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The Extraterritorial Effects of Sanctions

Abstract

We provide quantitative evidence that the primary effects of economic sanctions on trade and welfare are accompanied by strong extraterritorial effects — estimates of the former effects may be significantly biased if the latter effects are not taken into account. Furthermore, while the extraterritorial burden of sanctions on trade falls primarily on target countries, the corresponding effect on trade among senders and third countries is positive. General equilibrium analysis suggests that, for targets, the welfare losses due to extraterritorial effects are large and may exceed the losses due to reduced trade with senders. For senders, the gains from increased trade with third countries may outweigh the losses from decreased trade with targets to generate net welfare gains. The welfare effects on third countries are significant, too. However, the direction and size of these effects depend on three key factors: the size of the target, the size of the sender, and the economic ties among the target, the sender, and third countries.

JEL-Codes: F140, F510, Q170.

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"As [recent US sanctions against Iran, Cuba and Russia] purport to deter economic actors under EU jurisdiction from engaging with target countries, they have an important extraterritorial dimension, which affects EU business and individuals and ultimately the sovereignty of the EU and its Member States."

European Parliament (2020)

"[I]n an interconnected world of open borders, free movement of people, goods and capital, how can the architects of globalization [the United States] simultaneously legislate the isolation of one State [Cuba], or place extraterritorial restrictions on commerce, global trade and the movement of individuals?"

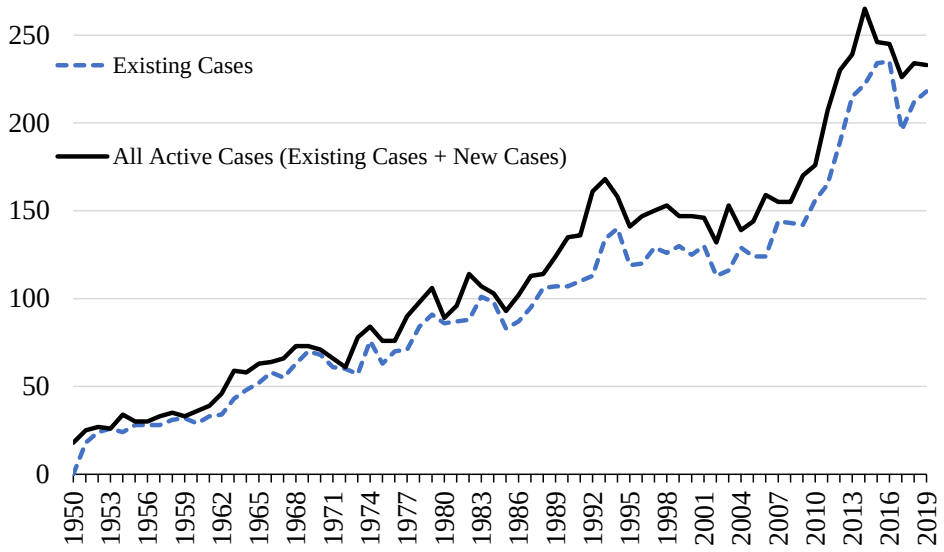
United Nations General Assembly (2011)

1 Introduction

"Sanctions are now a central tool of governments' foreign policy" (The Economist, 2021) and, as shown in Figure 1, the number of applied sanction cases has increased steadily since the middle of the last century. Furthermore, sanctions have evolved significantly along two distinct dimensions: (i) in form (e.g., from 'comprehensive' to 'smart' sanctions); and (ii) in purported objectives (e.g., from 'destabilize regimes' to 'defend human rights'). To be sure, these changes have been met with renewed interest among academics and policy makers. Nonetheless, while the debate on the extent to which sanctions are successful in achieving their objectives remains unsettled (e.g., Hufbauer et al., 2007; Bapat and Morgan, 2009; Kirilakha et al., 2021; Morgan and Kobayashi, 2021), there is ample quantitative evidence and an emerging consensus among scholars and analysts that their economic effects on the sanctioned states (the targets) and the sanctioning states (the senders) are large and significant (for recent surveys see Hufbauer and Jung, 2020; Felbermayr et al., 2021; van Bergeijk, 2021).[1]

[1]Without attempting to offer an exhaustive survey of the related literature, we note that most studies have been predominately focused on the impact of sanctions on target states, cf. Lektzian and Souva (2007)

Figure 1: The Evolution of the Number of Sanctions, 1950-2019.



Note: This figure is from Kirilakha et al. (2021), who use the The Global Sanctions Database (GSDB) to trace the evolution in the number of new (i.e., newly discovered) and existing (i.e., previously discovered) sanction cases during the period 1950-2019.

Economic sanctions have attracted substantial attention internationally, however, not just for their *primary* effects on interacting nations, but also for their *extraterritorial* (or *secondary*) effects especially on third countries.[2] The latter effects have assumed center stage in

and Bapat et al. (2013). For example, Haidar (2017) studies the impact of export sanctions on non-oil exporting Iranian firms, while Miromanova (2021) quantifies the effects of the Russian embargo on the firms operating in that country. Also focusing on Russian firms during the same period, Ahn and Ludema (2020) substantiate that smart sanctions indeed hurt their targets. However, they also demonstrate that target states are capable of 'shielding' some firms that are nationally important. Taking a broader perspective, Neuenkirch and Neumeier (2015) Neuenkirch and Neumeier (2016), Gutmann et al. (2020) quantify the effects of sanctions on growth, poverty, and human rights, respectively. Crozet et al. (2021) and Besedeš et al. (2021) explore the impact on senders by linking sanctions to the export decisions of firms and by quantifying the impact of financial sanctions, respectively. Finally, some studies, e.g., Hufbauer et al. (2007), Kohl and Reesink (2017), Felbermayr et al. (2020b), and Kohl (2021), have focused on the impact of sanctions on the bilateral relations between senders and targets.

[2]Following the literature, we identify as *'primary'* the effects of sanctions due to changes in bilateral trade costs among senders and targets. In contrast, we label *'extraterritorial'* the effects of sanctions due to changes in bilateral trade costs among the countries that are involved in a sanction incidence (i.e., the senders and the target) and the countries outside it (i.e., third countries). Importantly, this definition of *'extraterritoriality'* does not coincide – and, thus, should not be confused – with the standard general equilibrium (GE) effects of sanctions (or of any other policies) on third countries. For example, Felbermayr et al. (2020) obtain estimates of the primary effects of the sanctions on Iran and then translate these effects

the popular press (e.g., Bloomberg, 2021), policy reports (e.g., European Parliament, 2020), international discussions (e.g., United Nations General Assembly, 2011), political threats (e.g., European Union, 2019; Crabtree, 2019; Spain Ministry of Foreign Affairs, 2019), and academic publications (e.g., Gordon, 2016; Jaeger, 2021). There is also anecdotal evidence in support of the presence of these effects on firms and individuals (e.g., Swick-Martin and Evans, 1998; Moehr, 2019). However, to our knowledge, to date there is no systematic quantitative analysis of the extraterritorial effects of sanctions. Our principal objective in this paper is to fill this void by quantifying these effects on trade and welfare (real income) in the world economy.

To perform the analysis, we rely on the widely-used structural gravity system, a.k.a. 'new quantitative trade model', cf. Arkolakis et al. (2012). It is on the basis of this system that we are able to obtain our partial and general equilibrium results. Our innovation to the otherwise standard theoretical framework rests in modeling and quantifying the extraterritorial effects of sanctions on bilateral trade costs. In particular, our analysis demonstrates that the consideration of extraterritorial sanction effects: (i) is important from methodological and policy perspectives; and (ii) has noteworthy implications for the evaluation of both the partial and the general equilibrium effects of sanctions.

From a partial equilibrium/estimation perspective, our contribution is twofold. First, we provide econometric evidence that substantiates the presence of strong extraterritorial sanction effects. Specifically, these effects are sizable and statistically significant. Moreover, they are negative for targets (equivalent to a reciprocal tariff of 1.33%) and positive for senders (equivalent to a reciprocal tariff decrease of -1.69%). Second, we argue that, if analysts omit the extraterritorial sanctions effects from the econometric model their estimates of the primary effects will be biased downward (20% in our sample).

into GE effects on third countries. Even though, in that setting, third countries are affected by the sanctions on Iran, the effects are not *extraterritorial* per se – they are just GE effects due to the *'primary'* effects noted above. For additional clarity, we elaborate on these definitions in the context of specific examples in Section 2.

We also demonstrate that accounting properly for the extraterritorial effects of sanctions may have significant implications for the general equilibrium effects on the welfare of targets, senders, and third countries. Our main result with regards to targets is that the extraterritorial effects magnify significantly the losses due to the primary effects. Interestingly, and in sharp contrast to standard analysis and conventional wisdom, the extraterritorial sanction effects prove beneficial to sender countries. Finally, the effects on third countries in our experiments are also positive. However, the broad conclusion from our analysis is that the direction and magnitude of these effects depend on the economic sizes of the senders and targets, and on strength of their economic ties with third countries.

To obtain our results, we employ two recent data sets: (i) the Structural Gravity Database of the World Trade Organization, cf. (Larch et al., 2018) for data on trade flows, and (ii) the Global Sanctions Database (Felbermayr et al., 2020a; Kirilakha et al., 2021) for data on sanctions. The main advantage of the Structural Gravity Database is that, in addition to international trade flows, it includes domestic trade flows, which are crucial for our identification purposes. The Global Sanctions Database, on the other hand, covers all publicly traceable sanctions during the period of investigation; as such, it enables us to focus on the impact of complete trade sanctions for our main analysis.

Four main findings stand out from our econometric analysis. First, we obtain a negative and statistically significant estimate of the extraterritorial impact of sanctions on trade costs. Capitalizing on the structural properties of our model, we estimate that on average the extraterritorial impact of sanctions is equivalent to an 1.28% reciprocal tariff equivalent on trade between the countries that are involved in the incidence and third countries. Thus, we offer new econometric evidence in support of anecdotal claims that sanctions have a negative impact on trade with third countries.

Second, on a related note but from an econometric perspective, an important implication of the above result is that if the extraterritorial sanction effects are not properly accounted for in the empirical model, the estimates of the primary sanction effects on trade between

sanctioned and sanctioning countries will be biased downward (in absolute value). This is so because, when the extraterritorial effects are not explicitly controlled for, the reference group is subject to negative bias due to erroneously including observations that are under the influence of extraterritorial effects thereby leading to downward bias in the estimates of primary effects of sanctions up to 20% in our sample.

Third, we obtain a large, negative, and statistically significant estimate of the extraterritorial impact of sanctions on trade among targets and third countries. The corresponding reciprocal tariff equivalent in this case is 1.33%.

Fourth, we obtain a positive and statistically significant estimate of the impact of sanctions on trade among senders and third countries, whose effects is equivalent to an -1.7% reciprocal tariff. We emphasize that this favorable estimate is obtained while we control for all possible trade diversion general equilibrium effects in our econometric model. Thus, in effect, our result implies that sanctions bring about a reduction in bilateral trade costs among senders and third countries.

In combination, the opposing estimates of the extraterritorial effects of sanctions on trade among targets vs. senders reveal that, while the extraterritorial burden of sanctions is primarily borne by the targets, the net effect on senders' trade may be positive. The latter finding, which is intriguing, may shed new light on the motives of senders to impose sanctions. For example, it raises the possibility that a sender's rationale for pressuring third countries to impose sanctions may not be just the infliction of pain on target states but also gains in trade and welfare. Another implication of our partial equilibrium estimates is that the impact of sanctions on third-country trade and welfare may be ambiguous (and not necessarily negative).

With the help of a benchmark version of the structural gravity model (*à la* Eaton and Kortum (2002) and Anderson and van Wincoop (2003)), we employ our partial estimates of the primary and extraterritorial effects to quantify the general equilibrium welfare effects due to the sanction imposed by the United States (US) on Cuba. We focus on this specific

sanction for the following reasons. First, it is a well-known, long-lasting, and one of the most comprehensive trade embargoes in the world (Gordon, 2016; Moehr, 2019; Jaeger, 2021). Second, since its implementation, the extraterritorial effects of this sanction have been the object of controversy and heated political exchanges (United Nations General Assembly, 2011; European Union, 2019; Crabtree, 2019; Spain Ministry of Foreign Affairs, 2019). Yet, systematic quantitative evidence for its extraterritorial consequences is missing. Third, the US sanction on Cuba has been the most persistent and comprehensive trade embargoes that is documented in the GSDB during the period of investigation. This feature is helpful – as well as convenient from methodological and expositional perspectives – because it enables us to decompose the primary vs. extraterritorial sanction effects very clearly in our GE analysis. Finally, this sanction has been imposed by an economically large and powerful nation (the US) on a relatively small and economically isolated target (Cuba). The substantial differences in these economies' relative sizes and levels of economic integration in the world economy enable us to highlight some important implications of our analysis for the extraterritorial effects of sanctions on third countries as well.

The broad conclusion from our counterfactual GE analysis is that the extraterritorial sanction effects may lead to significant changes in the welfare of targets, senders, and third countries. With respect to targets, the main implication of our analysis is that if the extraterritorial effects are not taken into account, the estimates of the negative welfare effects on the sanctioned countries are likely to be greatly underestimated. For example, when the extraterritorial effects of the US sanction on Cuba's trade with third countries are added to the primary effects on the target, the negative impact on Cuba's welfare rises by 50% (from a loss of 1.27% to a loss of 1.84%). Turning to senders, our main finding is that the imposition of sanctions may enhance these countries' welfare. In the case of the US sanction on Cuba, our estimates suggest a small but positive welfare increase of 0.09% for the United States. This welfare improvement is driven by the increase in the US's trade with third countries which outweighs the loss associated with the reduction in trade between the US and Cuba.

Finally, we find that, owing to its extraterritorial impact on trade, the US sanction on Cuba has generated significant welfare effects for third countries that vary between -0.009% and 0.62%. Based on the magnitudes and variation of our estimates (as well as the related changes observed in the various experiments we consider), we conclude that the direction and size of the welfare effects on third countries depend on three key determinants: the size of the target, the size of the sender, and the nature of the economic ties between sender, target and outside countries. In particular, third countries could suffer welfare losses due to trade diversion from the target country. However, they could also enjoy welfare gains from possible increase in trade with senders. As a result, the net effect on the welfare on third countries is ambiguous with its sign being dependent upon the determinants noted above.

The rest of the paper is organized as follows. In Section 2 we review the theoretical foundation of our investigation and elaborate on our motivation to pursue it. We describe our data in Section 3. In Section 4, we present and discuss our partial equilibrium estimates of the extraterritorial effects of sanctions on bilateral trade costs. In Section 5, we translate these effects into general equilibrium effects on welfare for the world economy. Section 6 concludes. Supplementary materials are included in an Appendix, which is not intended for publication.

2 Theory and Intuition

Our objective in this section is twofold. First, we will review the structural gravity system we will rely on to obtain both the partial and the general equilibrium estimates for our analysis. Second, to emphasize the methodological importance of accounting properly for the extraterritorial effects of sanctions we will define, decompose, and then contrast the impact of the *primary* sanction effects of sanctions (which are standardly estimated in the literature) to the impact of the *extraterritorial* sanction effects.

It is established and well-understood, cf. Arkolakis et al. (2012), that the following '*struc-*

tural gravity' system can be derived from a very wide class of theoretical micro-foundations.[3]

$$X_{ij,t} = \frac{Y_{i,t}E_{j,t}}{Y_t}\left(\frac{t_{ij,t}}{P_{j,t}\Pi_{i,t}}\right)^{1-\sigma}, \quad (1)$$

$$\Pi_{i,t}^{1-\sigma} = \sum_j \left(\frac{t_{ij,t}}{P_{j,t}}\right)^{1-\sigma}\frac{E_{j,t}}{Y_t}, \quad (2)$$

$$P_{j,t}^{1-\sigma} = \sum_i \left(\frac{t_{ij,t}}{\Pi_{i,t}}\right)^{1-\sigma}\frac{Y_{i,t}}{Y_t}, \quad (3)$$

$$p_{j,t} = \frac{(Y_{j,t}/Y_t)^{\frac{1}{1-\sigma}}}{\gamma_j\Pi_{j,t}}. \quad (4)$$

Equation (1) is the structural gravity equation of bilateral trade flows where: $X_{ij,t}$ denotes trade flows from exporter i to importer j at time t; $E_{j,t}$ is the total expenditure in j; $Y_{i,t}$ is the value of total output in i and $Y_t = \sum_i Y_{i,t}$ is the value of world output; $t_{ij,t}$ captures the bilateral trade cost (factor) from i to j; $\sigma > 1$ is the elasticity of substitution among traded goods; and $P_{j,t}$ and $\Pi_{i,t}$ are the multilateral resistances (MRs) terms introduced in Anderson and van Wincoop (2003).[4] Finally, γ_j admits the dual interpretation of a CES preference parameter (Anderson and van Wincoop (2003)) or a composite technology parameter (Eaton and Kortum (2002)).

Equations (2)-(3) define the MRs as general equilibrium trade cost indexes. These equations consistently aggregate bilateral trade costs and decompose the incidence of these costs on each country's consumers (the inward multilateral resistance, IMR) and producers (the outward multilateral resistance, OMR) as if these agents buy from and ship to, respectively, a single world market. The MRs are important for our purposes because they enable us to translate the GE impact of our partial equilibrium estimates of the extraterritorial sanction effects. Since the IMR can be interpreted as an ideal consumer price index, we will use it to

[3]We will refer to system (1)-(4) as the 'structural gravity system/model/framework'. However, following Arkolakis et al. (2012), we will also refer to it as the 'new quantitative trade model'. Valuable surveys and reviews of the theoretical foundations of this system include Anderson (2011), Costinot and Rodriguez-Clare (2014), Head and Mayer (2014), Yotov et al. (2016), and Baier et al. (2018).

[4]It is worth noting that the trade costs considered in the system described above aim to capture the plethora of obstacles to trade that do not generate revenues.

translate the nominal extraterritorial GE sanction effects into real terms.

Finally, equation (4) is a restatement of the market-clearing condition $Y_{i,t} = \sum_j X_{ij,t}$. This condition will enable us (through the OMR) to translate the changes in bilateral trade costs due to extraterritorial effects into changes in factory-gate prices, $p_{j,t}$. In turn, these prices help determine the changes in nominal income $Y_j = p_j Q_j$, where Q_j is an exogenous endowment of country j's product.[5] Thus, in combination, the changes in the factory-gate prices and the IMRs will enable us to calculate the change in real income/welfare as:

$$\%\Delta W_j = \%\Delta(p_j/P_j). \tag{5}$$

In Section 5, we will rely on equation (5) to analyze the changes in welfare due to changes in the extraterritorial effects of sanctions.

In the remainder of this section we discuss the intuition behind the extraterritorial sanction effects and provide further motivation for our interest in their importance. To facilitate the discussion (and maintain consistency with our counterfactual analysis in Section 5), we will use as a case in point the unilateral (and complete) trade sanction imposed by the United States on Cuba. In addition, for simplicity, we will define the 'Rest of the World' (ROW) as a region that includes all countries that are not involved in a specific sanction incidence (e.g., in the US-Cuba sanction, ROW will include all countries other than the US and Cuba). In our counterfactual analysis, we will obtain individual estimates of the effects of the US-Cuba sanction for each country in the world and we will use the distribution of the sanction effects on third countries to identify several intuitive patterns. For method-

[5] We are keenly aware that, like many other policies that have been analyzed with the gravity model (e.g., RTAs, tariffs, etc.), the extraterritorial effects of sanctions may trigger additional GE effects (e.g., through input-output linkages, cf., Caliendo and Parro (2015), or through asset/capital accumulation, cf., Eaton et al. (2016) and Anderson et al. (2020)). Nonetheless, to perform our counterfactual analysis, we will rely on the most standard and traditional endowment GE gravity framework *à la* Eaton and Kortum (2002) and Anderson and van Wincoop (2003) for three reasons. First, this is the simplest and most widely accepted GE setting. Second, this enable us to trace and decompose the iextraterritorial sanction effects in the model. Third, it allow us to distinguish the main extraterritorial effects we wish to study from any other influences that may occur simultaneously.

ological and pedagogical purposes, our discussion will conform to the 'three-country' setting comprised by the sender (US), the target (Cuba), and the countries that are not part of the US-Cuba embargo (ROW).[6]

We start with several definitions. First, we define the *primary* effects of sanctions as changes in bilateral trade costs, $t_{ij,t}$, between sender and target states during the sanction period (e.g., in the US-Cuba example, this involves the changes in trade costs on trade between these countries). Thus, by their very definition, the primary effects of sanctions are captured by and can be identified from the structural gravity equation (1). These are the effects that the existing literature on sanctions and trade has aimed to assess (e.g., Hufbauer and Oegg, 2003; Hufbauer et al., 2007; Kohl and Reesink, 2017; Felbermayr et al., 2020b; Kohl, 2021). On the basis of standard theory and the findings of this literature, it is safe to expect/suppose such trade cost changes to reduce reciprocal trade flows between senders and targets. In short, the primary effects of sanctions in our framework can be thought of as the effects on bilateral trade costs of non-tariff trade protection measures on senders and targets.

As in our definition of the primary effects of sanctions, we may identify their *extraterritorial* effects with changes in the vector of bilateral trade costs, $t_{ij,t}$. These effects, too, are captured by and can be identified from the structural gravity equation (1). However, this time, the trade cost changes apply to the countries that are involved in the sanction incidence (i.e., both senders and targets) and third countries. Moreover, consistent with anecdotal claims and the existing literature, one may assume that, on average, these sanction effects result in higher trade costs.[7]

[6] In reality, only a subset of countries in ROW is involved in extraterritorial sanctions. Our three-country framework could be augmented to accommodate the possibility of including neutral countries. Since, for our current purposes, this extension would complicate matters without altering the key insights we believe our three-country focus is warranted. Still, because ROW remains a heterogeneous entity, one could interpret our estimates of the average extraterritorial sanction effects on ROW as a lower bound (in magnitude).

[7] In the context of our US-Cuba example, the extraterritorial sanction effects would be associated with trade cost increases on trade between the US and ROW as well as on trade between Cuba and ROW – which would diminish the corresponding trade flows.

We view the above definition of the *extraterritoriality* sanction effects as a step in the right direction. However, it may be unsatisfactory because it fails to distinguish between the extraterritorial effects on third countries vis-a-vis targets versus the effects on third countries vis-a-vis senders. We believe this distinction is important for (at least) two reasons. First, from a practical policy perspective, the complaints most often voiced in the popular press are about the negative extraterritorial sanction effects on trade flows between third countries and the target states (i.e., they concern the decreased trade between ROW and Cuba) and not about the reduced ROW-US trade flows.[8] Are these complaints warranted? Second, one of the most interesting findings of our empirical analysis is that, in fact, trade between ROW and senders actually *increased* as a result of sanctions. This raises the question of how trade costs between senders and ROW might change as part of a sanction package. It is conceivable that these trade costs fall? For these reasons, we find it useful to distinguish between the *extraterritorial effects on targets*, which one normally considers to be negative (i.e., higher trade costs between targets and ROW) and the *extraterritorial effects on senders*, which could be positive due to potentially reduced trade barriers between senders and ROW.

Equipped with the three types of sanction effects defined above (i.e., primary effects, extraterritorial effects on targets, and extraterritorial effects on senders), we use system (1)-(4) to characterize the total impact of sanctions on senders, targets, and ROW. To highlight the potential importance of the extraterritorial sanction effects, we proceed as follows. First, we analyze the total impact of (i) *the primary sanction effects*, (ii) *the extraterritorial sanction effects on targets*, and (iii) *the extraterritorial sanction effects on senders* on each of the three regions in our model. In each of these cases, we proceed as if only the specific effect considered in each case were operational. We then combine the total effects from steps (i)-(iii) to obtain the net total effect of sanctions on each country/region. To simplify exposition,

[8] In the case of the US sanctions on Cuba, for example, Canada, Mexico, and the European Union complained bitterly against the US pressure on these entities and its legislative measures to reduce/eliminate their trade with Cuba (cf. Moehr, 2019; United Nations General Assembly, 2011; European Union, 2019; Crabtree, 2019; Spain Ministry of Foreign Affairs, 2019; Gordon, 2016).

we will focus the following discussion on the total impact on trade, however, qualitatively identical conclusions would arise with regards to the impact on welfare. Finally, once again, for expositional purposes, we will use the US-Cuba sanction as a case in point.

We first analyze the *primary effects of sanctions*. The initial impact of these effects is captured by equation (1). We referred to this as a *direct/partial equilibrium* effect because it only affects the sender (US) and the target (Cuba). Specifically, given our assumptions and definitions, the primary effects of the US-Cuba sanction on trade flows will be a decrease in these countries' exports to each other – ROW will not be affected at this stage. The second transmission channel for the primary effects is through equations (2)-(3). We label this channel *trade diversion* because, when the US and Cuba trade less with each other, part of their lost trade is diverted toward ROW. Thus, the trade-diversion effects will mitigate (but, by construction, not eliminate) the initial negative effects on the US-Cuba trade and spur trade with ROW (i.e., ROW will gain). Finally, through equation (4), the third transmission channel effect may be through the *relative* factory gate prices, which we label *the (nominal) size effect*.[9] In turn, through equation (1), the possibly decreased sizes of the US and Cuba may result in even less trade for these countries. In principle, it is conceivable that the negative size effects on the targets outweigh the positive trade diversion effects for some members. (See Section 5 for specific examples.) The impact on the size of ROW will be positive, but small.

In sum, the total impact of the *primary effects of sanctions* on the trade (and, by extension of the argument, welfare) of the target and sender countries will be unambiguously negative (combining a strong negative *direct* effect, a smaller positive *trade-diversion* effect, and a negative *size* effect), while the impact on ROW would be positive, driven by trade diversion effects away from the countries in the sanction and toward ROW. An important implication of this discussion for our analysis of the extraterritorial effects of sanctions is

[9] We refer to the impact on factory gate prices as *relative* because it depends on the choice of numeraire. In particular, if ROW's product is chosen as the numeraire and the trade cost changes are equal and reciprocal, then the primary effect of the sanction on factory gate prices in the US and Cuba will be negative.

that, if such extraterritorial effects were *not* present, then the countries that are not directly involved in sanctions, i.e., ROW, would actually expect to gain from the imposition of sanctions. This reinforces their concerns about potential losses from extraterritorial sanction effects. For example, due to its traditionally strong ties with Cuba, Spain is a case in point, cf. Spain Ministry of Foreign Affairs (2019).

Next, we turn to *the extraterritorial sanction effects on targets*. As noted earlier, for clarity we discuss these effects in isolation (i.e., as if there were no primary sanction effects). The easiest way to characterize the full impact of these effects is to recognize that, qualitatively, this scenario resembles the analysis of the primary sanction effects. The key difference is that instead of increasing the bilateral trade costs between senders and targets, the hypothetical trade cost change in this scenario entails an increase in the trade costs between ROW and the target. Accordingly, the total effects on the target country's trade will be negative, for reasons similar to the ones discussed above. However, everything else being the same, if ROW is larger than the sender (as is the case in the US-Cuba sanction example), the trade (and welfare) losses that would be incurred by the target (i.e., Cuba) under these extraterritorial sanctions would exceed the target's corresponding losses under the primary sanction effects. Clearly, then, if the US's motivation is to inflict pain on Cuba, this does in fact explain why the US has an incentive to pressure third counties to revise their relationships with Cuba.

Due to trade diversion, *the extraterritorial sanction effects on targets* will spur trade flows between ROW and the sender, as well as trade flows between the target and the sender. This is a potentially important channel that could provide an alternative (and complementary) explanation for the senders' proclivity to promulgate the value of extraterritorial sanctions. Specifically, a sender may pressure third countries to foreclose on their trade with the target, in order to promote trade between itself and these countries. Note, however, that the trade diversion/creation effects for the sender that we described in this scenario are purely general equilibrium effects. As such, and as we discuss next, these effects differ from *the direct*

extraterritorial sanction effects on senders. Understandably, the impact of *the extraterritorial sanction effects on targets* on ROW's trade (and welfare) will be negative – combining a strong negative *direct* effect, a smaller positive *trade-diversion* effect, and a negative *size* effect.

Let us now focus on *the extraterritorial sanction effects on senders*. Once again, it helps to reflect on the nature of these effects in isolation from other effects. If, indeed, there is a reduction in trade costs between the sender and ROW (which might entail 'carrots' to induce ROW to embrace these sanctions), we may conceptualize this scenario as one of trade liberalization. This will lead to direct (trade and welfare) gains for the US and ROW, which will be mitigated by the diversion of trade from the target. The latter country will suffer GE losses due to these trade diversion effects. The relative size effects on the US and ROW will be positive too (because they will become larger due to increased trade between themselves) while Cuba–the target country–will become smaller and will suffer even more. In sum, *the extraterritorial sanction effects on senders* will lead to positive total effects for the sender and for ROW, and to negative GE effects on the target. The possibility for a positive impact of sanctions on ROW and the sender, which we confirm in the empirical analysis that follows, is an intriguing and novel finding that lends itself to a number of alternative interpretations related to, for example, political economy considerations, bribing, etc.

Since the primary and extraterritorial sanction effects discussed above may take place simultaneously, it is imperative to aggregate these effects. Indeed, in the last step of our analysis we combine the results obtained under the previous three steps to obtain the net total impact of sanctions. The result for the target country is clear, unambiguous and intuitive: the primary and the extraterritorial sanction effects will hurt the target. The impact on the sender is ambiguous for the following reasons. On the one hand, the sender will suffer due to higher trade costs on its trade with the target. On the other hand, the sender would benefit from *the extraterritorial sanction effects on the target* as well as from *the extraterritorial sanction effects on senders*. Given that the target countries/regions are

usually smaller relative to the rest of the world, the possibility for a sender to actually gain from a sanction is real, especially if this sender and ROW agree to liberalize their trade unilaterally and/or bilaterally.

Finally, the overall impact of sanctions on the trade (and welfare) in ROW is also ambiguous. This is so because the direction of the net effect is determined by the interaction between a positive GE effect from the *primary* impact of sanctions, a negative *trade-diversion* effect due to *the extraterritorial sanction effects on the target*, and a positive trade creation effect due to *the extraterritorial sanction effects on the sender*. The fact that usually sender countries/regions are significantly larger than target states gives rise to the possibility that, despite the losses due to extraterritorial sanction effects on trade with the target states, ROW may actually end up gaining from sanctions. We offer empirical evidence to support this possibility in the empirical analysis below.

3 Data: Description and Sources

To perform the empirical analysis, we rely on data from several new sources that have already been widely used in research. To motivate the appropriateness of these sources for our current purposes, in this section we provide a brief description of the two main datasets we use: the Structural Gravity Database (SGD) of the World Trade Organization, (Larch et al., 2018), and the Global Sanctions Database (GSDB) (Felbermayr et al., 2020a; Kirilakha et al., 2021).[10]

The SGD includes aggregate manufacturing trade data, and has two important advantages for our purposes. First, because it covers an extended period of time (i.e., almost 40 years between 1980 and 2016). it enables us to include most of the sanction cases contained in the GSDB. Second, the SGD includes consistently constructed domestic trade flows which,

[10]For additional information interested readers may consult the papers noted above and the websites cited below.

as we detail in the next section, is crucial for our identification purposes.[11]

Our source for data on sanctions is the Global Sanctions Database (GSDB).[12] The GSDB is the most comprehensive sanction database. It covers more than 1000 sanction cases over the period 1950-2019, and classifies them by type, objectives, and success. In addition to trade sanctions, the GSDB includes financial sanctions, arms sanctions, sanctions on military assistance, travel sanctions, and other sanctions. Furthermore, within the category of trade sanctions, the GSDB distinguishes between complete vs. partial sanctions and between sanctions on exports, sanctions on imports, and sanctions imposed in both directions of trade.

In the empirical analysis, we control for all possible types of sanctions from the GSDB during 1980-2016. Our focus on this period of investigation was dictated by the availability of trade data from the SGD. To obtain our salient results, we follow the existing literature and capitalize on the GSDB's classification of complete vs. partial trade sanctions to focus on complete trade sanctions. Table 3 in the Supplementary Appendix lists all trade sanction cases from the GSDB that entered our estimating sample along with information on the target/sanctioned country or region, the sender/sanctioning country or region, the start and end of the sanction, and the type of trade sanction considered.

In addition to relying on the SGD and GSDB for data on trade and sanctions, respectively, we use gravity variables (e.g., distance, contiguity, common language, etc.) from the Dynamic Gravity Dataset (DGD) of the United States International Trade Commission, cf. Gurevich and Herman (2018).[13] Finally, for data on trade agreements we rely on the extended version of the Regional Trade Agreements Database by Egger and Larch (2008), which includes all bilateral and regional trade agreements for the years from 1950 to 2019.[14] After combining

[11]The SGD is available at https://www.wto.org/english/res_e/reser_e/structural_gravity_e.htm.

[12]Details on the GSDB can be found at https://www.globalsanctionsdatabase.com. The data can be obtained by request (via e-mail) from GSDB@drexel.edu.

[13]The DGD can be downloaded for free from https://catalog.data.gov/dataset/dynamic-gravity-dataset-1948-2016.

[14]This dataset is available at https://www.ewf.uni-bayreuth.de/de/forschung/RTA-daten/index.html.

the variables we need from all datasets, our estimating sample turns out to be an unbalanced panel that covers the period 1980-2016 for 224 countries.

4 Extraterritorial Sanctions and Bilateral Trade Costs

The objective of this section is to test for and quantify the extraterritorial impact of economic sanctions on bilateral trade costs. To this end, we proceed in three steps. First, we translate the structural gravity equation (1) from Section 2 into an econometric model. Then, we sequentially implement a number of specifications to achieve two goals: (i) establish the representativeness of our estimating sample by comparing the results with previous work; and (ii) emphasize the importance of several elements of the econometric model that may impact our estimates of the effects of sanctions. Finally, we obtain and analyze estimates of the extraterritorial impact of sanctions on bilateral trade costs.

Equation (1) translates into the following baseline econometric model:

$$X_{ij,t} = \exp[\pi_{i,t} + \chi_{j,t} + \sum_t \gamma_t BRDR_{ij,t} + GRAVITY_{ij,t}\alpha + SANCTION_{ij,t}\beta] \times \epsilon_{ij,t}. \quad (6)$$

Following the best-practice recommendations from the related literature, cf. Yotov et al. (2016), we will retain six features of estimating equation (6) throughout the analysis. First, we will use Poisson Pseudo Maximum Likelihood (PPML) as our preferred estimator, cf. Santos Silva and Tenreyro (2006, 2011). Accordingly, the dependent variable $X_{ij,t}$ denotes trade in levels. Second, we will rely on panel data, which will improve estimation efficiency and will enable us to include pair fixed effects to control comprehensively for all time-invariant bilateral trade costs and to mitigate endogeneity concerns with the bilateral trade policy variables, including sanctions, cf. Baier and Bergstrand (2007).[15] Third, we will use exporter-time and importer-time fixed effects, cf. Hummels (2001) and Olivero and Yotov (2012), to

[15] We note that, while the use of panel has a number of advantages, it is not necessary for our identification purposes (i.e., as long as data on domestic trade flows are available, one can obtain estimates of the extraterritorial effects of sanctions even with cross-section data only).

account for the structural multilateral resistance terms of Anderson and van Wincoop (2003) and for the country-specific size variables from equation (1) in our panel setting. Fourth, our dependent variable will include domestic trade flows in addition to international trade flows, cf. Yotov (2021). Importantly, the inclusion of domestic trade flows will play a crucial role for identification purposes, as it will enable us to simultaneously obtain estimates of the primary and extraterritorial sanction effects (both relative to domestic sales).[16] Fifth, following the recommendations of Bergstrand et al. (2015), we will include a set of time-varying border dummy variables, $\sum_t \gamma_t BRDR_{ij,t}$, which are designed to account for common globalization trends. Finally, throughout the analysis, we will cluster the standard errors by country pair.

Our results are presented in Table 1 where, in order to establish the representativeness of our estimating sample and reinforce the importance of proper modeling of the vector of bilateral trade costs, the first five columns sequentially improve our econometric model by populating the vectors $GRAVITY_{ij,t}$ and $SANCTION_{ij,t}$ based on existing studies. The estimates in column (1) are obtained after replacing the vector $GRAVITY_{ij,t}$ with standard gravity variables, but without accounting for the presence of sanctions. We use three distance variables to proxy for geography and transportation costs. Motivated by Eaton and Kortum (2002), we split the logarithm of bilateral distance at its mean into two distance variables, $DIST\_LARGE_{ij}$ and $DIST\_SMALL_{ij}$, which allow for heterogeneous effects of long vs. short distances. In addition, we use the logarithm of internal distance, $DIST\_INTRA_{ij}$, to proxy for domestic trade costs.

The estimates of the effects of distance on international trade flows are in line with those in the literature, cf. Head and Mayer (2014). However, unlike Eaton and Kortum (2002), we do not find differences between the effects of shorter vs. longer distances. The estimate on $DIST\_INTRA_{ij}$ is also negative and (marginally) significant, but much smaller as compared to the estimates of the effects of international distance. A possible explanation

[16]Note that in the presence of proper fixed effects to control for the multilateral resistances, one cannot identify both the primary and the extraterritorial effects of sanctions in a gravity model with international trade flows only.

Table 1: Estimates of the Extraterritorial Effects of Sanctions on Bilateral Trade Costs

	(1) GRAV	(2) SANCT	(3) PAIR	(4) TRADE	(5) COMPLT	(6) DIVERT	(7) TARGET
$DIST\_LARGE_{ij}$	-0.723	-0.712					
	(0.061)**	(0.060)**					
$DIST\_SMALL_{ij}$	-0.722	-0.708					
	(0.071)**	(0.070)**					
$DIST\_INTRA_{ij}$	-0.153	-0.133					
	(0.092)+	(0.091)					
$CNTG_{ij}$	0.669	0.679					
	(0.101)**	(0.099)**					
$LANG_{ij}$	0.240	0.239					
	(0.068)**	(0.067)**					
$CLNY_{ij}$	0.436	0.416					
	(0.094)**	(0.094)**					
$EU_{ij,t}$	0.303	0.330	0.391	0.384	0.383	0.366	0.360
	(0.094)**	(0.094)**	(0.051)**	(0.049)**	(0.049)**	(0.049)**	(0.046)**
$WTO_{ij,t}$	1.042	1.080	0.285	0.285	0.284	0.267	0.230
	(0.080)**	(0.081)**	(0.047)**	(0.047)**	(0.047)**	(0.048)**	(0.045)**
$RTA_{ij,t}$	0.090	0.115	0.158	0.157	0.157	0.156	0.160
	(0.060)	(0.059)+	(0.039)**	(0.038)**	(0.038)**	(0.038)**	(0.037)**
$ANY\_SANCT_{ij,t}$		0.244	-0.069				
		(0.101)*	(0.020)**				
$TRADE\_SANCT_{ij,t}$				-0.183			
				(0.049)**			
$OTHER\_SANCT_{ij,t}$				0.010	0.011	0.015	0.035
				(0.018)	(0.018)	(0.019)	(0.018)+
$COMPL\_SANCT_{ij,t}$					-0.334	-0.401	-0.364
					(0.093)**	(0.097)**	(0.096)**
$PARTL\_SANCT_{ij,t}$					-0.179	-0.175	-0.153
					(0.050)**	(0.049)**	(0.044)**
$DIVERT\_SANCT_{ij,t}$						-0.063	0.085
						(0.023)**	(0.022)**
$DIVERT\_TARGET_{ij,t}$							-0.151
							(0.019)**
N	921236	921236	874600	874600	874600	874600	874600

Notes: This table reports our estimates of the impact of sanctions on trade. The dependent variable in each specification is bilateral trade flows in levels, and the estimator is always PPML. All estimates are obtained with exporter-time fixed effects, importer-time fixed effects, and time-varying border fixed effects. The estimates in columns (3) to (7) also employ country-pair fixed effects. The estimates of all fixed effects are omitted for brevity, but are available by request. A visualization of the estimates of the time-varying border dummies based on the specification in column (1) can be found in Figure 2. Column (1) reports estimates that are obtained with the set of standard gravity variables. Column (2) adds an indicator variable for sanctions of any type. Column (3) introduces country-pair fixed effects, which are also used in all subsequent specifications. Column (4) distinguishes between trade vs. other sanctions. Column (5) allows for differential effects depending on whether the trade sanctions were complete or partial. Column (6) delivers estimates of the average extraterritorial sanction effects. All standard errors are clustered by country-pair. + $p < 0.10$, * $p < .05$, ** $p < .01$. See text for further details.

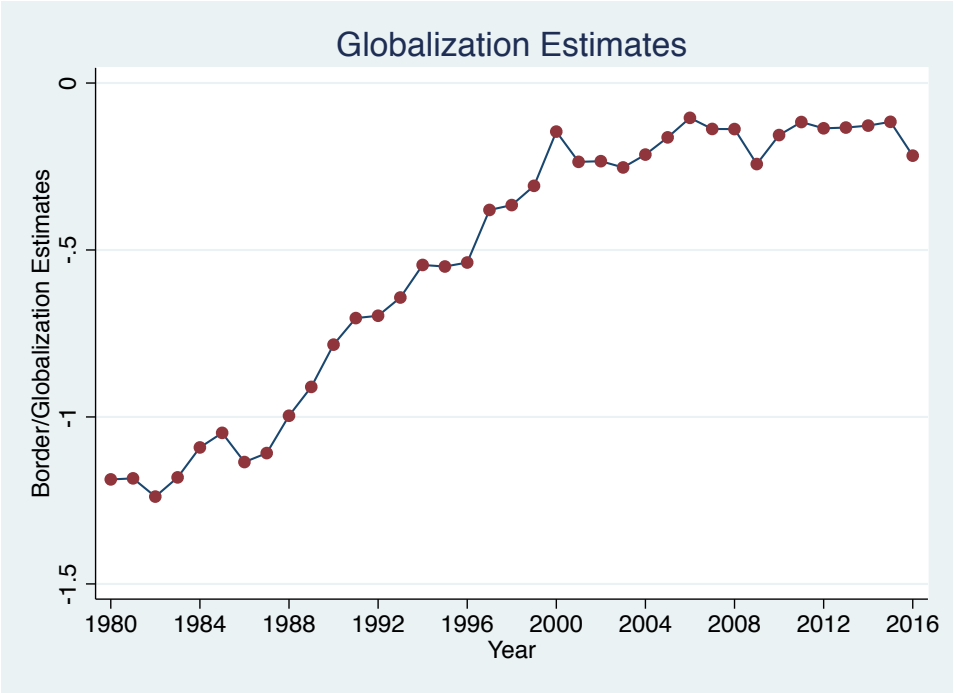
for this result is that domestic distance is proxying for a number of intra-national trade costs. Below we improve our treatment of domestic trade costs.

The next three covariates are indicator variables that account for contiguous borders ($CNTG_{ij}$), common official language ($LANG_{ij}$), and colonial relationships ($CLNY_{ij}$) of any type between countries i and j. The estimates on these variables are positive, sizable, and statistically significant, as expected, cf. Head and Mayer (2014). The next variables are indicators that account for the effects of membership in the European Union ($EU_{ij,t}$), the World Trade Organization ($WTO_{ij,t}$), and regional trade agreements ($RTA_{ij,t}$). The estimates of the effects of the EU and the WTO are positive and significant; however, we do not obtain the expected positive RTA effect. A possible explanation for this is that we do not account for potential endogeneity of RTAs, cf. Baier and Bergstrand (2007). We address this issue in subsequent specifications.

Due to the large number of time-varying border variables, $\sum_t \gamma_t BRDR_{ij,t}$, which is used to account for common globalization trends in column (1) and in the rest of our specifications, we do not report their estimates in a table. Instead, to facilitate the visualization of these trends, we present Figure 2. Several patterns stand out upon inspection of this figure. Consistent with Bergstrand et al. (2015), Figure 2 reveals that the gravity equation is well suited to capture the impact of globalization on international trade. This is captured by the negative and decreasing ('in absolute value') estimates of the time-varying border dummies. In addition, our estimates capture the golden age of globalization since the early 80s to the late 90s, as well as the recession in the early 2000s and the deep recession in 2007-2009. Overall, the results in column (1) are consistent with and comparable to estimates from the literature, thus confirming the representativeness of our sample.

The specification in column (2) is the same as the specification in column (1). However, in addition, we introduce the dummy variable ANY_SANCT, which takes a value of one for the presence of any type of sanction between two trading partners at year t and is equal to zero otherwise. Three findings stand out from a comparison between the results in columns

Figure 2: On the Effects of Globalization, 1980-2016.



Note: This figure reports estimates of the coefficients on the time-varying border variables that are obtained from the gravity specification with standard gravity variables from column (1) of Table 1. The dependent variable is bilateral trade flows in levels, and the estimator is always PPML. The estimates are obtained with exporter-time fixed effects and importer-time fixed effects. See text for further details.

(1) and (2). First, the estimates on all gravity variables that appear in both columns are not statistically different from each other. Second, the estimate on RTAs is still positive and small, but now it increases a bit in magnitude and becomes (marginally) statistically significant, suggesting that accounting for the presence of sanctions may impact the estimates of the effects of RTAs. Finally, somewhat surprisingly, we obtain a positive and significant estimate of the effects of sanctions on trade.

We explore a possible explanation of the positive impact of sanctions in column (3), where we introduce pair fixed effects (to absorb all time-invariant gravity variables from column (2) and control for all possible time-invariant bilateral trade costs). On a related note, as argued by Baier and Bergstrand (2007), the pair fixed effects mitigate endogeneity concerns with the bilateral policy variables. While the estimate on $EU_{ij,t}$ is similar between

columns (2) and (3), we do see significant changes in the estimates on the other three policy variables. Specifically, although all three of them are statistically significant, the estimate on $WTO_{ij,t}$ decreases in magnitude; the estimate on $RTA_{ij,t}$ increases in magnitude and becomes statistically significant; and, finally, the estimate of the effects of sanctions becomes negative and statistically significant as expected. The differences between the estimates in columns (2) and (3) point to the importance of properly controlling for time-invariant bilateral trade costs for the identification of the effects of bilateral policies.

Next, we capitalize on the rich classification of sanction types in the GSDB and follow Felbermayr et al. (2020a) to distinguish between trade sanctions ($TRADE\_SANCT_{ij,t}$) vs. other sanctions ($OTHER\_SANCT_{ij,t}$), in column (4), and further between complete trade sanctions ($COMPL\_SANCT_{ij,t}$) vs. partial trade sanctions ($PARTL\_SANCT_{ij,t}$), in column (5). Consistent with the findings of Felbermayr et al. (2020a), which are obtained with different data, the estimates from column (4) reveal that trade sanctions are effective in impeding bilateral trade flows while, on average, other sanctions do not affect trade flows. The results from column (5) are also intuitive and demonstrate that complete trade sanctions have a strong negative effect on international trade (they reduce trade by about 28%),[17] while the impact of partial trade sanctions, which also decrease trade (by 16%), is weaker as compared to complete trade sanctions.

Our main findings and most important results appear in columns (5) and (6) of Table 1. The specification we employ in column (5) is similar to the one in column (4)–the difference is that, in column (5), we introduce the covariate $DIVERT\_SANCT_{ij,t}$, which is designed to capture the extraterritorial effects of sanctions. Specifically, $DIVERT\_SANCT_{ij,t}$ is a dummy variable that takes the value of one when trade is between a country involved in a sanction case at year t (regardless of whether this country is a target or sender), and a third country that is neither a sender or a target.

Two salient findings emerge upon inspection of column (5). First, we obtain a negative

[17] This is calculated as $[\exp(-0.334) - 1] * 100 = -28.395$.

and statistically significant estimate on $DIVRT\_SANCT_{ij,t}$, which suggests that, consistent with anecdotal evidence, sanctions do indeed have extraterritorial effects that harm trade with third countries. Our estimate implies that, on average, complete trade sanctions decrease trade between the countries that are involved in sanctions and third countries by about 6% (calculated as $(\exp(-0.063)-1)*100=-6.106$). In addition, capitalizing on the structural properties of our model, we find that the estimate for the extraterritorial impact of sanctions is equivalent to a 1.27% reciprocal tariff on trade between the countries involved in sanctions and third countries.[18] While this number may seem relatively small as compared to the primary sanction effects on trade between targets and senders, our estimate of the extraterritorial sanction effects may imply very significant welfare losses, especially from bilateral sanctions, where the number of third countries is very large. We demonstrate this eventuality in the next section.

The second notable result from column (5) has implications for the estimates of the primary effects of sanctions on the countries that are involved in the sanction case. Specifically, we note that the estimate on $COMPL\_SANCT_{ij,t}$ in column (5) is still negative. However, its magnitude is larger (by 20% in absolute value) than its counterpart in column (4). The mechanical/econometric explanation for this result is that the reference group that is used to obtain the estimate on $COMPL\_SANCT_{ij,t}$ in column (4) includes trade between the participants in sanction cases and third countries, while in column (5) we explicitly allow for the possibility of a different impact of sanctions on trade with third countries (i.e., these observations are no longer in the reference group that is used to obtain the estimate on $COMPL\_SANCT_{ij,t}$). Given the negative estimate on $DIVERT\_SANCT_{ij,t}$, the increase in the estimate on $COMPL\_SANCT_{ij,t}$ is as expected. The policy implication of this result is that if the extraterritorial effects of sanctions are not properly accounted for in the econometric model, the estimates of the primary effects of sanctions that are standardly

[18] This is calculated as $(\exp(-0.063/(1-\hat{\sigma})-1)*100$, where we use a standard estimates for the elasticity of substitution $\hat{\sigma}=6$.

obtained in the literature may be biased downward (in absolute value).

In column (6) we allow for differential extraterritorial effects for targets vs. senders. This specification is motivated by the commonly held view that the negative extraterritorial sanction effects fall on trade between third countries and the targets, while the economic relations between third countries and the senders are preserved, if not improved. In fact, the main reasons for the negative extraterritorial impact of sanctions on trade among third countries and targets are often attributed to the preexisting economic interdependence among third countries and senders and their resolve to preserve their relationships. To allow for differential extraterritorial sanction effects on targets vs. senders, we introduce to our model the indicator variable $DIVERT\_TARGET_{ij,t}$, which takes the value of one for trade between targets and third countries. Thus, by construction, the estimate on $DIVERT\_SANCT_{ij,t}$ in column (6) aims to capture the extraterritorial effects on trade between senders and third countries, and the estimate on $DIVERT\_TARGET_{ij,t}$ should be interpreted as a deviation from $DIVERT\_SANCT_{ij,t}$.

Two findings stand out from column (6). First, we obtain a negative and statistically significant estimate on $DIVERT\_TARGET_{ij,t}$. Keeping in mind that the estimate on $DIVERT\_TARGET_{ij,t}$ is a deviation from the estimate on $DIVERT\_SANCT_{ij,t}$, the estimate implies that, on average, complete trade sanctions lead to a 6.39% reduction in the volume of trade between target states and third countries,[19] which corresponds to a tariff equivalent of 1.33%. Thus, consistent with our expectations and the popular view, our estimates confirm that the extraterritorial burden of sanctions on trade is primarily on the targets.

Second, the estimate on $DIVERT\_SANCT_{ij,t}$ in column (6), which now captures the extraterritorial impact of sanctions on senders, becomes positive and is statistically significant. This suggests that, on average, trade between the senders and third countries, not only remains steady at its pre-sanction levels, but actually increases (by 8.87%) following

[19] This is calculated as $(\exp(0.085 - 0.151) - 1) * 100$.

the imposition of sanctions. The corresponding tariff equivalent effect in this case is -1.69%. This is an interesting result with potential implications related to political economy motives for the imposition of sanctions.[20] For example, this result is consistent with a situation in which one country sanctions another to enhance its access (at the expense of the target) in third-country markets. We view this as an intriguing question that future work may address.

5 Sanctions, Trade, and Welfare: A GE Analysis

Our objective in this section is to highlight the importance of properly accounting for the extraterritorial sanction effects in general equilibrium settings. To this end, we use our partial equilibrium estimates of the sanction effects from the previous section to obtain estimated for the general equilibrium welfare effects of the US sanction on Cuba.[21] Following the standard approach in the literature, we perform the counterfactual analysis in three steps.[22] First, to match the data on trade (costs), output and expenditure, we solve system (1)-(4) in the baseline.[23] Then, we solve system (1)-(4) again (but now with the new vector of trade costs). The solution changes due to the primary and extraterritorial effects of sanctions that are based on our estimates from column (7) of Table 1.[24] Third, we construct and report percentage changes in welfare between the baseline and the counterfactual scenario,

[20] See Felbermayr et al. (2021) for a discussion of such motives.

[21] We remind the reader that the motivation for our focus on the US embargo on Cuba was discussed in the introduction.

[22] Mechanically, our counterfactual experiment is based on the most standard solution of the structural gravity system (1)-(4) in levels (e.g., *à la* Eaton and Kortum (2002) and Anderson and van Wincoop (2003)). We also refer the reader to the surveys cited in Footnote 3 for additional technical details.

[23] We chose 1989 as the baseline year for our analysis for two related reasons. First, because the big push for extraterritorial sanctions on Cuba started in the early 90s, e.g., with the passing by Congress of the Torricelli Act (i.e., the Cuban Democracy Act, 22 U.S.C. 69 § 6001–10), which made the U.S. embargo against Cuba extraterritorial in a variety of new ways, cf. Gordon (2016), and whose extraterritorial impact became unprecedented under the Helms-Burton Act in 1996. Second, because 1989 is the last year for which we have original/raw production data for Cuba. Using extrapolated production data for the early 90s delivers very similar results.

[24] While, in principle, it is possible to obtain sanction-specific primary and extraterritorial effects, for our analysis in this section we rely on the common (across all sanctions) estimates from column (7) of Table 1. We discuss possible extensions and refinements in the analysis for policy purposes in the concluding section.

as defined in Section 2:[25]

$$\%\Delta W_j = \%\Delta(p_j/P_j) = \left(\frac{(p_j^c/P_j^c)}{(p_j^b/P_j^b)} - 1\right) * 100, \tag{7}$$

where superscript 'c' denotes counterfactual and superscript 'b' is used for baseline, and all other variables are defined before.

To emphasize the importance of the extraterritorial sanction effects from a methodological perspective, and complement the hypothetical decomposition analysis in Section 2, we calculate the GE welfare impact of the US sanction on Cuba in three sequential steps. First, we obtain welfare changes in the world that are exclusively due to the primary effects of sanctions, i.e., we only change (increase) the bilateral trade costs between the US and Cuba. Then, in addition to taking into account the primary sanction effects, we also change (increase) the trade costs between Cuba and ROW (i.e., we account for the extraterritorial sanction effects on targets). Finally, we introduce the extraterritorial effects of sanctions on senders. In particular, in addition to the primary sanction effects and the extraterritorial effects on targets (and to maintain consistency with our estimates in the previous section), we decrease trade costs between US and ROW.

Our results appear in Table 2.[26] The welfare effects in column (1) are due to the primary effects of the US sanction on Cuba; that is, to obtain these effects we increased the bilateral

[25]The use of the term 'welfare' is not technically correct in our setting because the data we employ are on manufacturing only. In principle, for the counterfactual analysis one could employ existing datasets that cover the full economies, e.g., WIOD or GTAP. However, we prefer to perform the GE experiments with the same data that we used at the estimation stage. Alternatively, one can think of the indexes that we report as a term of trade indexes, cf. Anderson and Yotov (2016). In either case, our goal to capture and emphasize the importance of allowing for extraterritorial effects of sanctions is methodological, and we expect our main conclusions to remain valid with aggregate as well as with sectoral data.

[26]For expositional simplicity, Table 2 reports the GE welfare effects for a representative subsample of 26 countries, including the US, Cuba, the ten countries that were most negatively affected by the primary sanction effects, the ten countries that were most positively affected by the primary sanction effects, and four countries that have vocalized their concerns about the extraterritorial impact of the US sanction on Cuba through various outlets. The welfare indexes for all 193 countries are available in the Supplementary Appendix. The difference in the number of countries between our estimations (224) and the counterfactual analysis (193) is that not all countries appear in all years and the cross-section for our counterfactual analysis, i.e., 1989 includes 193 countries.

trade costs between the US and Cuba in system (1)-(4) using the estimate of -0.364 on $COMPL\_SANCT_{ij,t}$ from column (7) of Table 1. Several findings can be discerned from column (1). First, unsurprisingly, the two countries that suffer the most (in terms of foregone welfare) are the US and Cuba. Second, also as expected, the impact on Cuba is significantly larger as compared to the impact on the US. The large size difference between these countries is a natural explanation of this result.

Third, the effects on third countries are relatively small. However, these effects vary significantly and the variation across them is mostly intuitive. As discussed in Section 2, the small impact on third countries is due to the fact that these are pure GE trade-diversion and trade-creation effects. The observed variation can be explained on the basis of the economic relationships between these countries, the US and Cuba. Thus, for example, we see that the countries that gain the most from the US-Cuba sanction (i.e., the ten states in panel C of Table 2) are all small countries that trade heavily with the US and/or Cuba. Notably, while Spain is the EU country that is affected the most (as expected, due to its traditionally strong economic ties with Cuba), the effect on Spain is quite small. Finally, we note that some Asian and Latin American economies actually suffer from the sanction. (See panel A of Table 2.) This is also a general equilibrium result, but it is also a result related to GE size effects (which outweigh the GE trade-diversion effects).

To obtain the estimates in column (2) of Table 2, we account for the primary effects of sanctions but, in addition, we also take into account the extraterritorial effects of sanctions on targets; that is, in order to adjust the vector of bilateral trade costs in system for this experiment properly, we change trade costs between Cuba and the US on the basis of the -0.364 estimate on $COMPL\_SANCT_{ij,t}$ from column (7) of Table 1 and trade costs between Cuba and all other countries in ROW on the basis of -0.066 estimate on $DIVERT\_TARGET_{ij,t}$.[27] This, in our view, is an attractive scenario that is designed to

[27] We remind readers that, since the estimate on $DIVERT\_TARGET_{ij,t}$ is a deviation from $DIVERT\_TARGET_{ij,t}$, the index we use for the counterfactual is -0.066 = 0.085-0.151.

Table 2: Welfare Effects of the US Sanction on Cuba

(1)	(2)	(3)	(4)
Country	Primary Effects	(2) + Sender ET.	(3) + Target ET.
Panel A. Sender and Target Countries			
CUB	-1.2662	-1.8371	-1.8837
USA	-0.0052	-0.0050	0.0942
Panel B. Countries with the Least Positive Primary Effects			
JPN	-0.0011	0.0004	0.0028
KOR	-0.0009	0.0000	0.0095
BRA	-0.0006	0.0000	0.0229
SAU	-0.0002	0.0000	0.0093
ARE	-0.0001	0.0000	0.0353
ITA	0.0000	0.0000	0.0056
FRA	0.0000	0.0000	0.0247
BGD	0.0000	0.0000	0.0548
SVU	0.0000	-0.0010	0.0023
CHN	0.0000	0.0000	0.0073
Panel C. Countries with the Most Positive Primary Effects			
ABW	0.0072	-0.0035	0.4677
TCA	0.0077	-0.0049	0.5318
HND	0.0083	-0.0038	0.2021
SLV	0.0088	-0.0038	0.2455
DOM	0.0194	-0.0065	0.3203
BLZ	0.0197	-0.0044	0.6226
JAM	0.0197	-0.0062	0.4428
CYM	0.0229	-0.0075	0.4428
HTI	0.0243	-0.0095	0.4282
NIC	0.0246	-0.0091	0.4931
Panel D. Countries that Expressed Special Attitudes			
DEU*	0.0000	0.0000	0.0100
CAN*	0.0006	-0.0004	0.2197
ESP*	0.0006	0.0000	0.0447
MEX*	0.0044	-0.0009	0.3195

Notes: This table reports estimates of the welfare effects due to the US sanction on Cuba for a representative subset of countries in our sample. In addition to the US and Cuba, the countries selected are the 10 countries that are have enjoyed (suffered) the more favorable (adverse) impact of the sanction based on the estimates in column (1). We also selected four additional countries (those that are marked with a '*') that displayed a special attitude toward this sanction. The corresponding estimates for all 193 countries can be found in Table 4 of the Supplementary Appendix. The initial changes in the vector of bilateral trade costs are based on estimates from column (7) of Table 1. Column (1) lists the ISO codes for the selected countries. Column (2) reports estimates from an experiment that only takes into account the primary sanction effects. The estimates in column (3) take into account both the primary and the extraterritorial effects of sanction on target states. Finally, column (4) considers simultaneously the primary sanction effects, the extraterritorial effects on targets and the extraterritorial effects on senders. See main text for more details.

capture succinctly the concerns about the extraterritorial sanction effects from the popular media and political discussions (e.g., Moehr, 2019; United Nations General Assembly, 2011; European Union, 2019; Crabtree, 2019).

Three salient findings emerge from column (2). First, the negative welfare effect on Cuba is 50% larger than in column (1). Our explanation for this finding is that, even though the decrease in trade costs between Cuba and ROW in our experiment is about five times smaller than the decrease in the trade costs between Cuba and the US due to the primary sanction effects (i.e., based on estimates of -0.066 vs. -0.364, respectively), Cuba's trade with other countries is significantly larger as compared to its trade with the US. The policy implication of this result is that, indeed, extraterritorial effects can be a powerful weapon to inflict considerable additional pain on targets.

Second, the estimate of the welfare impact on the US is almost unchanged. The two related explanations for this result are that: (i) the additional impact of the extraterritorial sanction effects on Cuba for the US in this experiment are purely GE effects; and (ii) the changes in trade between Cuba and third countries are very small in relative terms to affect the very large US economy.

Third, we see that, while the effects on third countries in column (2) are still relatively small, now they are almost exclusively negative and, moreover, the biggest winners in column (1) turn into the biggest losers in column (2). (Once again, note that the effects on Spain, Canada, and Mexico are relatively small.) The implication of these results is that the countries that would suffer the most from the extraterritorial impact of the US sanctions on Cuba are actually not the most vocal ones (e.g., compare the estimates for EU countries, Canada, and Mexico vs. the estimates for the countries in the bottom of Table 2.)

The results in the last column of Table 2 are obtained when we simultaneously apply three shocks on the counterfactual bilateral trade cost vector. Specifically, as before, we increase the bilateral trade costs between US and Cuba using the estimate of -0.364 on $COMPL\_SANCT_{ij,t}$, and we increase the bilateral trade costs between Cuba and all other

countries but the US using the estimate of -0.066 on $DIVERT\_TARGET_{ij,t}$. We also decrease the trade costs between the US and all other countries but Cuba using the estimate of 0.085 on $DIVERT\_SANCT_{ij,t}$ from column (7) of Table 1. In other words, the difference between the scenarios in columns (2) and (3) is that in column (3) we also decrease the trade costs between the US and third countries due to the presence of extraterritorial sanction effects on senders.

The changes in the welfare effects in column (3) are mostly intuitive. Most importantly, we see that the welfare impact on the US in this scenario turns positive from negative. Even though the partial estimate of negative primary sanction effects on the trade costs between the US and Cuba is significantly larger (in absolute value) than the positive estimate of the extraterritorial sanction effects on trade costs between the sender (US) and third countries, the net GE effect on the US is positive because the combined size of the countries in ROW is much larger than the size of Cuba. We also see that the negative impact on Cuba is larger too. This result may be attributed to the trade diversion from the US to the third countries which is governed by lower trade costs. Finally, we note that many countries will be affected in this scenario due to changes in their trade with the large US. Unsurprisingly, Mexico and Canada are among the countries that enjoy the most significant welfare gains.

The analysis in this section demonstrated that not taking into account the extraterritorial effects of sanctions has significant implications for the quantification of the welfare effects of sanctions on the targets, senders, and third countries. In summary, with respect to target countries, we obtained 50% larger negative effects of sanctions due to their extraterritorial effects. With respect to sender countries, we showed that it is possible for sanctions to generate positive welfare effects for them. Finally, our results reveal that sanctions may have very significant welfare effects on third countries. In this context, we conclude that the direction and magnitude of these effects depend on three key determinants including, the size of the target, the size of the sender, and the nature of the economic ties between third countries, the target and the sender. Specifically, third countries may lose due to trade

diversion from the target country, but they may also benefit from possible trade creation with the sender. Once again, the net effects depend on the respective sizes of the target and the seder and on the strength of economic ties between them and third countries.

6 Concluding Remarks

We quantified the extraterritorial impact of sanctions on trade and welfare in the world economy. Our main findings and their implications may be summarized as follows: (i) The direct extraterritorial effects of sanctions are sizable and statistically significant. (ii) The extraterritorial effects on targets are negative and large. (iii) The extraterritorial effects on senders are positive. (iv) If the extraterritorial sanction effects are not considered in econometric models, the estimates of the primary sanction effects may be substantially biased. (v) The extraterritorial effects of sanctions have strong welfare implications. (vi) For targets, the welfare losses due to extraterritorial effects are large and magnify considerably the losses due to primary effects. (vii) For senders, the gains from increased trade with third countries may outweigh the losses from decreased trade with the target, thus generating net welfare gains. (viii) The welfare effects on third countries could be large. However, the direction and magnitude of these effects depend on the sizes of the target and the sender, and the economic ties between the regions considered. In sum, our analysis demonstrates that the extraterritorial impact of sanctions on trade and welfare in the world is significant, thus implying that these effects should be taken into account *ex ante*, when sanctions are imposed and *ex post*, when the total impact of sanctions is evaluated.

From a policy perspective, it is possible within our framework to refine the partial equilibrium analysis in order to zoom in on specific sanctions and countries. (See, for example, Kirilakha (2021) which obtains sanction-specific and pair-specific estimates of the primary effects of sanctions.) Similar analysis could be performed to obtain the extraterritorial effects of specific sanctions on specific targets, specific senders, and specific third countries or

regions. A potential challenge with such detailed econometric analysis is the small number of degrees of freedom when a large number of fixed effects (which are required to deliver sound estimates) are present. One way to address this issue is to utilize sectoral or product-level data and to rely on guidance from theory regarding the econometric modeling of the proper fixed effects. An additional advantage of using disaggregated data is that it may capture important patterns of the extraterritorial sanction effects on specific sectors as well as patterns of heterogeneity across sectors.

We also see two exciting opportunities for contributions from a methodological GE perspective. The first is to quantify the relationship between the extraterritorial effects of sanctions and global value chains (GVCs). A possible motivation for such analysis is that, instead of imposing secondary sanctions on trade of final goods, a sender may aim to disrupt the tradability of strategic production inputs between the target and third countries. Caliendo and Parro (2015) is a prominent framework that can be used as a departing point for this analysis. The other promising direction we see for future work is to characterize the relationship between the (extraterritorial) effects of sanctions and structural change. The motivation for this idea is that a sender may find it optimal to impose 'smart' sanctions to hurt specific strategic sectors in the target country. This, in turn, may lead to structural changes in the sanctioned state. In terms of methods, this analysis would require considering sectoral dynamic settings similar to the those of Eaton et al. (2016) and Anderson et al. (2020).

By identifying the channels through which the heterogeneous effects of sanctions travel, and by shedding light on the direction and magnitude of their impact on targets, senders and third countries, our work could serve as a springboard for additional research on the motives and objectives associated with the imposition of economic sanctions. Our findings on trade and welfare gains for senders are consistent with the possibility that some countries may impose sanctions on their own (or bow to external pressure to do so) for economic reasons (e.g., to gain on increase their access to third-country markets) instead of the officially stated

reasons at the imposition stage. Our GE analysis suggests that the impact of sanctions on third countries depends on the sizes of the senders and targets as well as the economic relationships between the countries in a sanction incidence and ROW. Future research could (and probably should) extend this analysis to treat ROW as a heterogeneous entity that contains 'friends' and 'foes' of senders and targets (Garfinkel et al., 2020). We view this as a valuable extension that may deliver more nuanced characterizations of the 'trade diversion' and 'size effects' we explored in this paper. What's more, our analysis and methods could be fruitfully employed to cast fresh light on the question of how national economic developments (e.g., trade and growth) affect political behavior of sovereign states, economic regions, and formal alliances (Kleinman et al., 2020). More ambitiously (and perhaps more interestingly), one may also be able to address how national political and military interests/objectives interact with their economic counterparts to determine not just welfare but also international power (Garfinkel et al., 2020; Felbermayr et al., 2021).

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Supplementary Appendix

This appendix is not intended for publication, and it includes supplementary materials to which we refer to in the main text of the paper. Specifically:

- Table 3 includes all trade sanction cases, which enter our estimating sample.
- Table 4 includes the full set of welfare estimates that correspond to the subsample of results that we report in Table 2

Table 3: Trade Sanctions, GSDB, 1980-2016

(1) Case ID	(2) Target(s)	(3) Sender(s)	(4) Start	(5) End	(6) Type
8	Afghanistan	UN	2000	2002	Exp.Partl.
12	Afghanistan	United States	1999	2002	Exp.Partl., Imp.Partl.
18	Albania, Montenegro, Liechtenstein, Iceland	Russia	2015	2019	Imp.Partl.
20	Algeria	EU	1992	1994	Exp.Partl.
24	Angola	UN	1993	2002	Exp.Partl.
25	Angola	UN	1997	2002	Exp.Partl.
26	Angola	UN	1998	2002	Imp.Partl.
27	Angola	United States	1986	1992	Imp.Partl.
28	Angola	United States	1993	2003	Exp.Partl., Imp.Partl.
30	Argentina	Australia	1982	1982	Imp.Compl.
31	Argentina	Canada	1982	1982	Imp.Compl.
32	Argentina	EEC	1982	1982	Imp.Compl.
33	Argentina	Iran	2003	2007	Exp.Partl.
34	Argentina	New Zealand	1982	1982	Exp.Compl., Imp.Compl.
35	Argentina	Norway	1982	1982	Imp.Compl.
38	Argentina	United Kingdom	1982	1985	Imp.Compl.
40	Argentina	United States	1977	1989	Exp.Partl.
41	Armenia	Azerbaijan	1989	2019	Exp.Compl., Imp.Compl.
42	Armenia	Turkey	1993	2019	Exp.Compl., Imp.Compl.
44	Australia	Russia	2014	2019	Imp.Partl.
52	Belarus	Canada	2006	2016	Exp.Partl.
55	Belarus	EU (+)	2011	2016	Exp.Partl.
56	Belarus	Russia	2010	2010	Exp.Partl.
61	Belarus	United States	2006	2019	Exp.Partl., Imp.Partl.
62	Belize	EU	2001	2004	Imp.Partl.
63	Belize	EU	2014	2014	Imp.Partl.
64	Belize	United States	1997	2004	Imp.Partl.
65	Belize	United States	2012	2019	Exp.Partl., Imp.Partl.
73	Brazil	NAFTA	2001	2001	Imp.Partl.
75	Brazil	United States	1978	1981	Exp.Partl.
86	Burundi	Congo, Eritrea, Ethiopia, Kenya, Rwanda, Tanzania, Uganda, Zambia	1996	1999	Exp.Compl., Imp.Compl.
92	Burundi	Organisation of African Unity	1996	1999	Exp.Compl., Imp.Compl.
96	Burundi	United States	2016	2019	Exp.Partl., Imp.Partl.
112	Cambodia	UN	1992	1992	Exp.Partl., Imp.Partl.
115	Cambodia	United States	1979	1989	Exp.Compl., Imp.Compl.
116	Cambodia	United States	1989	1992	Exp.Compl., Imp.Compl.
123	Cameroon	United States	1992	1998	Imp.Partl.
125	Canada	China	2003	2016	Imp.Partl.
126	Canada	Japan	2003	2006	Imp.Partl.
127	Canada	Korea, South	2015	2016	Imp.Partl.
130	Canada	Mexico	2003	2016	Imp.Partl.
134	Canada	United States	2003	2005	Imp.Partl.
139	Central African Republic	Kimberly Process Participants	2013	2016	Imp.Partl.
148	Ceylon	United States	2012	2019	Exp.Partl., Imp.Partl.
158	Chile	United Kingdom	1974	1980	Exp.Partl.
165	Chile	United States	1989	1989	Exp.Partl.
169	China	CoCom	1950	1985	Exp.Partl.
179	China	Organization of American States	1950	1985	Exp.Partl.
187	China	United States	1993	1994	Exp.Partl.
193	Colombia	United States	2011	2014	Exp.Partl., Imp.Partl.
194	Colombia	United States	2014	2018	Exp.Partl., Imp.Partl.
196	Comecon	Austria, Finland, Sweden, Switzerland	1950	1994	Exp.Partl.
197	Comecon	CoCom	1950	1994	Exp.Partl.
224	Cote d'Ivoire	EU (+)	2005	2016	Exp.Partl.
228	Cote d'Ivoire	UN	2005	2014	Exp.Partl., Imp.Partl.
240	Cuba	United States	1962	2019	Exp.Compl., Imp.Compl.
253	Dominican Republic	United States	2011	2019	Exp.Partl., Imp.Partl.
256	EEC	Argentina	1982	1982	Imp.Compl.
258	EU	Canada	1996	2015	Imp.Partl.
259	EU	Russia	2014	2019	Imp.Partl.
268	Egypt, Arab Rep.	EU	2013	2019	Exp.Partl.
273	Egypt, Arab Rep.	League of Arab States	1978	1983	Exp.Partl., Imp.Compl.
275	Egypt, Arab Rep.	Saudi Arabia	2016	2017	Exp.Partl.
297	Eritrea	Russia	2009	2018	Exp.Partl.
301	Eritrea	UN	2011	2018	Imp.Partl.
307	Estonia	Russia	1992	1998	Exp.Partl., Imp.Partl.
314	Fiji	Australia	1987	1987	Exp.Compl.
317	Fiji	Australia	2000	2000	Exp.Compl.
326	Fiji	EU	2007	2015	Exp.Partl.
327	Fiji	India	1987	1998	Exp.Compl., Imp.Compl.
328	Fiji	New Zealand	1987	1987	Exp.Compl.
331	Fiji	New Zealand	2000	2000	Exp.Compl.
336	Fiji	United Kingdom	2000	2003	Exp.Partl.
344	France	Australia	1983	1986	Exp.Partl.
345	France	Australia	1984	1986	Exp.Partl.
346	France	Australia	1988	1995	Exp.Partl.
347	France	Australia	1988	1996	Exp.Partl.
348	France	Australia	1995	1996	Imp.Partl.
350	France	China	1993	1994	Imp.Partl.
351	France	Denmark	1995	1995	Imp.Partl.
352	France	Japan	1995	1995	Imp.Partl.
355	France	New Zealand	1995	1996	Imp.Partl.
356	France	Norway, Sweden	1995	1995	Imp.Partl.
357	France	United Kingdom	1995	1996	Imp.Partl.

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(1) Case ID	(2) Target(s)	(3) Sender(s)	(4) Start	(5) End	(6) Type
359	France	United States	1985	1985	Imp.Partl.
360	France	United States	1995	1996	Imp.Partl.
361	France	United States	1998	2017	Imp.Partl.
362	France	United States	2003	2003	Imp.Partl.
370	Georgia	Russia	2006	2011	Exp.Compl., Imp.Compl.
371	Georgia	Russia	2006	2013	Imp.Partl.
372	Georgia	Russia	2006	2013	Imp.Partl.
373	Georgia	Russia	2009	2011	Exp.Partl.
382	Gibraltar	Spain	1964	1984	Exp.Partl.
383	Gibraltar	Spain	1965	1984	Exp.Partl.
385	Gibraltar	Spain	1969	1984	Exp.Compl., Imp.Compl.
388	Greece	United States	2013	2019	Exp.Partl., Imp.Partl.
389	Grenada	Organization of Eastern Caribbean States	1983	1983	Exp.Compl., Imp.Compl.
405	Guinea	EU (+)	2009	2014	Exp.Partl.
408	Guinea	Switzerland	2010	2014	Exp.Partl.
422	Haiti	Canada	1991	1994	Exp.Compl., Imp.Compl.
425	Haiti	Organization of American States	1991	1994	Exp.Compl., Imp.Compl.
426	Haiti	UN	1993	1994	Exp.Partl.
431	Haiti	United States	1991	1994	Exp.Compl., Imp.Compl.
436	Haiti	Venezuela	1991	1994	Exp.Partl.
441	Honduras	Venezuela	2009	2009	Exp.Partl.
445	India	Canada	1974	2008	Exp.Partl., Imp.Partl.
453	India	United States	1974	2008	Exp.Partl.
454	India	United States	1978	1982	Exp.Partl.
455	India	United States	1998	2001	Exp.Partl.
457	Indonesia	Australia	2011	2011	Exp.Partl.
461	Indonesia	EU	1999	2000	Exp.Partl.
470	Indonesia	United States	2011	2019	Exp.Partl., Imp.Partl.
471	Iran	Australia	2008	2016	Exp.Partl., Imp.Partl.
472	Iran	Canada	2010	2016	Exp.Partl.
473	Iran	Canada	2011	2016	Exp.Partl.
475	Iran	Canada	2012	2016	Exp.Partl., Imp.Partl.
476	Iran	Canada	2013	2016	Exp.Compl., Imp.Compl.
477	Iran	Canada	2016	2019	Exp.Partl.
479	Iran	EU	2012	2016	Exp.Partl.
480	Iran	EU (+)	2012	2016	Exp.Partl., Imp.Partl.
482	Iran	Japan	2006	2016	Imp.Partl.
483	Iran	Korea, South	2010	2012	Imp.Partl.
485	Iran	Switzerland	2011	2016	Exp.Partl., Imp.Partl.
486	Iran	Switzerland	2016	2016	Exp.Partl.
487	Iran	UN	2006	2016	Exp.Partl., Imp.Partl.
490	Iran	UN	2010	2016	Exp.Partl.
491	Iran	United States	1979	1981	Imp.Partl.
492	Iran	United States	1980	1981	Imp.Partl.
493	Iran	United States	1984	2016	Exp.Partl.
494	Iran	United States	1987	1995	Imp.Compl.
495	Iran	United States	1995	2016	Exp.Compl., Imp.Compl.
496	Iran	United States	1996	2019	Exp.Partl.
499	Iraq	EU	1990	2003	Exp.Partl.
502	Iraq	UN	1990	2003	Exp.Compl., Imp.Compl.
503	Iraq	UN	1991	2003	Exp.Compl., Imp.Compl.
508	Iraq	United States	1980	1990	Exp.Partl.
513	Ireland	United States	1998	2014	Imp.Partl.
518	Israel	League of Arab States	1950	2019	Exp.Compl., Imp.Compl.
520	Israel	Spain, United Kingdom	2014	2019	Exp.Partl.
523	Italy	Turkey	1998	1999	Imp.Partl.
524	Jamaica	United States	2011	2019	Exp.Partl., Imp.Partl.
527	Kazakhstan	Russia	1994	1995	Exp.Partl., Imp.Partl.
535	Korea, North	Australia	2006	2019	Exp.Partl., Imp.Partl.
537	Korea, North	Canada	2011	2019	Exp.Compl., Imp.Compl.
538	Korea, North	EU	2006	2019	Exp.Partl.
541	Korea, North	Japan	2006	2019	Imp.Compl.
542	Korea, North	Japan	2009	2019	Exp.Compl.
545	Korea, North	UN	2006	2019	Exp.Partl., Imp.Partl.
548	Korea, North	United States	1955	2008	Exp.Compl., Imp.Compl.
549	Korea, North	United States	2002	2006	Exp.Partl.
551	Korea, North	United States	2008	2019	Exp.Partl.
552	Korea, North	United States	2011	2019	Imp.Compl.
556	Kuwait	Japan	1990	1991	Exp.Compl., Imp.Partl.
557	Kuwait	UN	1990	1991	Exp.Compl., Imp.Compl.
558	Kuwait	United States	1990	1991	Exp.Partl., Imp.Partl.
559	Kyrgyzstan	Uzbekistan	1998	1998	Exp.Partl.
560	Kyrgyzstan	Uzbekistan	1999	2000	Exp.Partl.
561	Kyrgyzstan	Uzbekistan	2000	2000	Exp.Partl.
562	Kyrgyzstan	Uzbekistan	2001	2001	Exp.Partl.
563	Kyrgyzstan	Uzbekistan	2005	2006	Exp.Partl.
564	Kyrgyzstan	Uzbekistan	2010	2010	Exp.Partl.
565	Kyrgyzstan	Uzbekistan	2013	2014	Exp.Partl.
573	Latvia	Russia	1992	1998	Exp.Partl., Imp.Partl.
576	Lebanon	Israel	1995	1995	Exp.Partl., Imp.Partl.
577	Lebanon	Israel	2006	2006	Exp.Partl., Imp.Partl.
590	Liberia	ECOWAS	1992	1997	Imp.Partl.
591	Liberia	EU	2001	2016	Imp.Partl.
594	Liberia	UN	2001	2007	Imp.Partl.
595	Liberia	UN	2003	2006	Imp.Partl.
599	Liberia	United States	2004	2015	Exp.Partl., Imp.Partl.
601	Libya	Canada	2011	2019	Exp.Partl., Imp.Partl.
604	Libya	EU (+)	2011	2019	Exp.Partl.

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(1) Case ID	(2) Target(s)	(3) Sender(s)	(4) Start	(5) End	(6) Type
607	Libya	Switzerland	2011	2019	Exp.Partl.
608	Libya	UN	1992	2003	Exp.Partl.
609	Libya	UN	1993	2003	Exp.Partl.
612	Libya	United States	1978	2004	Exp.Partl.
613	Libya	United States	1981	2004	Exp.Partl.
614	Libya	United States	1982	2004	Exp.Partl., Imp.Partl.
615	Libya	United States	1986	2004	Exp.Partl., Imp.Partl.
616	Libya	United States	1996	2019	Exp.Partl.
620	Lithuania	Russia	1992	1992	Exp.Partl.
621	Lithuania	Russia	2013	2014	Imp.Partl.
623	Macedonia	Greece	1994	1995	Exp.Compl., Imp.Compl.
645	Mali	United States	2013	2013	Exp.Partl., Imp.Partl.
655	Moldova	Russia	2006	2007	Imp.Partl.
656	Moldova	Russia	2013	2019	Imp.Partl.
657	Moldova	United States	2012	2019	Exp.Partl., Imp.Partl.
661	Myanmar	Canada	2007	2012	Exp.Compl., Imp.Compl.
667	Myanmar	EU (+)	2000	2003	Exp.Partl.
668	Myanmar	EU (+)	2003	2010	Exp.Partl.
669	Myanmar	EU (+)	2010	2013	Exp.Partl., Imp.Partl.
670	Myanmar	EU (+)	2013	2019	Exp.Partl.
674	Myanmar	Switzerland	2000	2006	Exp.Partl.
675	Myanmar	Switzerland	2006	2012	Exp.Partl.
678	Myanmar	United States	1989	2016	Imp.Partl.
679	Myanmar	United States	1990	2016	Imp.Compl.
681	Myanmar	United States	2003	2016	Exp.Partl.
682	Myanmar	United States	2007	2016	Exp.Partl., Imp.Partl.
683	Myanmar	United States	2008	2016	Imp.Partl.
687	Nepal	India	1989	1990	Exp.Compl., Imp.Compl.
689	Nepal	India	2015	2016	Exp.Partl.
695	New Zealand	France	1986	1986	Imp.Partl.
699	Nicaragua	United States	1983	1985	Imp.Partl.
700	Nicaragua	United States	1985	1990	Exp.Compl., Imp.Compl.
728	Nigeria	United States	2013	2019	Exp.Partl., Imp.Partl.
734	Norway	China	2010	2018	Imp.Partl.
735	Norway	Russia	2014	2019	Imp.Partl.
754	Pakistan	United States	1993	1995	Exp.Partl.
767	Palestine	United States	2012	2016	Exp.Partl., Imp.Partl.
769	Panama	United States	1987	1989	Imp.Partl.
798	Poland	United States	1981	1987	Exp.Partl.
800	Poland	United States	1982	1987	Imp.Partl.
830	Russia	Australia	2014	2019	Exp.Partl.
831	Russia	Canada	2014	2019	Exp.Partl.
832	Russia	EU	2014	2019	Exp.Partl., Imp.Partl.
834	Russia	EU (+)	2014	2019	Imp.Partl.
836	Russia	Japan	2014	2019	Imp.Partl.
839	Russia	Switzerland	2014	2019	Exp.Partl., Imp.Partl.
840	Russia	Ukraine	1993	1996	Imp.Partl.
841	Russia	United States	2014	2019	Exp.Partl., Imp.Partl.
852	Sierra Leone	ECOWAS	1997	2003	Exp.Compl., Imp.Compl.
854	Sierra Leone	Liberia	2001	2003	Imp.Partl.
855	Sierra Leone	UN	1997	1998	Exp.Partl.
857	Sierra Leone	UN	2000	2003	Exp.Partl.
863	Somalia	EU (+)	2012	2019	Imp.Partl.
864	Somalia	Switzerland	2009	2019	Imp.Partl.
865	Somalia	Switzerland	2013	2019	Imp.Partl.
868	Somalia	UN	2012	2019	Imp.Partl.
871	Somalia	United States	2010	2019	Imp.Partl.
872	Somalia	United States	2012	2019	Imp.Partl.
874	South Africa	Australia	1985	1994	Exp.Partl., Imp.Partl.
875	South Africa	Commonwealth	1985	1994	Exp.Partl., Imp.Partl.
876	South Africa	Denmark	1975	1992	Exp.Compl., Imp.Compl.
877	South Africa	Denmark	1986	1994	Exp.Compl., Imp.Compl.
878	South Africa	Denmark, Finland, Iceland, Norway, Sweden	1985	1994	Exp.Partl., Imp.Partl.
879	South Africa	EEC	1985	1992	Imp.Partl.
880	South Africa	EEC	1986	1994	Imp.Partl.
883	South Africa	India	1964	1993	Exp.Compl., Imp.Compl.
885	South Africa	Japan	1986	1994	Exp.Partl., Imp.Partl.
887	South Africa	Norway, Sweden	1987	1993	Exp.Compl., Imp.Compl.
890	South Africa	Switzerland	1963	1994	Exp.Partl.
895	South Africa	UN	1986	1994	Exp.Partl.
899	South Africa	United States	1975	1982	Exp.Partl.
900	South Africa	United States	1985	1994	Exp.Partl., Imp.Partl.
909	South Vietnam	China	1978	1988	Exp.Compl., Imp.Compl.
918	South Vietnam	United States	1976	1994	Exp.Compl., Imp.Compl.
927	Soviet Union	United States	1978	1987	Exp.Partl.
928	Soviet Union	United States	1980	1981	Exp.Partl., Imp.Partl.
930	Soviet Union	United States, EEC	1981	1983	Imp.Partl.
943	Sudan	United States	1997	2019	Exp.Compl., Imp.Compl.
944	Sudan	United States	2006	2017	Exp.Partl., Imp.Partl.
945	Sudan	United States	2006	2019	Exp.Partl.
951	Suriname	Venezuela	1990	1991	Exp.Compl., Imp.Compl.
953	Switzerland	Libya	2010	2011	Exp.Compl., Imp.Compl.
955	Syria	Australia	2011	2019	Exp.Partl., Imp.Partl.
956	Syria	Canada	2011	2019	Exp.Partl., Imp.Partl.
957	Syria	Canada	2012	2019	Exp.Partl.
958	Syria	Canada	2013	2019	Exp.Partl.
961	Syria	EU (+)	2011	2013	Exp.Partl., Imp.Partl.
962	Syria	EU (+)	2013	2019	Exp.Partl., Imp.Partl.

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(1) Case ID	(2) Target(s)	(3) Sender(s)	(4) Start	(5) End	(6) Type
963	Syria	League of Arab States	2011	2019	Exp.Partl., Imp.Partl.
965	Syria	Switzerland	2011	2012	Exp.Partl.
966	Syria	Switzerland	2012	2019	Exp.Partl.
968	Syria	United States	1986	1987	Exp.Partl.
969	Syria	United States	2004	2019	Exp.Partl., Imp.Partl.
971	Syria	United States	2011	2019	Exp.Partl., Imp.Partl.
976	Taiwan	United States	1994	1995	Imp.Partl.
992	Thailand, South Vietnam	Cambodia	2004	2007	Imp.Partl.
1004	Transjordan	Saudi Arabia	1990	1991	Exp.Partl.
1027	Ukraine	Canada	2014	2019	Exp.Partl., Imp.Partl.
1028	Ukraine	EU (+)	2014	2014	Exp.Partl.
1029	Ukraine	EU (+)	2014	2019	Exp.Partl., Imp.Partl.
1030	Ukraine	Japan	2014	2019	Imp.Partl.
1031	Ukraine	Russia	1993	1996	Exp.Partl.
1032	Ukraine	Russia	1995	1996	Imp.Partl.
1033	Ukraine	Russia	2006	2006	Exp.Partl.
1034	Ukraine	Russia	2009	2009	Exp.Partl.
1035	Ukraine	Russia	2014	2014	Exp.Partl.
1036	Ukraine	South Vietnam	2015	2018	Imp.Partl.
1038	Ukraine	Switzerland	2014	2019	Exp.Partl., Imp.Partl.
1039	Ukraine	United States	2014	2019	Exp.Partl., Imp.Partl.
1041	United Kingdom	Argentina	1982	1989	Imp.Compl.
1045	United States	Brazil	2003	2016	Imp.Partl.
1046	United States	Canada	2003	2006	Imp.Partl.
1047	United States	Japan	2003	2013	Imp.Partl.
1049	United States	Russia	2014	2019	Imp.Partl.
1052	Uzbekistan	EU	2005	2009	Exp.Partl.
1053	Uzbekistan	Switzerland	2006	2009	Exp.Partl.
1060	Venezuela	United States	2015	2019	Exp.Partl., Imp.Partl.
1076	Yugoslavia	EU	1998	2001	Exp.Partl., Imp.Partl.
1077	Yugoslavia	EU	1999	2000	Exp.Partl.
1085	Yugoslavia	UN	1992	1996	Exp.Compl., Imp.Compl.
1090	Yugoslavia	United States	1999	2000	Exp.Partl.
1096	Zimbabwe	EU (+)	2002	2019	Exp.Partl.
1097	Zimbabwe	Switzerland	2002	2019	Exp.Partl.
1099	Zimbabwe	United Kingdom	2002	2019	Exp.Partl.

Notes: This table lists the active trade sanction cases from the GSDB that enter our estimating sample after matching the sanctions data with the manufacturing data from the Structural Gravity Database (SGD). Column (1) lists the case IDs, as they appear in the original GSDB. The cases are sorted by the name of the sanctioned/target country in column (2). Column (3) lists the sanctioning/sender states. EU (+) in this column denotes cases where the EU was joined by other countries. Often these countries include Cyprus, Malta, Turkey, Croatia, Macedonia, Montenegro, Iceland, Albania, Serbia, Bosnia and Herzegovina, Liechtenstein, Norway, Ukraine, Moldova, Armenia, Georgia, Switzerland. However, not all of these countries join the EU sanctions at all times. For details, we refer the reader to the description of the original GSDB data at https://www.globalsanctionsdatabase.com. Columns (4) and (5) report the start and the end year of the sanction, respectively. Some sanctions do not actually end in 2019, however, this year is listed because it is the last year in the GSDB. The last year in our estimating sample is actually 2016, and it was predetermined by data availability in SGD. Finally, column (6) describes the type of trade sanctions.

Table 4: Welfare Effects of the US Sanction on Cuba

(1)	(2)	(3)	(4)
Country	Primary	Extraterritorial Effects	
	Effects	Target	Sender
CUB	-1.2662	-1.8371	-1.8837
USA	-0.0052	-0.0050	0.0942
JPN	-0.0011	0.0004	0.0028
KOR	-0.0009	0.0000	0.0095
BRA	-0.0006	0.0000	0.0229
TWN	-0.0005	0.0000	0.0072
SAU	-0.0002	0.0000	0.0093
ARE	-0.0001	0.0000	0.0353
ITA	0.0000	0.0000	0.0056
FRA	0.0000	0.0000	0.0247
MAC	0.0000	0.0000	0.0328
BGD	0.0000	0.0000	0.0548
SVU	0.0000	-0.0010	0.0023
CHN	0.0000	0.0000	0.0073
IRQ	0.0000	0.0000	0.0371
DEU	0.0000	0.0000	0.0100
BRN	0.0000	0.0000	0.0274
CSK	0.0000	-0.0003	0.0075
NLD	0.0000	0.0000	0.0426
PRK	0.0000	0.0000	0.0419
AUS	0.0002	0.0000	0.0338
BGR	0.0003	0.0000	0.0074
TUR	0.0003	0.0000	0.0210
THA	0.0004	0.0000	0.0216
POL	0.0004	0.0000	0.0290
SGP	0.0004	0.0000	0.0303
FIN	0.0004	0.0000	0.0243
IRL	0.0004	0.0000	0.0805
IND	0.0004	0.0000	0.0387
DNK	0.0005	0.0000	0.0252
YUG	0.0005	0.0000	0.0246
SWE	0.0005	0.0000	0.0446
AUT	0.0005	0.0000	0.0221
REU	0.0005	0.0000	0.0569
CAN	0.0006	-0.0004	0.2197
NPL	0.0006	-0.0006	0.0598
MNG	0.0006	-0.0006	0.0800
ESP	0.0006	0.0000	0.0447
PRT	0.0006	-0.0003	0.0400
CHE	0.0006	0.0000	0.0217
GRC	0.0006	0.0000	0.0367
HUN	0.0006	0.0000	0.0323
LBR	0.0007	0.0000	0.0480
NOR	0.0007	0.0000	0.0763
IDN	0.0007	0.0000	0.0662
QAT	0.0007	0.0000	0.0295
MNP	0.0008	-0.0004	0.1130

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(1)	(2)	(3)	(4)
Country	Primary Effects	Extraterritorial Effects Target	Sender
PAK	0.0008	0.0000	0.0413
AND	0.0008	0.0000	0.0526
MYS	0.0008	0.0003	0.0570
EGY	0.0009	0.0000	0.0687
ARG	0.0009	-0.0003	0.0803
PHL	0.0009	-0.0004	0.0717
LBN	0.0009	0.0000	0.0801
SMR	0.0009	0.0000	0.0548
KWT	0.0009	-0.0002	0.0429
ISR	0.0009	0.0000	0.0782
BHR	0.0009	0.0000	0.0276
ALB	0.0009	0.0000	0.0429
GBR	0.0009	0.0000	0.0241
ZAF	0.0009	0.0000	0.0441
LBY	0.0009	0.0000	0.0734
KHM	0.0010	0.0000	0.1795
AFG	0.0010	-0.0005	0.0692
JOR	0.0010	0.0000	0.0595
MWI	0.0010	-0.0010	0.1880
CXR	0.0011	-0.0003	0.0988
BTN	0.0011	0.0000	0.1473
LAO	0.0011	0.0000	0.1591
YEM	0.0011	-0.0006	0.0345
CYP	0.0011	0.0000	0.1308
MHL	0.0012	-0.0004	0.1411
MUS	0.0012	0.0000	0.1490
ETF	0.0012	-0.0006	0.0404
TZA	0.0012	0.0000	0.1769
UGA	0.0012	0.0000	0.1897
VNM	0.0012	0.0000	0.1255
IRN	0.0012	0.0000	0.0128
LSO	0.0012	0.0000	0.1712
NZL	0.0012	0.0002	0.0891
MOZ	0.0013	-0.0004	0.0491
ZMB	0.0013	0.0000	0.1610
OMN	0.0013	0.0000	0.0792
MLT	0.0013	0.0000	0.1635
SYC	0.0013	0.0000	0.1443
CMR	0.0013	0.0000	0.1813
PNG	0.0013	0.0000	0.0507
DJI	0.0013	-0.0004	0.1523
CIV	0.0013	-0.0013	0.1757
VEN	0.0013	-0.0011	0.0667
LKA	0.0013	0.0000	0.1429
FSM	0.0014	-0.0007	0.1414
SYR	0.0014	0.0000	0.0456
MMR	0.0014	0.0000	0.1467
MDV	0.0014	0.0000	0.1313
GIB	0.0014	0.0000	0.1557

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(1)	(2)	(3)	(4)
Country	Primary Effects	Extraterritorial Effects Target	Sender
FJI	0.0014	0.0000	0.1650
NGA	0.0015	0.0000	0.1123
TUN	0.0015	0.0000	0.0464
COM	0.0015	-0.0004	0.1687
DZA	0.0015	0.0000	0.0383
SOM	0.0016	-0.0004	0.0744
NRU	0.0016	-0.0006	0.1536
KEN	0.0016	0.0000	0.1127
AGO	0.0016	-0.0004	0.0453
SWZ	0.0016	0.0000	0.0682
SDN	0.0017	0.0000	0.1246
FRO	0.0017	-0.0006	0.0982
BDI	0.0017	-0.0010	0.1115
RWA	0.0018	-0.0010	0.1305
STP	0.0018	-0.0004	0.1056
VUT	0.0018	-0.0004	0.2189
SLB	0.0019	0.0000	0.2447
MDG	0.0019	0.0000	0.2266
CHL	0.0019	-0.0016	0.1124
GRL	0.0019	-0.0009	0.1887
PYF	0.0019	-0.0003	0.1940
COG	0.0020	-0.0020	0.2356
NFK	0.0020	0.0000	0.2725
ZWE	0.0020	0.0000	0.0917
TUV	0.0021	-0.0010	0.3216
CAF	0.0021	-0.0010	0.2301
CCK	0.0021	-0.0014	0.1652
MAR	0.0021	-0.0006	0.1266
GAB	0.0021	-0.0021	0.2147
TGO	0.0021	-0.0021	0.2427
KIR	0.0022	-0.0010	0.3018
URY	0.0022	-0.0017	0.1676
TCD	0.0022	-0.0010	0.2277
BEN	0.0022	-0.0010	0.2351
BFA	0.0022	-0.0010	0.2537
MRT	0.0023	-0.0021	0.2848
CPV	0.0023	-0.0018	0.1422
WSM	0.0023	-0.0016	0.1744
GNB	0.0023	-0.0005	0.2235
SHN	0.0023	0.0000	0.2559
TON	0.0023	-0.0013	0.3033
TKL	0.0023	-0.0013	0.3473
MLI	0.0023	0.0000	0.1805
GMB	0.0024	-0.0010	0.3068
NER	0.0024	-0.0010	0.2292
GIN	0.0024	-0.0005	0.1898
BWA	0.0024	0.0000	0.1669
COK	0.0025	-0.0013	0.3551
NIU	0.0026	-0.0010	0.3508

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(1)	(2)	(3)	(4)
Country	Primary Effects	Extraterritorial Effects Target	Sender
GHA	0.0026	-0.0010	0.2185
FLK	0.0026	-0.0017	0.3095
SEN	0.0026	-0.0010	0.2230
WLF	0.0027	-0.0013	0.3400
PRY	0.0029	-0.0012	0.1430
PER	0.0030	-0.0024	0.1598
MTQ	0.0031	-0.0014	0.2016
ISL	0.0031	0.0000	0.1426
PCN	0.0032	-0.0016	0.4270
GLP	0.0032	-0.0017	0.2052
GUF	0.0033	-0.0008	0.1829
BOL	0.0033	-0.0013	0.1501
SLE	0.0034	-0.0010	0.3053
GNQ	0.0034	-0.0023	0.2191
BMU	0.0036	-0.0017	0.3033
SPM	0.0039	-0.0015	0.4572
ANT	0.0040	-0.0013	0.1974
ESH	0.0040	-0.0020	0.2536
TTO	0.0042	-0.0024	0.3429
SUR	0.0043	-0.0010	0.4442
LCA	0.0044	-0.0020	0.3207
MEX	0.0044	-0.0009	0.3195
DMA	0.0045	-0.0020	0.3608
GUY	0.0047	-0.0022	0.4254
BRB	0.0047	-0.0022	0.4280
ECU	0.0047	-0.0023	0.1234
VCT	0.0047	-0.0019	0.3589
GRD	0.0050	-0.0019	0.3898
COL	0.0052	-0.0027	0.1722
MSR	0.0055	-0.0019	0.4307
AIA	0.0055	-0.0024	0.4279
KNA	0.0056	-0.0019	0.4156
VGB	0.0056	-0.0024	0.4404
ATG	0.0057	-0.0033	0.5111
PAN	0.0057	-0.0040	0.1265
CRI	0.0061	-0.0031	0.1550
GTM	0.0069	-0.0036	0.1971
BHS	0.0069	-0.0038	0.3463
ABW	0.0072	-0.0035	0.4677
TCA	0.0077	-0.0049	0.5318
HND	0.0083	-0.0038	0.2021
SLV	0.0088	-0.0038	0.2455
DOM	0.0194	-0.0065	0.3203
BLZ	0.0197	-0.0044	0.6226
JAM	0.0197	-0.0062	0.4428
CYM	0.0229	-0.0075	0.4428
HTI	0.0243	-0.0095	0.4282
NIC	0.0246	-0.0091	0.4931

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(1)	(2)	(3)	(4)
Country	Primary Effects	Extraterritorial Effects	
		Target	Sender

Notes: This table corresponds to Table 2 from the main text, but it reports the welfare effects due to the US sanction on Cuba for all countries in our sample. See main text for further details.