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Disclaimer. The Global Sanctions Data Base (GSDB) is a public good that was created in response to demand by scholars and institutions. The initial development of the database and its subsequent updates required substantial long-term efforts by the authors. Accordingly, in return for that effort, we expect two things from all users of the GSDB.

First, please cite the current paper along with the original paper, if you use Release 4 of the database:

- Felbermayr, Gabriel, Aleksandra Kirilakha, Constantinos Syropoulos, Erdal Yalcin, and Yoto V. Yotov, *"The Global Sanctions Data Base," European Economic Review*, 2020, 129 (C).

Second, if you believe that you have discovered an error in the database or that the database can be improved by incorporating additional or more reliable data, even if only for an individual sanction case or any of its dimensions, please let us know by writing to the GSDB's e-mail address (`GSDB@drexel.edu`). We will do our best to accommodate any detection of errors, inconsistencies, and suggestions as soon as possible. For updates, please visit http://www.globalsanctionsdatabase.com.

1 Introduction

In recent years, the use of economic sanctions has surged, becoming a crucial tool for international policy and diplomacy. Governments and international organizations have increasingly relied on sanctions to exert pressure on countries, businesses, and individuals in response to geopolitical conflicts, human rights violations, and breaches of international norms. This growing reliance on sanctions reflects their perceived effectiveness in influencing the behavior of target states without resorting to military intervention.

The expansion of sanctions as a policy tool is mirrored by the heightened scholarly interest in their effects on international economics and global political dynamics. Researchers and policymakers seek to understand the multifaceted impacts of sanctions, including their economic repercussions, effectiveness in achieving political objectives, and unintended consequences on global trade and economic stability.

The Global Sanctions Data Base (GSDB) (Felbermayr et al. (2020)), has emerged as a vital resource for documenting and analyzing sanctions. The database offers comprehensive and systematic data on sanctions imposed worldwide, providing valuable insights into their usage and impacts. Initially covering 729 sanction cases from 1950 to 2016, the GSDB has undergone significant expansions to include more recent data and broader coverage.

Against this backdrop, this paper makes two related contributions. First, we introduce the fourth release of the database, GSDB-R4, which extends the coverage to the end of 2023, totaling 1547 sanction cases. The latest update incorporates 223 newly recorded sanction cases, reflecting the dynamic and evolving landscape of international sanctions. Second, to highlight one of the new features of the GSDB-R4, we combine the sanctions data with trade flows data until 2023, and we evaluate the effects of the recent sanctions on Russia's trade within an econometric gravity model.

The GSDB defines sanctions as restrictive policy measures imposed on a target nation(s) by one or several countries to punish the target and/or persuade the target to change its policies or address presumed violations of international norms. Each sanction case recorded in the GSDB is categorized into six types: trade sanctions, financial sanctions, travel sanctions, arms sanctions, military assistance sanctions, and other sanctions that do not fit into any of the former types. Additionally, the GSDB defines political objectives for each sanction, as well as the success score for each sanction objective. Finally, the database distinguishes between unilateral and multilateral sanction impositions.

The recent sanctions on Russia, imposed after the country invaded Ukraine, are among the most widely studied sanctions not only in recent years but probably overall, too. The number of studies that have evaluated the impact and effectiveness of these sanctions from various perspectives is large and growing. While reviewing all recent papers is beyond the scope of our objectives, we note that many of them focus on the 2014 sanctions on Russia, others rely on simulation analysis, while the studies on the recent (2022-2023) sanctions on Russia are case- or country-specific.[1] Despite this extensive literature, we are not aware of any study that employs aggregate data to investigate the impact of the 2022-2023 sanctions on Russia's bilateral trade relationships in a multi-country model, incorporating trade data post the Russian invasion of Ukraine.

Motivated by the significant public interest in sanctions on Russia, and also because these sanctions are among the most important new cases in the new release of the GSDB, our contribution to the literature is to obtain estimates of the effects of the recent sanctions on Russia from a specification that includes a large number of countries. This enables us to (i) compare the stringency of the sanction effects across different senders, (ii) compare the sanction effects between senders and third countries that did not sanction Russia, and (iii) draw implications about the overall effectiveness of the sanctions on Russia.

To achieve these objectives, we combine data on international trade flows from the *Direc-*

[1] For instance, Gullstrand (2020) examines the impact of the sanctions on Swedish firms, Kohl et al. (2024) focus on Dutch firms, Crozet and Hinz (2020) use French firm-level export data, while Jäkel et al. (2024) use data on Danish firms. Mahlstein et al. (2022) examine the effects of sanctions and embargoes on Russia's trade using a computable general equilibrium (CGE) model. Larch et al. (2022) estimate the effects of the sanctions on Russia in the energy and mining sector. Felbermayr et al. (2023) study a decoupling of 'Western countries' from Russia (and China). Imbs and Pauwels (2024) utilize input-output data to approximate the economic impact of trade sanctions on Russia and the EU. Finally, Syropoulos et al. (2024) and Flach et al. (2024) analyze the trade impact of the 2014 sanctions on Russia.

tion of Trade Statistics (DOTS) of the International Monetary Fund (IMF) and the United Nations' Comtrade Database to construct an estimating sample for many countries and a long period (1960-2023), including the two recent years (2022 and 2023) when the sanctions on Russia were imposed and implemented.[2] To obtain our econometric results, we rely on the workhorse model of international trade – the gravity equation – and we use established practices for estimating trade gravity models (e.g., Yotov et al. (2016)). To capture different aspects of the effects of the sanctions on Russia and explore their heterogeneity across various dimensions (e.g., time, senders, and third countries), we develop our analysis sequentially, by introducing a series of sanction covariates within nested econometric models.

Six main results stand out from our empirical analysis. First, the overall effect of the sanctions on Russia's trade has been negative and statistically significant but relatively small. Second, our estimates suggest a clear ranking of the effects: the effects of the 2014 sanctions on Russia are larger than the pre-2014 sanctions, but smaller than the recent (2022-2023) wave. Third, despite being negative and statistically significant, the effects of the recent sanctions on Russia's trade with the senders have been relatively small (e.g., a decrease of about 24 percent relative to Russia's trade with non-sanctioning states). Fourth, the effects of recent sanctions on Russia have been very heterogeneous across senders, with U.S. and Canadian sanctions being the most stringent and those of the U.K. and Japan being the most lenient. Fifth, we also observe significant heterogeneity of the sanctions effects within the EU, where Sweden, Czech Republic, and Poland emerge as the most strict senders, while Malta, Estonia, and Latvia are among the countries with the smallest relative sanction effects within the EU.

Finally, and potentially most importantly, we obtain estimates of the change in bilateral trade costs between Russia and three countries (China, India, and Turkey), which did not impose sanctions on Russia but have been viewed as Russia's economic allies during the war in Ukraine. We obtain large, positive, and statistically significant estimates for Russia's

[2] We also used WITS https://wits.worldbank.org/ to download the trade data.

trade with each of these three countries, especially with India. While we are keenly aware that our estimates are relative and should be interpreted with caution, they point to a very important possibility with clear implications for the effectiveness and potential success of the sanctions on Russia.

Specifically, if the estimates that we obtain for Russia's trade with India, China, and Turkey are indeed positive and statistically significant, this means that trade between Russia and these countries has increased beyond the traditional trade diversion general equilibrium (GE) effects, i.e., *the direct bilateral trade costs* between Russia and India, China, and Turkey have decreased significantly after 2021. In turn, the implication is that such a decrease in the direct bilateral trade costs between Russia and third countries (e.g., India, China, and Turkey) may be sufficient not only to fully offset the losses from less trade with the senders of sanctions but to generate net gains for Russia. In combination with the sanctions on Russia, such trade liberalization between Russia and third countries is consistent with the new geopolitical fragmentation of the global trading system that has been developing in recent years. Indeed, there is growing evidence that trade within groups of geopolitically aligned countries grows faster than trade between them; see the latest edition of the World Trade Report (World Trade Organization (2023)).

The rest of the paper is organized as follows. Section 2 describes the main features of the GSDB-R4, highlighting the new sanction cases, along with the methods that we used to update our database. In Section 3, we briefly describe our econometric model and we evaluate the effects on trade of the recent (2022-2023) sanctions on Russia due to its invasion of Ukraine. Finally, Section 4 summarizes our contributions and points to directions for future work.

2 The Global Sanctions Data Base - Release 4

2.1 General Overview

The GSDB defines sanctions as restrictive policy measures that one or more countries (sender(s)) impose on (a) target nation(s) to punish the target(s) and/or persuade the target(s) to change its (their) policies or to address presumed violations of international norms. The GSDB contains records of sanctions categorized into six distinct types. Each sanction case can encompass one or multiple types: *trade* sanctions, *financial* sanctions, *travel* sanctions, *arms* sanctions, *military assistance* sanctions, and *other* sanctions that do not fit into the previous five categories. The GSDB focusses especially on *trade* sanctions and categorizes them further into complete and partial import and export sanctions. Thus, the GSDB is well-suited for studying the effects of trade sanctions based on empirical trade models, such as the gravity model of trade. The GSDB excludes sanction threats. Additionally, the GSDB defines nine political objectives (policy change, regime destabilization, ending territorial conflict, war prevention, ending war, terrorism, human rights violation, restoration of democracy, and other objectives that do not fit into any of the aforementioned categories) and five objective-specific success score categories (total success, partial success, negotiation settlement, failure, and ongoing for cases that have not been repealed) for each sanction objective.

The GSDB (Felbermayr et al. (2020)) was first released in 2020 in response to the rising demand for policy analysis, correlated with the popularity of sanctions usage as a foreign policy tool. The database is available in two formats: a case-list version and a dyadic version, with the latter being specifically curated for advanced policy analysis. The first release of the GSDB (GSDB_V1) contained records of 729 sanction cases imposed between 1950 and 2016. The first update of the GSDB (GSDB_V2) (Kirilakha et al. (2021)) extended the coverage of sanction impositions to 2019, increasing the total number of recorded cases to 1,101. Among the newly recorded sanction cases, 75 cases were imposed between 2016 to

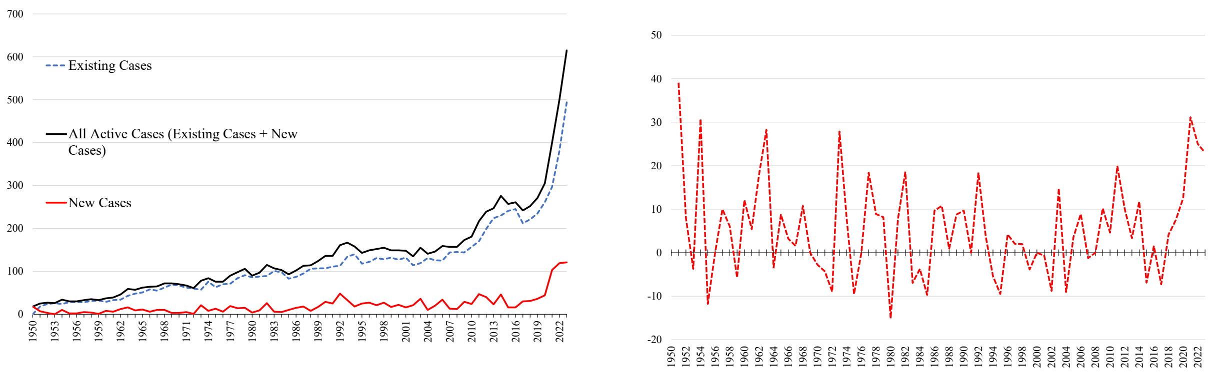
2019, and 306 cases were imposed before 2016. The second update of the GSDB (GSDB-R3) (Syropoulos et al. (2024)) expanded the sanctions coverage to mid-April 2022, adding 99 newly recorded cases. The GSDB-R3 also included a new dimension – the distinction between unilateral and multilateral targets allowing to conduct policy analyses on unilateral vs. multilateral sanctions.

Multiple sources have been utilized and thoroughly studied to ensure comprehensive coverage. Sanctions imposed by the United Nations (UN) were primarily sourced from the United Nations Security Council Resolutions (UNSCR). For the sanctions imposed by the U.S., the information was gathered from several government sources including the Office of Foreign Assets Control (OFAC), the Department of State, the Department of Commerce, and U.S. federal executive orders, as well as public statements made by U.S. officials and embassies. For sanctions imposed by the EU, the primary sources were Common Positions issued by the Council of the EU. In addition, national sources, newspapers, and history books were reviewed, along with keyword searches, which were helpful in collecting sanctions imposed by smaller nations and country blocs as well as older sanctions imposed prior to 1990. Some other sources that were utilized during the collection of sanction cases were the Sanctions Alert publications by Debevoise & Plimpton, which helped to gather sanctions imposed between 2013 and 2017; and the Intrastate Dispute Narratives of the DADM Project by the University of Central Arkansas (UCA) (Mullenbach (2013)). The collected cases were also cross-referenced with the existing databases on sanctions such as the Stockholm International Peace Research Institute (SIPRI), the HSE/HSEO database by Hufbauer and Oegg (2003), the Threats and Imposition of Economic Sanctions (TIES) database by Morgan et al. (2009), and the EUSANCT by Weber and Schneider (2020). Finally, the GSDB benefited from the feedback received from the GSDB users on missing and existing cases.

This paper introduces the latest version of the GSDB - GSDB-R4 - which extends the coverage to the years 2022 and 2023, yielding a total of 1547 sanction cases. The new update incorporates 223 additional sanction cases, comprising 178 cases imposed post-April

Figure 1: Number of Sanctions over Time

(a) New vs. Existing Cases (b) Active Cases (Year-over-Year % Change)



Panel (a) of this figure illustrates the number of all active sanctions (dark solid line), all pre-existing minus terminated sanctions (blue dashed line), and newly imposed sanctions (red solid line, which is equivalent to the distance between the dark solid and blue dashed lines) in each year (1950-2023). Panel (b) presents the year-over-year percentage changes in the number of all active sanctions.

2022. One case was omitted for being a duplicate. The new cases have been identified via thorough keyword web searches. They have been cross-checked using the online resource Global Sanctions (*https://globalsanctions.co.uk*) which provides up-to-date information on sanctions imposed by various OECD countries and Russia.

2.2 Recent Developments: 2022 and 2023

Inspection of panel (a) in Figure 1 reveals that the use of sanctions as a foreign policy tool has grown significantly since the mid-20th century, reflecting the increasing complexity and interdependence of global political and economic relations. Notably, from 2021 to 2023, the world saw the largest year-on-year increase in active sanctions, marking the first time such a significant and continuous rise has occurred since 1950. Specifically, as depicted in panel (b), in 2021, the number of active sanctions grew by 31.2% compared to 2020. This trend continued into 2022 and 2023, with increases of 25% and 23%, respectively, marking one of the most substantial yearly increases in the last decades, driven by escalating geopolitical tensions and conflicts.

The explanation for this trend is multifaceted. Between 2021 and 2023, very few pre-existing sanctions were lifted, likely due to persistent global political and economic uncertainties. The continuation of these sanctions was compounded by the imposition of new sanctions, reflecting the intensifying geopolitical rivalries and conflicts around the world. The imposition of new sanctions reached unprecedented levels, driven primarily by the U.S., as explained in more detail in Section 2.3.

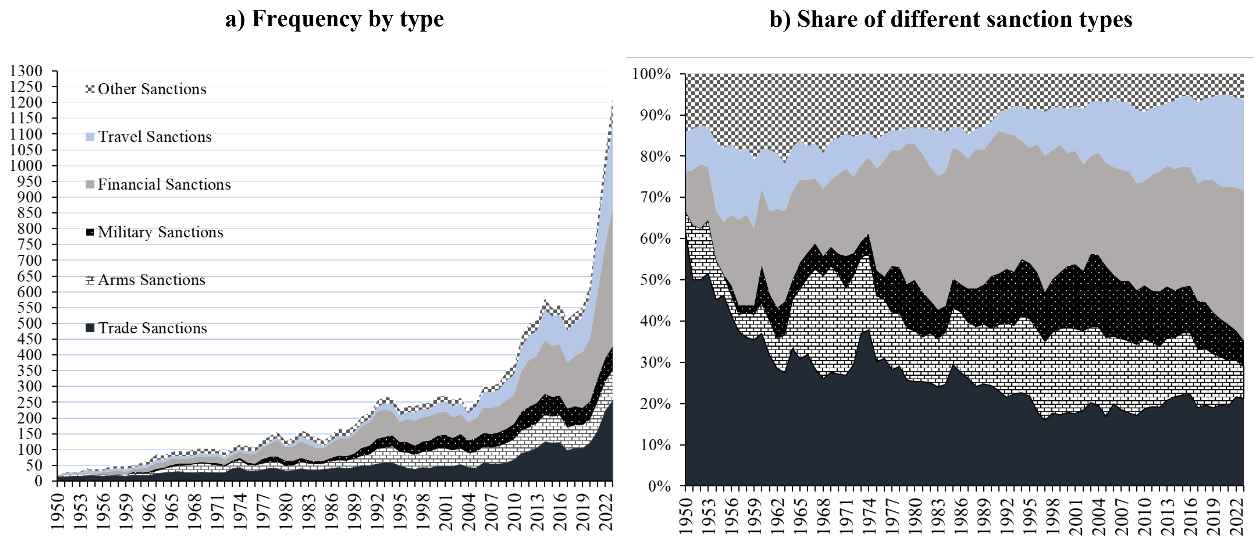
In 2022, the U.S., alongside its allies, imposed a series of financial and travel sanctions targeting key political figures and entities involved in ongoing conflicts and human rights violations. For instance, the U.S. and the EU imposed coordinated sanctions on Russian officials and businesses in response to the ongoing conflict in Ukraine. Similarly, in response to the political upheaval in Myanmar, the U.S. expanded its sanctions list to include additional military leaders and associated businesses.

Moreover, 2023 saw an extension of these trends, with further sanctions being imposed on individuals and entities in countries such as Iran and North Korea in response to their nuclear activities and other violations of international norms. The EU also played a significant role, imposing sanctions on Iranian and Belarusian officials and companies in reaction to the continued suppression of political opposition and civil society.

Overall, the spike in active sanctions in 2022 and 2023 can be attributed to both the persistence of existing sanctions and the imposition of new ones in response to emerging geopolitical conflicts and violations of international norms. Historically, this period marks a notable escalation in the use of sanctions as a tool of international policy, reflecting the heightened global tensions and the strategic use of economic measures to exert political pressure.

Inspection of panel (a) in Figure 2 reveals that the absolute frequency of different types of sanctions has varied significantly over the years. The data show a varying increasing trend of different types of sanctions, reflecting a heightened reliance on particular types of sanctions, specifically, financial, trade, and travel sanctions. In 2022, the total number of sanctions reached a new peak, with significant contributions from trade sanctions, financial sanctions, and travel restrictions.

Figure 2: Types of Sanctions



Note: These two panels report the evolution of the number of sanctions by type for each year between 1950 and 2023. Types of sanctions are: trade sanctions, arms sanctions, military assistance sanctions, financial sanctions, travel sanctions, and other sanctions. Other sanctions include actions like suspension of specific international organizations, or restriction to access harbors and airports.

Panel (b) of Figure 2 provides insights into the share of the different types of sanctions imposed each year. This panel highlights the evolving nature of sanctions, illustrating how the composition of sanctions has changed over time. For instance, trade sanctions and financial sanctions have consistently represented a substantial portion of all the sanctions imposed, particularly in the last two decades, underscoring their importance as primary tools for exerting economic pressure. Equally, travel restrictions have seen a relative increase in their share, however, particularly in 2022 and 2023, reflecting the growing use of targeted measures against individuals and businesses.

The analysis of these panels underscores two key trends. First, the overall increase in the absolute number of different types of sanctions suggests a growing reliance on specific measures to address geopolitical tensions and conflicts. Second, the changing composition of sanctions, with a notable rise in the use of travel restrictions and financial measures, indicates a strategic shift from comprehensive country-wide sanctions towards more targeted and multifaceted approaches. These trends highlight the dynamic and adaptive nature of sanctions as a policy instrument, capable of evolving to meet the challenges of an increasingly complex international landscape. In summary, the data depicted in Figure 2 illustrate the significant rise in both the frequency and diversity of sanctions from 2021 to 2023.

The radial chord diagrams comparing global sanction activities in 1990 vs. 2023 in Figure 3 provide a vivid illustration of the dynamics of sanction activities over the last three decades, focusing on the regions imposing sanctions and the targets of these sanctions.

In 1990, the radial chord diagram reveals that the imposition of sanctions was relatively concentrated among certain regions. Notably, North America and Western Europe were prominent in imposing sanctions, primarily targeting Eastern Europe and parts of Asia. The thickness of the arrows indicates that these regions not only imposed a higher number of sanctions but also targeted multiple countries across different regions. This period was marked by geopolitical tensions at the end of the Cold War, leading to a higher frequency of sanctions aimed at Eastern Europe and the former Soviet states.

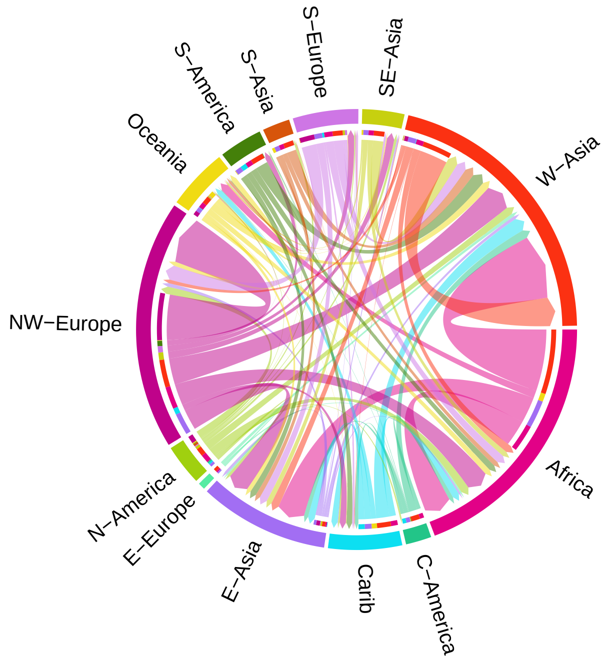
Other regions, such as Africa and South America, were less active in imposing sanctions during this time, reflecting a more limited role in global sanction dynamics. The sanctions imposed by these regions were fewer and primarily focused on their regions or immediate neighbors.

By 2023, the landscape of sanctions had evolved significantly, becoming more complex and widespread. The radial chord diagram for 2023 shows a broader distribution of sanction activities across various regions. North America and Western Europe continue to play significant roles in imposing sanctions, but there is a notable increase in sanction activities from other regions as well. For example, Asia, particularly East Asia and Southeast Asia, has emerged as both a significant imposer and a target of sanctions.

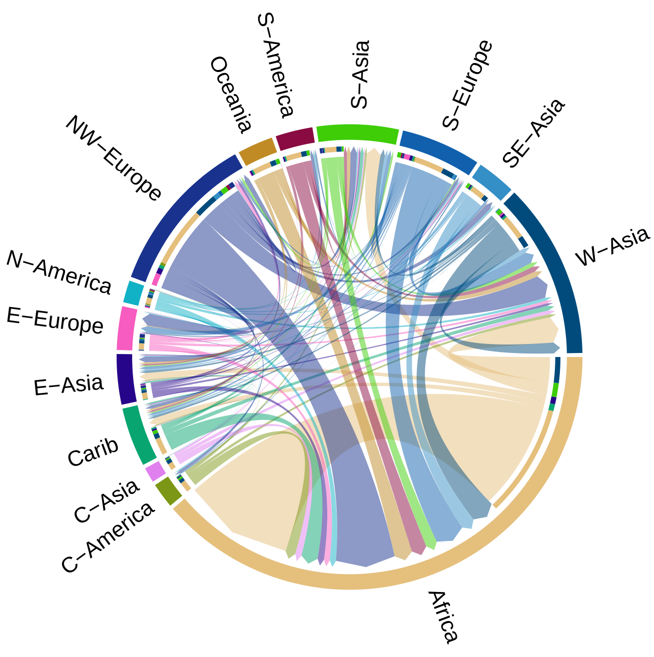
The arrows in the 2023 radial chord diagram are thicker and more numerous, indicating a substantial increase in the number of sanctions imposed globally. This reflects the heightened geopolitical tensions and conflicts that have characterized the recent years. The U.S. and EU have continued to impose sanctions on Russia due to the ongoing conflict in Ukraine, and there has been an increase in sanctions targeting Iran and North Korea over their nuclear

Figure 3: Global Sanction Activities over Time

(a) 1990



(b) 2023



Note: These two radial chord diagrams visualize sanctions imposed on different regions in the world for the years 1990 and 2023. Regions are classified according to the UN Geoscheme, provided on the UN webpage. The direction of the arrows indicates the sanctioning and sanctioned countries, while the thickness of the arrows reflects the number of sanctioning countries and sanctioned countries plus the number of sanctions imposed between regions.

activities.

Another key development in 2023 is the increased sanction activities within regions. For instance, African countries have started to impose more sanctions on their neighbors in response to regional conflicts and political instability. Similarly, Latin American countries have imposed sanctions within the region to address issues such as human rights violations and anti-democratic practices.

Comparing the radial chord diagrams from 1990 and 2023, several trends are evident:

Increased Complexity and Volume: The number of sanctions and the diversity of their sources have increased dramatically. While sanctions in 1990 were largely driven by a few major powers, by 2023, a wider array of countries and regions are actively imposing sanctions.

Regional Sanctions: There is a noticeable rise in the imposition of sanctions within regions. This intra-regional dynamic suggests a growing recognition of sanctions as a tool to address local and regional issues, in addition to global geopolitical concerns.

Broad Targeting: The targets of sanctions have also diversified. In 1990, sanctions were primarily targeted at Eastern Europe and parts of Asia. By 2023, sanctions are imposed more evenly across all regions, reflecting the interconnected nature of contemporary global politics.

In summary, the comparison of the 1990 and 2023 radial chord diagrams highlights the evolving and increasingly complex nature of global sanctions. The growing involvement of more regions both as imposers and targets of sanctions underscores the changing dynamics of international relations and the pervasive role of sanctions as a tool of geopolitical strategy.

A notable trend in the latest GSDB data (GSDB-R4) is the increasing number of ongoing sanctions. This pattern, which was already evident in previous GSDB releases, indicates that once sanctions are imposed, they are seldom lifted. The number of repealed sanction cases remains significantly lower than the number of new sanctions imposed, reflecting a tendency for governments to keep established sanction regimes in place. This has led to the highest share of ongoing sanctions in history during recent years. The persistence of these sanctions underscores a strategic approach where governments maintain pressure on target countries over extended periods, indicating a long-term commitment to their enforcement. Whether sanctions turn out to be more successful is a topic still not clarified in the existing literature (Morgan and Schwebach (1997); Hufbauer et al. (2007); Drezner (1999)).

2.3 Increasing U.S. Sanctions and the Case of Russia

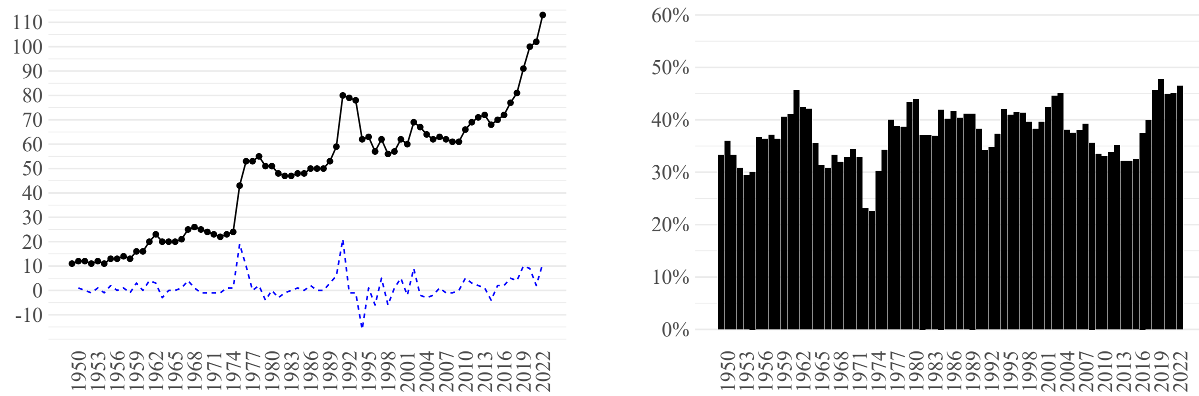
From 1950 to 2023, the U.S. has sanctioned 155 different countries, including nations that no longer exist, such as the German Democratic Republic and Yugoslavia. Since 2000, the U.S. has imposed sanctions on 132 different countries, and since 2010, on 123 countries. These sanctions were not necessarily active simultaneously but were imposed at various points in time.

Figure 4(a)'s black line shows the number of countries sanctioned by the U.S. each year, starting with 11 countries in 1950. This number increased gradually to 24 by 1975, with the second-largest jump occurring between 1975 and 1976 due to sanctions on all Arab League countries during the oil crisis. The largest jump in 1992 was not from new sanctions but from the collapse of the Soviet Union and subsequent sanctions on newly independent states. The number of countries sanctioned by the U.S. has sharply risen since 2010, peaking at 113 in 2023. The increase from 2022 to 2023 was the highest in the 21st century and the third-highest overall, after 1994 and 1976. Newly sanctioned countries include Gabon, with financial sanctions following a coup, and Singapore and Malaysia, with sanctions on individuals and entities for facilitating Iranian petroleum sales, as well as travel sanctions on Israeli settlers in the West Bank. Figure 4(b) illustrates the proportion of total global sanctions attributed to the U.S. in each given year. A decade ago, this share reached its lowest point of the century at 32%, marking the smallest proportion in over 40 years. Since then, the share has been on a steady ascent, peaking at 47% in 2020 and plateauing thereafter.

Figure 5(a) illustrates the countries sanctioned by the U.S. in 2023, regardless of the type

Figure 4: U.S. Sanctions over Time

(a) Unique sanctioned countries vs change (b) Share of U.S. Sanctions



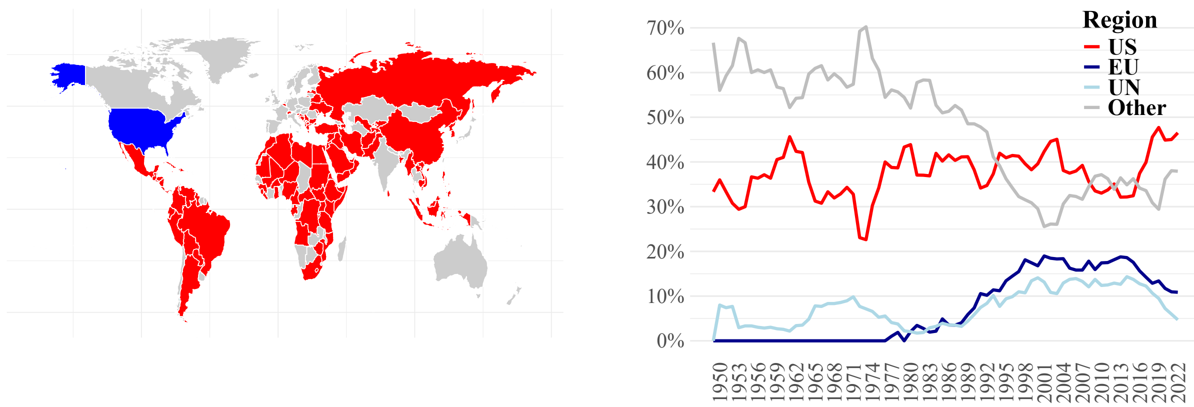
Panel (a) of this figure illustrates the number of all unique sanctioned countries (black line) and the year-over-year change in unique sanctioned countries (blue dashed line) in each year (1950-2023). Panel (b) presents the share of U.S. sanctions as shares of all sanctions globally in a given year.

of sanction. Geographically, nearly all of Latin America is under U.S. sanctions, with the exceptions of Chile, Uruguay, and Guyana. In the Middle East, every country, including U.S. allies such as Saudi Arabia, the United Arab Emirates (UAE), and Israel, is subject to some type of sanctions. This figure, however, does not distinguish between the various types of sanctions imposed. For countries with which the U.S. maintains friendly relations, sanctions are typically targeted at specific individuals and companies that oppose U.S. interests by circumventing sanctions imposed on other states. This approach characterizes the majority of sanctions imposed on Latin American countries, such as those targeting human rights abuses within the Nicaraguan judiciary or members of Mexican organized crime groups. Exceptions in Latin America include Venezuela and Cuba, where broader sanction regimes are enforced. Similarly, for U.S. allies in the Middle East and North Africa, targeted sanctions are applied to individuals and companies, e.g., a U.S. sanction imposed on the UAE, where a company and individual were sanctioned for facilitating the circumvention of U.S. sanctions on Iran.

Figure 5(b) presents the global share of sanctions attributed to the U.S., EU, UN, and all other senders. As previously discussed with reference to Figure 4(b), the share of U.S. sanctions has gone up. This increase is partly due to the relative decline in sanctions imposed by the EU and UN. The latter has been impacted by the conflict between the U.S., EU, and Russia, leading to reduced cooperation within the United Nations Security Council, where Russia holds veto power. For instance, Russia exercised its veto power to block sanctions on Niger following the 2023 coup and to prevent the extension of UN sanctions on Mali to include arms restrictions. Conversely, the rise in sanctions attributed to other states, particularly since 2020, has been driven by Russian counter-sanctions following the invasion of Ukraine. The overall dynamics in the number of active sanctions is strongly driven by the

Figure 5: US Sanctions in 2023 and Development of Shares

(a) Countries sanctioned by the U.S. in 2023 (b) Share of the U.S., EU, UN and Others



Panel (a) of this figure illustrates a world map where all countries sanctioned by the U.S. in 2023 are highlighted in red, and the U.S. itself is denoted in blue. Panel (b) presents the share of the U.S. in the total number of sanctions as well as thes share of the EU, the UN, and Others.

Russian invasion of Ukraine, which was followed by the most comprehensive sanction regime ever imposed on a major economy.

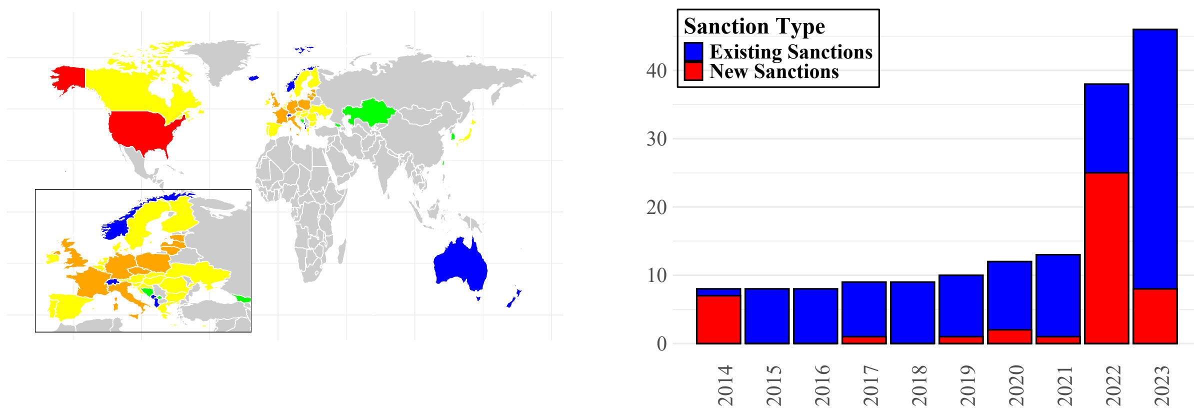
Figure 6(a) displays a world map of all countries imposing sanctions on Russia in 2023, categorized by the number of sanction regimes. Countries in grey did not impose any sanctions, this includes all states in Central and South America, Africa, and the Middle East. Countries colored green imposed a single sanction regime, those in blue imposed two or three regimes, countries in yellow imposed up to six regimes, countries in orange imposed up to nine, and countries in red imposed ten or more. The U.S. is the country with the highest amount of sanctions imposed on Russia. Within Europe, there is surprising heterogeneity, the countries in yellow are all EU member states (plus Ukraine) that have implemented every EU sanction round but have not imposed any unilateral sanctions on Russia. This group includes countries such as Spain, Portugal, and Austria. Countries geographically closer to Russia, possibly feeling more threatened, have imposed unilateral sanctions, such as Poland and the Czech Republic, or even trade sanctions that go beyond EU measures. For instance, Lithuania has implemented a complete ban on agricultural products from Russia.

Figure 6(b) depicts the development of sanctions on Russia since the annexation of Crimea. The height of each bar represents the total number of sanctions imposed on Russia, with the red portion indicating new sanctions and the blue portion indicating existing sanctions. The majority of sanctions were imposed in 2014 in response to the annexation of Crimea. Between 2014 and 2021, only a few targeted sanctions were imposed by the U.S., with minimal additional action. However, in 2022, following Russia's full-scale invasion of Ukraine, the U.S., Europe, and their allies in East Asia imposed a wide array of sanctions, including sectoral trade sanctions. In 2022 alone, 25 sanction regimes were imposed, bringing the total to 38. In 2023, an additional eight sanction regimes were implemented, primarily focusing on trade sanctions on Russian energy exports by the U.S. and Europe, as well as a substantial number of targeted sanctions against Russian companies supporting the military complex. These also included travel bans and asset freezes against Russian generals, politicians, and politically aligned oligarchs. The total amount of sanctions imposed on Russia reached its highest point so far with 56 sanction regimes in place.

Figure 6: Sanctions on Russia

(a) Countries sanctioning Russia

(b) New vs Existing Sanctions on Russia



Panel (a) presents a world map highlighting the countries that have imposed sanctions on Russia. The map uses a color-coding scheme to represent the number of sanctions regimes in place: green for one sanctions regime, blue for two to three regimes, yellow for four to six regimes, orange for seven to nine regimes, and red for ten or more regimes. For better readability, we zoom in on Europe. Note that not a single country in Latin America has imposed any sanctions on Russia. Panel (b) features a stacked bar plot where the height of each bar indicates the total number of sanctions against Russia in a given year. The blue segments of the bars represent existing sanctions, while the red segments denote new sanctions imposed within that year.

3 The Heterogeneous Effects of the Sanctions on Russia

Motivated by the importance and interest in the effects of the 2022 sanctions on Russia due to its invasion of Ukraine, our objective in this section is to obtain estimates of the effects of these sanctions, to explore their heterogeneity across senders and third countries, and to draw some implications about their effectiveness. As discussed in the introduction, we believe that our study is the first to obtain estimates of the effects of the recent sanctions on Russia from a specification that includes a large number of countries. We view such an analysis as important because it will enable us to compare the stringency of the sanction effects across senders and between senders and third countries and also draw implications about the overall effectiveness of the sanctions on Russia.

To achieve these objectives, we have combined data on international trade flows from the *Direction of Trade Statistics* (DOTS) of the International Monetary Fund (IMF) and the United Nations' Comtrade Database, which cover the period 1960-2023, including the two recent years (2022 and 2023) when the sanctions on Russia were in place.[3] From an

[3]Thus, the availability of trade data determines the coverage of our estimating sample (1960-2023).

econometric perspective, we rely on the workhorse model of international trade – the gravity equation, as captured by the following specification, which implements established practices for estimating trade gravity models (e.g., Yotov et al. (2016)):

$$X_{ij,t} = \exp[SANCT_{ij,t}\alpha + GRAV_{ij,t}\beta + \pi_{i,t} + \chi_{j,t} + \overrightarrow{\mu}_{ij}] \times \epsilon_{ij,t}. \tag{1}$$

The dependent variable in equation (1), $X_{ij,t}$, denotes nominal bilateral trade flows in levels from exporter i to importer j at time t, and, following the recommendations of Egger et al. (2022), we use consecutive-year panel data (instead of data with intervals or averaged data). To account for heteroskedasticity in the trade data and to take advantage of the information contained in the zero trade flows, we follow Santos Silva and Tenreyro (2006) to estimate the model with the Poisson Pseudo Maximum Likelihood (PPML). The standard errors in all specifications are clustered by country pair; however, our results are robust to clustering them three-way, i.e., by exporter, importer, and time Egger and Tarlea (2015).

The main covariates in our model are included in $SANCT_{ij,t}$. We use vector notation because we employ different (and sometimes multiple) sanction variables in the alternative specifications. $GRAV_{ij,t}$ denotes a vector of time-varying bilateral covariates, which are standardly used in gravity regressions. Specifically, we include indicator variables to control for the presence of regional trade agreements between countries i and j at time t ($RTA_{ij,t}$), common membership in the World Trade Organization ($WTO_{ij,t}$), and membership in the European Union ($EU_{ij,t}$). The data on RTAs come from Egger and Larch (2008), while the data on WTO and EU membership come from the *Dynamic Gravity Database* of the USITC (Gurevich and Herman (2018)).

Finally, specification (1) includes 3 sets of fixed effects. $\pi_{i,t}$ and $\chi_{j,t}$ are exporter-time and importer-time fixed effects, respectively, which will control for the structural multilateral resistances of Anderson and van Wincoop (2003) but also for country size and any other observable and unobservable country-specific determinants of trade flows. In addition, we use directional country-pair fixed effects, $\overrightarrow{\mu}_{ij}$, which control for all time-invariant bilateral trade costs (Egger and Nigai (2015), Agnosteva et al. (2019)) and mitigate potential endogeneity concerns (Baier and Bergstrand, 2007).[4] Relatedly, and as discussed in Felbermayr et al. (2022), *"another factor that mitigates potential endogeneity concerns with respect to sanctions is that, by definition, sanctions are usually imposed in response to actions/inactions that are specific to the target country. Therefore, the use of exporter-time and importer-time fixed effects in our econometric specification completely controls for any such target-specific linkages"* (p. 27).

Our estimation results are presented in Table 1, where we start with a benchmark specification that includes a single indicator variable for the presence of any sanction in our sample, and then gradually introduce a series of additional sanction covariates within nested econometric models. This sequential approach enables us to capture different aspects of the effects of the sanctions on Russia and explore their heterogeneity across various dimensions (e.g., time, senders, and third countries). All estimates in Table 1, are obtained with the PPML estimator and include the full set of fixed effects and control variables from specification (1), whose estimates are omitted for brevity. Instead, we focus exclusively on the estimates of the effects of sanctions.

The estimates in column (1) are obtained with a single dummy variable that captures the presence of any sanctions in our sample. The corresponding estimate is negative and statistically significant, but it is very small in magnitude. A natural explanation for the small sanction effect in column (1) is that it may be masking significant heterogeneity depending on the type of sanctions, especially with respect to trade sanctions. Therefore, in column (2), we capitalize on the rich dimensionality of the GSDB-R4 with respect to trade sanctions, and we distinguish between the effects of complete trade sanctions vs. partial trade sanctions vs. other types of sanctions.[5]

[4]We refer the reader to Baier et al. (2019) for a discussion of the importance of using *directional* (instead of symmetric) country-pair fixed effects in gravity regressions.

[5]We also experimented by breaking the 'other sanctions' covariate by individual sanction type, but this did not significantly affect our results and conclusions.

Table 1: The Effects of the Sanctions on Russia

	(1) CMMN	(2) TRADE	(3) RUSSIA	(4) 2014	(5) 2022	(6) SNDRS	(7) THIRD
ANY	-0.073						
	(0.012)**						
COMPLT		-1.029					
		(0.178)**					
PARTL		-0.120					
		(0.026)**					
NO_TRADE		-0.022					
		(0.017)					
RUS_ALL			-0.097	0.142	0.163	0.160	0.161
			(0.033)**	(0.106)	(0.121)	(0.121)	(0.121)
RUS _2014				-0.255	-0.214	-0.214	-0.218
				(0.112)*	(0.126)$^{+}$	(0.127)$^{+}$	(0.128)$^{+}$
RUS _2022					-0.277	-0.433	-0.268
					(0.044)**	(0.128)**	(0.136)*
USA_2022						-0.444	-0.330
						(0.046)**	(0.054)**
CAN_2022						-0.363	-0.248
						(0.268)	(0.266)
JPN_2022						-0.119	-0.005
						(0.049)*	(0.054)
CHE_2022						-0.137	-0.022
						(0.069)*	(0.071)
NOR_2022						-0.243	-0.129
						(0.191)	(0.191)
GBR_2022						-0.176	-0.062
						(0.066)**	(0.069)
EU_2022						-0.264	-0.150
						(0.045)**	(0.053)**
CHN_2022							0.338
							(0.140)*
TUR_2022							0.203
							(0.102)*
IND_2022							0.881
							(0.286)**
N	2394730	2394730	2394730	2394730	2394730	2394730	2394730

Notes: This table reports estimates of the heterogeneous effects of sanctions on Russia's trade. The dependent variable is aggregate bilateral trade in levels. All estimates are obtained with the PPML estimator and exporter-time, importer-time and directional country-pair fixed effects. In addition, we control for the presence of RTAs, WTO membership, and EU membership. The estimates on all controls and the fixed effects are omitted for brevity. Column (1) reports the estimate of the effects of any sanction on trade flows. Column (2) distinguishes between the effects of complete trade sanctions vs. partial trade sanctions vs. non-trade sanctions. Column (3) obtains an average estimate of the effects of all sanctions on Russia. Column (4) distinguishes between the effects of the 2014 sanctions on Russia vs. the other sanctions on Russia. In addition, column (5) also introduces the 2022 sanctions on Russia. In column (6), we obtain estimates of the effects of the sanctions on Russia for some of the main senders. Finally, column (7) also allows for 'extraterritorial' effects for China, India, and Turkey. Standard errors are clustered by country pair. $^{+}$ $p < 0.10$, * $p < .05$, ** $p < .01$. See text for further details.

As expected, we obtain a large, negative, and statistically significant estimate of the impact of complete trade sanctions, which implies that they have eliminated about 64 percent of the bilateral trade between the senders and targets of sanctions in our sample.[6] The estimate of the effects of partial trade sanctions is also negative and statistically significant, however, as expected, it is significantly smaller in absolute value as compared to the estimate of complete trade sanctions.[7] Finally, we see that the estimate of the effects of other sanctions in column (2) is no longer statistically significant. Overall, we find these results intuitive and they are consistent with the existing literature.

The results in column (3) zoom in on the effects of the sanctions on Russia by introducing an additional indicator variable, which takes a value of one for any sanction that was imposed on Russia during the period of investigation, and it is equal to zero otherwise. To ease interpretation, we redefine the other sanction variables in this specification to exclude the sanctions on Russia. The estimate of the average effect of all sanctions on Russia that we obtain in column (3) is negative and statistically significant but it is quite small, implying that, on average, trade between Russia and the countries that have sanctioned it during the period of investigation (1960-2023) has decreased by about 9 percent. Based on this result, we conclude that, on average, the sanctions on Russia have not been very effective in impacting Russia's trade with sanctioning states.

In column (4), we distinguish between the effects of the post-2014 sanctions on Russia (i.e., those sanctions that were imposed due to the Crimea conflict) vs. all other sanctions on Russia. To ease interpretation, we redefine the variable for all sanctions on Russia in this specification to exclude the post-2014 sanctions on Russia. Perhaps not surprisingly, we find that the effects of the post-2014 sanctions on Russia are negative, statistically significant, and larger than the effects of all other sanctions, albeit still relatively small. Interestingly,

[6] This effect is calculated as $[\exp(-1.029) - 1] * 100 = -64.264$.

[7] As discussed in Felbermayr et al. (2022), the smaller estimate of the effects of partial sanctions is not surprising since, by definition, these sanctions apply only to specific sectors or activities. Unfortunately, the GSDB does not identify the specific sectors and activities that are targeted by partial trade sanctions. This is an important dimension that we are considering for possible inclusion in future releases of the GSDB.

the estimate on all other sanctions on Russia, i.e., those imposed before 2014 are no longer statistically significant, suggesting that, on average, they have not been effective in decreasing trade between Russia and the sanctioning states.

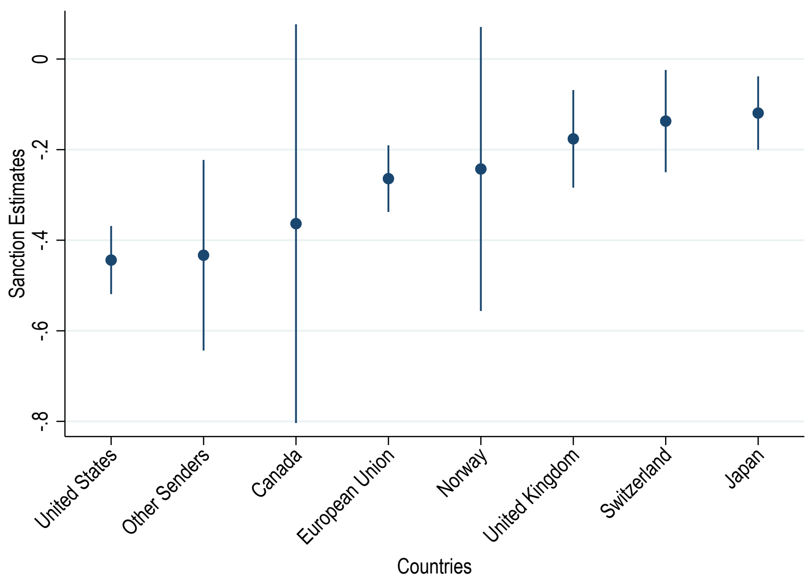
The specification in column (5) of Table 1 allows for differential effects of the most recent sanctions on Russia, i.e., those that were imposed and implemented in 2022 and 2023, due to the Russian invasion in Ukraine. As expected, the estimate of the effects of the 2022 sanctions on Russia is negative and statistically significant, and it is larger in magnitude as compared to the estimate of the 2014 sanctions and all other sanctions on Russia. Somewhat surprisingly, however, the estimate is still relatively small in magnitude, implying a decrease in the bilateral trade flows between Russia and the sanctioning states of about 24 percent. A possible explanation for the small effect is that our estimate may hide significant heterogeneous effects across individual senders.

We explore this hypothesis in our next specification, where we allow for heterogeneous effects of the 2022 sanctions on Russia across seven prominent senders, including the U.S., Canada (CAN), Japan (JPN), Switzerland (CHE), Norway (NOR), the UK (GBR), and the European Union (EU). Our estimates appear in column (6) of Table 1, and they are visualized in the top panel of Figure 7. The main message from these results is that the impact of the 2022 sanctions on Russia has indeed been quite heterogeneous across senders. Specifically, our estimates suggest that the effects of the sanctions sent by the U.S. and Canada were the strongest, followed by the EU, Norway, and Switzerland, while the estimates for Japan and the UK are not statistically significant. We should emphasize, however, that while we are confident in the ranking of the estimates in column (6), we are hesitant to interpret their magnitudes and statistical significance because, by construction, these estimates are relative to the 2022 sanction effects on trade between Russia and other countries, including other senders and third countries that did not impose sanctions on Russia.

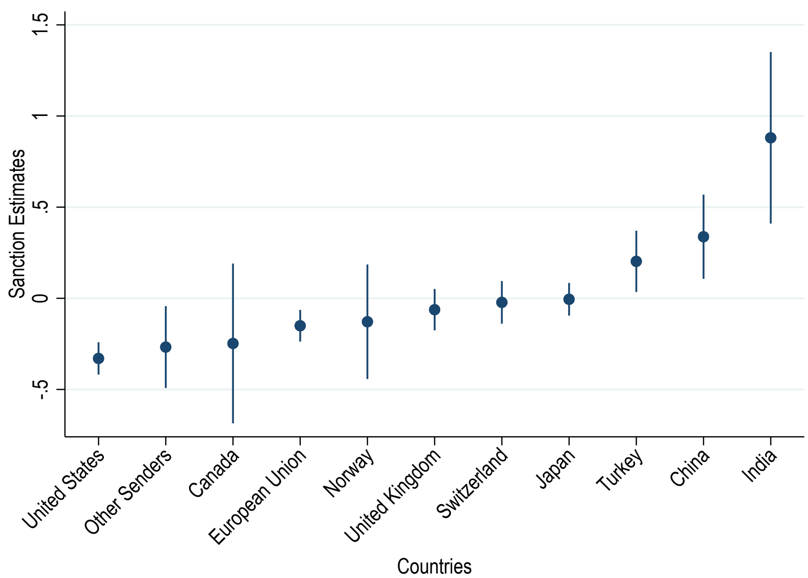
This argument will become clearer in our next experiment where, in addition to allowing for heterogeneous sanction effects for the seven senders from column (6), we introduce three

Figure 7: Country-specific effects of the sanctions on Russia

(a) Including senders only



(b) Including senders and third countries



Notes: Panel (a) of this figure visualizes the estimates from column (6) of Table 1, which are of the effects of the sanctions on Russia on trade with each of the main senders of sanctions. Panel (b) plots the corresponding estimates from column (7) of Table 1, which include both the senders of sanctions and the three 'outside' countries. See text for further details.

covariates that will capture potential changes in the bilateral trade costs post-2021 between Russia and three other countries - China, India, and Turkey. We selected these countries because they have been viewed as Russia's economic allies during the war in Ukraine. While these countries did not impose any sanctions on Russia, they may have gained from trade with Russia beyond the traditional GE effects, which are fully controlled for by the exporter-time and importer-time fixed effects in our econometric model. This specification is motivated by (i) anecdotal evidence for the unusually strong increase in trade between Russia and these three countries in 2022 and 2023, and also (ii) by the findings of Kwon et al. (2022) for strong and heterogeneous effects of extraterritorial sanctions, which may be positive or negative.

Our estimates appear in column (7) of Table 1 and they are visualized in the bottom panel of Figure 7. Two notable findings stand out from these results. First, we see that the magnitudes and statistical significance of the estimates of the effects of sanctions for each of the senders that we included in column (6) have changed. However, the ranking of these estimates across the seven senders remains the same. This, of course, is expected as the specification in column (7) has a different reference group for the country-specific sanction effects. Second, and potentially more importantly, we obtain large, positive, and statistically significant estimates for China, Turkey, and, especially, for India.

As before, the magnitude and statistical significance for each of the country-specific estimates in column (7) should be interpreted with caution because they are relative to the countries for which we do not obtain sanction estimates on their trade with Russia. Thus, changing the reference group, e.g., by explicitly allowing for potential effects for other countries, may impact these estimates, but not their ranking.[8] Nevertheless, the results in column (7) of Table 1 point to a very important possibility with clear implications for the effectiveness and potential success of the sanctions on Russia.

Specifically, if the estimates that we obtain for India, China, and Turkey are indeed positive and statistically significant, this means that trade between Russia and these countries has increased beyond the traditional trade diversion GE effects, which are captured by the

[8] Kwon et al. (2022) propose a solution to this problem by using domestic trade flows to estimate the effects of extraterritorial sanctions. Unfortunately, consistently constructed data on domestic trade flows for many countries does not exist for the recent years that we are interested in.

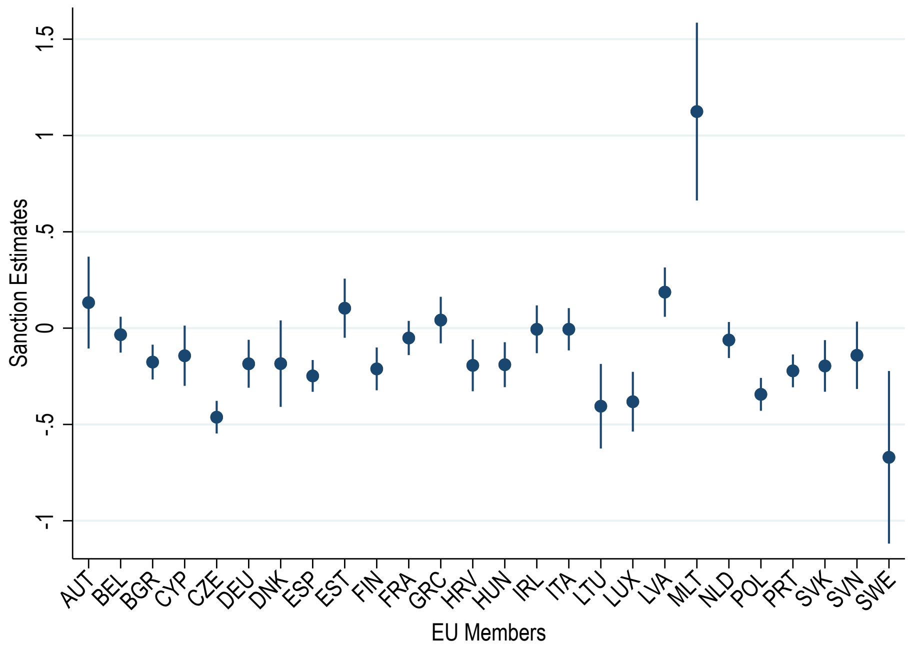
exporter-time and the importer-time fixed effects in our model. In other words, the *direct bilateral trade costs* between Russia and India, China, and Turkey have decreased significantly after 2021. This could be a pure coincidence. Or, more likely, it is the result of deliberate actions undertaken by governments. This has very important policy implications, pointing towards active circumvention measures used by those countries. Moreover, the result also has strong implications for the welfare effects of the Western sanctions on Russia. While (by construction) the traditional GE trade diversion effects to India, China, and Turkey, which were triggered by the sanctions, cannot offset the losses from less trade between Russia and the senders of sanctions, a decrease in the *direct trade costs* between Russia and third countries (e.g., India, China, and Turkey) may be sufficient not only to fully offset the losses from less trade with the senders but to generate net gains for Russia. In combination with the sanctions on Russia, such trade liberalization between Russia and third countries is consistent with the new geopolitical fragmentation in the world that has been developing and forming in recent years.

We conclude the analysis by zooming in on the heterogeneous effects of the sanctions on Russia within the EU. Our estimates appear in Figure 8, and they are based on the specification from column (7) of Table 1 with the only difference that we now obtain estimates for each EU member state instead of imposing a common effect across all EU members.[9] The effects that we estimate vary widely across the EU member states. Sweden, Czechia, and Poland are among the countries with the largest negative and statistically significant effects, while the estimates for Austria, Estonia, Greece, and Ireland are not statistically significant. Finally, we also obtain two positive and statistically significant results: The positive estimate for Latvia is relatively small, however, the estimate for Malta is very large. While we remind the reader that these estimates are relative and should be interpreted with caution, the result for Malta, relative to other EU member states, is consistent with some discussion in the popular media about the fact that Malta has not been very firm in its

[9] The only member state for which we could not obtain an estimate, due to lack of data, is Romania.

treatment of Russia, (e.g., Baczynska (2023) and Meilak (2024)).

Figure 8: Within-EU effects of the sanctions on Russia



Note: This figure visualizes the estimates of the effects of the sanctions on Russia across senders within the EU. The estimates are obtained from the specification from column (7) of Table 1 with the only difference that we have replaced the single EU covariate with country-specific variables for each EU member. See text for further details.

4 Conclusion

In this paper, we introduce the fourth release of the GSDB - GSDB-R4 - that includes 223 previously unrecorded sanction cases imposed worldwide and extends the period coverage through 2023. We observe a continuous rise in the number of sanctions as well as the largest continuous year-over-year increase in sanctions that occurred in 2021-2023. We also observe that newly imposed sanctions outnumber repealed sanctions which have resulted in the largest share of ongoing cases in 2021-2023. In addition, there is a significant shift from country-wide sanctions to sanctions that target entities and individuals. Among the unilateral senders, the largest share of sanctions imposed globally is by the U.S., and Russia is one of the most frequent targets.

Motivated by the significant interest in the sanctions on Russia, and because these sanctions are among the most important new cases in the GSDB-4, we combine the GSDB-4 with recent trade data and we use an empirical gravity model of trade to obtain estimates of the effects of the recent sanctions on Russia. Our estimates reveal that the impact of the sanctions on Russia has been negative and statistically significant, but relatively small. In addition, we obtain very heterogeneous effects across the most prominent senders of sanctions, including very heterogeneous effects across the EU members.

Importantly, we also obtain relative estimates of the change in bilateral trade costs between Russia and three countries (China, India, and Turkey) that did not impose sanctions on Russia but have been viewed as Russia's economic allies. These estimates are positive, large, and statistically significant, suggesting that the *direct bilateral trade costs* between Russia and these countries, relative to Russia's trade costs with other countries, have decreased significantly after 2021. This result is consistent with the view that China, India, and Turkey have deliberately worked towards reducing their bilateral trade costs with Russia to take maximum advantage of the West's sanctions against Russia. The result highlights that the trade liberalization between Russia, China, India, Turkey, and possibly other countries may be sufficient not only to fully offset the losses from less trade with the senders of sanctions but also to generate net gains for Russia. In any case, our result provides further evidence of the fragmentation of the world economy into blocs of geopolitically aligned countries.

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