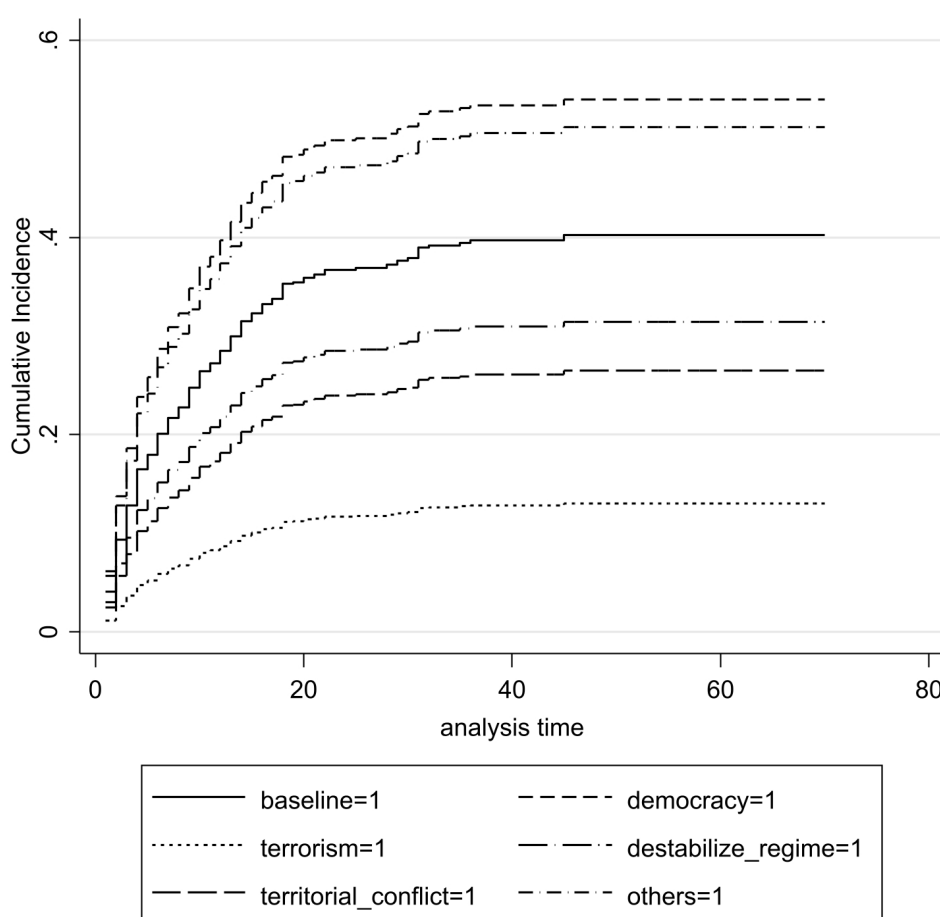
our main result appears to be robust in regard to a possible time trend and multiple sanctions at the same time.

Finally, we extend our first series of models by including the side of the sanctioned countries (see Table 9). We include variables regarding their GDP, democracy index, trade openness, and positive democratic change during the sanction period. It becomes apparent that sanctions against countries with low GDP (<55% of the normalized world GDP) and sanctions against autocracies are less likely to end in total success. Otherwise, the probability of success of sanctions against democracies does not differ significantly from countries we are not assigning to any spectrum. This first result in this model differs from the previous literature. However, the success of a sanction seems to be positively influenced by democratic changes in the sanctioned country. This positive connection can have several reasons. A democratic change usually occurs when a new government replaces a government in a country or when the current government makes concessions. Both can result in sanction objectives being met. Democratic goals may be directly affected when the government makes democratic concessions, possibly also to get rid of this sanction. If there is a change of government, be it a putsch, democratic change of government, or other takeovers, it is usually advantageous for the new government to make concessions on the international stage to legitimize the new government. Likewise, countries with sanctions against the old government want to accommodate and support the new governments. We cannot determine which reasons are ultimately decisive in our analysis, but we can see that democratic change positively affects the probability of a sanction succeeding.

Regarding the inclusiveness of sanctioned countries in the world economy, sanctions against countries less integrated into the world economy are more likely to succeed than those against more integrated countries. This may seem counterintuitive, but it should be noted that the data

set on trade openness is incomplete, and sanctions against countries for which no data is available are less likely to be successful. Mostly isolated countries or countries undergoing political upheaval often do not transmit trade openness and export data; examples include Cambodia under the Khmer regime and Afghanistan under the rule of the Taliban. We try to use data that is not available consistently by checking for missing trade openness data. In our model, sanctions against countries that do not provide data on their exports during the sanction period are far less likely to be successful. This lack of data can indicate that these countries and their governments are so isolated from the rest of the world that they are not interested in sanctions..

Figure 6.3: Cumulative incidence function on sanctions objectives (Model 4)



Source: own estimation



Figure 6.3 presents the cumulative incidence function for the different sanction objectives. We see that our first result remains robust 6.1. "Democratic" and "others" objectives are more likely to end in total success, and "terrorism" and "territorial conflict" are less likely to be crowned with success. However, considering our control variables, the objective of "destabilizing a regime" is no longer significant.

In the last step, we checked whether the objectives that had been excluded due to the log rank test had a significant result in our model with control variables. Therefore, we calculated four separate models that included the four previously excluded objectives 11. Our results showed that the objectives of "human rights", "preventing war" and "policy change" had no significant effect on the total success of a sanction. For the objective "end war", we found a positive effect on the total success of a sanction after including all control variables. We could not evaluate if the result of "end war" was mainly driven by one particular control variable. Instead, it seemed to be the combination of all control variables.

In summary, our results concerning the objectives: democracy, terrorism, territorial conflict, and others remain robust. It does not affect these objectives if we include one of the remaining four objectives in the final model. With the help of this analysis, we manage to show that the different objectives have different probabilities of success.

## **6.2 Differences in sanction types**

Countries issuing a sanction can issue different sanction types to achieve the target. So far, we do not differentiate between different types of sanctions in our models, and we only control for the different sanction types. Our results only generally show which sanction objectives have a higher

probability of success. In a more in-depth analysis, we want to examine whether certain sanction types are more effective for some sanction objectives. For this analysis, we include the objective end war, statistically significant in model 6 11 as the only objective from the control group.

Let us first consider all arms sanctions. 333 (23%) sanctions are declared as arms sanctions of the total dataset, and 110 ended with total success. The results in table 12 show that the trends of different objectives remain similar. The democratic objective is more likely to end successfully, while the terrorism objective is less likely to end successfully. In contrast to our main result, destabilizing a regime is more likely to be ended successfully when weapons sanctions are applied. However, it is not statistically significant because fewer observations on arms sanctions are in the data set. What is remarkable is that “end war” is still positively significant and the group of the “other “objective is in the group of the arms sanctions not significant anymore.

We find several differences from our main result in analyzing all separated sanction types. We find that the objective of “end war “besides arm sanction is only more often successful when a trade sanction is imposed. In comparison, the objective of destabilizing a regime is much more successful when a military sanction is imposed. For the “other “, these sanctions are only above average successful when a trade or a military sanction is imposed. Overall we find that the democracy objective is always positively significant regardless of which sanction type is assessed. Let us briefly highlight which types are particularly effective against which specific countries. It is striking that sanctions against countries in a democratic upheaval are very effective across all types of sanctions. In contrast, financial sanctions appear to be less effective against autocratic countries, and trade, arms, and travel sanctions are less effective against countries with lower GDPs. If we look at the sanctioning countries, we see that UN sanctions only make no significant difference in the case of financial sanctions. We see that UN sanctions are far more effective than any other type of sanction. EU and US sanctions, on the other hand, still do not seem to have a significant impact. Only EU travel sanctions significantly increase the chances of a sanction

being successful. Sanctions from country alliances seem to be highly effective with certain types of sanctions, mainly weapons, travel, and “other” sanctions, leading more often to the desired result.

All in all, differences in the likelihood of the sanction objectives become apparent. Both for the whole data set and broken down to the individual sanction types. In the following chapter of the discussion, we will detail the results and discuss the conclusions we have drawn.

## 7 Conclusion

The present paper aims to examine why sanctions are successful and see differences in sanction characteristics. To do this, we used the newly developed Global Sanction Database. In the sanctions listed here, almost 36% ended with total success. We wanted to take up findings from previous studies that used different methods in our comparative risk analysis. For this purpose, we have extended the GSDB with additional data sources. Regarding the effect of the GDP of the sanctioned countries and their democracy index, we could not falsify the results from the previous studies. However, we determined a positive effect of democratic change in the sanctioned country on the probability of a sanction ending with total success. In addition to verifying the results of other studies using the GSDB, we wanted to verify whether the objectives and types of sanctions predetermine success. Regarding the different sanction objectives, our comparative risk analysis showed that the sanction objectives have different probabilities of success. So the objectives: Democracy, Other and End war are more promising to end with total success.

On the other hand, we have to consider that the objectives of destabilizing a regime, territorial conflicts and terrorism are far less promising. From these results, we can conclude that the objective of a sanction effects the outcome. However, we base our findings on data over the last 70 years. Thus, our results cannot be generalized to every single sanction. A sanction with the proclaimed objective of ending terrorism can end successfully, and a sanction to build democratic values can fail. However, our results suggest that the average odds of success differ between the objectives

As already mentioned, according to our findings, it is at least worth considering whether sanctions are the most appropriate policy tools for sanctions against terrorism. Based on the conclusions of our model, sanctions can be successful. In particular, sanctions with the objective of democracy have a chance to end successfully. We see differences between different sanction objectives, and it is impossible to say that sanctions are a misleading political tool to achieve the desired outcome

of a sanction. Instead, it depends on the pre-circumstances, whether or not sanctions can achieve the objective.

## A Appendix: Frequency tables

Table 5: Frequency table sanctioning state 1

sanctioning state	frequency	sanctioning state	frequency
United States	366	New Zealand	11
EU	123	Spain	11
UN	81	Uzbekistan	11
Norway	51	Commonwealth	10
Canada	47	ECOWAS	10
United Kingdom	44	China	9
Iceland	38	Belgium	6
Liechtenstein	38	Italy	6
Japan	37	Organisation of African Unity	6
Albania	36	Organization of American States	6
Montenegro	36	Venezuela	6
Australia	34	Cyprus	5
Switzerland	33	Saudi Arabia	5
Macedonia	32	South Africa	5
Croatia	31	Arab Rep. Egypt	4
France	30	Finland	4
Russia	30	Greece	4
Moldova	28	Indonesia	4
Germany	27	Korea, South	3
Bosnia and Herzegovina	26	Argentina	3
Serbia	25	Libya	3
Armenia	24	Malaya	3
Turkey	24	Malta	3
League of Arab States	17	Thailand	3
Georgia	16	Austria	2
Ukraine	16	Azerbaijan	2
Denmark	15	Belgium	2
EEC	14	Brazil	2
India	14	Bulgaria	2
Netherlands	14	Cambodia	2
African Union	13	CoCom	2
Soviet Union	13	Czech Republic	2
Sweden	13	Eritrea	2

Table 6: Frequency table sanctioning state 2

sanctioning state	frequency	sanctioning state	frequency
G8	2	Jordan	1
Hungary	2	Kenya	1
Ireland	2	Kimberly Process Participants	1
Israel	2	Kiribati	1
Lithuania	2	Kuwait	1
Mexico	2	Latvia	1
NATO	2	Liberia	1
Romania	2	Luxembourg	1
Slovakia	2	Maldives	1
Slovenia	2	Mauritania	1
South Vietnam	2	MERCOSUR	1
Taiwan	2	NAFTA	1
Afghanistan	1	Nauru	1
Algeria	1	Niger	1
Bahrain	1	Nigeria	1
Burkina Faso	1	Korea, North	1
Central African Republic	1	OAPEC	1
Chad	1	OIC	1
ChinCom	1	Organization of Eastern Caribbean Sta..	1
Colombia	1	Pacific Islands Forum	1
Cominform	1	Paris Agreement Signatories	1
Comoros	1	Peru	1
Congo	1	Poland	1
Costa Rica	1	Portugal	1
CSCE	1	Rwanda	1
Czechoslovakia	1	SADC	1
Ethiopia (excludes Eritrea)	1	Senegal	1
Djibouti	1	Syria	1
Dominican Republic	1	Tanzania	1
FRY	1	Uganda	1
Gambia	1	UNASUR	1
German Democratic Republic	1	United Arab Emirates	1
Hong Kong	1	Yemen, South	1

Table 7: Frequency table sanctioned state 1

sanctioned state	frequency	sanctioned state	frequency
Fiji	29	Niger	10
Iran	29	Israel	9
Pakistan	28	Mali	9
South Africa	28	Portugal	9
Myanmar	27	Sierra Leone	9
Cambodia	24	Soviet Union	9
China	24	Togo	9
Egypt, Arab Rep.	20	Venezuela	9
Libya	20	Zimbabwe	9
France	19	Guinea-Bissau	8
Korea, North	19	Kyrgyzstan	8
Syria	19	Rhodesia	8
Congo, Democratic Republic of the	18	Rwanda	8
Nigeria	18	Yemen, North	8
Yugoslavia	18	Bulgaria	7
India	16	Gambia, The	7
South Vietnam	16	Kenya	7
Sudan	16	Turkey	7
Chile	15	Colombia	6
Haiti	15	Honduras	6
Indonesia	14	Laos	6
Iraq	14	Mauritania	6
Ukraine	14	Nepal	6
Afghanistan	13	Nicaragua	6
Burundi	13	Romania	6
Guinea	13	United States	6
Russia	13	Albania	5
Somalia	13	Algeria	5
Central African Republic	12	Angola	5
Cote d'Ivoire	12	Belize	5
Cuba	12	Dominican Republic	5
Argentina	11	Ecuador	5
Belarus	11	Equatorial Guinea	5
Guatemala	11	Estonia	5
Liberia	11	Gibraltar	5
Peru	11	Palestine	5
Poland	11	Philippines	5
Canada	10	Qatar	5
Eritrea	10	South Sudan	5
Lebanon	10	Suriname	5
Malawi	10	Tunisia	5



Table 8: Frequency table sanctioned state 2

sanctioned state	frequency	sanctioned state	frequency
Uganda	5	Germany	2
Cameroon	4	Ghana	2
El Salvador	4	Hungary	2
Ethiopia (excludes Eritrea)	4	Japan	2
Georgia	4	Korea, South	2
Lesotho	4	Latvia	2
Lithuania	4	Switzerland	2
Moldova	4	Uruguay	2
Panama	4	Zambia	2
Taiwan	4	Liechtenstein	1
Tanzania	4	Antigua and Barbuda	1
Thailand	4	Balkans	1
Transjordan	4	Burkina Faso	1
United Kingdom	4	Congo (Brazzaville)	1
Australia	3	Cyprus (Northern)	1
Brazil	3	Denmark	1
EU	3	Dominica	1
German Democratic Republic	3	ECOWAS	1
Greece	3	Finland	1
Kuwait	3	Grenada	1
Malagasy Republic	3	ICC Rome Statute Signatories	1
Netherlands	3	Ireland	1
North Vietnam	3	Italy	1
Norway	3	Jamaica	1
Paraguay	3	Kazakhstan	1
Tajikistan	3	League of Arab States	1
Turkmenistan	3	Macedonia	1
Uzbekistan	3	Malaya	1
Armenia	2	Malta	1
Austria	2	Mozambique	1
Azerbaijan	2	New Zealand	1
Benin	2	Czechoslovakia	1
Bolivia	2	Saudi Arabia	1
Bosnia and Herzegovina	2	Singapore	1
Ceylon	2	Sweden	1
Chad	2	Terrorist Organizations (Al-Qaeda)	1
Comecon	2	Terrorist Organizations (ISIL and ANF)	1
Costa Rica	2	Terrorist Organizations (Taliban and ..	1
Croatia	2	Terrorist Organizations (Taliban)	1
Cyprus	2	Western countries	1
EEC	2	Montenegro	1

## B Appendix: Main Result - Comparative risk analysis

Table 9: comparative risk analysis models

	(1) objectives	(2) objectives + types	(3) + sender side	(4) + receiver side
democracy	1.835*** (.181)	1.731*** (.176)	1.8*** (.188)	1.673*** (.181)
terrorism	.204*** (.083)	.202*** (.082)	.206*** (.084)	.25*** (.102)
destabilize regime	.593* (.136)	.579** (.135)	.538** (.132)	.718 (.176)
territorial conflict	.618* (.145)	.57** (.133)	.564** (.134)	.583** (.147)
other objective	1.433*** (.218)	1.388**	1.503*** (.244)	1.432** (.244)
trade		.8** (.079)	.805** (.079)	.857 (.081)
arms		.853 (.099)	.817* (.098)	.79** (.085)
military		.979 (.116)	.998 (.118)	.854 (.104)
financial		.872 (.082)	.912 (.086)	.976 (.092)
travel		.964 (.109)	1.01 (.116)	1.156 (.127)
other type		1.138 (.132)	1.08 (.125)	1.138 (.133)
simultaneous sanctions			.927 (.112)	.833 (.102)
year			1.005 (.003)	1.003 (.003)
UN			1.502** (.231)	1.417** (.212)
EU			1.085 (.166)	1.059 (.156)
US			1.147 (.123)	1.018 (.109)
unions			1.711*** (.295)	1.5** (.255)
low GDP country				.691*** (.07)
high GDP country				.975 (.137)
democratic country				.839 (.146)
autocratic country				.809** (.086)
democratic change				2.062*** (.195)
high TO				1.181 (.22)
low TO				1.213* (.134)
nodata TO				.687*** (.087)
Observations	1452	1452	1452	1452
Pseudo R <sup>2</sup>	.z	.z	.z	.z
No. of failed	516	516	516	516
No. of competing	598	598	598	598
No. of censored	338	338	338	338

*Standard errors are in parentheses*

\*\*\*  $p < .01$ , \*\*  $p < .05$ , \*  $p < .1$

Source: own estimation

#	Name of the dummy variable	log rank test p-value
sanction types		
1	arms	0.0001
2	trade	0.0035
3	military	0.5012
4	travel	0.0284
5	financial	0.3504
6	other	0.0887
sanction objectives		
1	democracy	0.0000
2	terrorism	0.0000
3	end war	0.6612
4	human rights	0.2601
5	destabilize regime	0.0001
6	territorial conflict	0.0006
7	prevent war	0.4442
8	policy change	0.8761
9	other sanction objective	0.0003

*Note: When the log rank test result is higher than 0.2 it is highly unlikely that it will contribute to the model.*

Table 10: Log rank test for sanction types and objectives

Table 11: comparative risk analysis models for control objectives

	(5) human rights	(6) end war	(7) prevent war	(8) policy change
human rights	0.874 (.114)			
end war		1.347** (.193)		
prevent war			1.12 (.177)	
policy change				.813 (.134)
democracy	1.579*** (.199)	1.797*** (.206)	1.709*** (.187)	1.625*** (.176)
terrorism	.229*** (.094)	.259*** (.106)	.248*** (.101)	.234*** (.095)
destabilize regime	.667* (.166)	.744 (.184)	.71 (.175)	.656* (.165)
territorial conflict	.532* (.2137)	.592** (.151)	.562** (.143)	.515** (.133)
other objective	1.368* (.241)	1.492** (.259)	1.466** (.254)	1.342* (.24)
trade	.851* (.082)	.866 (.084)	.857 (.083)	.872 (.086)
arms	.814** (.093)	.798** (.091)	.817* (.093)	.81* (.092)
military	.882 (.102)	.866 (.101)	.882 (.103)	.872 (.102)
financial	.973 (.091)	.976 (.092)	.967 (.09)	.964 (.091)
travel	1.16 (.128)	1.156 (.127)	1.164 (.128)	1.165 (.128)
other type	1.152 (.134)	1.138 (.133)	1.15 (.135)	1.138 (.133)
simultaneous sanctions	.85 (.105)	.833 (.102)	.844 (.103)	.827 (.103)
year	1.003 (.004)	1.003 (.003)	1.003 (.003)	1.004 (.004)
UN	1.373** (.207)	1.355** (.205)	1.385** (.212)	1.387** (.211)
EU	1.077 (.16)	1.057 (.158)	1.08 (.16)	1.071 (.159)
US	1.075 (.117)	1.066 (.116)	1.069 (.116)	1.058 (.116)
unions	1.375* (.238)	1.391* (.24)	1.385* (.239)	1.407** (.244)
low GDP country	.705*** (.072)	.681*** (.071)	.705*** (.072)	.69*** (.072)
high GDP country	.955 (.138)	.952 (.134)	.972 (.139)	.985 (.14)
democratic country	.835 (.145)	.868 (.152)	.831 (.146)	.852 (.148)
autocratic country	.801** (.089)	.805** (.088)	.786** (.085)	.776** (.086)
democratic change	2.116*** (.202)	2.116*** (.202)	2.105*** (.2)	2.094*** (.199)
high TO	1.147 (.216)	1.145 (.215)	1.16 (.217)	1.171 (.22)
low TO	1.221* (.134)	1.203* (.133)	1.213* (.133)	1.195 (.133)
nodata TO	.664*** (.086)	.648*** (.084)	.661*** (.085)	.648*** (.085)
Observations	1452	1452	1452	1452
Pseudo R <sup>2</sup>	.z	.z	.z	.z
No. of failed	516	516	516	516
No. of competing	598	598	598	598
No. of censored	338	338	338	338

Standard errors are in parentheses

\*\*\* $p < .01$ , \*\* $p < .05$ , \* $p < .1$ 

Source: own estimation

Table 12: comparative risk analysis models by different sanction types

	(9) arm sanctions	(10) trade sanctions	(11) military sanctions	(12) financial sanctions	(12) travel sanctions	(12) other sanctions
end war	1.558* (.388)	2.734*** (.645)	1.307 (.357)	1.318 (.251)	1.114 (.264)	1.641 (.585)
democracy	2.163*** (.576)	1.913** (.484)	1.909** (.54)	1.641*** (.244)	1.966*** (.496)	2.492*** (.651)
terrorism	0 *** (0)	.514 (.327)	0*** (0)	.266** (.161)	.362 (.246)	.326 (.263)
destabilize regime	1.931 (1.076)	.695 (.327)	2.412** (.931)	.707 (.268)	.878 (.809)	.912 (.515)
territorial conflict	.188 (.207)	.865 (.338)	.428 (.481)	.515 (.363)	.237* (.187)	.991 (.43)
other objective	1.118 (.8)	2.224*** (.597)	2.436* (1.276)	1.181 (.389)	1.667 (.88)	.58 (.362)
simultaneous sanctions	.856 (.366)	.982 (.219)	.393*** (.108)	.783 (.146)	.97 (.377)	.728 (.249)
year	1.007 (.008)	1.006 (.006)	.996 (.01)	1.007 (.006)	1.013 (.01)	1.02** (.008)
UN	1.665** (.207)	1.687** (.369)	2.296** (.728)	1.29 (.319)	2.08** (.655)	3.705*** (1.276)
EU	1.076 (.344)	.971 (.264)	.764 (.33)	1.018 (.19)	1.644* (.466)	1.555 (.952)
US	.764 (.222)	.92 (.188)	1.203 (.352)	.923 (.143)	1.125 (.352)	1.358 (.526)
unions	3.587** (1.802)	.544 (.241)	1.439* (1.502)	1.357 (.413)	4.004*** (1.259)	2.357** (.811)
low GDP country	.568** (.143)	.423*** (.084)	.778 (.205)	.842 (.134)	.485** (.141)	.789 (.192)
high GDP country	.921 (.346)	.932 (.194)	1.085 (.408)	1.225 (.299)	1.032 (.399)	.771 (.267)
democratic country	.393 (.429)	1.497 (.433)	1.348 (.623)	.669 (.207)	.771 (.546)	1.01 (.452)
autocratic country	1.051 (.269)	1.403 (.088)	1.114 (.263)	.635*** (.099)	.785 (.23)	.665 (.177)
democratic change	2.247*** (.54)	2.985*** (.544)	2.743*** (.605)	2.498*** (.331)	5.088*** (1.329)	2.286*** (.557)
high TO	2.027 (.966)	1.03 (.299)	3.128** (1.482)	.881 (.259)	1.221 (.65)	1.152 (.721)
low TO	1.008 (.241)	1.221 (.26)	2.116*** (.59)	1.077 (.172)	.966 (.26)	.985 (.264)
nodata TO	.649 (.214)	.393*** (.097)	1.65* (.483)	.617*** (.111)	.448*** (.13)	.338*** (.097)
Observations	333	514	290	735	319	243
No. of failed	110	158	106	248	94	100
No. of competing	124	229	104	270	88	102
No. of censored	99	127	80	217	137	41

Standard errors are in parentheses

\*\*\* $p < .01$ , \*\* $p < .05$ , \* $p < .1$

Source: own estimation

## C Appendix: Methodology of the spliced GDP dataset

As explained in the text, we use a spliced dataset for real per capita GDP in international dollars to compare countries income levels. The data sources are:

- World Economic Outlook Database (WEO), available at: <https://www.imf.org/en/Publications/SPROLLs/v-economic-outlook-databases>
- Penn World Tables (PWT), available at: <https://www.rug.nl/ggdc/productivity/pwt/>
- Data from the Institute of Health Metrics and Evaluation (IHME), University of Washington, available at: <https://pophealthmetrics.biomedcentral.com/articles/10.1186/1478-7954-10-12>

From these sources, we use the following data lines:

- WEO: Gross domestic product per capita, constant prices, Purchasing power parity; 2017 international dollar
- PWT: Expenditure-side real GDP at chained PPPs (in mil. 2017US\$); divided by population, also from PWT
- IHME: Real GDP per capita IHME ID (2005 base year)

As explained, we splice the data from these three sources going backwards in time. We start with the complete WEO dataset. Where WEO data end, we splice them with the PWT data. Moreover, where PWT data end, we splice them with IHME data. This gives us real per capita GDP data for 196 countries from 1950 through 2026. Figure 17 shows the data, distinguishing data sources by colour and indicating the percentage shares of the data sources. Red denotes WEO data, blue denotes Penn data, and black denotes the IHME data that complete the dataset for the early years.

## D Appendix: GSDB data

We present in this appendix a overview over the case oriented GSDB file, which lists all sanctions cases in the database with one line per case and the country oriented GSDB file. An overview of the file structure is provided in Table 13 and Table 14, using the `info()` function of the Python pandas package.

#	Column	Non-Null Count	Dtype
0	case id	1101 non-null	int64
1	sanctioned state	1101 non-null	object
2	sanctioning state	1101 non-null	object
3	begin	1101 non-null	int64
4	end	1101 non-null	int64
5	trade	1101 non-null	int64
6	descr trade	407 non-null	object
7	arms	1101 non-null	int64
8	military	1101 non-null	int64
9	financial	1101 non-null	int64
10	travel	1101 non-null	int64
11	other	1101 non-null	int64
12	objective	1101 non-null	object
13	success	1101 non-null	object

Table 13: GSDB – Case-oriented presentation (Python pandas info)

Currently, there are 1101 sanctions cases. Each case is divided into 14 columns, beginning with the ID number of the case and continuing with the name of the sanctioned state (which could also be a non-state entity such as ISIS, more on this below) sanctioning states or non-state entities. The latter include international organizations like the UN, EU, African Union etc. The columns ‘begin’ and ‘end’ show the first and last year of the sanctions case. Columns 5 and 7 through 11 are indicator variables for the respective types of sanctions. If the case comprises trade sanctions, column 6 informs about the scope of the sanctions, with a

4-way distinction between export vs import sanctions and partial vs complete sanctions. The ‘ob-

jective' column distinguishes ten objectives, namely democracy, regime destabilization, end war, prevent war, human rights, policy change, territorial conflict, terrorism and an unspecified residual category ('others'). The 'success' column distinguishes between failure, negotiated settlement, ongoing sanctions (in the last year of the database), partial and total success.

#	Column	Non-Null Count	Dtype	The country-oriented GSDB file lists country pairs involved in sanctions cases on an annual basis. The pandas' information on the file is provided in Table 14. It is immediately evident that this file is much larger than the case-oriented file, even though it is based on a query from the same database. The country-oriented file has 137697 rows, whereas the case-oriented file has 1101 rows (equal to the number of cases currently in the database). There are two reasons for this difference in size.
0	case id	137697 non-null	int64	
1	sanctioning state iso3	137691 non-null	object	
2	sanctioning state	137697 non-null	object	
3	sanctioned state iso3	131102 non-null	object	
4	sanctioned state	137697 non-null	object	
5	year	137697 non-null	int64	
6	arms	137697 non-null	int64	
7	trade	137697 non-null	int64	
8	military	407 non-null	int64	
9	trade	137697 non-null	int64	
10	descr trade	51963 non-null	object	
11	financial	137697 non-null	int64	
12	travel	137697 non-null	int64	
13	other	137697 non-null	int64	
14	objective	137697 non-null	object	
13	success	137697 non-null	object	

Table 14: GSDB – Country-oriented presentation (Python pandas info)

First, the sanctions cases are broken down into single years for their duration in the country-oriented file.



Second, the column sanctioning state in each row of the country-oriented file shows exactly one country and not (as in the case-oriented database) groups of countries and/or non-state entities (e.g. international organizations). This is because, in the country-oriented file, international organizations are broken down into their member countries. A sanctions case with the EU as sanctioning entity and five years thus result in five consecutive years for each EU member country. This, combined with the fact that the EU and UN are among the most frequent participants in sanctions cases, leads to a multiplication of entries compared to the case-oriented file. The country-oriented GSDB file also provides ISO-3 codes for each sanctioning and sanctioned state. This is important for linking the data from this file with the case-oriented file and GSDB with other country-oriented databases such as, e.g. the IMF WEO database. Apart from this, the country-oriented sanctions file contains essentially the same information as the case-oriented file.

GDP data are important for understanding the economic environment in which sanctions occur and investigating their economic effects. GDP data are not the only economic data needed, but they are the most basic. The GSDB sanctions database covers ... countries during the years 1950 through 2019. GDP for this scope of countries and this long time period is not available as a ready-made dataset. We, therefore, construct our dataset with complete GDP data to match the sanctions data. We refer to this as the IPW dataset for reasons to be explained. Its sources are:

- The latest available data from the IMF's World Economic Outlook database (WEO database).
- The latest available data from Penn World Tables, currently available in Version 10 (PWT 10.0)
- Data compiled by a team at the Institute for Health Metrics and Evaluation (IHME) at the University of Washington, which provide comprehensive time series of GDP per capita for 210 countries from 1950 to 2015.

The dataset is publicly available for download, with the methodology summarized in the accompanying article.<sup>9</sup> This dataset draws on other resources, notably also the WEO database and Penn World Tables. For earlier years, where these sources provide no information, it also uses other sources, particularly the historical data on economic activity compiled by Angus Maddison.<sup>10</sup> Here is a summary of how these three data sources were combined to give the IPW dataset. Details are found in the appendix. We proceed according to the following rules:

1. From all three data sources, we use real per capita GDP in international dollars.
2. We use the complete IMF WEO database, going back in time as far as data are available for each country (which differs between countries).
3. Where WEO data end for a given country, we splice the WEO series with its PWT series, going backwards with annual growth rates.
4. Where PWT data end (or where none are available), we splice the data with the IHME data, again going back with annual growth rates. Since data from IHME are consistently available back until 1950, this ensures that we eventually arrive at a complete data set stretching from the latest WEO data back to 1950.

The acronym IPW for the resulting dataset is derived from the initials of the three data sources in the time sequence in which they enter the dataset: first IHM, then Penn World Tables, and finally and for the most part, the WEO database. The IPW dataset provides data for 192 countries from

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<sup>9</sup>James, S.L., e.a., 2012, Developing a comprehensive time series of GDP per capita for 210 countries from 1950 to 2015, *Population Health Metrics* 2012, 10:12. URL: <http://www.pophealthmetrics.com/content/10/1/12>

<sup>10</sup>Cf. the web page of the Maddison project for more information:  
<https://www.rug.nl/ggdc/historicaldevelopment/maddison/>

1950 through 2026, where the data at the end are WEO projections. 56 % of the data are from the WEO database, 24 % are from the Penn World Tables, the remaining 20 % are from the dataset compiled by the IHME team.

We used IPW data in two versions:

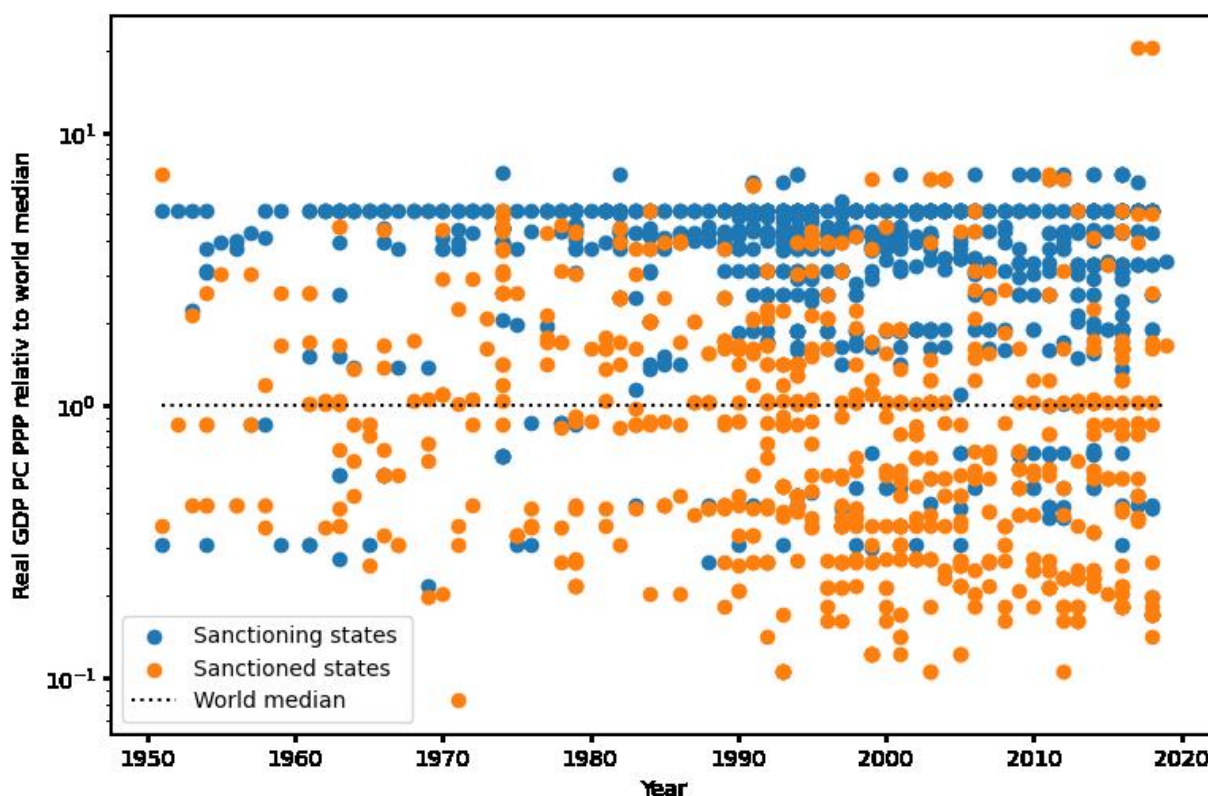
(a) As detailed above, per capita real GDP data is in international dollars.

(b) In a detrended version, we obtain by dividing each year's data under (a) by the annual median across countries. The detrended data have a constant median of 1 each year and thus show only deviations from the median.

## E Appendix: Linking GSDB with GDP data

In this chapter we want to provide a deep insight in the GSDB database and combine data from the sanctions database GSDB with data on real per capita GDP in the occupied countries. Sources and methodology for our GDP data were described in [D](#), so we proceed directly to the results. There is a host of questions that can be addressed concerning the link between international sanctions and economic activity, but here we focus solely on one aspect, namely the relative per capita GDP of countries involved on the sanctioning side and the sanctioned side. Which side has the higher GDP per capita, the sanctioning side or the sanctioned side? Or are there no observable differences?

Figure E.1: Relative GDP per capita for sanctioning and sanctioned countries (case averages)

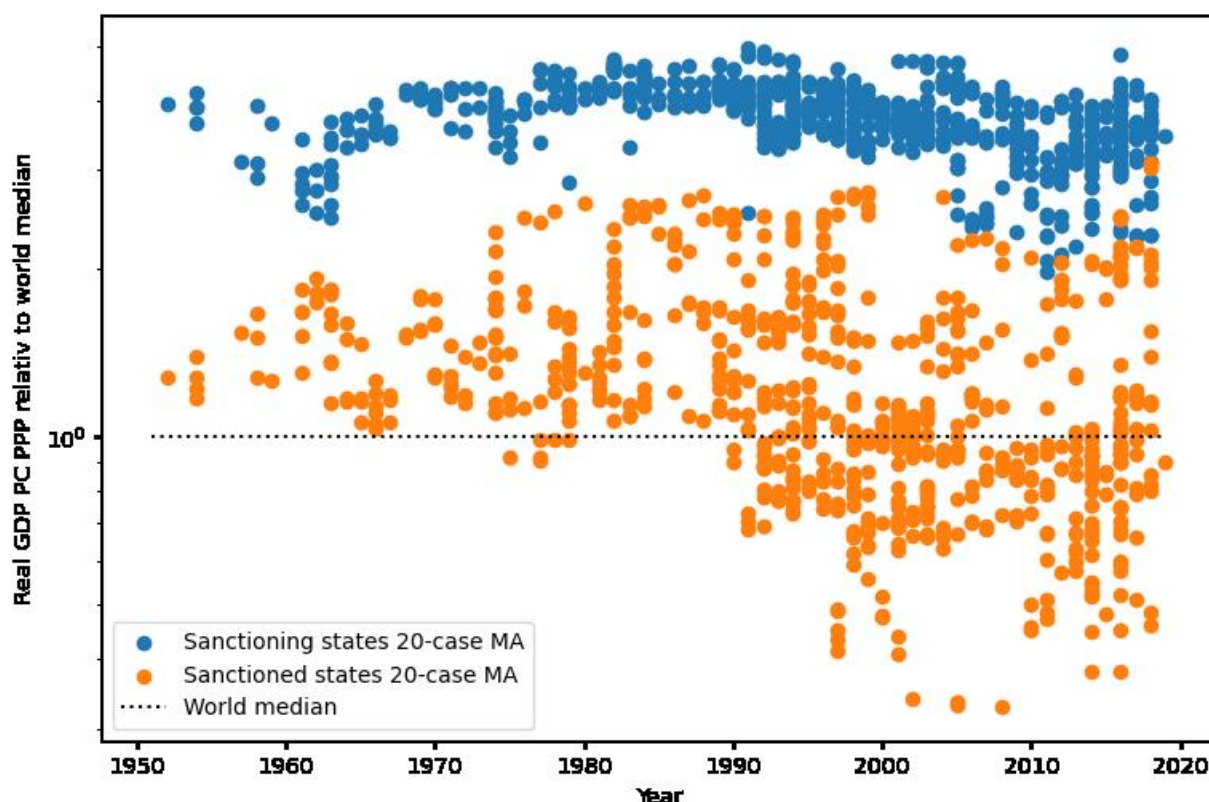


Source: GSDB V2 and IPW data

To answer these questions, we first adopt a case-oriented view. If a sanctions case lasts, say, from 2005 to 2010, we compute the average per capita GDP for the sanctioning countries and the sanctioned country from 2005 through 2010. We use detrended GDP data to focus exclusively on

the relative difference in per capita GDP. This means that each year's world median of the data stays at one, and the data express only differences from this median. The results are presented in Figure E.1 and Figure E.2, which both use log scales.

Figure E.2: Relative GDP per capita for sanctioning and sanctioned countries (case averages)

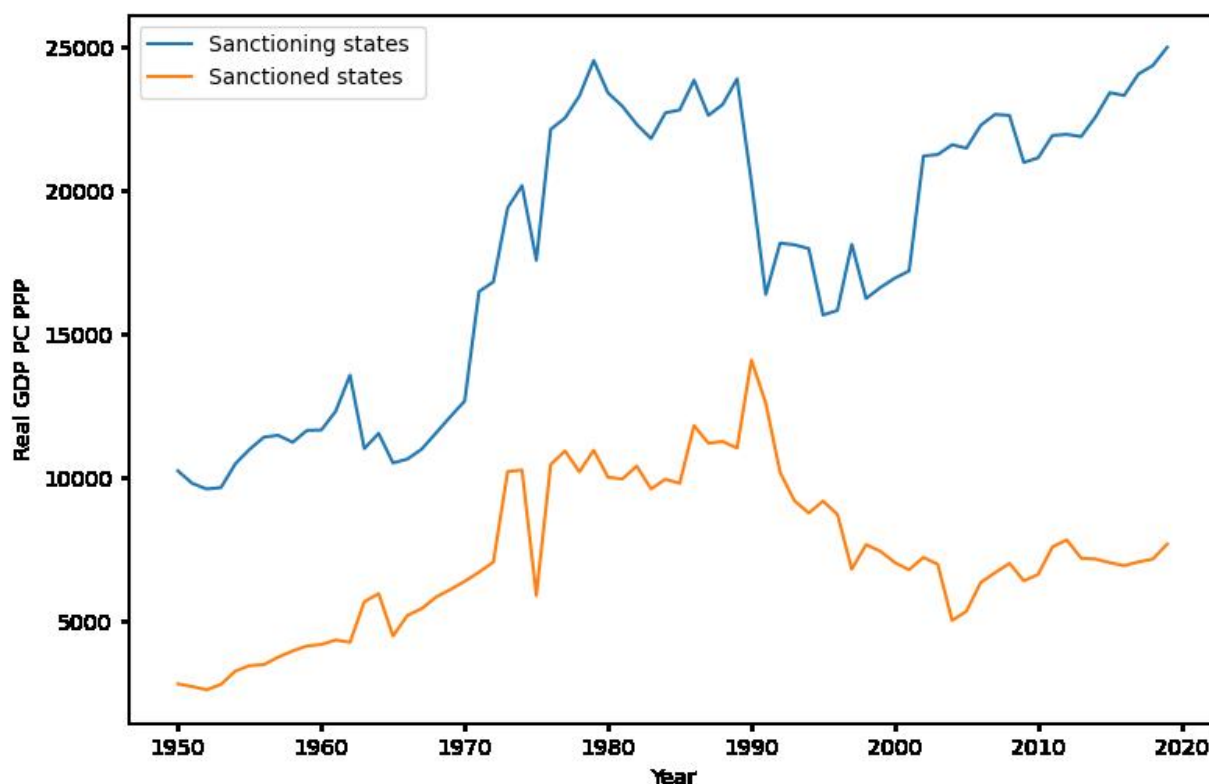


Source: GSDB V2 and IPW dataset (see appendix)

The difference between the figures is that Figure E.1 shows the raw case averages while Figure E.2 smooths the raw case averages with a moving average of 20 cases. The raw data in Figure E.1 reveal substantial heterogeneity in the per capita GDP data of countries involved in either side of sanctions cases. A few stylized facts suggest themselves. Heterogeneity increases with time and affects both sides of sanctions cases. Sanctioned countries, at least initially, seem to be equally present above and below the world median, but with the years, the share of countries below the median increases. On the other hand, the larger share of sanctioning countries is above the median, even though they are below. These stylized facts are confirmed if we look at the same data smoothed with a 20 case moving average. We now clearly see a level difference in

the per capita GDP of sanctioning and sanctioned countries. Sanctioning countries, on average, clearly have higher per capita GDP than sanctioned countries, and as a group, they are more homogeneous than these.

Figure E.3: Real GDP per capita for sanctioning and sanctioned countries (annual averages)



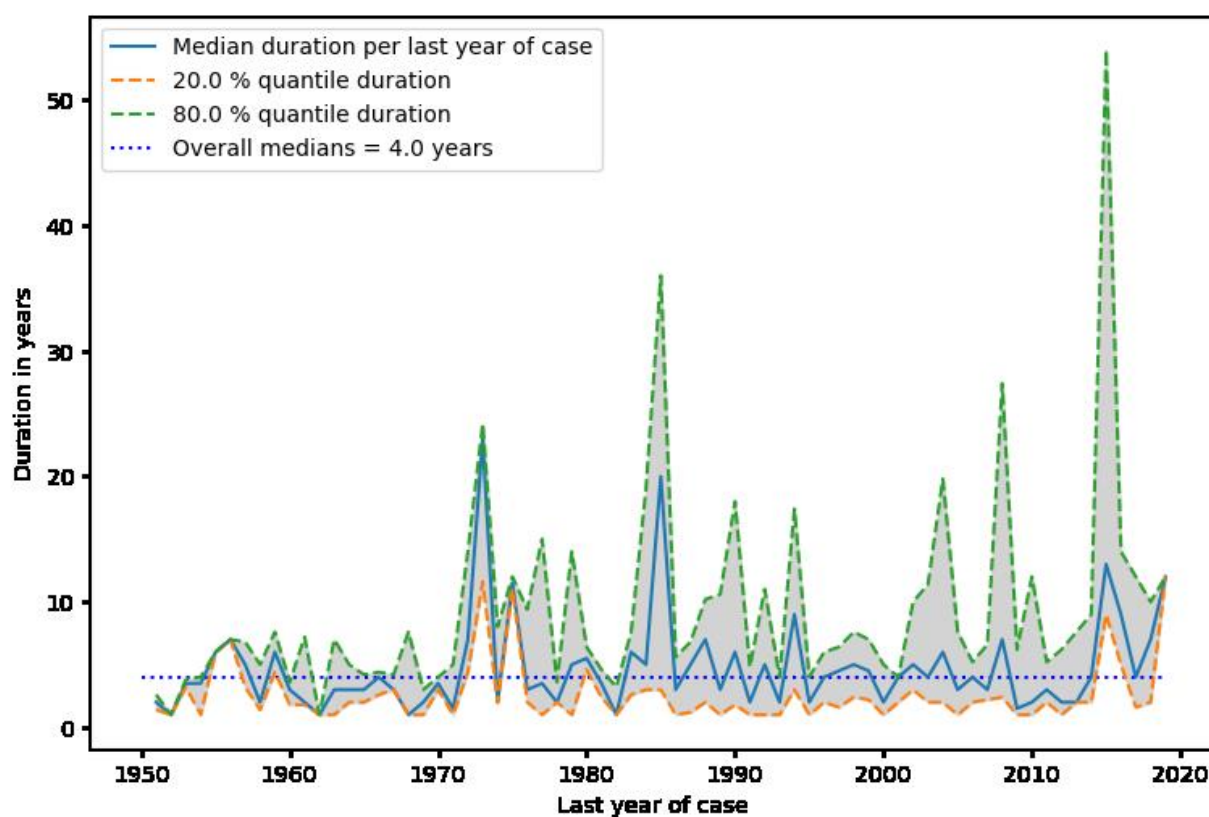
Source: GSDB V2 and IPW data

To crosscheck the stylized facts from these two figures, Figure E.3 presents per capita GDP data from a country-oriented perspective (as opposed to the case-oriented perspective just discussed). Our approach here is to identify all sanctioning-sanctioned country pairs in a given year, regardless of what case they belong to, and compare the two countries' GDPs. The results are then averaged within each year. Since we do not average the duration of each case (which may span decades), we do not detrend the GDP data. So the data shown are per capita GDP in PPP USD. Figure E.3 confirms the stylized facts of the previous two figures and adds new insights. First, the per capita GDP of sanctioning countries is higher than that of sanctioned countries. This result holds in all years. In 1990 we see the two lines approaching each other, only to diverge again

in the following years. The convergence in 1990 is probably due to the expansion in multilateral sanctioning activity, particularly sanctions issued by the United Nations. This then counts all UN member countries among the sanctioning countries. Since most of them lacked at the time, this resulted in a drop in the average income of sanctioning countries. After 1990 this effect disappeared again, and the GDP gap between sanctioning and sanctioned countries widens again. While per capita GDP in sanctioning countries continues to grow, per capita GDP in sanctioned countries stagnates at a low level.

## F Appendix: Quantiles of case duration per last years of cases

Figure F.1: Quantiles of case duration per last years of cases



Source: GSDB V2, case-oriented file

Figure F.1 presents basic statistical information on the duration of cases. We see that the median duration hovers around four years, while the 20 per cent quantile is close to 1 year for most cases. The 80 per cent quantile increases with the years, reflecting the expanding period at which observed duration are truncated.



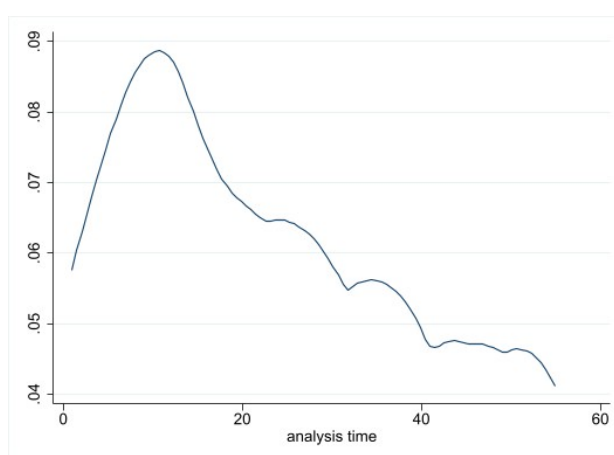
## G Appendix: smooth hazard function

In this chapter is our goal to understand the process of a sanction. To do this, we use the hazard history of sanctions. We distinguish between four different possibilities for a sanction to end:

- (a) The positive event when a sanction ends successfully.
- (b) The counterpart if a sanction fails as a harmful elimination of a sanction.
- (c) Sanctions that are eliminated, because the result is still open, but negotiations between the participating countries were started.
- (d) As a last neutral option, we include all sanctions that have ended, so they no longer run regardless of their positive or negative outcome.

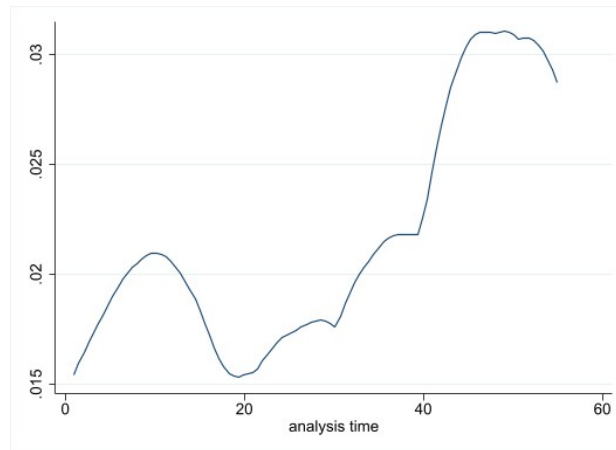
We consider first option (d). As we can see in Figure G.1, the probability that a sanction will end is not constant over time. For a sanction it is most likely it finish in the first 15 to 20 years, with the highest probability after around ten years with 9%. After that, the probability decreases progressively.

Figure G.1: Smoothed hazard estimate - ended sanctions



Source: Own estimation on the GSDB

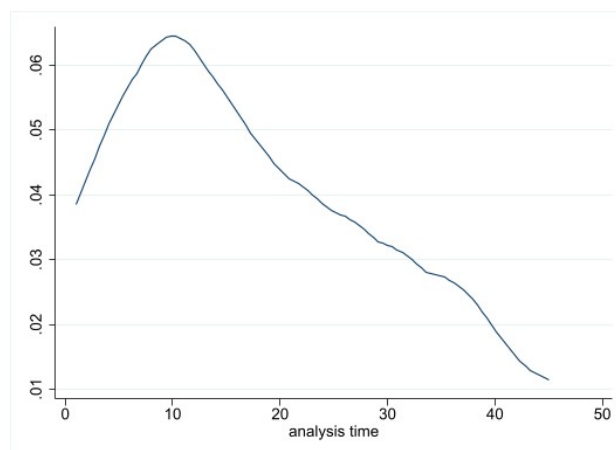
Figure G.2: Smoothed hazard estimate - failed sanctions



Source: Own estimation on the GSDB

Figure G.2 displays the probability that a sanction will end with a failure. We see that failed sanctions have a higher probability of ending in the first couple of years, like all sanctions in general. It is evident, however, that the probability is higher after the first 40 years the sanction has been placed. A possible reason for this higher probability may be that after such a long time, it may be unlikely that the sanction will still be successful, so the sanctioning countries cancel it accordingly.

Figure G.3: Smoothed hazard estimate - successful sanctions

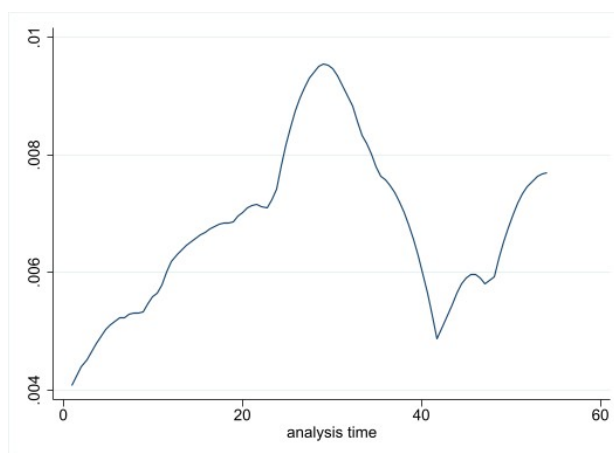


Source: Own estimation on the GSDB

Figure G.3 displays the hazard of successful sanctions. Here an adverse trend of the probability can be seen in comparison to the trend of failed sanctions. According to this, it is most likely

that sanctions end successfully in the first 10 to 15 years; thereafter, the probability decreases continuously.

Figure G.4: Smoothed hazard estimate - sanctions under negotiation



*Source:* Own estimation on the GSDB

At last, we look at the hazard for option (c). It is initially not clear to us if the initiated negotiation will lead to a success or a failure of the sanction. Figure G.4 shows that it is most likely that negotiations will start after 30 years the sanction has been in place. This is a relatively late point in time compared to successful sanctions.

In summary, we state that sanctions generally end within the first 10 to 20 years. During this period, most sanctions succeed; only after 40 years does the probability of a sanction failing surpass the probability of success. Only a few sanctions have the status of "Negotiations Started", as these negotiations aim to achieve either a positive or negative result.

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