Pain and Gain: The Short- and Long-run Effects of Economic Sanctions on Growth*

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Abstract

We study the impact of sanctions on per capita GDP in target countries and make four contributions to the literature. First, we demonstrate that standard OLS estimates overstate the negative impact of sanctions and propose a novel instrumental variable (IV) strategy to address the issue of endogeneity. Second, we find that the average estimates of the impact of sanctions contain significant heterogeneity and treat this issue by studying the differential effects of the types of sanctions considered (e.g., trade sanctions have significantly stronger negative impact on growth as compared to smart sanctions). Third, we quantify the effects of sanctions in the short and long runs and show that trade sanctions impede contemporaneous and, to a lesser degree, long-run growth. In contrast, smart sanctions have no impact on growth in the short run but, interestingly, they promote long-run growth. Fourth, we explore possible mechanisms through which sanctions affect growth and unveil the presence of several intuitive patterns.

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Keywords: Economic sanctions, Economic growth

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1 Introduction

Especially since World War II, but more so nowadays, individual states and groups of nations have embraced economic sanctions as instruments of coercive diplomacy to achieve their foreign policy objectives. History is replete with examples of trade sanctions (e.g., trade embargoes and economic blockades). In the past two decades, however, policymakers have expressed a distinct preference for "smart sanctions" (aka targeted sanctions), that include financial restrictions and travel bans aimed at political figures and powerful elites in targeted states that could influence policy. A central question in this context – and one that has attracted the attention of countless intellectuals, researchers, policy analysts, government leaders and pundits – is whether these "weapons" of choice are "effective" in achieving their professed goals. One consequence of this has been the emergence of a vibrant, controversial, and expanding literature purporting to address salient aspects of this problem.

Since, by their very definition, economic sanctions are punitive measures that aim to alter the behavior of policymakers in targeted states, a number of analysts have contended that the actual and/or threatened use of sanctions should engender compliant behavior by recalcitrant leaders of targeted states. Critics of this view (e.g., Pape (1997); Kaempfer and Lowenberg (1988); Haass (1997)) assert that sanctions are destined to fail because the sender countries' demands often conflict with the interest of the target countries' representatives and, in any event, are difficult to implement. Numerous other scholars have participated in a lively – and occasionally contentious – exchange of ideas. We contribute to this debate by subjecting the issue of the efficacy of sanctions to rigorous scrutiny. Specifically, paying special attention to the differential effects of trade and smart sanctions over time, we study empirically the impact of economic sanctions on target countries' real income.

Expectedly, the impact of economic sanctions on GDP growth has attracted the attention of the media as well as the scholars and practitioners of foreign policy. However,

while the standard prediction is that sanctions damage economic growth in target countries, the extant empirical evidence is mixed. For example, Shin et al. (2016), who set out to study the extent to which sanctions "impair" target economies, find that "[a]ll of these variables (US, US case, unilateral, and multilateral sanctions) fail to achieve significance, indicating that none of these sanctions, regardless of the economic indicator, hinders the performance of target economies in a meaningful way" (p. 492). Similarly, focusing on smart sanctions, Rosenberg et al. (2016) report that these sanctions "...are correlated with stronger growth relative to the target's peer economies, though this result is not statistically significant" (p. 18) and conclude that "...sanctioned countries do not suffer significant costs as measured by lost economic growth" (p. 15). In prior research, Hufbauer et al. (2008) assessed the impact of bilateral and multilateral sanctions on the target countries' GDP. Emphasizing the contraction of their foreign trade and investment flows, they report sizable reductions in these countries' GDPs. More recently, Felbermayr et al. (2019) study the heterogeneous and general equilibrium effects of terminating the US, EU and UN sanctions on Iran and show, among other things, that Iran's per capita income would rise by about 4.2%. Neuenkirch and Neumeier (2015), also explore econometrically the effects of multilateral UN and unilateral US sanctions on the rate of economic growth in target states. Their findings suggest that, on average, the UN sanctions reduce a targeted country's per capita GDP growth rate by 2.3-3.5%. Moreover, their analysis suggests that the effects of comprehensive UN sanctions bring about a more than 5% reduction in real GDP growth in a target country, whereas the corresponding effects of US sanctions are smaller in magnitude and less lasting.

With the help of the Global Sanctions Database (GSDB) developed by Felbermayr et al. (2020), which contains a comprehensive coverage of sanctions during 1950-2016, we study the effects of economic sanctions on GDP per capita in target countries and contribute to the literature in the following ways. First, and foremost, we recognize the inherent endogeneity problem associated with unobserved variables (that confound the outcomes of

interest) in targeted countries; we demonstrate that standard ordinary least square (OLS) estimates overstate the negative impact of sanctions; and then, to tackle the endogeneity issue, we propose a novel instrument variable (IV) strategy. The construction of our instrument variable is based on interactions among the sender countries' time-varying sanctions aggressiveness with predetermined sender-target country ties. The rationale behind this IV strategy is that target countries experience variation in the number of sanctions partly driven by *sender* countries' variation in institutions and diplomatic policies, which can be seen as exogenous to the target country's economic growth. Second, motivated by the salience of trade and smart sanctions in actual (especially post 2000) foreign policy and our empirical finding that the average estimates of the impact of aggregate sanctions contain substantial heterogeneity, we study the differential impact of these types of sanctions on GDP per capita. Third, acknowledging the possible differentiation in the duration of the effects of these sanctions, we study their short- and long-term effects. Lastly, building on our long-term findings, we explore the possible relevance of several socioeconomic mechanisms (including, for example, trade openness, TFP, human capital and democracy) through which sanctions could potentially GDP affect growth.

The idea that the imposition, choice of specific instrument(s), extent and breath of sanctions may be endogenous is familiar from the political economy of trade policy. For example, Kaempfer and Lowenberg (2007) address this issue theoretically with the help of an interest group model in their survey of the literature on economic sanctions. In that contribution they also emphasize the empirical challenges that researchers are likely to face. However, the empirical application of this idea in the context of sanctions seems to be relatively new. As Gutmann et al. (2019) put it in their work on the effects of US sanctions on human right, an important drawback of empirical models in this area is that they "ignore" the "potential endogeneity of economic sanctions" (p. 2).[1] Our work differs

[1]Gutmann et al. (2019) address this issue by employing an endogenous treatment model. Specifically, they use as instruments the potential target country's geographical and genetic distance from the US, as well as its voting alignment with the US in the UN General Assembly (UNGA). Neuenkirch and Neumeier (2015) are also aware of the endogeneity problem and attempt to address by reducing the control sample. In their

significantly in the way we treat this problem.[2]

The inherent endogeneity problem between the imposition of sanctions and the economic growth in target countries is not difficult to understand. International sanctions are generally triggered by a series of events that disrupt usual economic activities and raise macro-economic uncertainties. For example, UN sanctions on South Africa in 1963 and those on Iraq in 1990 are triggered by South Africa's apartheid regime and Iraq's invasion on Kuwait. Presumably, the apartheid regime, the war against Kuwait and any other factors leading to economic sanctions cause a (negative) spurious correlation between the target country's GDP per capita and imposition of sanctions.

Our empirical analysis confirms the above ideas. Starting with an ordinary least squares (OLS) estimation of the aggregated effect of sanctions on economic growth, we find that this estimation method generates an estimate of 0.23 percent reduction in the contemporaneous level of GDP per capita due to an extra sanction. In contrast, our IV estimation results reveal that an additional economic sanction leads to 0.19 percent reduction in the contemporaneous level of GDP per capita, which is lower in magnitude than the OLS estimate. Interestingly, and in broad agreement with the existing literature, our long-run (10 years) IV results suggest that sanctions in general do not have a significant effect on the target country's level of real income.

The remainder of the paper is organized as follows. Section 2 provides a brief overview of the deployment of sanctions since the 1950s. Section 3 discusses the endogeneity problem associated with the conventional OLS estimation approach and presents our IV strategy. Section 4 describes our data source and provide summary statistics. Section 5 presents our estimation results, and Section 6 concludes.

exploration of effects of sanctions on poverty, Neuenkirch and Neumeier (2016) address the endogeneity of sanctions by employing a "nearest neighbor matching approach."

[2]We believe our IV strategy has much broader implications than just properly quantifying the impact of sanctions on GDP per capita. In fact, as we demonstrate in the mechanism section, the IV approach applies and should be used to treat pretty much all country-specific political and economic outcomes. In addition, it should also be applied (even more directly because we do not need to aggregate to the country level) to bilateral specifications, e.g., trade, FDI, migration.

2 Evolution of Sanctions

This section provides some background on the evolution and types of sanctions to rationalize our IV strategy. We start by defining several terms that are widely used in the related literature. Following Cortright and Lopez (2002), we introduce the concept of "smart sanctions" (a.k.a. targeted sanctions) that contrast sharply to trade sanctions. Then, we describe the evolution of international sanctions by type and senders. We document the presence of systematic shift based on prioritized types and frequencies of sanctions from key senders since the 1950s. This change can be traced to regulatory and geopolitical changes over time, a key point that motivates our IV strategy.

2.1 Types of Sanctions

Depending on their specific measures, sanctions are usually classified into 6 categories: trade sanctions, financial sanctions, travel restrictions on individuals, restrictions on arms sales, cease in military assistance (other than direct arms sales) and others. Motivated by the distinction in the related literature between trade sanctions and smart sanctions (Drezner, 2011; Rosenberg et al., 2016), we group the 6 types of sanctions into the following 3 broader categories, which we use in our empirical analysis: (i) trade sanctions, (ii) smart sanctions which, following Rosenberg et al. (2016), combine financial sanctions and travel restrictions, and (iii) other sanctions that include arms embargoes, military assistance, and other sanctions from the original GSDB classification. Table 1 provides the definition for each type of sanctions.

Smart sanctions refer to types of sanctions that target politically sensitive individuals and entities. The most prominent examples of smart sanctions include financial sanctions and travel bans, c.f., (Drezner, 2011) and Rosenberg et al. (2016). In general, and consistent with (Hufbauer et al., 2008), we find that travel restrictions are usually imposed in addition to financial sanctions against key foreign individuals. In our data, which we

Table 1: Types of Sanctions and Their Definitions

Trade sanctions are defined as measures that aim to restrain economic interactions with a target country by limiting international trade.
Financial sanctions involve freezing the exchange of financial assets and investments. Foreign assets can be frozen as a while or partially for certain individuals, influential politicians or leaders in industry (targeted sanctions).
Travel restrictions restrict the freedom of geographical movement of individuals. The GSDB identifies: (1) travel restrictions for people into the sender country; and (2) journeys from the sanctioning to the sanctioned country.
Other types of sanction include primarily arms embargo, military assitance restrictiosn, diplomatic measures as well as flight and harbor restrictions.

describe below, travel and financial sanctions have the highest pairwise correlation coefficient of 0.77. An advantage of combining these sanctions is the provision of a more transparent head-to-head comparison with trade sanctions in terms of their outcomes.

It is known that trade sanctions impose overly high economic and humanitarian costs to the target country. A prominent example of trade sanctions is the UN's trade embargo on Iraq in 1990 following its invasion of Kuwait. This embargo was unprecedented in its comprehensiveness of coverage and almost all UN countries participated without exception. Studies estimate that pre-Gulf War trade sanctions cost Iraq around half of its GDP; post-Gulf war sanctions cost Iraq between 175 bn and 250 bn USD in oil revenues (O'Sullivan, 2004; Rosenberg et al., 2016). In a more recent study, Felbermayr et al. (2019) quantify the damage of the sanctions on Iran to be about 4.2 percent of it real expenditure.

We also note that there has been a significant change in the popular types of sanctions. In Table 2, we depict the total number of different types of sanctions in every decade since 1950. Clearly, trade sanctions were the most commonly used type of sanctions in the 50s and 60s. In the 70s and 80s, trade and financial sanctions were almost equal in

their frequency of use. Since the 90s, however, financial sanctions became by far the predominant type of sanctions.

Table 2: Popularity of Different Types of Sanctions

		smart sanctions		
period	**trade**	**financial**	**travel**	**other**
1950-59	**18**	8	6	2
1960-69	**23**	15	4	13
1970-79	35	**38**	2	9
1980-89	**48**	47	19	10
1990-99	53	**133**	24	40
2000-09	46	**77**	58	31
2010-16	55	**89**	54	20

Notes: This table displays the total number of different types of sanctions initiated in every decade. The most popular type of sanctions in a decade is bold-faced. Source: Global Sanctions Data Base (GSDB).

Previous contributions to the literature suggest the presence of several contributing factors to the rise of financial sanctions. Prior to 1990, the "brute force" theory of sanctions – according to which sanctions become more effective if greater economic costs are imposed on the target – enjoyed extensive popularity among top sender countries. However, since the early 1990s governments have realized that trade sanctions inflict large humanitarian costs to targets (Drezner, 2011) and impose extensive monitoring costs to the senders (Andreas, 2005).[3] In comparison, international financial sanctions have been facilitated by the Interlaken Process sponsored by the Swiss government in 1998 (Gordon, 2011) and the dominant role played by the US in the international financial system (Gottemoeller, 2007).

Table 2 also shows that three other types of smart sanctions – travel restrictions, arms embargos and military assistance restrictions – have also gained popularity since the 1990s. This is partly due to senders' abstinence from trade sanctions; it has also been

[3] A case in point is the UN sanctions on Iraq in 1990.

facilitated by the "Bonn-Berlin Process" that was jointly proposed by the German foreign office, the UN Secretariat and the Bonn International Centre for Conversion in 2000 (Brzoska, 2001). Bonn-Berlin Process lays out the basic framework to design and implement arms embargo and travel bans. In 2004, the council of the European Union issued "Basic Principles on the Use of Restrictive Measures (Sanctions)", which strongly favored targeted sanctions. The *Basic Principles* called for the use of targeted sanctions to minimize the unintended consequences of comprehensive measures on civilians and maximize the impact on those responsible for misconduct (Giumelli, 2010).

Table 3: Top Senders of Sanctions

Top 5 Senders	**Sanctions**	**Percentage**
United States	214	29%
EU	103	14%
UN	76	10%
Norway	41	6%
Canada	40	6%

Notes: This table displays the top 5 senders of sanctions in the GSDB. As of 2020, there are a total number of 1158 senders involved in 726 cases of sanctions in the GSDB. Source: Global Sanctions Data Base (GSDB).

2.2 A Brief History of Sanctions

In this section, we provide a brief history of sanctions since the 1950s. We build our discussion around the top users of sanctions shown in Table 3. The key takeaway from this section can be summarized as follows: the top senders' time variation in frequency of sanctions can be traced to the promulgation of key regulations or the evolution of geopolitics.

2.2.1 U.S. Sanctions

As shown in Table 3, the number of sanctions unilaterally initiated by the US accounts for 29% of all sanctions between 1950 and 2016. As such, the US has been the predominant

user of sanctions in the world during this period. Additionally, the US has participated in the imposition of multilateral and/or plurilateral sanctions through UN, NATO and G8.

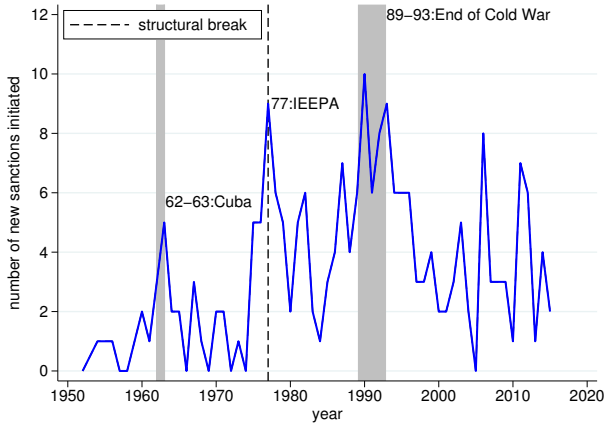
Panel (a) of Figure 1, reveals that the number of sanctions unilaterally initiated by the US varies significantly across the years. We note the emergence of a structural break in 1977, the year that IEEPA (International Emergency Economic Powers Act) came into effect. The political science literature on sanctions has advanced the idea that the promulgation of IEEPA has been a watershed event for US sanctions (Hufbauer et al., 2008). IEEPA provides the US president broad authority to regulate a variety of economic transactions following a declaration of national emergency (Casey et al., 2019). Hufbauer (1998) notes that IEEPA became the "all-purpose" statute for US sanctions and that, when IEEPA was enacted, the frequent use of economic sanctions by the US became at odds with customary international law at the time.[4]

[4]The key role played by IEEPA in US sanctions is also evidenced by US executive order documents for economic sanctions, where we find that documents in recent period share the following paragraph:

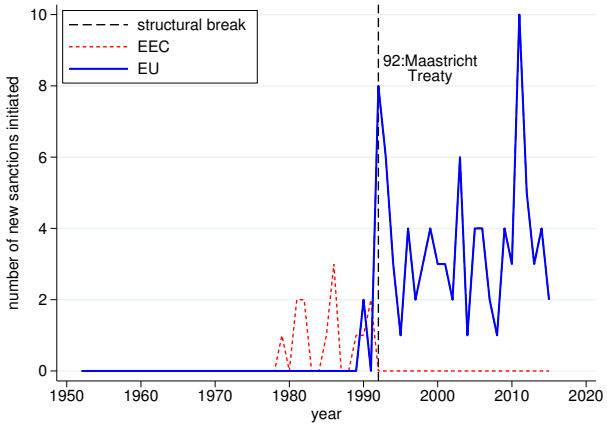
> By the authority vested in me as President by the Constitution and the laws of the United States of America, including the International Emergency Economic Powers Act (50 U.S.C. 1701 et seq.) (IEEPA), the National Emergencies Act (50 U.S.C. 1601 et seq.), section 212(f) of the Immigration and Nationality Act of 1952, as amended (8 U.S.C. 1182(f)), and section 301 of title 3, United States Code,
>
> I, BARACK OBAMA, President of the United States of America, hereby find that... (Executive Order 13608)

Figure 1: Trend in Sanctions by Top Senders

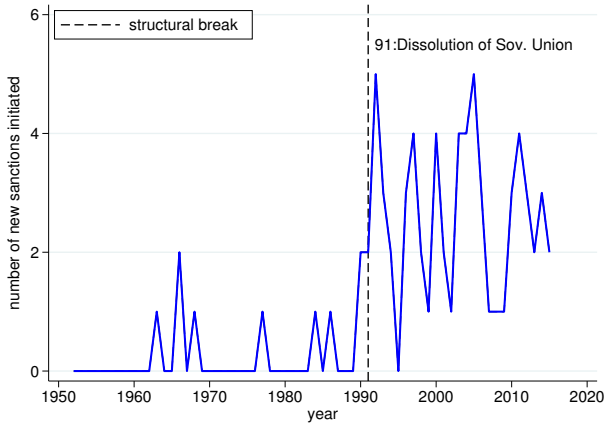
(a) US Unilateral Sanctions (non-UN)



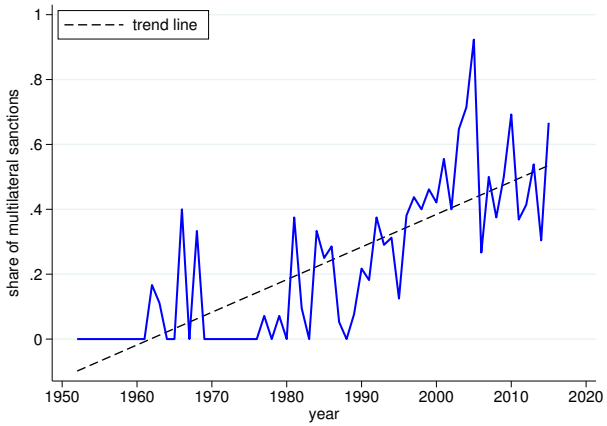
(b) EU Unilateral Sanctions (non-UN)



(c) UN Sanctions



(d) Multilateral Sanctions



Source: Global Sanctions Data Base (GSDB). Multilateral sanctions in panel (d) are defined as sanctions initiated by any of the following: African Union, Commonwealth, CSCE, ECOWAS, EEC, EU, G8, NATO and UN.

Before IEEPA came into effect, a small peak in sanctions emerged around 1962-63 that was driven by the crisis in Cuba. During that period, the US initiated three sanction cases against Cuba. Apart from this, the US did not use sanctions aggressively against other countries until 1975-76, when the US initiated three case of sanctions against Vietnam. We observe a significant increase in the number of US sanctions after 1977. In the post-IEEPA era, there is still some year-to-year variation driven by geopolitical changes. For instance, in the final years of the cold war, we find a significant increase in the number of US sanctions. Not surprisingly, target countries from 1989 to 1993 include Azerbaijan, the Soviet Union and Yugoslavia. This is accompanied by two separate cases related to China (1989 and 1993) following the Tiananmen Square incident.

Around the turn of 21st century, we observe a decline in the number of US sanctions. This is consistent with the view that, toward the end of the 1990s, scholars and policy-makers were frustrated by the (lack of) effectiveness of past sanctions.[5] An influential article titled as "Why economic sanctions do not work" reflects this view at that time (Pape, 1997). Some even argue that "(a) power motivation behind the 2003 (US) invasion of Iraq was the widespread, albeit mistaken, belief that the UN sanctions regime had failed" (Rosenberg et al., 2016). Perhaps due to this reason, we do not see an immediate spike in the number of sanctions after the 9-11 attack in 2001. We notice that large year-to-year variations still exist after 2001. There was a peak in 2006 that is not well explained by institutional reasons.[6] There was another peak in 2011-12 against Libya, Mali and Yemen associated with the Arab Spring movement. We notice, however, that there was a contemporaneous increase in sanctions during 2011-12 against countries not associated with the Arab Spring (such as Belize, Indonesia, Guinea-Bissau, Guatemala and Moldova), perhaps reflecting a political climate at the time that displayed a high propensity to use economics sanctions.

[5] A widely cited examples include the failed attempts to: force Iraq out of Kuwait, to topple the Haitian military and to punish China for human rights abuses among others.

[6] In 2006, the US imposed sanctions against Fiji for the military coup (twice), Belarus for undermining democratic institutions, and Venezuela for terrorism among others.

2.2.2 Sanctions by the EU and the UN Security Council

The EU and the UN Security Council have been the second and third active users of economic sanctions, respectively accounting for 14% and 10% of all observed sanctions. In our description of their respective sanction trends, we combine the EU and the UN sanctions in a single section as we find that their structural changes to be far more apparent and easily explained than the US.

Panel (b) of Figure 1, displays the number of sanctions initiated by the EU in each year since the 1950s. We see that, prior to 1992, the EU issued only a limited number of sanctions through the EEC (European Economic Community), including two sanctions against South Africa (in 1985 and 1986 for Apartheid) and one sanction against China (1989, Tiananmen). Apart from these specific cases, the EU did not appear to be a regular user of sanctions. In 1992, the Maastricht Treaty (a.k.a. Treaty on European Union) was signed and led to the creation of EU's CFSP (Common Foreign and Security Policy). According to Article J.1 of title V of the Maastricht Treaty, the primary goal of CFSP, broadly speaking, is to safeguard the common values and fundamental interests under the principles of the UN Charter; that is, to preserve peace, strengthen international security and consolidate democracy, the rule of law and respect for human rights. Since the creation of CFSP, the imposition of EU sanctions fell under the domain of CFSP and sanctions have been a part of regular EU foreign policy (Giumelli and Ivan, 2013). Panel (b) of Figure 1 seems to confirm these institutional changes with what appears to be a structural break around the time when Maastricht Treaty was signed. Since then, the number of EU sanctions has increased significantly.

Panel (c) of 1 shows the evolution of the sanctions by the UN Security Council (UNSC). Although the trend appears to be similar to that of EU sanctions, we posit that the fundamental reason behind the sudden rise in the number of sanctions since 1991 is due to the dissolution of the Soviet Union. (The Soviet Union was a permanent member of the UNSC until its succession by Russian Federation in 1991 and, under Article 27 of the UN

Charter, a permanent member has the veto power to obstruct any proposals.) During the Cold War, the UNSC was unable to intervene aggressively in international affairs due to lack of consensus among the permanent members. Since the dissolution of the Soviet Union, sanctions have become a common policy tool of the UNSC (Hufbauer et al., 2008). Confirming this, we find a significant increase in the number of UN sanctions since 1991.

2.3 Other Factors

In the preceding discussion, we identified a number of key institutional and geopolitics changes governing the frequencies of sanctions by key users. Nonetheless, it is difficult to compile an exhaustive list of factors that contributed to the widely time-varying frequencies of sanction use. The existing literature suggests that the rising involvement of Congress in the US (Hufbauer et al., 2008), the substitution of economic sanctions for military actions, and the increasing tendency of states to resort to multilateral (as opposed to) unilateral sanctions (Rosenberg et al., 2016) also played important roles in the determination of the frequencies of sanctions. (As evidence, we plot the share of multilateral sanctions on a yearly basis in panel (d) of Figure 1.) Consistent with the existing literature, we find a significant increase in the share of multilateral sanctions over time. This is driven (at least in part) by the globalizing trend in country relations where unilateral sanctions become less effective as targets may engage in trade with other countries.

We conclude this section by reaffirming that there are systematic variations in the pattern of sanctions driven by time-varying sender characteristics. These characteristics include regulatory changes in the US and the EU, geopolitical changes (for the UNSC) and an increasing proclivity to rely on smart sanctions. We use these findings to motivate our instrumental variable (IV) strategy next.

3 Identification: Challenges and Strategies

Endogeneity is a key challenge in identifying the effects of sanctions on growth. In Subsection 3.1, we describe the source of endogeneity in economic sanctions. Then, in Subsection 3.2, we propose an instrumental variable strategy to address the issue.

3.1 The Endogeneity Issue

Let Y_{jt} denote (real) GDP per capita for a target country j in year t. Also let S_{jt} denote the number of sanctions that country j receives in year t, and consider the following benchmark OLS specification:

$$\log(Y_{jt}) = \beta_S S_{jt} + \Phi_j + \Psi_t + \eta_{jt}, \tag{1}$$

where β_S is the coefficient of interest, Φ_j is a set of country fixed effects, Ψ_t is a set of year fixed effects and η_{jt} is the error term. Conditional on Φ_j and Ψ_t, the estimate of β_S is likely to be biased because the imposition of sanctions itself is an endogenous outcome determined by both sender and target countries' time-varying characteristics. Perhaps the best manifestation of this problem can be found in Libya in 2011. Due to the Libyan civil war that lasted from February to October of 2011, Libya faced sanctions from parties that include the UN, EU, United Stated and others. In that year, the total output in Libya dropped by over 50%. An OLS regression would identify a spurious correlation between sanctions and output caused by the devastating impact of the civil war. Also consider, for instance, the UN sanctions on Liberia in 1992 due to its lingering civil conflicts (UNSC Resolution 788).[7] Due to the endogneity issue, an OLS regression cannot distinguish whether the change in the level of output is an outcome of UN sanctions or

[7]The 1992 UN sanctions on Liberia took the form of arms embargo and aimed at ending the civil conflicts. Besides the UN sanctions, there is a more comprehensive sanctions in Liberia in 1992 by ECOWAS (Economic Community of West African States). The sanctions from the ECOWAS took the form of trade, financial, travel and arms embargo.

that of civil conflicts. To overcome this problem, we use an instrumental variable to estimate the causal effect of sanctions on GDP per capita.

3.2 The Instrument

To fix the ideas, let S_{ijt} denote a dummy variable that equals one when a sender country i imposes sanctions on country j in year t. Conceptually, the outcome S_{ijt} is a function of both sender-country aggressiveness $\mathcal{S}_{it}$ and target-country characteristics χ_{jt}:

$$S_{ijt} = S_{ijt}(\mathcal{S}_{it}, \chi_{jt}), \tag{2}$$

where we conceptualize $\mathcal{S}_{it}$ as a latent variable that governs the temporal variation in sanction frequencies observed in Figure 1 and χ_{jt} as the characteristics of country j in year t that triggered the sanctions (such as civil conflicts in Liberia in 1992). We refer to the term $\mathcal{S}_{it}$ as the *aggressiveness* of country i in year t.

A primary concern of endogeneity is that χ_{jt} affects per capita GDP Y_{jt} beyond the correlation with S_{ijt} to become a direct determinant of per capita GDP. Thus, to construct an IV that captures the $S_{ijt}(\mathcal{S}_{it}\cdot)$ component of sanctions, we adopt the following steps which are assumed to be exogenous to Y_{jt}.

Prior to a conventional first-stage to the 2SLS estimation, we introduce a "stage zero" to predict the number of sanctions that country j would have faced solely based on exogenous variables. First, we parameterize $S_{ijt}(\mathcal{S}_{it}, \cdot)$ as a function of $\mathcal{S}_{it}$ as follows:

$$S_{ijt} = \beta_0 + \beta_1 \mathcal{S}_{it} + \beta_2 \mathcal{C}_{ij} + \beta_3 \mathcal{S}_{it} \cdot \mathcal{C}_{ij}, \tag{3}$$

where $\mathcal{C}_{ij}$ is a variable that measures the pre-determined country-pair characteristics that affect the likelihood of country i imposing a sanction on country j. We posit that the imposition of S_{ijt} is driven by country i's aggressiveness in year t ($\mathcal{S}_{it}$), the pre-determined country-pair characteristics ($\mathcal{C}_{ij}$) and their interaction term.

Rajan and Subramanian (2008) argue that bilateral foreign-aid decisions are determined by two countries' *history* and the sender country's potential *influence* on the target country. Following their lead, we proxy $\mathcal{C}_{ij}$ with $\hat{\mathcal{C}}_{ij}$, which is defined as a linear function of history variables $\{LANG_{ij}, \{COL_{ij}^k\}_k\}$ and influence variables $\{\log(distance_{ij}), POP_i/POP_j\}$. $LANG_{ij}$ is a dummy variable that equals 1 if two countries share a common official language and COL_{ij}^k is a set of dummy variables that indicate whether country j was ever a colony to country i prior to 1950. Superscript k takes a value from $k \in \{GBR, FRA, PRT, OTH\}$, which represent colonizers UK, France, Portugal and others, respectively. $\log(distance_{ij})$ is the measure of distance between country i and j and POP_i/POP_j is the ratio of population between country i and j in 1950.

To estimate equation (3), we further proxy $\mathcal{S}_{it}$ with $\hat{\mathcal{S}}_{it}$, which is defined as:

$$\hat{\mathcal{S}}_{it} = \sum_{j \in J^{-j}} S_{ijt}, \tag{4}$$

where J^{-j} denotes the set of all countries except country j, and variable $\hat{\mathcal{S}}_{it}$ captures the total number of sanctions imposed by country i against other countries except for country j in year t. In constructing $\hat{\mathcal{S}}_{it}$ we omit country j to prevent any mechanical correlation from χ_{jt} to $\hat{\mathcal{S}}_{it}$. We believe (i) $\hat{\mathcal{S}}_{it}$ is a good proxy variable for $\mathcal{S}_{it}$ because the frequency of sanctions reflects the aggressiveness of sender countries, and (ii) we can estimate equation (3) to predict the probability of bilateral sanctions *without* relying on country j specific factors that triggered sanctions.

Thus, we propose the following specification to implement equation (3) in practice:

$$S_{ijt} = \beta_0 + \beta_1 \hat{\mathcal{S}}_{it} + \beta_2 \hat{\mathcal{C}}_{ij} + \beta_3 \hat{\mathcal{S}}_{it} \cdot \hat{\mathcal{C}}_{ij} + \epsilon_{ijt}. \tag{5}$$

In stage zero of our empirical strategy, we estimate equation (5) using a Probit specification. We express the fitted values of S_{ijt} with $\hat{S}_{ijt}$. Then, we aggregate $\hat{S}_{ijt}$ across all

sender countries to derive our instrument $\hat{S}_{it}$ defined as:

$$\hat{S}_{jt} \equiv \sum_{i} \hat{S}_{ijt}. \tag{6}$$

S_{jt} is a valid instrument for S_{jt} in equation (1), as it does not contain any information from χ_{jt}. We also construct instruments $\hat{S}^z_{it}$ for each of the differing sanction types z listed in Table 1. For each sanction type z, the instrument variable $\hat{S}^z_{it}$ is constructed by replacing $\hat{S}_{ijt}$ with $\hat{S}^z_{ijt}$ in equation (6), which become in turn the fitted values of equation (5) with replacement of $\hat{S}_{it}$ with $\hat{S}^z_{it}$. Intuitively, our IV construction procedure explicitly accounts for the fact that different types of sanctions have experienced heterogeneous trends that vary by senders and time.

3.3 The IV Regressions

Based on the instrument variable $\hat{S}_{it}$ obtained in stage zero, we proceed with 2SLS IV regressions conventionally. In our first stage regressions, we regress our endogenous variable S_{jt} on our instrument variable $\hat{S}_{jt}$ along with all other exogenous covariates in the second stage. Our baseline specification for the second stage IV regression is:

$$\log(Y_{jt}) = \beta_0 + \beta_S S_{jt} + \Phi_j + D_t + \Phi_j \cdot D_t^{10y} + R_j \cdot D_t + \eta_{jt}, \tag{7}$$

where Y_{jt} is the real GDP per capita of country j in year t, S_{jt} is the endogenous total number of sanctions on country j in year t, Φ_j is the vector of country fixed effects, D_t is the vector of year fixed effects, $\Phi_j \cdot D_t^{10y}$ is the interaction term between country fixed effects and 10-year fixed effects, $R_j \cdot D_t$ is the interaction term between the region fixed effects of country j and year fixed effects, and finally η_{jt} is the noise term.[8] To control for

[8]The spans of sanctions differ widely. Around 49% of all sanctions cases are lifted within 3 years. Yet some sanctions last almost throughout the sample period (e.g., the US sanctions on Cuba since 1962 and the UN sanctions on North Korea since 1961. To account for the differing lengths of sanctions, our key independent variable S_{jt} is defined as the total number of sanctions *in place* against country j in year t

any country-specific structural change in GDP per capita in this specification, we interact country fixed effects with 10-year fixed effects. We also control for the interaction between region and year fixed effects to fully account for any regional differences in temporal trends.

The first-stage regression that precedes the IV regression in equation (7) is:

$$S_{jt} = \beta_S^{1st} \hat{S}_{jt} + \Phi_{jt}^{2nd} + \epsilon_{jt}, \tag{8}$$

where Φ_{jt}^{2nd} is loosely defined to inlcude all exogenous covariates in equation (7).

Finally, to gauge the long-run impact of sanctions on growth, we also estimate equation (7) by replacing the dependent variable with $\log(\bar{Y}_{jt}^{Ty})$, the average of GDP per capita up to T years since year t:

$$\log(\bar{Y}_{jt}^{Ty}) = \frac{1}{T} \sum_{t'=t}^{t+T-1} \log(Y_{jt'}). \tag{9}$$

In our baseline specification, we consider the effects of sanctions up to 10 years after sanctions ($T = 1, \ldots, 10$).

4 Data and Sources

To perform the empirical analysis we rely on a series of variables from several sources. Most important for our purposes is the data on sanctions, which come from the Global Sanctions Data Base (GSBD) of Felbermayr et al. (2020). The GSDB provides case-by-case information on 726 publicly traceable sanctions over the 1950-2016 time period. In addition to its comprehensiveness in terms of case coverage, a key feature that distinguishes the GSDB from other sanction databases and makes it especially attractive for our purposes is its long time coverage. We use the GSDB to extract information about

(instead of the number of sanctions *initiated* in year t).

the senders of sanctions, the targets, the years of imposition and termination of sanctions, and the sanction types.

In terms of country coverage, we focus on the top 56 target countries, which account for 95% of the sanction-year observations in the original GSDB. North Korea, Somalia and Syria are dropped from our samples since the GDP per capita data are not available from these countries. Focusing on the top target countries is advantageous for two key reasons. First, inclusion of a large number of countries that never receive sanctions adds pressure both to first-stage and IV regressions without providing any variations to our key regressor of interests S_{it}, as we include a full set of country dummy variables interacted with a full set of decade dummy variables. Second, we posit that it is naturally more relevant to study the effects of sanctions on sanctions-prone countries (e.g., Iraq) than the effects on sanctions-proof countries (e.g., Australia). A list of the sanctioned countries in our sample appears in Table A.1.

In addition to data on sanctions, we employ real GDP per capita (in 2010 USD) data, which come from the World Development Indicators (WDI) database of the World Bank. We construct a T-year average GDP per capita using the formula in equation (9). Basic summary statistics for GDP per capita appear in Table 4. Columns (1) to (3) present the average, minimum, and maximum values of the variables specified in each row. From row 2 to row 4, we show the unconditional *difference* between 3, 5 and 10-year average log-GDP per capita after year t with the log-GDP per capita in year t. From column (1) of Table 4, we observe that countries, on average, experience growth in GDP per capita as shown by the increment in the difference in the GDP per capita.

Columns (4) and (5) of Table 4 compare the mean of variables conditional on whether a country received a sanction $(S_{jt} > 0)$ or not $(S_{jt} > 0)$. In column (6), we show the p-value of the statistical test whether the two conditional means are statistically different. In the first row of column (4) and (5), we observe that countries that are subject to sanctions, on average, have higher GDP per capita to start with. From row 2 to row 4, we observe that

Table 4: Summary Statistics: GDP per capita

	(1) **mean**	(2) **min**	(3) **max**	(4) **mean($S_{jt} = 0$)**	(5) **mean($S_{jt} > 0$)**	(6) **p-value**
$\log(Y_{jt})$	7.33	4.88	10.81	6.98	7.59	0.00
$\log(Y_{jt+3}) - \log(Y_{jt})$	0.05	-0.96	1.17	0.03	0.07	0.00
$\log(Y_{jt+5}) - \log(Y_{jt})$	0.08	-0.94	1.41	0.04	0.11	0.00
$\log(Y_{jt+10}) - \log(Y_{jt})$	0.15	-0.91	1.65	0.07	0.23	0.00

Notes: This table shows the summary statistics of the GDP per capita in target countries used in the regression sample. $\log(Y_{jt})$ and $\log(Y_{jt+x})$ denote the natural logarithm of GDP per capita in year t and that in year $t + x$ in target countries, respectively. Columns (1), (2) and (3) show the average, minimum and the maximum of relevant variables, respectively. Column (4) shows the average of the relevant variables conditional on that the target countries do not face any sanctions in year t and column (5) shows the average of the relevant variables conditional on that the target countries face at least one sanctions in year t. We carry out a t-test between the values in columns (4) and (5) and present the p-values in column (6).

both groups experience GDP per capita growth, but the sanctioned countries experience a more rapid GDP per capita growth.

We also employ a series of country pair characteristics to implement our stage-zero regressions. These variables come from the CEPII dataset (Head et al., 2010). To study the mechanisms through which sanctions impact growth, we also use the measures of trade-openness, TFP, human capital and physical capital from the Penn World Table. We also use a binary variable from Acemoglu et al. (2019) to indicate whether a target country is a democracy in a given year. Additional variables that include the occurrence of terrorist attacks and the measure of social unrest are from the Cross-National Time Series database. Finally, the binary indicator for whether the target country has a civil or inter-state conflict is from the UCDP (Uppsala Conflict Data Program) databse.

Finally, we present the summary statistics for the number of sanctions by their types in Table 5.

Table 5: Summary Statistics for Sanctions by Types

sanctions	mean	median	sd.	min	max
Any	9.06	1.00	15.36	0.00	49.00
Trade	4.01	0.00	10.90	0.00	49.00
Fin./Trav.	5.17	0.00	12.61	0.00	49.00
Other	2.37	0.00	7.92	0.00	49.00

Notes: This table shows the summary statistics for the number of sanctions that target countries face in a given year. For a given sender-target country pair, "Any" sanctions equal to one if there is at least one type of sanctions imposed by the sender country on the target country. "Trade", "Fin./Trav." and "Other" sanctions indicate trade, financial or travel and other sanctions, respectively.

5 Estimation Results and Analysis

Following our identification srtategy, this section presents three sets of results. Subsection 5.1 demonstrates that, along with a series of bilateral characteristics, sender's aggressiveness is an important determinant of the probability of sanctions. Subsection 5.2 establishes the validity of our instrument. Finally, Subsection 5.3 presents our main findings.

5.1 Stage Zero: Sender Aggressiveness and Economic Sanctions

The estimation results from stage zero (equation (3)) are shown in Table 6. To ease the interpretation of our estimates, in the first column of Table 6, we drop the interaction term $\hat{S}_{it} \cdot \hat{C}_{ij}$. Most importantly, the estimates in column (1) reveal that $\hat{\mathcal{S}}_{it}$, our proxy variable for the sender country's aggressiveness, is highly correlated with the sender country's sanctions on target j. Note that, by construction, we have excluded the mechanical correlation between S_{ijt} and $\hat{\mathcal{S}}_{it}$ since $\hat{\mathcal{S}}_{it}$ is defined as the "leave-out" aggregation of all sanctions from the sender country i except the one against the target country j. The positive and significant coefficient on $\hat{\mathcal{S}}_{it}$ confirms our earlier conjecture that the sender countries' sanctions are highly correlated across target countries in a given year.

Table 6: Bilateral Sanctions Probability - Stage Zero (Probit)

Dep. Var.	(1) Any S_{ijt}	(2) Any S_{ijt}	(3) z=Trade S^z_{ijt}	(4) z=Fin./Trav. S^z_{ijt}	(5) z=Other S^z_{ijt}
$\hat{\mathcal{S}}_{it}$	0.0631***	0.0511***			
	(0.000465)	(0.000890)			
$\hat{\mathcal{S}}^z_{it}$			0.0653***	0.0943***	0.102***
			(0.00167)	(0.00123)	(0.00391)
POP_i/POP_j	-0.0562***	-0.110***	-0.0885***	0.0305***	-0.0858***
	(0.00192)	(0.00327)	(0.00407)	(0.00310)	(0.00345)
$\log(distance)$	-0.0949***	-0.150***	-0.239***	-0.0239***	0.216***
	(0.00507)	(0.00748)	(0.00779)	(0.00806)	(0.0106)
$LANG$	0.0843***	0.113***	-0.181***	0.146***	0.314***
	(0.0117)	(0.0185)	(0.0234)	(0.0183)	(0.0192)
$COL-GBR$	-0.140***	-0.607***	0.318**	-0.0299	0.0930
	(0.0420)	(0.109)	(0.144)	(0.0721)	(0.100)
$COL-FRA$	-0.475***	-0.814***	-0.320*	-0.507***	-0.168
	(0.0558)	(0.140)	(0.184)	(0.119)	(0.200)
$COL-PRT$	-0.728***	-1.824***	0.358	-0.578**	
	(0.147)	(0.406)	(0.428)	(0.278)	
$COL-OTH$	0.211***	0.180***	0.0662	0.270***	0.679***
	(0.0341)	(0.0684)	(0.0851)	(0.0545)	(0.0786)
Observations	190,400	190,400	190,400	190,400	190,264
$\hat{\mathcal{S}}_{it} \cdot \hat{\mathcal{C}}_{ij}$		✓			
$\hat{\mathcal{S}}^z_{it} \cdot \hat{\mathcal{C}}_{ij}$			✓	✓	✓

Notes:

(i) This table shows the regression results from estimating equation (3): $\hat{\mathcal{S}}_{it}$ is the number of sanctions that the sender country i imposed on other countries except for country j in year t, superscript z refers to the type of sanctions considered, and $\mathcal{C}_{ij}$ indicates the set of characteristics associated with country pair ij. Please see section 5.1 for the definitions of the other variables. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

(ii) In the first column, we dropped the interaction term to ease the interpretation of coefficients.

We also find the other estimates in column (1) to be intuitive for the most part. For example, the negative estimate on the population ratio implies that a target country is less likely to be sanctioned if it has a smaller population relative to the sender country. The coefficient of the bilateral distance is also negative, which suggests that a sender country is more likely to use sanctions on targets that are geographically close. The estimate of the coefficient on common language is positive and significant, meaning that sanctions are more likely if the target country shares a common official language with the sender country. We also observe significant heterogeneity in the likelihood of sanctions depending on colonial ties. We find that, relative to the reference group (i.e., no colonial relationship), the colonial ties of the UK, France and Portugal can significantly reduce the likelihood of sanctions, whereas other colonial ties increase it.

Column (2) of Table 6 introduces the interactions between our aggressiveness index and each of the bilateral characteristics we employ in our analysis. We omit the interaction estimates for brevity and we refrain from interpreting the estimates in column (2). However, we do rely on the estimates from column (2) to construct the predicted bilateral sanctions probability in order to implement our IV strategy. The estimates in columns (3) to (5) of Table 6 reproduce the results from column (2) for each type of sanctions. Most importantly, we note that the direct estimate of our key aggressiveness index remains positive and significant for each individual type of sanctions.

5.2 First Stage: Instrument Strength

The objective of this section is to offer support for the validity of our instrument. To this end, we start by evaluating the performance of our constructed instrument variable with a simplified version of our first stage OLS regression:

$$S_{jt} = \beta_0 + \beta_S^{1st} \hat{S}_{jt} + \epsilon_{jt} \tag{10}$$

Table 7: Simplified First Stage Regressions

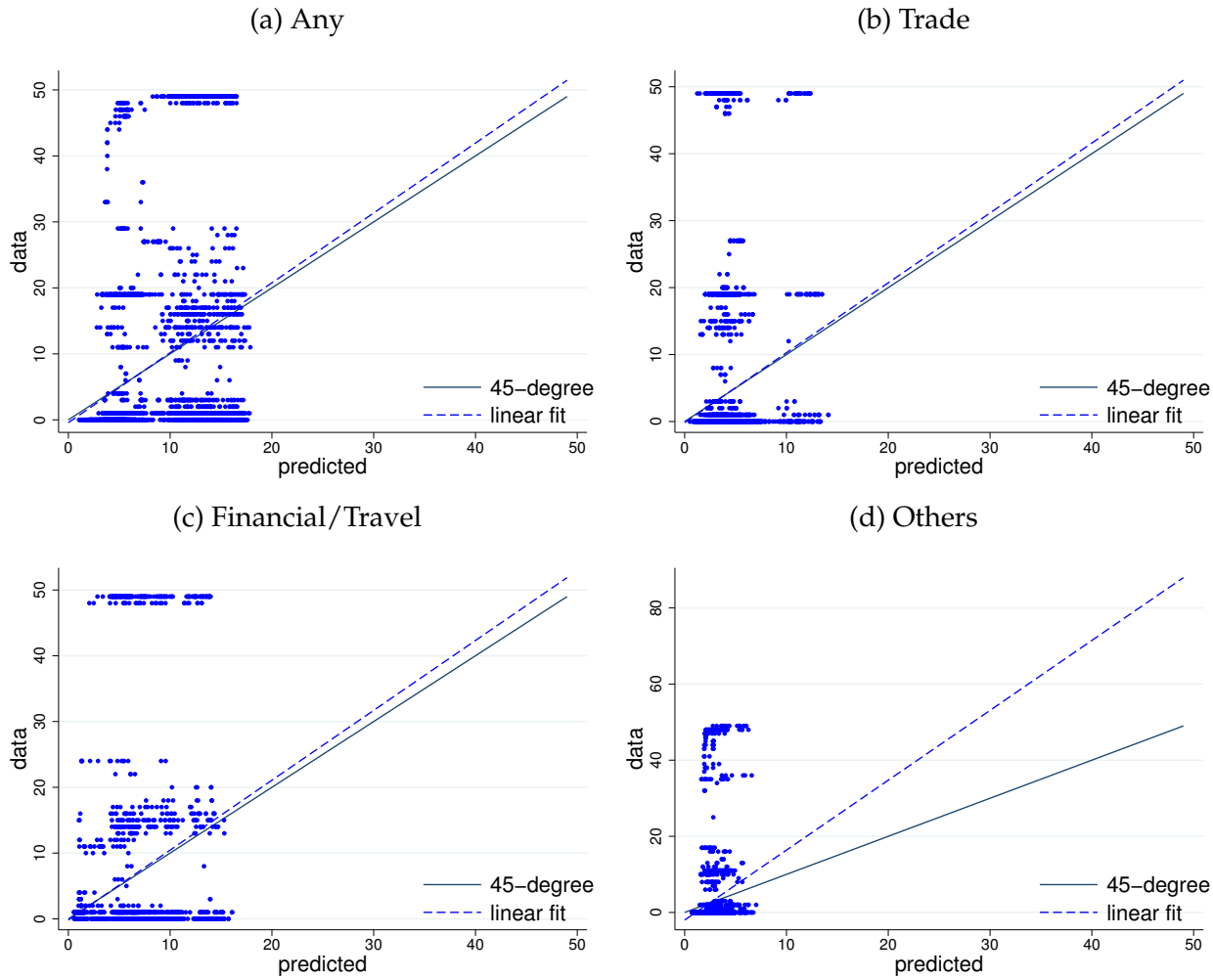
	(1)	(2)	(3)	(4)
		z=Trade	z=Fin./Trav.	z=Other
Dep. Var.	S_{jt}	S^z_{jt}	S^z_{jt}	S^z_{jt}
$\hat{S}_{jt}$	1.059***			
	(0.0570)			
$\hat{S}^z_{jt}$ (z=Trade)		1.044***		
		(0.118)		
$\hat{S}^z_{jt}$ (z=Fin./Trav.)			1.062***	
			(0.0643)	
$\hat{S}^z_{jt}$ (z=Other)				1.836***
				(0.201)
Constant	-0.425	-0.168	-0.177	-1.988***
	(0.380)	(0.438)	(0.142)	(0.428)
Observations	3,808	3,808	3,808	3,808
Adjusted R^2	0.096	0.040	0.130	0.038
F-statistic	345.27	78.25	272.65	83.17

Notes: This table shows the estimation results of the simplified version of our first stage regressions. The regression specification is in equation (10). Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

We note that (10) is a simplified version of our first-stage regressions because it does not include the exogenous covariates Φ^{2nd}_{jt} from the second stage. The estimation results from equation (10) appear in Table 7. Four principal findings stand out from Table 7. First, the coefficients of $\hat{S}_{jt}$ and $\hat{S}^z_{jt}$ are all highly statistically significant. Second, all estimates (with the exception of the result for other sanctions) are very close to one. Third, all constant terms (once again with the exception of the result for other sanctions) are not statistically different from zero. Finally, the F-statistics reported at the bottom of Table 7 are much higher than the conventional levels suggested by Staiger and Stock (1997).

We offer a visual presentation of the performance of our the first-stage regressions in Figure 2. The figure shows that, although our first stage regressions are unable to pre-

Figure 2: Correlation of Sanctions with Instruments (Predicted Sanctions)



Notes: This figure shows the correlation between the occurrence of sanctions in the data and the occurrence of predicted sanctions.

dict the extreme numbers of sanctions (close to 50), we can linearly predict the number of sanctions one-for-one on average. Overall, the results in Table 7 and Figure 2 suggest that our constructed instrument variables can predict the incidence of sanctions on country j very well. We remind readers, however, that the first-stage regressions for the IV regressions are different from the results reported in Table 7 for two reasons. First, due to the lack of full availability of the GDP data, we do not utilize the full sample as in Table 7. Second, the inclusion of exogenous covariates Φ_{jt}^{2nd} tends to reduce the F-statistics of our instrument variables.

5.3 Second Stage: Sanctions and Growth

Following the existing literature, we start the analysis in this section with a standard/benchmark OLS specification designed to capture the average impact of sanctions of any type on contemporaneous growth. These baseline results are reported in column (1) of Table 8, where the dependent variable is the natural logarithm of GDP per capita of country j in year t. In addition to the key variable of interest, S_{jt}, which measures the number of sanctions that country j received on year t, we control for region-year fixed effects as well as for country-10-year fixed effects. Finally, we note that all coefficient estimates (and their estimated standard errors) in Table 8 are multiplied by 100 to ease the interpretation.

The main message from column (1) of Table 8 is that economic sanctions have a negative impact on contemporaneous growth. This result is reflected in the negative and highly statistically significant estimate (0.230 std.err. 0.040) on the coefficient on S_{jt}. Specifically, our estimate implies that an additional sanction is associated with 0.23 percent reduction in the target country's per capita GDP. Overall, we find the main OLS result from column (1) to be intuitive and consistent with findings from the existing literature, which is encouraging for the representativeness of our estimating sample.

The estimates in column (2) of Table 8 are obtained with our IV procedure. Two main findings stand out from column (2). First, we see that the estimate on S_{jt} is still negative and statistically significant, thus reinforcing our previous conclusion that economic sanctions hurt contemporaneous economic growth. Second, we note that the estimated IV coefficient of S_{jt} is smaller in magnitude as compared to the corresponding OLS estimate in column (1). The observation that the OLS estimates contain a negative bias is consistent with our motivation for adopting an IV strategy. Namely, the incidents that led to sanctions on the target country are generally negatively associated with the GDP per capita of the country.

We draw two conclusions based on the results form panel A of Table 8. First, on aver-

Table 8: Effects of Sanctions on GDP Per Capita

Dep. Var.	(1)	(2)	(3)	(4)
	$\log Y_{jt} \times 100$		$\log \bar{Y}_{jt}^{10y} \times 100$	
	OLS	IV	OLS	IV
panel A				
S_{jt}	-0.230***	-0.188***		
	(0.0397)	(0.0525)		
panel B				
$\sum_{t'=t}^{t+9} S_{jt'}$			-0.0281***	-0.00422
			(0.00531)	(0.0150)
Observations	2,103	2,103	1,573	1,573
Countries	53	53	53	53
Region $\times$ Year FE	✓	✓	✓	✓
Country $\times$ 10-Year FE	✓	✓	✓	✓
First Stage F-statistic		249.83		82.43

Notes: This table shows the regressions results of our main regression specification (equation (7)). The same dependent variable in column (1) and (2) is the natural logarithm of GDP per capita of country j in year t and that in column (3) and (4) is the 10-year average of the natural logarithm of GDP per capita since year t. S_{jt} indicates the number of sanctions that country j received in year t and $\sum_{t'=t}^{t+9} S_{jt'}$ is the 10-year cumulative number of sanctions since year t. All regression coefficients (and their standard errors) are multiplied by a factor of 100 to facilitate interpretation. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

age, economic sanctions (of any type) hurt contemporaneous growth. Second, standard OLS estimates may over-predict the negative impact of sanctions on contemporaneous growth.

In Panel B of Table 8, we explore the long-run impact of sanctions on GDP per capita. Specifically, we use the 10-year average of GDP per capita of the target country as the dependent variable and report the coefficient estimates of 10-year cumulative number of sanctions since year t. Once again, we use region-year fixed effects as well as country-10-year fixed effects, and we remind readers that the coefficient estimates (and their estimated standard errors) in Table 8 are multiplied by 100 for ease of interpretation. As before, we report the OLS estimates in column (3) and the corresponding IV results in column (4).

We draw the following conclusions based on the estimates from Panel B of Table 8. The OLS estimates in column (3) imply that the long-run effects of economic sanctions are smaller as compared to their contemporaneous effects. Nonetheless, our OLS results suggest that the long-run impact of sanctions is still negative and statistically significant. On the other hand, our IV estimates in column (4) suggest that, once we have accounted for endogeneity, the long-run effects of sanctions are no longer statistically significant. In combination with the estimates from panel A of Table 8, the results in panel B imply that economic sanctions hurt growth but only in the short run.

Next, we explore the differential impact of sanctions on GDP per capita depending on the type of sanctions considered. In the spirit of the existing literature, we are primarily interested in the differential effects of trade vs. smart sanctions on growth in target countries. In addition to trade and smart sanctions, some of our specifications also control for other sanctions. Our estimates are presented in Table 9 where, as before, we distinguish between the short- and long-run effects of sanctions by type. However, this time we only report our IV results.

Based on the estimates in columns (1) and (2), we see that trade sanctions hurt con-

Table 9: Effects of Sanctions on GDP Per Capita by Types (IV Regressions)

	(1)	(2)	(3)	(4)
Dep. Var.	$\log Y_{jt} \times 100$		$\log \bar{Y}_{jt}^{10y} \times 100$	
panel A				
S_{jt}^{z} (z=Trade)	-0.183*	-0.204**		
	(0.0973)	(0.0984)		
S_{jt}^{z} (z=Fin./Trav.)	-0.109	-0.122		
	(0.0721)	(0.0755)		
S_{jt}^{z} (z=Other)		-0.281		
		(0.285)		
panel B				
$\sum_{t'=t}^{t+9} S_{jt'}^{z}$ (z=Trade)			-0.0754***	-0.0611**
			(0.0197)	(0.0291)
$\sum_{t'=t}^{t+9} S_{jt'}^{z}$ (z=Fin./Trav.)			0.0534***	0.0622***
			(0.0180)	(0.0219)
$\sum_{t'=t}^{t+9} S_{jt'}^{z}$ (z=Other)				0.314***
				(0.117)
Observations	2,103	2,103	1,573	1,573
Countries	53	53	53	53
Region $\times$ Year FE	✓	✓	✓	✓
Country $\times$ 10-Year FE	✓	✓	✓	✓
First Stage F-statistic	69.32	10.65	53.30	6.40

Notes: This table shows the regressions results of our main regression specification (equation (7)). The same dependent variable in column (1) and (2) is the natural logarithm of GDP per capita of country j in year t and that in column (3) and (4) is the 10-year average of the natural logarithm of GDP per capita since year t. S_{jt}^{z} indicates the number of sanctions with type z that country j received in year t and $\sum_{t'=t}^{t+9} S_{jt'}^{z}$ is the 10-year cumulative number of sanctions with type z since year t. All regression coefficients (and their standard errors) are multiplied by a factor of 100 to ease the interpretation. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

temporaneous economic growth but smart sanctions do not. Specifically, our estimates suggest that an extra trade sanction leads to approximately a 0.2 percent decline in the target country's GDP per capita. Two implications of this result are: (i) the average estimates of the impact of sanctions may hide significant heterogeneity depending on the type of sanctions, and (ii) that, consistent with their design, smart sanctions do not hurt

the whole target economy.

In columns (3) and (4) of Table 9, we explore the long-run effect of trade vs. smart sanctions on growth. Our estimates reveal that trade sanctions still have a negative and statistically significant impact on economic growth in the long-run. However, as expected, these effects are smaller in magnitude. More specifically, our estimates suggest that an additional trade sanction would decrease the target country's 10-year average GDP per capita by about 0.07 percent.

Interestingly, our estimates suggest that the long-run effects of smart sanctions on growth are positive and statistically significant. In particular, an additional smart sanction leads to approximately a 0.05 percent *increase* of the target country's average GDP per capita. In combination with our findings that smart sanctions do not hurt contemporaneous growth while trade sanctions hurt growth both in the short and the long run, this result offers encouraging support for the use of smart/targeted sanctions, which normally are designed to hurt specific individuals, as opposed to trade sanctions that hurt the entire economy.

6 On the Channels through which Sanctions Affect Growth

The results thus far provide no information about the mechanisms through which sanctions affect growth. The objective of this section is to shed some light on this issue. To this end, we distinguish between two types of such channels: direct economic channels, which we discuss in Subsection 6.1, and other/indirect channels, which we analyze in Subsection 6.2.

6.1 Direct Economic Channels

In Table 10, we explore the mechanism whereby trade and smart sanctions generate different outcomes on the target country's growth. In column (1) of Table 10, we observe

that trade sanctions lead to a decline in the target country's trade-to-GDP ratio whereas smart sanctions lead to an increase in trade. In terms of the TFP in column (2), we observe that trade sanctions exert a negative effect and smart sanctions exert a positive impact on the target country's TFP. Column (3) suggests that smart sanctions affect positively the target country's level of human capital while trade sanctions do not have a significant effect. In column (4), we observe that trade sanctions have a positive effect on the target country's human capital and smart sanctions do not have a significant effect.

From Table 10, we have an understanding of the channels through which trade and smart sanctions affect the economic growth in the target country. Specifically, trade sanctions lead to a decline in target country's GDP per capita by reducing the trade-openness and the TFP, although they have a slight positive impact on the physical capital accumulation. On the other hand, smart sanctions contribute to the target country's GDP by increasing its trade-openness, TFP and human capital.

6.2 Other/Indirect Mechanisms

We further investigate the long-run effects of sanctions on other outcome variables that may be related to the target country's economic growth. Specifically, we focus on how trade and smart sanctions affect: (1) the level of democracy; (2) the occurrence of terrorist attacks; (3) social unrest; and (4) whether the country is either in a civil or interstate war. We focus on these outcome variables as they are associated with the commonly held objectives of sanctions (see Figure A.1 for the distribution of sanctions differentiated by their objectives).

We present the estimated effects of sanctions on the aforementioned outcome variables in Table 11. In column (1), we observe that trade sanctions have a negative long-run effect on the level of democracy in the target country, whereas smart sanctions do not have a significant effect. In both columns (2) and (3), we observe that trade sanctions are effective in reducing terrorist activities and wars in the target country, whereas trade sanctions

increase these activities. Finally, in column (4), we see that neither sanction type has a significant effect on the level of social unrest in the target country.

There are a few key messages from Table 11. First, neither major sanction type is able to improve the level of democracy in the region. Thus, economic sanctions should be avoided as a measure that aims to promote democracy in target countries. Moreover, according to the view that democracy contributes to growth (e.g., Acemoglu et al. (2019)), a decline in the level of democracy caused by trade sanctions provides another explanation of the reasons that trade sanctions disrupt the target country's economy in addition to the reasons studied in Table 10. Second, the results in columns (2) and (3) are consistent with the evidence that trade sanctions are more effective than smart sanctions in the sense of imposing a larger cost on the target country (Drezner, 2011). Specifically, Escribà-Folch (2010) shows that comprehensive embargoes are more effective in ending intrastate conflicts than smart sanctions. Although we are not aware of any previous study that has drawn a similar conclusion regarding terrorist activities, we take columns (2) and (3) as evidence that trade sanctions may outperform smart sanctions in terms of achieving the proclaimed objectives of sanctions.

Table 10: Effects of Sanctions on Potential Mechanisms (IV Regressions)

	(1)	(2)	(3)	(4)
Dep. Var.	Trade/GDP	TFP	Hum. Cap.	Phy. Cap.
$\sum_{t'=t}^{t+9} S_{jt'}^{z}$ (z=Trade)	-0.0806***	-0.00117***	-7.84e-05	0.000559*
	(0.0309)	(0.000296)	(6.95e-05)	(0.000337)
$\sum_{t'=t}^{t+9} S_{jt'}^{z}$ (z=Fin./Trav.)	0.0469**	0.000548**	0.000143**	-0.000290
	(0.0212)	(0.000231)	(6.02e-05)	(0.000269)
Observations	1,329	882	1,330	1,464
Countries	48	30	40	47
Region $\times$ Year FE	✓	✓	✓	✓
Country $\times$ 10-Year FE	✓	✓	✓	✓
First Stage F-statistic	35.29	37.00	40.36	50.93

Notes:

(i) This table shows the IV estimation results of the effects of trade and smart sanctions on potential mechanisms for growth. All dependent variables are the 10-year average (since the year of sanctions) of the variables defined as follows:

- Trade/GDP: trade (import plus export) share of GDP in from the World Development Indicator
- TFP: total factor productivity from the Penn World Table
- Hum. Cap.: measure of human capital from the Penn World Table
- Phy. Cap.: capital stock from the Penn World Table

(ii) Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 11: Effects of Sanctions on Other Outcome Variables (IV Regressions)

Dep. Var.	(1) Democracy	(2) Terrorism	(3) War	(4) Unrest
$\sum_{t'=t}^{t+9} S_{jt'}^{z}$ (z=Trade)	-0.00123***	-0.000445*	-0.000121*	0.000166
	(0.000470)	(0.000266)	(6.93e-05)	(0.000384)
$\sum_{t'=t}^{t+9} S_{jt'}^{z}$ (z=Fin./Trav.)	0.000197	0.000476**	0.000118*	0.000292
	(0.000465)	(0.000216)	(6.11e-05)	(0.000271)
Observations	1,242	1,573	1,573	1,573
Countries	49	53	53	53
Region × Year FE	✓	✓	✓	✓
Country × 10-Year FE	✓	✓	✓	✓
First Stage F-statistic	39.42	53.30	53.30	53.30

Notes:

(i) This table shows the IV estimation results of the effects of trade and smart sanctions. All dependent variables are the 10-year average (since the year of sanctions) of the variables defined as follows:

- Democracy: dichotomous indicator from Acemoglu et al. (2019) that equals to 1 if the target country is a democracy in a given year.
- Terrorism: dichotomous indicator generated from Banks and Wilson (2017) that equals to 1 if terrorist attacks occurred in the target country in a given year.
- Unrest: dichotomous indicator generated from Banks and Wilson (2017) that equals to 1 if the target country has a social revolt or revolution in a given year.
- War: dichotomous indicator from the Uppsala Conflict Data Program that equals to 1 if there is a civil or an inter-state wars in the target country in a given year.

(ii) Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

7 Concluding Remarks

This paper is motivated by the following two research questions. How do economic sanctions affect the economic growth of target countries? How do trade and smart sanctions differ in terms of their effects on target countries?

To answer these questions, we propose a novel IV strategy that addresses the endogeneity problem that arises from target-country specific characteristics (e.g., civil war). The key idea underlying this IV strategy is to identify the variation in sanctions that is exogenous from the perspective of each target country by exploiting the correlation of sanctions across target countries for a given sender country and year.

Our preliminary findings suggest that: (1) an OLS estimation leads to a negative bias in the estimated effects of sanctions on growth; (2) IV estimation results suggest that sanctions, in general, have negative contemporaneous effects on the target country's GDP per capita and that their long-run effects are insignificant; (3) trade sanctions have both short- and long-run negative effects on the target country's growth, whereas smart sanctions have long-run positive effects; and (4) trade sanctions lead to a long-run decline in both trade-openness and TFP in the target country, whereas smart sanctions have positive effects on both channels.

We believe that the comprehensive findings in our paper provide a strong policy implication regarding the design of future sanctions especially when the policymaker needs to consider the effectiveness of sanctions and the humanitarian cost of sanctions on the target country.

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Appendices

A Additional Tables and Figures

Table A.1: List of Countries

	country	first year	last year	avg. GDPpc growth	democracy	sanctions-years
1	South Africa	1960	2015	0.93	0.33	1505
2	Iraq	1968	2015	4.69	0.00	1287
3	China	1960	2015	6.86	0.00	1064
4	Sudan	1960	2015	1.49	0.14	983
5	Cuba	1970	2015	2.57	0.00	875
6	Liberia	2000	2015	-0.01	0.64	784
7	Rwanda	1960	2015	1.99	0.00	735
8	Macedonia	1990	2015	1.20	0.95	699
9	Sierra Leone	1960	2015	0.54	0.34	696
10	Cote d'Ivoire	1960	2015	0.45	0.04	671
11	Bosnia and Herzegovina	1994	2015	11.48	0.00	562
12	Lebanon	1988	2015	2.48	0.26	556
13	Iran	1960	2015	1.71	0.00	502
14	Angola	1980	2015	0.73	0.00	497
15	Fiji	1960	2015	1.74	0.80	467
16	Libya	2000	2015	2.78	0.00	461
17	Azerbaijan	1990	2015	3.55	0.05	414
18	Myanmar	1960	2015	4.18	0.04	395
19	Albania	1980	2015	2.70	0.58	304
20	Slovenia	1990	2015	1.81	0.90	301
21	Bulgaria	1980	2015	2.29	0.65	300
22	Mongolia	1981	2015	3.10	0.60	273
23	Zimbabwe	1960	2015	0.66	0.20	270
24	Togo	1960	2015	1.12	0.00	261
25	Eritrea	1992	2011	1.96	0.00	258
26	Belarus	1990	2015	3.18	0.19	243

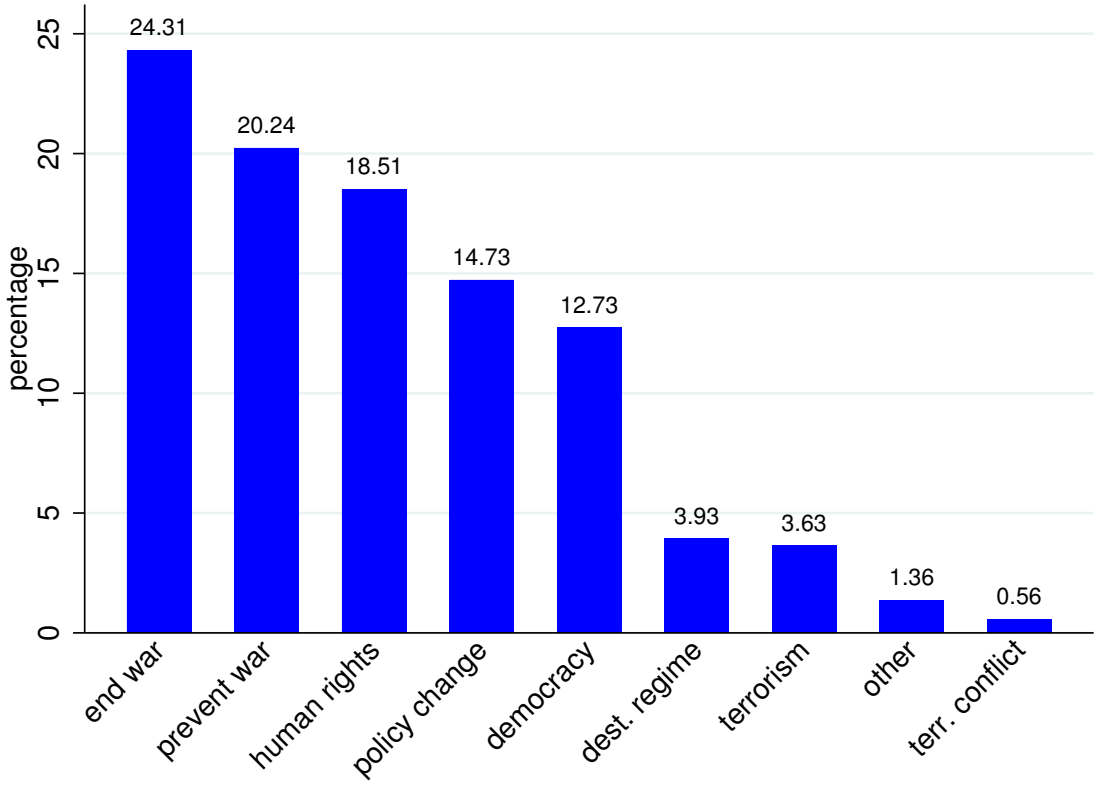
Table A.2: List of Countries (Cont.)

	country	first year	last year	avg. GDPpc growth	democracy	sanctions-years
27	South Vietnam	1984	2015	4.92	0.00	227
28	Guinea-Bissau	1970	2015	0.60	0.38	226
29	Kenya	1960	2015	1.39	0.19	218
30	Central African Republic	1960	2015	-0.75	0.20	217
31	Croatia	1995	2015	2.59	0.69	216
32	Haiti	1970	2015	-0.38	0.27	213
33	Moldova	1995	2015	3.16	1.00	206
34	Israel	1960	2015	2.49	1.00	198
35	Nigeria	1960	2015	1.40	0.45	187
36	Guinea	1986	2015	1.33	0.04	176
37	Egypt, Arab Rep.	1960	2015	2.88	0.00	155
38	Afghanistan	2002	2015	4.53	0.00	129
39	Ethiopia (excludes Eritrea)	1981	2015	2.45	0.50	123
40	Yemen, North	1990	2015	-0.68	0.00	123
41	Malagasy Republic	1960	2015	-0.93	0.31	120
42	Niger	1960	2015	-0.68	0.31	120
43	Gambia, The	1966	2015	0.23	0.62	117
44	Burundi	1960	2015	0.27	0.16	110
45	Romania	1990	2015	2.55	1.00	104
46	Poland	1990	2015	3.71	1.00	102
47	Mauritania	1961	2015	0.57	0.02	84
48	Hungary	1991	2015	2.19	1.00	83
49	Mali	1967	2015	1.72	0.43	77
50	Pakistan	2002	2015	1.94	0.33	64
51	Cambodia	1993	2015	3.78	0.11	58
52	Kuwait	1995	2015	-0.56	0.00	21
53	Portugal	1980	2015	1.74	1.00	9

Table A.3: Types of Sanctions

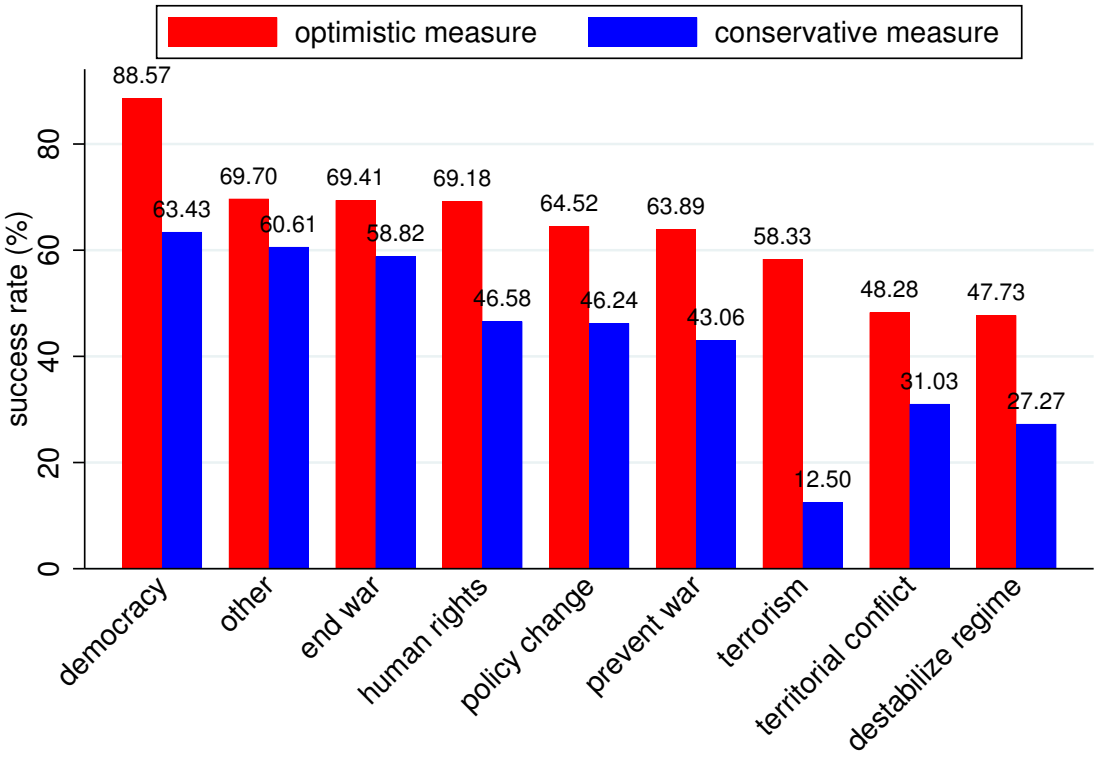
variable	**description**	**source**
GDP per capita	real GDP per capita measured in constant 2010 USD	World Development Indicators (World Bank)
country-pair characteristics	$COMLANG$, COL, POP, $distance$	CEPII (Head et al., 2010)
sanctions types	see Table A.3 for details	Felbermayr et al. (2020)
trade openness	the sum of import and export divided by the GDP	World Development Indicators (World Bank)
TFP	total factor productivity	Penn World Table
human capital	measure of human capital	Penn World Table
physical capital	measure of physical capital	Penn World Table
democracy	whether the country is a democracy	Acemoglu et al. (2019)
terrorism	whether there is any terrorist activities in the country	Cross National Time Series
unrest	whether there are socail revolts and revolution in the country	Cross National Time Series
war	whether the country engages in inter-state or civil wars	Uppsala Conflict Data Program

Figure A.1: Sanctions By Objectives



Source: Global Sanctions Data Base (GSDB)

Figure A.2: Sanctions Success Rates by Objectives



Source: Global Sanctions Data Base (GSDB)

Table A.4: Proclaimed Objectives of Sanctions

policy change - sanctions aimed at enforcing a domestic (i.e., an economic, political or social) policy change in the sanctioned state.
destabilize regime - sanctions aimed at destabilizing the regime of a sanctioned state or just to exert political influence. In particular, for older sanction cases this objective includes cases where ideological reasons evoke sanctions (e.g., to prevent the spread of communism).
territorial conflict - sanctioning and sanctioned states are parties to a militarized conflict over territory.
prevent war - sanctions aimed at de-escalating amilitary conflict with other countries.
terrorism - sanctions aimed at motivating a country to stop sustaining or tolerating terroist groups.
end war - sanctions aimed at ending inter-state war, instra-state war, civil wars, and territorial conflict, including genocide.
human rights - sanctions aimed at ending human rights violations in sanctioned states, including minority rights violations.
democracy - sanctions aimed at restoring democratic order mostly after a coup d'etat.
other sanctions - other objectives include ending drug trafficking, changing trade practices, releasing imprisoned citizens and fighting corruption.