INNOCENT OR NOT-SO-INNOCENT BYSTANDERS:
EVIDENCE FROM THE GRAVITY MODEL OF INTERNATIONAL TRADE ABOUT THE EFFECTS OF UN SANCTIONS ON NEIGHBOR COUNTRIES

(preliminary and incomplete)

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Abstract

This paper examines two theories about the effects of UN sanctions on trade flows between land neighbors of the target country and the rest of the world. First, there have been claims that sanctions hurt neighbor countries by cutting off trading routes, increasing transportation costs, and disrupting established trading ties. We would expect that a neighbor's trade with the rest of the world would *fall*, as a result. Second, there is extensive evidence that neighbors have been heavily involved in smuggling. As a result, neighbors should trade *more* with the rest of the world during UN trade embargoes, because now they also trade on behalf of the target. I employ the gravity model of international trade to show that, overall, a neighbor's trade with the rest of the world tends to fall during UN sanctions episodes. This confirms the first claim above: overall, land neighbors have been "innocent bystanders" hit by UN sanctions.

1. Introduction

With the end of the Cold War, we have witnessed a proliferation in the use of international economic sanctions under Article 41 of Chapter VII of the UN Charter. During the Cold War the UN imposed only two sanctions regimes – against Rhodesia (1966-1979) and against South Africa (1977-1994). In the 1990s the UN enacted sanctions against twelve countries: Iraq, the former Yugoslavia, Libya, Somalia, Liberia, Haiti, Angola, Rwanda, Sudan, Sierra Leone, Afghanistan, and Ethiopia/Eritrea.[1]

Economic sanctions are a blunt policy tool. They often hurt those people in the target country who are least responsible for the policies that prompted the imposition of sanctions, and who are also least likely to be able to change these policies. Allegedly, sanctions also hurt third countries, neighbors or major trading partners. Under Article 50 of Chapter VII of the UN Charter, these countries have the right to "consult the Security Council with regard to a solution of [the special economic problems arising from the carrying out of those measures]." A total of 21 states claimed injuries from sanctions against Iraq (Stremlau (1996)).[2] Losses stemmed from disrupted trade flows, increased transportation costs, dependence on oil imports from Iraq or Kuwait, and suspension of payments of sovereign debt by Iraq. Eight states consulted the Security Council about losses incurred as a result of the embargo against former Yugoslavia (Burci (1994)).[3] In neither case was compensation granted by the UN, in spite of the historical precedent with Zambia and Mozambique, which received UN-mandated aid during sanctions against Rhodesia in the 1960s and 1970s.

A lively literature has sprung up discussing the economics of sanctions. Most studies have focused on the strategic interaction between targets and senders of sanctions, on quantifying the costs to both parties, and on finding correlates of the ultimate success or failure of sanctions regimes. However, the literature has largely neglected the impact of UN-mandated sanctions on third countries, either land neighbors or major trading partners of the target country. Compliance with UN sanctions is mandatory for all member states. However, trading partners and especially land neighbors of the target often face special costs and opportunities. There exist three sets of claims on how trade embargoes affect the target's land neighbors:

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[1] See Table 1 for a summary of the most important facts about the thirteen sanctions regimes that have occurred since 1989. This includes sanctions against South Africa which were imposed in 1977 and lifted in 1994.
[2] Bangladesh, Bulgaria, Czechoslovakia, Djibouti, India, Jordan, Lebanon, Mauritania, Pakistan, the Philippines, Poland, Romania, the Seychelles, Sri Lanka, Sudan, Syria, Tunisia, Uruguay, Vietnam, Yemen, and Yugoslavia.
[3] Albania, Bulgaria, Hungary, Macedonia, Romania, Slovakia, Uganda, Ukraine. Uganda's losses stemmed from an abandoned large road construction project.

First, using a neoclassical model of trade with two goods and three countries, Curovic (1997) has shown that sanctions *benefit* third countries if in free-trade equilibrium they exported and imported the same types of goods as the target country. Assuming that most targets are similar to their neighbors in terms of trade patterns (due to similar preferences, resources, or technologies), sanctions will benefit neighbors by moving the terms of trade in their favor, due to increased world demand for their exports and increased world supply of imports. Both of these shifts occur because the target is now shut off from world markets. The problem with this theory is that most targets and their neighbors happen to be small countries with hardly any influence on the world terms of trade. Therefore, this channel appears implausible, with the notable exception of sanctions against Iraq and their significant impact on world oil prices.

Second, sanctions allegedly *hurt* neighbor countries by cutting off trading routes, by increasing transportation costs, and by disrupting established trading ties with suppliers or customers. Governments of neighbor countries have repeatedly made this argument the cornerstone of their demands for compensation from the UN. On the basis of this claim, we would expect to see a drop in neighbors' trade with the rest of the world following the imposition of a UN trade embargo.

Third, sanctions allegedly *benefit* neighbors by enabling them to engage in sanctions-busting activities. Anecdotal evidence on the involvement of neighbor countries in smuggling is overwhelming. The problem with smuggling is that, by definition, it is hard to observe and quantify. Official statistics do not measure smuggling directly. One needs to think of indirect ways to infer how much smuggling is going on. The smuggling story would lead one to expect that neighbors will trade more heavily with the rest of the world during sanctions because they trade on behalf of the target (who is officially confined to autarky), and then smuggle goods back and forth across the border. We cannot observe how much smuggling is going on, but we can infer something about smuggling from the extra trade with the rest of the world in which the neighboring country engages.

The common thread running through these theories is that they have implications for trade volumes. Under the "disrupted trade" story, neighboring countries should trade less with the rest of the world during UN trade embargoes. Under the smuggling story, neighboring countries should trade more with the rest of the world during UN trade embargoes. Theoretically, the impact of UN sanctions on neighboring countries is ambiguous – trade could go either up or down. Then it becomes an empirical issue.

Using a modified gravity equation with annual data on 82 countries for the years 1989-2000, this paper finds that neighbors' imports and exports with the rest of the world decrease significantly during sanctions episodes, thus lending support to the "disrupted trade" story. This confirms the second claim above: overall, land neighbors have been "innocent bystanders" hit by UN sanctions. The rest of the paper is organized as follows. Section 2 briefly reviews existing work on the effects of sanctions on third countries and on the use of gravity models in analyzing trade embargoes. Section 3 discusses the gravity model, the data, and the choice of variables and estimation procedures. Section 4 presents the results and Section 5 concludes.

2. The literature

Perhaps the most monumental treatment of the economics of sanctions is Hufbauer *et al.* (2000) which catalogs 170 sanctions episodes (unilateral as well as multilateral) since World War I, of which 50 occurred in the last 10 years. Its main focus is on finding correlates of the success or failure of sanctions. Earlier editions of the book (1985, 1990) have inspired a large literature. Bonetti (1997) provides a critical summary.

Existing work on the impact of sanctions on third countries is scarce. Hayes (1987) includes a chapter dealing with the impact of sanctions against South Africa on its neighbors. His case study approach is illustrative of the bulk of studies on the topic. While case studies are an important first step in identifying the impact of international economic sanctions, they have significant drawbacks. Case studies often rely on the assessment of injuries by "competent observers," such as affected companies or government agencies. These rarely happen to be disinterested observers as well. Solicitation of handouts from the government or from the international community often biases their analysis. Even when objective, anecdotal evidence and eyewitness reports tend to neglect less visible secondary effects of sanctions and to confuse causality with correlation. This approach provides a partial coverage of the issue, at best.

Curovic (1997) provides the only available theoretical analysis of the effect of economic sanctions on third countries. She does not distinguish between neighbors and major trading partners because location does not matter her theoretical framework. Sanctions are analyzed in a Heckscher-Ohlin model of trade. In an endowment economy with two goods and three countries, sanctions are modeled as a restriction on the exchange of endowments for the target country. The severity of sanctions is measured by a parameter between zero and one, the fraction of endowments that can be

exchanged. The model formalizes the intuitively plausible result that sanctions hurt third countries if they were net importers of the good exported by the target in free-trade equilibrium. Sanctions benefit the third country if under free trade it exported the same good as the target country.

Curovic (1997) also applies a modified gravity equation to the issue of economic sanctions. The author's focus this time is not on third countries but on the target: whether there was a structural change in Italy's pattern of trade following the short-lived and disastrous League of Nations sanctions in 1935-36, which were prompted by Italy's takeover of Abyssinia. Curovic estimates pre-sanctions, post-sanctions, and combined versions of the gravity equation for Italy's exports to 15 European countries over 15 years. The data test positive for a structural break in 1935-36, with Italian exports being diverted from participants to non-participants in the sanctions regime. Interestingly, the structural change was found to be persistent: Italy's pattern of trade did not revert to "normal" once the sanctions were lifted.

Hufbauer *et al.* (1997) also study the effects of economic sanctions using a gravity model. Once again, the focus of the study is not on third countries. The authors' primary concern is with the costs unilateral sanctions impose on sender (sanctions-imposing) countries in terms of lost trade. The intensity of economic sanctions is modeled by introducing three dummy variables corresponding to three intensity levels. Almost invariably, the signs on these dummies were found to be significantly negative for the three sample years (1985, 1990, 1995). Of course, this result is vulnerable to the criticism (made by many, but most forcefully in Srinivasan (1998)) that these dummy variables do not really measure the effect of sanctions but rather the researcher's own ignorance about what determines the remaining variation in trade flows for a subset of the trading pairs. A significant change in the dummy coefficients in years with sanctions relative to years without is what would have really established the authors' claim.[4]

Hufbauer *et al*. (1997) further analyze the "echo effects" of economic sanctions: whether sanctions continue to pull trade away from the sender even after they are lifted, perhaps because firms in the sender country earn a reputation for being "unreliable suppliers". Two more sets of dummy variables are added to measure the impact of sanctions 1-2 and 3-4 years after they are lifted. In contrast to the high-persistence result in Curovic (1997), the results here are inconclusive. They are, in any case, subject to the criticism outlined in the previous paragraph.

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[4] My paper fixes this problem by estimating the gravity equation as a panel, using both "fixed effects" ("within") and "random effects" (GLS).

Montenegro and Soto (1996) is another study linking the issue of economic sanctions to the gravity equation but once again the focus is on the target. Their objective is to illustrate and quantify Cuba's distorted direction of trade, due to decades of US sanctions and Cuba's CMEA membership, as well as to predict Cuba's direction of trade in a post-Castro world. Their econometric approach together with that in Soloaga and Winters (1999) is closest to the one adopted in this paper.

3. The gravity equation

The gravity model of international trade is the natural weapon of choice for signing and measuring the effects of sanctions on land neighbors of target countries. The gravity model produces a benchmark for trade flows which enables us to investigate if and how departures from "normal" volumes of trade between pairs of countries are correlated with the imposition of a UN trade embargo. Over the past 40 years, the gravity model of international trade has provided a remarkably good fit to empirical data, especially if one considers its somewhat suspect theoretical and econometric pedigree. In its most basic specification, the model relates trade flows between two countries to their size (as measured by national incomes) and the distance between them. The "full" version of the gravity model adds per capita incomes, as well as more measures of proximity, such as a dummy variable for a common land border and another one for a common language. More recently, the gravity model has been used to analyze the effects of preferential trade agreements (PTAs) on the world trading system.

Tinbergen (1962), Pöyhönen (1963), and Linnemann (1966) are universally cited as the pioneering works in the field. Aitken (1973) was perhaps the first to apply the gravity equation to PTAs. Jeffrey Frankel has written prolifically on the issue in the 1990s,[5] and Andrew Rose has done so more recently.[6] Leading references on the theoretical underpinnings of the gravity model are Anderson (1979), Bergstrand (1985, 1989), Helpman and Krugman (1985), Helpman (1987), Deardorff (1998), and Anderson and van Wincoop (2003). A quick and safe way to summarize their work is to say that the gravity model is atheoretical and broadly consistent with most leading theories of international trade: starting with the Heckscher-Ohlin model, and including more recent theories of trade based on imperfect competition and product differentiation. Deardorff (p. 21, 1998) summarizes what the gravity equation should <u>not</u> be used for: ". . . because the gravity equation appears to

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[5] Frankel (1997) is probably the most comprehensive summary.
[6] See Rose (2004) most recently.

characterize a large class of models, its use for empirical tests of any of them is suspect." However, the gravity model is very useful in providing a benchmark for trade flows between countries. Then we can search for departures from "normal" levels of trade and for correlates of these departures.

The log-form specification of the gravity model I adopt is as follows:

$$X_{ij} = C + \beta_1 GDP_i + \beta_2 GDP_j + \beta_3 PerCapGDP_i + \beta_4 PerCapGDP_j + \beta_5 Distance +$$
$$+ \beta_6 Contiguity + \beta_7 Language \tag{1}$$

X_{ij} denotes the log of exports from country i to country j in constant 1997 US dollars. GDP_i and GDP_j are the logs of national incomes of countries i and j measured in constant 1997 US dollars. $PerCapGDP_i$ and $PerCapGDP_j$ are defined similarly. Coefficients on incomes and per capita incomes are expected to be positive, reflecting the fact that trade increases with the size of the countries involved and with their level of economic development. $Distance$ is the logged great-circle distance between the national capitals or major economic centers of the two countries, in miles.[7] It is expected to have a negative coefficient since it proxies for transportation costs. $Contiguity$ and $Language$ are dummy variables, each taking the value of one if the two countries share a land border or a language, respectively.[8] The coefficients on $Contiguity$ and $Language$ are expected to be positive. They are included in order to refine the concept of distance between two countries.

My data set includes 82 countries. The country list appears in Appendix 1. These are the 63 countries used in Frankel (1997) plus targets of UN sanctions and their land neighbors since 1989.[9] The data set contains seven targets of UN sanctions and a total of 33 land neighbors. I had to exclude targets and neighbors without country pages in the IMF's International Financial Statistics (my data source for incomes, exchange rates, and populations). Eighty two countries give a maximum of 82 x 81 = 6,642 observations in each year. The data span 12 years, from 1989 to 2000. The maximum total number of observations is 12 x 6,642 = 79,704. Data on trade came from Statistics Canada's World Trade Analyzer. To convert all numbers into constant 1997 US dollars I used line *rf* or *wf* (dollar exchange rates, period averages) from the IMF's International Financial Statistics, and the US Producer Price Index available through the US Bureau of Labor Statistics. For languages, national

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[7] See Appendix 1 for a list of the cities I used for each country. Note that, for example, Chicago was chosen over Washington, New York, or Los Angeles, because of its central location. Sensitivity studies by other authors have confirmed that the distance variable is quite robust to the choice of cities.

[8] English, Spanish, Chinese, Arabic, French, German, Japanese, Dutch, or Portuguese.

capitals, and contiguity I used the online edition of CIA's World Factbook. Finally, distances were calculated using the web site *www.indo.com/distance*.

As a test of my choice of variables, I first ran a pooled equation for all 12 years *without* bringing in the issue of economic sanctions. Because of the pooled nature of the data, I added time-fixed effects – 11 dummy variables for the years from 1990 to 2000. Table 2 reports results from two variations of equation **(1)**. The dependent variable in both is *log(exports)*. I drop all observations in which trade was zero. The dependent variable in specification 2 is total exports excluding oil and oil products (SITC category 33). Montenegro and Soto (1996) and Soloaga and Winters (1999) are other recent papers that exclude fuel exports. Oil trade fits awkwardly with theories of intra-industry trade, sometimes used to justify the gravity model. We rarely observe two oil-exporting countries buying each other's oil "for love of variety." Furthermore, above it was noted that oil is one of the few commodities in which even small countries (like Iraq) might be able to influence world prices. Thus, it would be interesting to see how much of a difference the exclusion of oil is going to make.

All variables in Table 2 enter with the expected sign and are very highly statistically significant. The reported standard errors are robust to heteroscedasticity as well as to clustering by country pairs. Coefficients on GDPs are close to one, in line with previous estimates. The coefficient on distance is somewhat larger than what previous studies have found, but is broadly in line with them. The two specifications provide a reasonably good fit to the data: they have an R^2 of 0.72 and 0.66, respectively. Finally, note that it does not matter whether trade in oil and oil products is included or excluded.

4. The impact of UN sanctions on trade flows: the results

Table 1 summarizes the most important facts about the twelve sanctions episodes that took place in the 1990s. UN sanctions against Sudan are not analyzed in this paper because the Security Council has imposed various diplomatic and travel restrictions against that country but no trade embargo. Since I only have annual data, I consider sanctions to be "on" for the entire year, even if they were in place for only a part of it. Thus, 1992 is considered to be a sanctions year for Liberia even though UN sanctions were imposed in November 1992. 1994 is a sanctions year for South Africa, even though sanctions were lifted in May 1994. I defer the discussion of a few more minor technicalities to the notes for that table.

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[9] See Table 1.

As a first step in analyzing the effect of economic sanctions on neighboring countries, I added two dummy variables to the gravity model outlined in the previous section. The variable "One country is target" equals one whenever the trading pair includes a country targeted by a UN trade embargo, only for the years during which the embargo was in place. For example, the variable equals zero for trade between Iraq and the US in 1989, and one for trade between the same pair of countries for the years after and including 1990. I expect the coefficient on this variable to turn up strongly negative. The variable "One country is neighbor to target" is set to one whenever at least one member of the trading pair is a land neighbor to a target country. This variable is designed to capture anything special in the trading patterns of neighbors during years of UN sanctions. Because the theory (discussed in Section 1) is ambiguous, there is no presumption about the coefficient sign here.

Results are reported in Table 3. Specifications 1 and 4 are similar to those in Table 2. In both specifications, the sign on the target dummy variable ("One country is a target") is negative, large, and statistically significant. This result is hardly surprising – UN sanctions reduce (officially recorded) trade between targets and the rest of the world. The sign on the neighbor dummy variable ("One country is a neighbor to a target") is also negative and highly statistically significant. This result lends empirical support to the claim that neighbor countries are "innocent bystanders." For them, UN sanctions cut off trading routes, increase transportation costs, and disrupt established trading ties. This reduces trade between them and the rest of the world. Note that the coefficient on the neighbor variable is always smaller in magnitude than it is on the target variable. That makes intuitive sense. UN sanctions hurt both targets and their neighbors, but they seem to hurt targets more.

Because the data set is a panel in which the cross-section unit is the country pair, I also estimate the model using "fixed effects" ("within") and "random effects" (GLS). See specifications 2-3 and 5-6. Each trading pair is unique, in the sense that each pair involves a unique combination of an exporting and importing country. Therefore, I have a very large number (6,642) of cross-section units. The cross-section fixed effects control for our ignorance. For reasons we do not know, trade between any pair of countries in the sample can be lower or higher than what the gravity model predicts, both in years with sanctions and in years without. The coefficients on the target dummy variable in specifications 2-3 and 5-6 are still negative and statistically significant, but also somewhat smaller than before. The coefficients on the neighbor dummy variable are still negative, but they are very small and statistically insignificant now. The cross-section dummies use up a lot of degrees of

freedom. Furthermore, when the gravity equation is estimated using "fixed effects" ("within"), the coefficients on the *Distance*, *Contiguity*, and *Language* variables are no longer identified, since they have no time-series variation for each cross-section unit. For these reasons, I view specifications 2-3 and 5-6 as robustness checks, which broadly confirm the generally negative impact of sanctions on the land neighbors of targets. Finally, note that whether trade in oil and oil products is included or excluded does not matter too much for the results.

As a logical next step, I distinguish between the impact of sanctions on exports and on imports by running the basic model from Section 3 with four additional dummy variables. "Importing country is a target" is set to one for all trading pairs where the importing country was a target, only for years with economic sanctions. "Exporting country is a target" equals one for all trading pairs where the exporter was a target, only for years with economic sanctions. "Importing country is a neighbor" and "Exporting country is a neighbor" are defined similarly. Table 4 presents the results.

Once again, the coefficients on the target dummy variables are negative, large, and statistically significant, regardless of the specification. UN sanctions force targets to both export and import less with the rest of the world, and this is unsurprising. Once again, in specifications 1 and 4 the coefficients on the neighbor dummy variables are negative and statistically significant, but not as large as they are for targets. The nice surprise are the panel specifications (2-3 and 5-6), in which the coefficients are now mostly statistically significant but smaller in magnitude. Once again, it does not matter for the results whether trade in oil and oil products is included or excluded.

5. Conclusion

Using regression analysis, this paper has taken a step forward in sorting out the sign and magnitude of the effect of international economic sanctions on neighboring countries. The general impact of sanctions on trade flows was shown to be negative – a land neighbor's trade with the rest of the world tends to fall during UN sanctions. This confirms that, on a net basis, land neighbors have been "innocent bystanders." Increased transportation costs and trade disruptions appear to have played an important role.

The empirical results allow us to assign a rough quantitative measure for the amount of trade lost or gained during sanctions episodes, and for the corresponding losses or benefits neighbor countries derive from being at the wrong place at the wrong time. There is a large literature on the principle-agent problem in public law enforcement (see Polinsky and Shavell (1999)). Costs or

benefits from sanctions obviously enter the trade-off calculations of policymakers in neighboring countries. In imposing sanctions, the international community should take into consideration the costs inflicted on land neighbors' as well as their temptation to "cheat" and participate in smuggling.

It is important to discuss the limitations of this study. First, for a number of reasons, it considers only UN-imposed sanctions and leaves out unilateral sanctions. There have been relatively few UN sanctions regimes over the last ten years. UN sanctions are binding for all member states and thus compliance with them is universal, at least on paper. Data on UN sanctions regimes are widely available. Thus, UN sanctions are a good starting point for analyzing the effect of sanctions on neighboring countries. Unilateral sanctions are harder to analyze, primarily because of their sheer number. Hufbauer (1990) catalogs more than one hundred such cases, but the list is not meant to be exhaustive. There is much more variability in the intensity and weaponry of unilateral sanctions regimes. Some of these are redundant or never enforced. A final problem is that compliance with unilateral sanctions in the rest of the world is dramatically lower.

Second, this paper chooses to focus on land neighbors of target countries and leaves "major trading partners" out of the analysis. A "land neighbor" can be defined objectively. On the other hand, it is hard to decide who counts as a "major trading partner." To avoid having to make arbitrary decisions, this paper focuses on land neighbors.

Third, the empirical analysis uses data on officially recorded trade flows. It is reasonable to suppose that official data on trade flows between the targets' land neighbors and the rest of the world are as reliable as trade data in general. Neighbors might have an incentive to conceal the ultimate origin or final destination of the traded goods, but they don't have an incentive to distort the magnitude of trade flows. On the other hand, it is hard to take seriously data on trade flows between targets and anybody in the world, for obvious reasons.

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Appendix 1: List of the 82 countries included in the dataset
(with names of the cities used in calculating great-circle distances)

Algeria (Algiers)
Angola (Luanda)
Argentina (Buenos Aires)
Australia (Sydney)
Austria (Vienna)
Belgium-Luxembourg (Brussels)
Bolivia (La Paz)
Brazil (Sao Paulo)
Bulgaria (Sofia)
Burundi (Bujumbura)
Canada (Ottawa)
Central African Republic (Bangui)
Chad (N'djamina)
Chile (Santiago)
China (Shanghai)
Colombia (Bogota)
Democratic Republic of Congo (Kinshasa)
Republic of Congo (Brazzaville)
Cote D'Ivoire (Yamoussoukro)
Denmark (Copenhagen)
Dominican Republic (Santo Domingo)
Ecuador (Quito)
Egypt (Cairo)
Ethiopia (Addis Ababa)
Finland (Helsinki)
France (Paris)
Germany (Bonn)
Ghana (Accra)
Greece (Athens)
Haiti (Port-au-Prince)
Hong Kong (Hong Kong)
Hungary (Budapest)
Iceland (Reykjavik)
India (New Delhi)
Indonesia (Jakarta)
Iran (Tehran)
Ireland (Dublin)
Israel (Jerusalem)
Italy (Rome)
Japan (Tokyo)
Jordan (Amman)
Kenya (Nairobi)

Republic of Korea (Seoul)
Kuwait (Kuwait City)
Libya (Tripoli)
Malaysia (Kuala Lumpur)
Mexico (Mexico City)
Morocco (Casablanca)
Mozambique (Maputo)
Netherlands (Amsterdam)
New Zealand (Wellington)
Niger (Niamey)
Nigeria (Lagos)
Norway (Oslo)
Pakistan (Karachi)
Paraguay (Asuncion)
Peru (Lima)
Philippines (Manila)
Poland (Warsaw)
Portugal (Lisbon)
Romania (Bucharest)
Rwanda (Kigali)
Saudi Arabia (Riyadh)
Sierra Leone (Freetown)
Singapore (Singapore)
South Africa (Pretoria)
Spain (Madrid)
Sudan (Khartoum)
Sweden (Stockholm)
Switzerland (Geneva)
Syria (Damascus)
Tanzania (Dar es Salaam)
Thailand (Bangkok)
Tunisia (Tunis)
Turkey (Ankara)
Uganda (Entebbe)
UK (London)
Uruguay (Montevideo)
USA (Chicago)
Venezuela (Caracas)
Zambia (Lusaka)
Zimbabwe (Harare)

Table 1: List of UN trade sanctions regimes with target countries, land neighbors, relevant dates and Security Council resolutions (1989-2004)

Target country[1]	Land neighbors [1]	Dates of imposition and lifting of UN trade sanctions and relevant Security Council resolutions	"Sanctions years" for the purposes of the gravity model analysis
Afghanistan	**China, Iran, Pakistan**, Tajikistan, Turkmenistan, Uzbekistan	Imposed: 19 December 2000, #1333	2000
Angola	**Democratic Republic of Congo, Republic of Congo**, Namibia, **Zambia**	Imposed: 15 September 1993, #864 Lifted: 9 December 2002, #1448	1993 – 2000
Ethiopia and Eritrea	Djibouti, **Kenya, Sudan**, Somalia	Imposed: 17 May 2000, #1298 Lifted: 15 May 2001, by Statement S/PRST/2001/14 by the President of the Security Council	2000
Haiti	**Dominican Republic**	Imposed: 16 June 1993, #841 Lifted: 29 September 1994, #944	1993 – 1994
Iraq	**Iran, Jordan, Kuwait,[2] Saudi Arabia, Syria, Turkey**	Imposed: 6 August 1990, #661 Lifted: 22 May 2003, #1483	1990 – 2000
Liberia	**Cote D'Ivoire**, Guinea, **Sierra Leone**	Imposed: 19 November 1992, #788	1992 – 2000
Libya	**Algeria, Chad, Egypt, Niger, Sudan, Tunisia**	Imposed: 31 March 1992, #748 Lifted: 12 September 2003, 1506	1992 – 2000
Rwanda	**Burundi, Democratic Republic of Congo, Tanzania, Uganda**	Imposed: 17 May 1994, #918	1994 – 2000[3]
Federal Republic of Yugoslavia (Serbia and Montenegro)	Albania, **Austria, Bulgaria, Greece, Hungary, Italy, Romania[4]**	Imposed: 25 September 1991, #713 Lifted or suspended: 22 November 1995, #1021, #1022 Lifted: 1 October 1996, #1074 Imposed: 31 March 1998, #1160 Lifted: 10 September 2001, #1367	1991 – 1995, 1998 – 2000
Sierra Leone	Guinea, Liberia	Imposed: 8 October 1997, #1132	1997 – 2000
Somalia	Djibouti, **Ethiopia, Kenya**	Imposed: 24 April 1992, #751	1992 – 2000
South Africa	Botswana, Lesotho, **Mozambique**, Namibia, Swaziland, **Zimbabwe**	Imposed: 4 November 1977, #418 Lifted: 25 May 1994, #919	1989 – 1994

Source: The United Nations via *http://www.un.org/Docs/sc/committees/INTRO.htm*.

Notes: 1. Highlighted countries are included in my dataset. Certain targets and land neighbors were excluded due to lack of trade, GDP, exchange rate, or population data.

2. Kuwait was included as Iraq's land neighbor despite the fact that between August 1990 and February 1991 it was a part of Iraq and, technically, a target of UN sanctions as well.

3. UN sanctions against Rwanda were considerably relaxed in 1995 but the arms embargo remained in force against non-government forces.

4. For former Yugoslavia, I included as neighbors all the land neighbors of the old, pre-1989 Socialist Federal Republic of Yugoslavia, which consisted of six republics.

5. UN sanctions against Sudan imposed in 1996 are not included in the table. The UN Security Council has imposed various diplomatic and travel restrictions but no trade embargo.

Table 2: Benchmark gravity equation

	1	2
Dependent variable	**All exports**	**Non-oil exports**
Estimator	**OLS**	**OLS**
Independent variables	**Coefficient**	**Coefficient**
	p-value	*p-value*
GDP of exporter	1.05	1.04
	0.000	*0.000*
GDP of importer	0.95	0.92
	0.000	*0.000*
Per capita GDP of exporter	0.18	0.21
	0.000	*0.000*
Per capita GDP of importer	0.08	0.08
	0.000	*0.000*
Distance	-0.96	-0.90
	0.000	*0.000*
Contiguity	0.72	0.81
	0.000	*0.000*
Language	0.87	0.93
	0.000	*0.000*
Number of observations	**59207**	**59096**
R^2	**0.72**	**0.66**

Notes: Both regressions include constants and time-fixed effects (coefficients not reported). Standard errors are heteroscedasticity-consistent as well as robust to clustering by country pairs. Both regressions define the dependent variable as *log(exports)* and exclude all observations where exports were zero. Regression 2 excludes oil exports.

Table 3: The effect of UN sanctions on trade flows involving targets or their land neighbors and the rest of the world – part I

Dependent variable	1	2	3	4	5	6
	All exports	**All exports**	**All exports**	**Non-oil exports**	**Non-oil exports**	**Non-oil exports**
Estimator	**OLS**	**Fixed effects (within)**	**Random effects (GLS)**	**OLS**	**Fixed effects (within)**	**Random effects (GLS)**
Independent variables	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**
	p-value	*p-value*	*p-value*	*p-value*	*p-value*	*p-value*
One country is a target	**-0.66**	**-0.49**	**-0.43**	**-0.94**	**-0.50**	**-0.46**
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
One country is neighbor to target	**-0.44**	**-0.01**	**-0.02**	**-0.55**	**-0.02**	**-0.04**
	0.000	*0.507*	*0.255*	*0.000*	*0.242*	*0.027*
Number of observations	**59207**	**59207**	**59207**	**59096**	**59096**	**59096**
R²	**0.72**	**0.36**	**0.71**	**0.67**	**0.37**	**0.66**

Notes: All regressions include the gravity equation variables from Table 2, as well as constants and time-fixed effects (coefficients not reported). OLS regressions report standard errors which are heteroscedasticity-consistent as well as robust to clustering by country pairs. All regressions define the dependent variable as *log(exports)* and exclude all observations where exports were zero. Regressions 4-6 exclude oil exports.

Table 4: **The effect of UN sanctions on trade flows involving targets or their land neighbors and the rest of the world – part II**

	1	2	3	4	5	6
Dependent variable	**All exports**	**All exports**	**All exports**	**Non-oil exports**	**Non-oil exports**	**Non-oil exports**
Estimator	**OLS**	**Fixed effects (within)**	**Random effects (GLS)**	**OLS**	**Fixed effects (within)**	**Random effects (GLS)**
Independent variables	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**
	p-value	*p-value*	*p-value*	*p-value*	*p-value*	*p-value*
Importing country is a target	-0.57	-0.54	-0.46	-0.56	-0.51	-0.43
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Exporting country is a target	-0.73	-0.47	-0.43	-1.35	-0.50	-0.53
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Importing country is a neighbor	-0.15	-0.03	-0.03	-0.11	-0.03	-0.02
	0.000	*0.041*	*0.065*	*0.014*	*0.126*	*0.334*
Exporting country is a neighbor	-0.55	-0.04	-0.06	-0.76	-0.05	-0.09
	0.000	*0.010*	*0.001*	*0.000*	*0.022*	*0.000*
Number of observations	**59207**	**59207**	**59207**	**59096**	**59096**	**59096**
R²	**0.72**	**0.36**	**0.71**	**0.67**	**0.37**	**0.66**

Notes: All regressions include the gravity equation variables from Table 2, as well as constants and time-fixed effects (coefficients not reported). OLS regressions report standard errors which are heteroscedasticity-consistent as well as robust to clustering by country pairs. All regressions define the dependent variable as *log(exports)* and exclude all observations where exports were zero. Regressions 4-6 exclude oil exports.