The Potential for Trade Sanctions

Benedikt Heid and Mario Larch*

October 31, 2014

Abstract

Trade sanctions as a policy tool are a contentious issue in international relations due to the large degree of uncertainty about their effectiveness on the target country as well as their potentially harmful effects on innocent bystanders. Target countries differ in their degree of integration into world markets and hence their vulnerability to trade sanctions. Third countries which heavily trade with a target country might suffer from negative effects due to trade diversion effects. We contribute to this debate by introducing structural gravity models to the literature on trade sanctions. These models allow the calculation of counterfactual welfare effects of changes in bilateral trade costs due to e.g. the introduction of trade sanctions against a target country. Welfare effects derived from these models are consistent with a wide class of underlying theoretical models of international trade, see Arkolakis et al. (2012), and have become the industry standard for quantitative trade policy analysis in the international trade literature, see **?**. Importantly, they allow for general equilibrium spillover effects on third countries which are crucial for the evaluation of the effects of trade sanctions. Even though reduced form gravity estimations have been used in the literature on trade sanctions, their potential for the evaluation of counterfactual trade sanctions has been overlooked so far. To gauge the

*Heid: University of Bayreuth, Universitätsstraße 30, 95447 Bayreuth, Germany, benedikt.heid@uni-bayreuth.de. Larch: University of Bayreuth, CESifo, ifo Institute, and GEP at University of Nottingham, Universitätsstraße 30, 95447 Bayreuth, Germany, mario.larch@uni-bayreuth.de. Funding from the DFG under project 592405 is gratefully acknowledged. We thank Clara Stinshoff for excellent research assistance, Hartmut Egger, David Stadelmann, Joschka Wanner and seminar participants at the 2014 Bayreuth Graduate Seminar for helpful discussions. The usual disclaimer applies.

quantitative effects of trade sanctions, we estimate a structural gravity model following Anderson and van Wincoop (2003) for a sample of 173 countries in 2012 and calculate the potential of trade sanctions against any of these countries in terms of welfare losses inflicted on the target country as well as for all of its trading partners by simulating the effects of a full international embargo against the target country. Our results indicate a large degree of heterogeneity in terms of the potential for trade sanctions on target countries as well as innocent bystanders. Interestingly, some countries actually gain from the introduction of a trade embargo due to trade diversion effects.

Keywords: International trade; trade sanctions; structural gravity model; trade policy
JEL-Codes: F10; F13; F14; F51

1 Introduction

Trade sanctions are a commonly used tool of international politics and have become used more often after the end of the Cold War (Bergeijk, 1995). Still, academic scholars remain skeptical about the efficacy of sanctions. According to Bergeijk (1995), about two in three sanctions have not reached their intended goal.

On the most critical side, some authors (repeatedly) state that sanctions simply do not work, see Pape (1997) and Pape (1998). Despite this widespread doubt about the efficacy of trade sanctions, they are applied widely. This seeming contradiction has been called the sanction paradox, see Baldwin (1999). This may be due to the fact that other types of sanctions are harder to implement or are expected to have even larger negative effects on third countries.[1]

There is a large literature focussing on the efficacy of sanctions. Whang (2010) finds that an important factor of the success of sanctions is whether the sending and target countries are allies,

An important determinant of the success of sanctions are the costs imposed on the target country. As trade sanctions reduce consumers' ability to buy goods of their choice, welfare effects of sanctions are born by a country's population and their welfare is reduced. This effect should be higher the more intensive trade relations the target country has with the sending country. The higher the hardship felt by the population, the higher the pressure on the government to change the behavior for which sanctions were imposed. Surprisingly, as Baldwin (1999) notes, most studies neglect the influence of the cost of sanctions alltogether.

When costs of sanctions are considered, generally, scholars use measures of trade exposure, i.e. supposed correlates to the costs of sanctions. For example, Whang (2010) does not find a significant effect of trade dependence on the

[1] Jayachandran and Kremer (2006) argue for loan sanctions on (future) debt incurred by dictatorial regimes as they have more favorable effects on the population of the target country. The scope for applying these sanctions, however, is probably restricted to only clear-cut cases where governments are clearly dictatorial and act against the interest of the general population. Trade sanctions, however, are mostly applied in cases where such a identification of dictatorial behavior is less clear.

success of sanctions.

Some authors use more direct measures of costs.

One reason for the mixed results on the effects of trade dependence may lie in the difficulty of measuring the economic costs of trade sanctions.

In our framework, we propose a theory-consistent measure of the welfare loss imposed by trade sanctions. Using this measure in standard regressions used in the literature, we (hopefully) find a positive and significant effect of trade dependence on the probability of successful sanctions.

2 The model

For our calculations, we use the quantitative model for bilateral flows from Anderson and van Wincoop (2003). We assume that every country j of a total of $\mathcal{N}$ countries is populated by a representative consumer whose utility function is given by

$$U_j = \left[\sum_{i=1}^{\mathcal{N}} \beta_i^{\frac{1-\sigma}{\sigma}} q_{ij}^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}, \tag{1}$$

where q_{ij} is the quantity consumed in country j of goods produced in country i. This assumption implies that consumers perceive goods to be differentiated by their country or origin, going back to Armington (1969). Whereas goods are different across countries, they can be substituted by goods from other regions of the world. σ is the elasticity of substitution; the higher σ, the less consumers care which countries' goods they consume.

Alternatively, one can interpret U_j as the utility derived from an aggregate consumption good which is a an aggregate of intermediate goods q_{ij}. In this view, one may interpret lower values of σ as describing the short-run substitutability between intermediate goods in the short-run, and higher values as a long-run elasticity, reflecting different adjustment margins of firms' modes of production in a reduced form sense even though the model is static.

Consumers maximize their utility subject to their budget constraint

$\sum_{j=1}^{\mathcal{N}} p_{ij}q_{ij} = \sum_{j=1}^{\mathcal{N}} x_{ij} = y_i$, i.e. that total expenditure on goods x_{ij} with price p_{ij} of country i from all countries j equals domestic income or GDP y_i. To ship goods from country i to j, firms have to incur Samuelson (1954) iceberg-type trade costs, i.e. a firm from country i has to ship $t_{ij} > 1$ units of the good such that 1 unit reaches country j. In essence, this assumes that the transport sector uses the same production technology as the goods producing sector. Given that we only set out to model aggregate trade flows, this assumption is not unduly restrictive. We also assume that $t_{ii} = 1$, i.e. domestic trade is costless. It is well known that this consumer problem delivers the following import demand function:

$$X_{ij} = \left(\frac{p_i}{P_j}\right)^{1-\sigma} t_{ij}^{1-\sigma} y_j, \tag{2}$$

where P_j is the ideal price index in country j defined by $[\sum_{i=1}^{\mathcal{N}} (\beta_i p_i t_{ij})^{1-\sigma}]^{1/(1-\sigma)}$. Anderson and van Wincoop (2003) show that by plugging in the budget constraint into Equation (2) results in the following so called gravity equation of exports between i and j

$$X_{ij} = \frac{y_i y_j}{y^W} t_{ij}^{1-\sigma} P_i^{1-\sigma} P_j^{1-\sigma}, \quad \text{where} \tag{3}$$

$$P_i^{1-\sigma} = \sum_{j=1}^{\mathcal{N}} t_{ij}^{1-\sigma} P_j^{\sigma-1} \frac{y_j}{y^W}. \tag{4}$$

The system of $\mathcal{N}$ equations given in Equation (4) determines the price levels across all $\mathcal{N}$ countries. Anderson and van Wincoop (2003) show how one can estimate Equation (3) consistently using data on bilateral trade flows as well as measures for bilateral trade costs. Using the estimated model, one can solve for the $\mathcal{N}$ price levels given by Equation (4). Crucially, Anderson and van Wincoop (2003) show that changes in trade flows and welfare (measured as real GDP) brought about changes in trade policy can be expressed solely as functions of the price levels implied by the model. Therefore, the estimated model can be used to infer the trade and welfare effects of trade policies. Their insight, however, has so far not been applied to calculate the effects of trade

sanctions.

3 The welfare impact of trade embargos

Having set up the model, we now use the methodology of Anderson and van Wincoop (2003) to calculate the welfare Importantly, Arkolakis et al. (2012) show that the above model implies the same welfare effects of a change in trade policy as e.g. brought about by the introduction of a trade sanction as a wide class of other trade models. Alternatively to the presented simplest framework, welfare effects are identical in Ricardian-type models of trade arising due to differences in technology as in Eaton and Kortum (2002), in models of monopolistically competitive firms as in Krugman (1980) or in models which explicitly take into account that firms differ in their productivity and only a subset of firms exports as stressed by Melitz (2003). Hence the model we present is quite robust to different assumptions about the rationales due to which international trade arises in the first place, one of the main reasons why these types of models have been increasingly used in quantitative trade analysis. Therefore, also the quantitative results are arguably more robust than subjective case-by-case accounts of the economic impact of the imposition of trade sanctions used in the literature so far. Finally, there is an emerging consensus that these types of models give conservative estimates on the effects of trade policies, i.e. departures from the assumptions common to these models like the one sector setup tend to increase the absolute size of the trade and welfare effects of trade policy changes, see e.g. **?** and Melitz and Redding (2014).

4 Data and estimation of trade cost parameters

We use bilateral trade data from the UNCOMTRADE data base for 173 countries in 2012. To create the GDP shares in the baseline scenario, we use GDP

in current US-$ from the World Development Indicators database.[2] We specify trade costs as

$$t_{ij}^{1-\sigma} = \exp(\beta_1 PTA_{ij} + \beta_2 \ln DIST_{ij} + \beta_3 CONTIG_{ij} + \beta_4 LANG_{ij} + \beta_5 COL_{ij}),$$

where $DIST_{ij}$ indicates bilateral weighted distance between country i and j, $CONTIG_{ij}$ indicates whether both countries share a common border, $LANG_{ij}$ whether they share a common language spoken by a significant fraction of their respective population, and COL_{ij} indicates whether both countries share a common colonizer. Data for the trade cost variables are from the gravity data set from CEPII (see Head et al., 2010, for further details) except PTA_{ij}, a variable which indicates whether two countries share a preferential trade agreement which is from Mario Larch.

We estimate Equation (3) via a Poisson Pseudo Maximum Likelihood estimator as proposed by Santos Silva and Tenreyro (2006) to control for heteroscedasticity of trade flows.

5 Potential for trade sanctions: full embargo

We set $\sigma = 5$, a value used in many quantitative trade studies, e.g. Anderson and van Wincoop (2003); see also Head and Mayer (2014). We follow Jayachandran and Kremer (2006) in modelling trade sanctions as a complete trade embargo of all countries against the target country, effectively sending the country back into autarky.[3]

The efficacy of trade sanctions is debated because other countries may sell to a target country when the sanction is not applied by all countries. By analyzing the effects of a complete embargo, we can focus squarely on the third country effects on innocent bystanders. The model, however, could

[2] In our sample, Israel does not report its GDP for 2012 yet. We use the value from 2011 instead.

[3] In our calculations, we follow Eaton and Kortum (2002) and model autarky as a 10,000 times increase in bilateral trade costs from their estimated level for imports and exports of the target country, effectively reducing trade flows to 0. We have also tried out different factors for the increase in trade costs in unreported calculations; results are identical.

Table 1: Estimation Results, Gravity for 173 Countries in 2012

	no selection	selection	
	Poisson	Probit	Poisson
	X_{ij}	$P(X_{ij} > 0)$	$X_{ij}\|X_{ij} > 0$
PTA_{ij}	0.296***	0.323***	0.299***
	(0.067)	(0.057)	(0.067)
$\ln(DIST)_{ij}$	-0.727***	-0.721***	-0.729***
	(0.036)	(0.028)	(0.036)
$CONTIG_{ij}$	0.346***	-0.745***	0.347***
	(0.071)	(0.158)	(0.071)
$COMLANGUAGE_{ij}$	0.224**	0.150**	0.226**
	(0.071)	(0.048)	(0.071)
$COMCOLONY_{ij}$	0.450**	0.346***	0.446**
	(0.147)	(0.047)	(0.147)
N	29,756	26,396	21,536
* p<0.05, ** p<0.01, *** p<0.001			

Notes: All regressions include exporter and importer dummies to control for multilateral resistance terms. Standard errors are robust to heteroscedasticity.

easily be applied also to trade sanctions which are only imposed by a fraction of countries.

6 Probit

As Lektzian and Souva (2003) show that democracies have a higher likelihood to impose sanctions on non-democracies, we control for the type of government in our regressions. We use the ...

Most empirical studies on sanctions use the data from HUFBAUER AND SCHOTT who collect data on sanctions which are imposed as a reaction to to change the behavior of the target country in terms of foreign policy, see Drezner (2001).

Drezner (2001) and Zeng (2002) study sanctions which specifically target trade or economic policies related to Section 301 of the U.S. Trade Act of 1974, a law which authorizes the U.S. government to impose sanctions in order to reach a removal of a trade barrier it considers unjustified.

"[t]he contentious literature on sanctions has failed to reach consensus on why sanctions are imposed and whether they succeed in achieving policy objectives", page 25, Lacy and Niou (2004). Lacy and Niou (2004) discuss the sample selection bias introduced by most studies when focussing only on a sample of imposed sanctions. They argue that sanctions are imposed when using sanctions as a threat has failed as a policy tool. Hence, many cases where sanctions have been successful as they only have been used as a threat are left out of data sets like the often used HUFBAUER AND SCHOTT data. On the other hand, Baldwin (1999) argues that selection bias is less of an issue as sanctions are also used even if the probability of success of a sanction is low, given that policy makers often have very few choices (mostly voice concern, impose sanction, or military intervention).

STEINBRUCH

country	EV_j	$E(EV_{j,-j})$	avg. EV_{-j}	median EV_{-j}	min. EV_{-j}	max. EV_{-j}	std.dev. EV_{-j}	% innocents	% beneficiaries
Afghanistan	-16.53	-0.09	-0.01	0.00	-0.21	0.01	0.02	0.40	0.60
Angola	-4.37	-0.02	-0.04	-0.01	-0.65	0.03	0.10	0.51	0.49
Albania	-32.00	-0.15	-0.01	-0.01	-0.49	0.01	0.04	0.72	0.28
Argentina	-3.24	-0.02	-0.17	-0.09	-1.69	0.02	0.22	0.97	0.03
Armenia	-27.69	-0.14	-0.01	-0.01	-0.31	0.00	0.03	0.82	0.18
Antigua and Barbuda	-43.47	-0.19	-0.01	-0.00	-0.25	0.00	0.03	0.70	0.30
Australia	-1.33	-0.01	-0.39	-0.16	-4.61	-0.01	0.77	0.99	0.01
Austria	-10.08	-0.05	-0.20	-0.14	-1.63	0.03	0.22	0.99	0.01
Azerbaijan	-12.11	-0.06	-0.05	-0.02	-1.53	0.02	0.14	0.68	0.32
Burundi	-28.32	-0.14	-0.01	-0.00	-0.57	0.00	0.04	0.63	0.37
Belgium	-10.57	-0.06	-0.21	-0.17	-1.89	-0.00	0.20	0.99	0.01
Benin	-21.07	-0.11	-0.02	0.00	-1.08	0.01	0.09	0.44	0.56
Burkina Faso	-17.80	-0.09	-0.02	0.00	-0.65	0.02	0.08	0.45	0.55
Bangladesh	-9.08	-0.05	-0.04	-0.01	-2.02	0.02	0.16	0.55	0.45
Bulgaria	-19.65	-0.10	-0.06	-0.04	-0.69	0.01	0.07	0.98	0.02
Bahamas, The	-22.31	-0.12	-0.01	-0.00	-0.23	0.01	0.04	0.51	0.49
Bosnia and Herzegovina	-30.28	-0.15	-0.02	-0.01	-0.26	0.01	0.03	0.91	0.09
Belarus	-15.85	-0.08	-0.05	-0.04	-0.56	0.02	0.08	0.88	0.12
Bermuda	-24.84	-0.13	-0.01	-0.00	-0.19	0.00	0.03	0.76	0.24
Bolivia	-13.24	-0.07	-0.03	-0.01	-0.23	0.01	0.04	0.90	0.10
Brazil	-1.25	-0.01	-0.44	-0.25	-2.34	-0.01	0.49	0.99	0.01

(continued on next page)

country	EV_j	$E(EV_{j,-j})$	avg. EV_{-j}	median EV_{-j}	min. EV_{-j}	max. EV_{-j}	std.dev. EV_{-j}	% innocents	% beneficiaries
Barbados	-29.74	-0.15	-0.03	-0.00	-1.07	0.00	0.14	0.82	0.18
Brunei Darussalam	-17.53	-0.09	-0.01	-0.00	-0.10	0.01	0.02	0.64	0.36
Bhutan	-30.32	-0.16	-0.00	0.00	-0.02	0.00	0.00	0.18	0.82
Botswana	-16.26	-0.08	-0.03	-0.00	-0.70	0.01	0.09	0.60	0.40
Central African Republic	-30.83	-0.15	-0.00	0.00	-0.08	0.00	0.01	0.31	0.69
Canada	-2.10	-0.01	-0.38	-0.22	-2.13	-0.01	0.44	0.99	0.01
Switzerland	-8.68	-0.05	-0.25	-0.20	-1.05	-0.01	0.20	0.99	0.01
Chile	-4.58	-0.02	-0.10	-0.06	-0.65	0.02	0.12	0.91	0.09
China	-0.84	-0.00	-0.31	-0.17	-3.71	0.21	0.55	0.69	0.31
Cote d'Ivoire	-16.48	-0.08	-0.06	-0.02	-0.77	0.01	0.13	0.90	0.10
Cameroon	-18.94	-0.10	-0.06	-0.02	-1.09	0.01	0.13	0.86	0.14
Congo, Rep.	-14.57	-0.08	-0.01	-0.00	-0.46	0.01	0.05	0.52	0.48
Colombia	-4.34	-0.02	-0.19	-0.08	-1.33	0.01	0.26	0.97	0.03
Comoros	-38.92	-0.18	-0.00	0.00	-0.04	0.00	0.00	0.27	0.73
Cabo Verde	-28.94	-0.15	-0.00	-0.00	-0.09	0.00	0.01	0.51	0.49
Costa Rica	-11.35	-0.06	-0.05	-0.02	-1.12	0.01	0.11	0.91	0.09
Cyprus	-25.17	-0.13	-0.03	-0.02	-0.23	0.01	0.04	0.83	0.17
Czech Republic	-13.29	-0.07	-0.13	-0.09	-0.67	-0.00	0.11	0.99	0.01
Germany	-3.38	-0.02	-0.64	-0.50	-3.51	-0.01	0.53	0.99	0.01
Dominica	-53.33	-0.21	-0.00	0.00	-0.16	0.00	0.02	0.47	0.53
Denmark	-9.48	-0.05	-0.16	-0.13	-0.53	-0.00	0.12	0.99	0.01

(continued on next page)

country	EV_j	$E(EV_{j,-j})$	avg. EV_{-j}	median EV_{-j}	min. EV_{-j}	max. EV_{-j}	std.dev. EV_{-j}	% innocents	% beneficiaries
Dominican Republic	-9.91	-0.05	-0.09	-0.03	-1.60	0.00	0.19	0.97	0.03
Algeria	-9.47	-0.05	-0.14	-0.09	-1.24	0.04	0.18	0.91	0.09
Ecuador	-8.25	-0.04	-0.04	-0.02	-0.42	0.03	0.08	0.75	0.25
Egypt, Arab Rep.	-8.19	-0.04	-0.16	-0.12	-0.90	0.03	0.17	0.91	0.09
Eritrea	-32.14	-0.16	-0.00	0.00	-0.07	0.00	0.01	0.24	0.76
Spain	-3.65	-0.02	-0.38	-0.27	-1.66	-0.01	0.31	0.99	0.01
Estonia	-26.32	-0.13	-0.02	-0.02	-0.45	0.01	0.04	0.87	0.13
Ethiopia	-11.13	-0.06	-0.05	-0.02	-0.84	0.01	0.09	0.88	0.12
Finland	-8.53	-0.04	-0.14	-0.11	-1.25	-0.00	0.14	0.99	0.01
Fiji	-23.53	-0.12	-0.02	-0.00	-0.60	0.00	0.07	0.74	0.26
France	-3.56	-0.02	-0.56	-0.44	-2.58	-0.01	0.45	0.99	0.01
Micronesia, Fed. Sts.	-38.46	-0.19	-0.00	0.00	-0.00	0.00	0.00	0.09	0.91
Gabon	-14.52	-0.07	-0.02	-0.00	-0.62	0.01	0.08	0.50	0.50
United Kingdom	-3.19	-0.02	-0.33	-0.25	-2.17	0.17	0.40	0.78	0.22
Georgia	-23.48	-0.12	-0.01	-0.01	-0.52	0.01	0.04	0.67	0.33
Ghana	-13.93	-0.07	-0.07	-0.02	-1.18	0.02	0.14	0.90	0.10
Guinea	-25.73	-0.13	-0.01	0.00	-0.45	0.01	0.05	0.47	0.53
Gambia, The	-43.48	-0.19	-0.00	0.00	-0.09	0.00	0.01	0.36	0.64
Guinea-Bissau	-33.00	-0.16	-0.00	0.00	-0.19	0.00	0.02	0.28	0.72
Equatorial Guinea	-10.09	-0.05	-0.01	0.00	-0.60	0.02	0.06	0.36	0.64
Greece	-8.56	-0.04	-0.14	-0.10	-1.59	0.04	0.20	0.89	0.11

(continued on next page)

country	EV_j	$E(EV_{j,-j})$	avg. EV_{-j}	median EV_{-j}	min. EV_{-j}	max. EV_{-j}	std.dev. EV_{-j}	% innocents	% beneficiaries
Grenada	-38.23	-0.18	-0.01	0.00	-0.45	0.01	0.04	0.30	0.70
Guatemala	-11.21	-0.06	-0.04	-0.01	-1.28	0.02	0.12	0.70	0.30
Guyana	-35.17	-0.17	-0.01	-0.00	-0.26	0.00	0.04	0.80	0.20
Hong Kong SAR, China	-6.51	-0.03	-0.18	-0.09	-3.11	-0.00	0.32	0.99	0.01
Honduras	-16.58	-0.09	-0.02	-0.00	-0.59	0.01	0.06	0.72	0.28
Croatia	-19.97	-0.10	-0.07	-0.04	-0.98	-0.00	0.10	0.99	0.01
Haiti	-20.84	-0.11	-0.01	0.00	-0.18	0.01	0.03	0.40	0.60
Hungary	-15.13	-0.08	-0.07	-0.05	-0.90	0.04	0.12	0.80	0.20
Indonesia	-2.38	-0.01	-0.24	-0.14	-1.84	-0.00	0.31	0.99	0.01
India	-2.28	-0.01	-0.57	-0.32	-5.14	-0.01	0.71	0.99	0.01
Ireland	-10.81	-0.06	-0.13	-0.10	-0.45	-0.00	0.11	0.99	0.01
Iraq	-5.92	-0.03	-0.05	0.00	-0.75	0.04	0.11	0.47	0.53
Iceland	-24.07	-0.12	-0.01	-0.01	-0.04	0.01	0.01	0.75	0.25
Israel	-9.19	-0.05	-0.18	-0.11	-4.12	0.05	0.37	0.88	0.12
Italy	-3.50	-0.02	-0.51	-0.37	-2.36	-0.01	0.46	0.99	0.01
Jamaica	-17.98	-0.09	-0.03	-0.00	-0.52	0.00	0.09	0.64	0.36
Jordan	-25.77	-0.13	-0.03	-0.02	-0.40	0.01	0.06	0.79	0.21
Japan	-0.82	-0.00	-0.62	-0.36	-5.26	-0.02	0.89	0.99	0.01
Kazakhstan	-6.25	-0.03	-0.11	-0.06	-2.57	0.02	0.24	0.87	0.13
Kenya	-12.33	-0.06	-0.04	-0.01	-0.87	0.03	0.13	0.55	0.45
Kyrgyz Republic	-26.28	-0.13	-0.01	-0.00	-0.32	0.00	0.03	0.70	0.30

(continued on next page)

country	EV_j	$E(EV_{j,-j})$	avg. EV_{-j}	median EV_{-j}	min. EV_{-j}	max. EV_{-j}	std.dev. EV_{-j}	% innocents	% beneficiaries
Cambodia	-21.94	-0.11	-0.01	-0.00	-0.37	0.01	0.03	0.66	0.34
Kiribati	-46.78	-0.21	-0.00	0.00	-0.01	0.00	0.00	0.26	0.74
St. Kitts and Nevis	-34.71	-0.17	-0.00	0.00	-0.13	0.00	0.01	0.28	0.72
Korea, Rep.	-2.85	-0.02	-0.31	-0.18	-4.08	-0.01	0.46	0.99	0.01
Lao PDR	-24.42	-0.13	-0.00	0.00	-0.24	0.00	0.02	0.29	0.71
Lebanon	-19.94	-0.10	-0.05	-0.04	-0.50	0.01	0.07	0.95	0.05
Liberia	-32.93	-0.16	-0.00	0.00	-0.19	0.00	0.02	0.47	0.53
St. Lucia	-31.17	-0.15	-0.01	0.00	-0.88	0.02	0.08	0.27	0.73
Sri Lanka	-10.84	-0.06	-0.05	-0.03	-1.13	0.01	0.10	0.86	0.14
Lesotho	-29.48	-0.15	-0.00	0.00	-0.18	0.00	0.02	0.20	0.80
Lithuania	-21.93	-0.11	-0.04	-0.02	-0.85	0.01	0.08	0.83	0.17
Luxembourg	-25.37	-0.13	-0.04	-0.04	-0.18	0.01	0.04	0.98	0.02
Latvia	-25.19	-0.13	-0.02	-0.01	-0.58	0.01	0.06	0.72	0.28
Macao SAR, China	-14.29	-0.08	-0.02	-0.01	-0.46	0.02	0.04	0.67	0.33
Morocco	-12.79	-0.07	-0.09	-0.06	-0.49	0.02	0.10	0.94	0.06
Moldova	-35.14	-0.17	-0.01	-0.01	-0.07	0.00	0.01	0.84	0.16
Madagascar	-17.92	-0.09	-0.02	-0.01	-0.75	0.00	0.06	0.77	0.23
Maldives	-29.61	-0.15	-0.00	0.00	-0.03	0.00	0.00	0.42	0.58
Mexico	-2.66	-0.01	-0.13	-0.06	-1.32	0.09	0.25	0.68	0.32
Marshall Islands	-45.84	-0.21	-0.00	0.00	-0.01	0.00	0.00	0.25	0.75
Macedonia, FYR	-35.14	-0.17	-0.01	-0.01	-0.37	0.00	0.03	0.87	0.13

(continued on next page)

country	EV_j	$E(EV_{j,-j})$	avg. EV_{-j}	median EV_{-j}	min. EV_{-j}	max. EV_{-j}	std.dev. EV_{-j}	% innocents	% beneficiaries
Mali	-21.35	-0.11	-0.02	-0.00	-0.39	0.01	0.06	0.72	0.28
Malta	-36.43	-0.17	-0.01	-0.01	-0.07	0.00	0.01	0.77	0.23
Mongolia	-18.46	-0.10	-0.00	0.00	-0.03	0.00	0.00	0.34	0.66
Mozambique	-16.33	-0.09	-0.03	-0.01	-0.40	0.01	0.06	0.88	0.12
Mauritania	-28.85	-0.14	-0.01	-0.00	-0.16	0.00	0.02	0.79	0.21
Mauritius	-19.48	-0.10	-0.02	-0.01	-0.32	0.00	0.04	0.90	0.10
Malawi	-25.67	-0.13	-0.01	0.00	-0.17	0.01	0.02	0.36	0.64
Malaysia	-5.70	-0.03	-0.17	-0.10	-1.70	0.02	0.24	0.99	0.01
Namibia	-17.13	-0.09	-0.01	-0.00	-0.25	0.01	0.04	0.67	0.33
Niger	-27.20	-0.13	-0.02	-0.00	-0.29	0.00	0.04	0.72	0.28
Nigeria	-5.68	-0.03	-0.25	-0.08	-2.34	0.04	0.41	0.92	0.08
Nicaragua	-23.23	-0.12	-0.01	-0.00	-0.24	0.01	0.03	0.75	0.25
Netherlands	-7.25	-0.04	-0.16	-0.12	-1.49	0.11	0.22	0.77	0.23
Norway	-6.42	-0.03	-0.19	-0.15	-0.69	0.04	0.15	0.98	0.02
Nepal	-16.32	-0.09	-0.00	0.00	-0.07	0.01	0.01	0.31	0.69
New Zealand	-3.93	-0.02	-0.12	-0.04	-1.69	0.01	0.27	0.99	0.01
Pakistan	-7.72	-0.04	-0.18	-0.11	-0.99	-0.00	0.20	0.99	0.01
Panama	-11.80	-0.06	-0.02	-0.00	-0.44	0.02	0.06	0.53	0.47
Peru	-5.39	-0.03	-0.09	-0.04	-0.69	0.02	0.13	0.90	0.10
Philippines	-5.37	-0.03	-0.14	-0.07	-3.18	0.03	0.31	0.94	0.06
Palau	-47.84	-0.22	-0.00	0.00	-0.00	0.00	0.00	0.25	0.75

(continued on next page)

country	EV_j	$E(EV_{j,-j})$	avg. EV_{-j}	median EV_{-j}	min. EV_{-j}	max. EV_{-j}	std.dev. EV_{-j}	% innocents	% beneficiaries
Papua New Guinea	-13.66	-0.07	-0.03	-0.01	-0.54	0.00	0.09	0.83	0.17
Poland	-7.71	-0.04	-0.23	-0.17	-1.17	-0.00	0.20	0.99	0.01
Portugal	-8.40	-0.04	-0.13	-0.10	-0.72	0.01	0.12	0.99	0.01
Paraguay	-13.80	-0.07	-0.01	-0.00	-0.21	0.01	0.03	0.62	0.38
Romania	-10.56	-0.05	-0.11	-0.08	-1.64	0.04	0.17	0.88	0.12
Russian Federation	-2.17	-0.01	-0.44	-0.31	-1.72	-0.01	0.39	0.99	0.01
Rwanda	-24.09	-0.12	-0.02	-0.00	-1.71	0.00	0.13	0.79	0.21
Saudi Arabia	-3.26	-0.02	-0.21	-0.14	-1.80	0.04	0.26	0.88	0.12
Sudan	-12.47	-0.06	-0.07	-0.04	-1.65	0.01	0.15	0.88	0.12
Senegal	-18.73	-0.10	-0.05	-0.01	-1.80	0.01	0.18	0.86	0.14
Singapore	-6.41	-0.03	-0.18	-0.10	-1.24	-0.00	0.24	0.99	0.01
Solomon Islands	-26.22	-0.14	-0.00	0.00	-0.04	0.00	0.00	0.28	0.72
Sierra Leone	-27.61	-0.14	-0.01	-0.00	-0.44	0.00	0.05	0.51	0.49
El Salvador	-15.87	-0.08	-0.02	-0.00	-0.78	0.01	0.08	0.64	0.36
Sao Tome and Principe	-47.37	-0.21	-0.00	0.00	-0.01	0.00	0.00	0.29	0.71
Suriname	-22.79	-0.12	-0.01	0.00	-0.38	0.01	0.03	0.40	0.60
Slovak Republic	-17.97	-0.09	-0.08	-0.05	-0.63	0.02	0.08	0.98	0.02
Slovenia	-24.46	-0.12	-0.05	-0.03	-0.45	0.01	0.05	0.98	0.02
Sweden	-6.50	-0.03	-0.21	-0.16	-1.00	0.04	0.18	0.98	0.02
Swaziland	-27.19	-0.14	-0.01	0.00	-0.28	0.00	0.03	0.39	0.61
Seychelles	-40.26	-0.18	-0.00	0.00	-0.03	0.00	0.00	0.37	0.63

(continued on next page)

country	EV_j	$E(EV_{j,-j})$	avg. EV_{-j}	median EV_{-j}	min. EV_{-j}	max. EV_{-j}	std.dev. EV_{-j}	% innocents	% beneficiaries
Syrian Arab Republic	-14.43	-0.07	-0.03	0.00	-0.93	0.03	0.10	0.46	0.54
Chad	-14.34	-0.08	-0.00	0.00	-0.25	0.01	0.02	0.30	0.70
Togo	-30.31	-0.14	-0.01	-0.00	-0.49	0.01	0.04	0.60	0.40
Thailand	-4.35	-0.02	-0.09	-0.04	-2.49	0.04	0.25	0.73	0.27
Tajikistan	-21.03	-0.11	-0.00	0.00	-0.04	0.00	0.01	0.30	0.70
Turkmenistan	-11.52	-0.06	-0.01	0.00	-0.32	0.01	0.03	0.30	0.70
Tonga	-32.10	-0.16	-0.00	0.00	-0.07	0.00	0.01	0.33	0.67
Trinidad and Tobago	-14.94	-0.08	-0.08	0.00	-3.53	0.03	0.38	0.45	0.55
Tunisia	-19.28	-0.10	-0.03	-0.01	-0.39	0.02	0.05	0.57	0.43
Turkey	-4.64	-0.02	-0.33	-0.24	-1.59	-0.01	0.30	0.99	0.01
Tuvalu	-56.91	-0.23	-0.00	0.00	-0.00	0.00	0.00	0.08	0.92
Tanzania	-14.52	-0.08	-0.06	-0.02	-0.69	0.01	0.11	0.89	0.11
Uganda	-17.95	-0.09	-0.04	-0.01	-0.66	0.01	0.09	0.85	0.15
Ukraine	-9.06	-0.05	-0.14	-0.09	-2.24	0.02	0.20	0.98	0.02
Uruguay	-10.28	-0.06	-0.03	-0.01	-0.28	0.01	0.04	0.81	0.19
United States	-0.54	-0.00	-0.52	-0.25	-4.74	0.36	0.89	0.71	0.29
Uzbekistan	-10.60	-0.06	-0.02	0.00	-1.34	0.02	0.11	0.32	0.68
St. Vincent and the Grenadines	-39.50	-0.18	-0.01	-0.00	-0.48	0.00	0.05	0.73	0.27
Venezuela, RB	-3.84	-0.02	-0.09	0.00	-1.95	0.13	0.27	0.45	0.55
Vietnam	-7.31	-0.04	-0.10	-0.05	-1.84	0.02	0.21	0.94	0.06

(continued on next page)

country	EV_j	$E(EV_{j,-j})$	avg. EV_{-j}	median EV_{-j}	min. EV_{-j}	max. EV_{-j}	std.dev. EV_{-j}	% innocents	% beneficiaries
Vanuatu	-31.79	-0.16	-0.00	0.00	-0.07	0.00	0.01	0.20	0.80
Samoa	-29.17	-0.15	-0.00	0.00	-0.11	0.00	0.01	0.33	0.67
Yemen, Rep.	-13.37	-0.07	-0.03	-0.01	-0.85	0.01	0.08	0.69	0.31
South Africa	-3.32	-0.02	-0.27	-0.11	-5.87	-0.00	0.57	0.99	0.01
Zambia	-12.76	-0.07	-0.03	0.00	-1.03	0.02	0.11	0.42	0.58
Zimbabwe	-23.81	-0.12	-0.03	-0.01	-0.39	0.00	0.06	0.82	0.18

7 Robustness checks

7.1 Selection

We use the extension of the Anderson and van Wincoop (2003) proposed by Egger and Larch (2011) to model the extensive and intensive margins of international trade to control for the fact that about

8 Conclusion

Appendix

A Descriptive Statistics

B List of countries

Afghanistan, Angola, Albania, Argentina, Armenia, Antigua and Barbuda, Australia, Austria, Azerbaijan, Burundi, Belgium, Benin, Burkina Faso, Bangladesh, Bulgaria, Bahamas, The, Bosnia and Herzegovina, Belarus, Bermuda, Bolivia, Brazil, Barbados, Brunei Darussalam, Bhutan, Botswana, Central African Republic, Canada, Switzerland, Chile, China, Cote d'Ivoire, Cameroon, Congo, Rep., Colombia, Comoros, Cabo Verde, Costa Rica, Cyprus, Czech Republic, Germany, Dominica, Denmark, Dominican Republic, Algeria, Ecuador, Egypt, Arab Rep., Eritrea, Spain, Estonia, Ethiopia, Finland, Fiji, France, Micronesia, Fed. Sts., Gabon, United Kingdom, Georgia, Ghana, Guinea, Gambia, The, Guinea-Bissau, Equatorial Guinea, Greece, Grenada, Guatemala, Guyana, Hong Kong SAR, China, Honduras, Croatia, Haiti, Hungary, Indonesia, India, Ireland, Iraq, Iceland, Israel, Italy, Jamaica, Jordan, Japan, Kazakhstan, Kenya, Kyrgyz Republic, Cambodia, Kiribati, St. Kitts and Nevis, Korea, Rep., Lao PDR, Lebanon, Liberia, St. Lucia, Sri Lanka, Lesotho, Lithuania, Luxembourg, Latvia, Macao SAR, China, Morocco, Moldova, Madagascar, Maldives, Mexico, Marshall Islands,

Table 3: Correlations between Trade Sanction Effects

	EV_j	$E(EV_{j,-j})$	avg. EV_{-j}	median EV_{-j}	min. EV_{-j}	max. EV_{-j}	std.dev. EV_{-j}	% inno-cents	gdp-share
EV_j	1.00								
$E(EV_{j,-j})$	0.99	1.00							
avg. EV_j	-0.63	-0.67	1.00						
median EV_j	-0.57	-0.61	0.97	1.00					
min. EV_j	-0.63	-0.67	0.78	0.66	1.00				
max. EV_j	0.29	0.30	-0.22	-0.14	-0.31	1.00			
std.dev. EV_j	0.66	0.70	-0.91	-0.80	-0.94	0.37	1.00		
% innocents	0.60	0.61	-0.55	-0.54	-0.47	0.00	0.49	1.00	
gdpshare	0.33	0.36	-0.63	-0.56	-0.55	0.73	0.69	0.16	1.00

Figure 1: Impact of Average Distance on Welfare Loss of Embargo Target Country

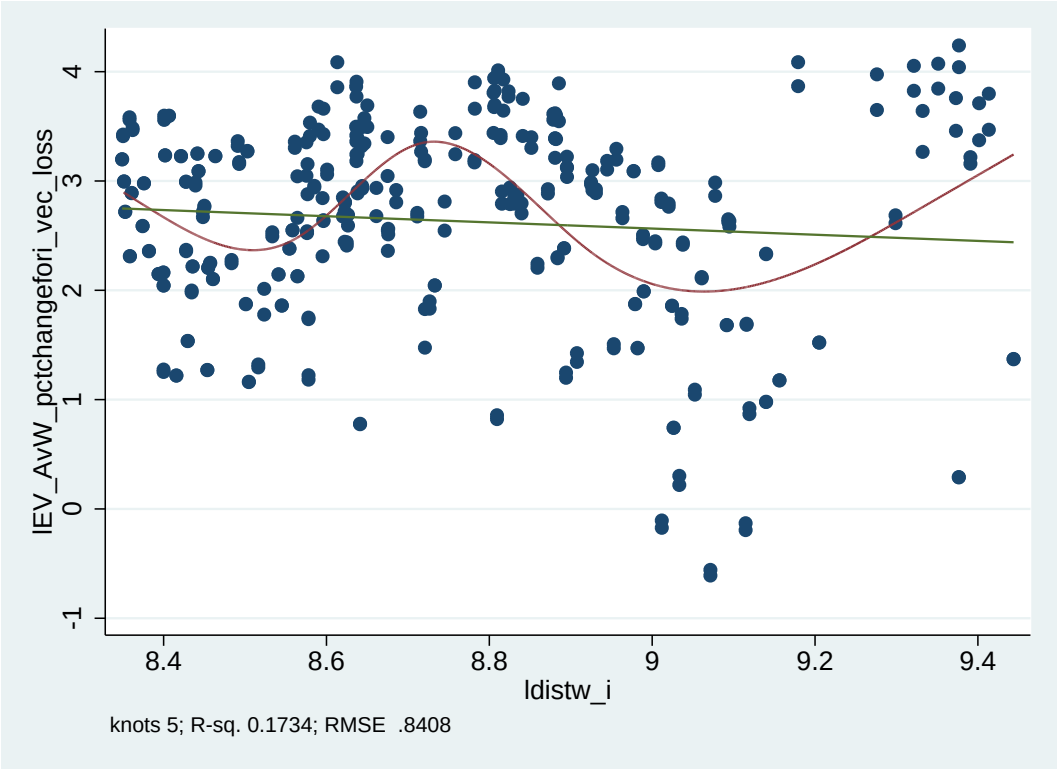

Figure 2: Impact of Average RTA on Welfare Loss of Embargo Target Country

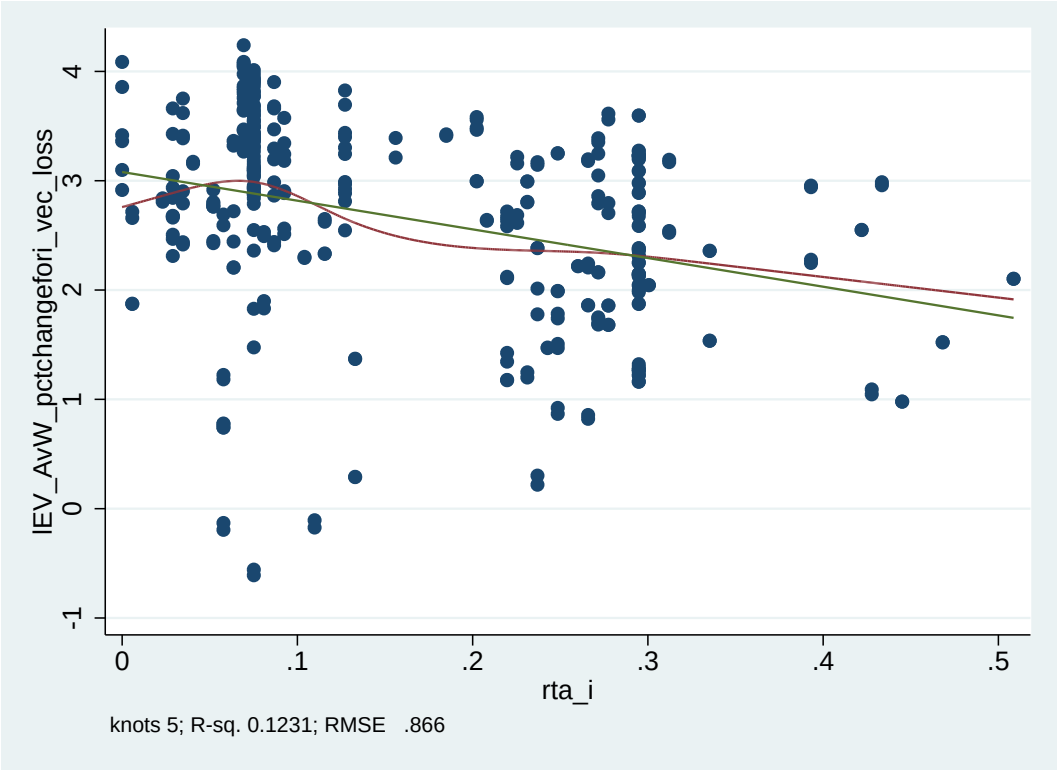

Figure 3: Impact of Average Common Language on Welfare Loss of Embargo Target Country

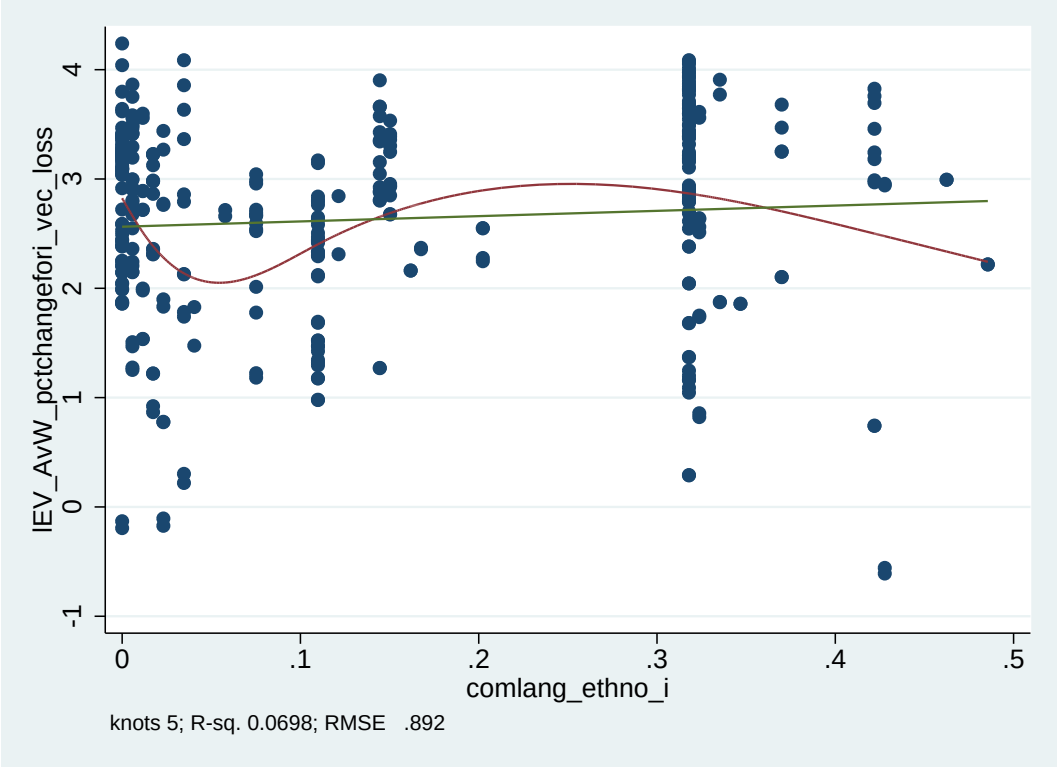

Figure 4: Impact of Average Common Colonizer on Welfare Loss of Embargo Target Country

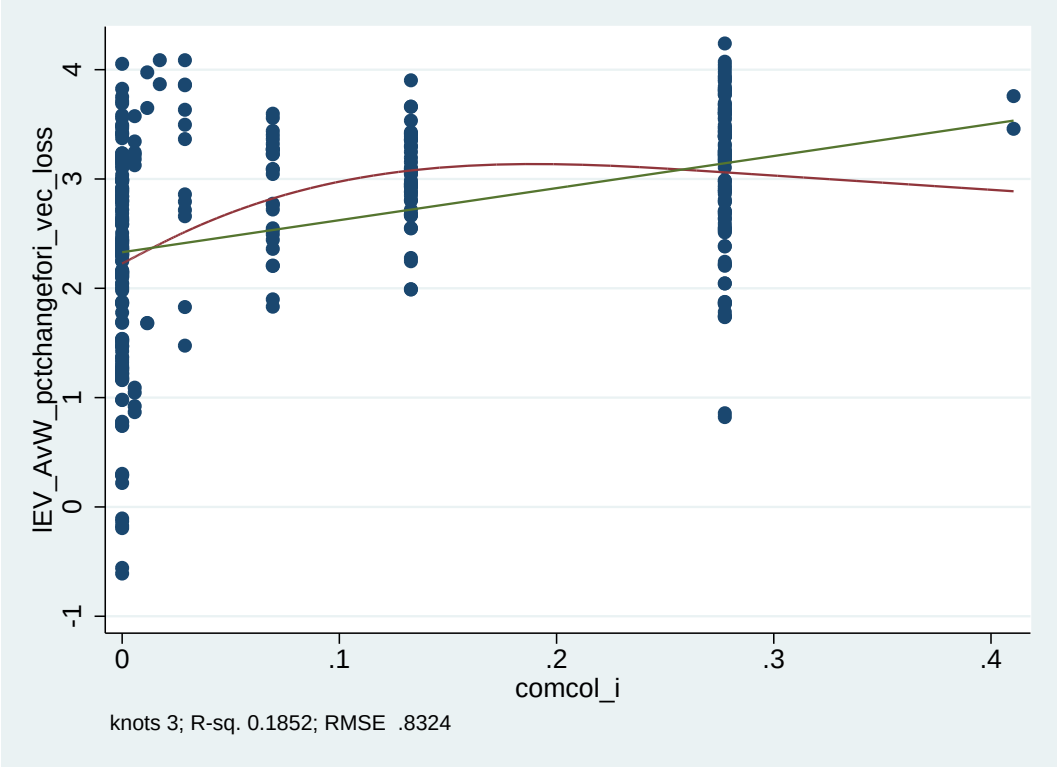

Figure 5: Impact of World GDP Share on Welfare Loss of Embargo Target Country

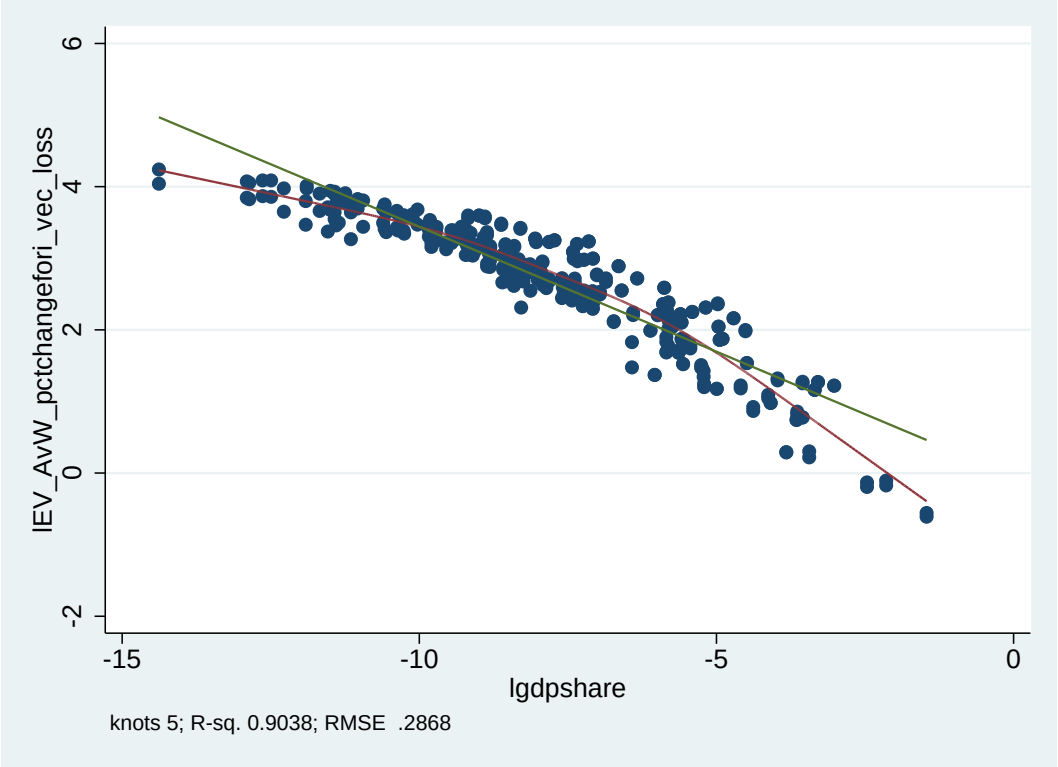

Table 4: Determinants of Target Country Loss Size $\ln(-EV_j)$

$SELECTION_j$	-0.088***	-0.088**
	(0.018)	(0.030)
$\ln(GDPSHARE)_j$	-0.608***	-0.746***
	(0.019)	(0.033)
$\ln(GDPSHARE)_j^2$	-0.015***	-0.026***
	(0.001)	(0.002)
$\overline{\ln(DIST)}_j$	-0.784***	
	(0.039)	
$\overline{CONTIG}_j$	-2.643***	
	(0.741)	
$\overline{COMLANGUAGE}_j$	-0.139*	
	(0.062)	
$\overline{COMCOLONY}_j$	0.013	
	(0.084)	
$\overline{RTA}_j$	0.747***	
	(0.098)	
$CONSTANT$	5.764***	-1.384***
	(0.378)	(0.138)
R^2	0.966	0.906
N	346	346

Table 5: Descriptive Statistics Regression Sample

Variable	**Mean**	**Std. Dev.**	**Min.**	**Max.**
trade flow_{ij} (current million US-$)	545.445	5862.419	0	444407.156
$I(\text{trade flow}_{ij} > 0)$	0.724	0.447	0	1
rta_{ij}	0.171	0.377	0	1
ldistw_{ij}	8.777	0.764	4.107	9.890
contig_{ij}	0.016	0.127	0	1
$\text{comlang\_ethno}_{ij}$	0.147	0.354	0	1
comcol_{ij}	0.104	0.306	0	1
N		29756		

Macedonia, FYR, Mali, Malta, Mongolia, Mozambique, Mauritania, Mauritius, Malawi, Malaysia, Namibia, Niger, Nigeria, Nicaragua, Netherlands, Norway, Nepal, New Zealand, Pakistan, Panama, Peru, Philippines, Palau, Papua New Guinea, Poland, Portugal, Paraguay, Romania, Russian Federation, Rwanda, Saudi Arabia, Sudan, Senegal, Singapore, Solomon Islands, Sierra Leone, El Salvador, Sao Tome and Principe, Suriname, Slovak Republic, Slovenia, Sweden, Swaziland, Seychelles, Syrian Arab Republic, Chad, Togo, Thailand, Tajikistan, Turkmenistan, Tonga, Trinidad and Tobago, Tunisia, Turkey, Tuvalu, Tanzania, Uganda, Ukraine, Uruguay, United States, Uzbekistan, St. Vincent and the Grenadines, Venezuela, RB, Vietnam, Vanuatu, Samoa, Yemen, Rep., South Africa, Zambia, Zimbabwe.

References

Anderson, J. E. and van Wincoop, E. (2003). Gravity with Gravitas: A Solution to the Border Puzzle. *American Economic Review*, 93(1):170–192.

Arkolakis, C., Costinot, A., and Rodríguez-Clare, A. (2012). New Trade Models, Same Old Gains? *American Economic Review*, 102(1):94–130.

Armington, P. S. (1969). A Theory of Demand for Products Distinguished by Place of Production. *Staff Papers - International Monetary Fund*, 16(1):159–178.

Baldwin, D. A. (1999). The Sanctions Debate and the Logic of Choice. *International Security*, 24(3):80–107.

Bergeijk, P. a. G. V. (1995). The Impact of Economic Sanctions in the 1990s. *The World Economy*, 18(3):443–455.

Drezner, D. W. (2001). Outside the box: Explaining sanctions in pursuit of foreign economic goals*. *International Interactions*, 26(4):379–410.

Eaton, J. and Kortum, S. (2002). Technology, Geography, and Trade. *Econometrica*, 70(5):1741–1779.

Egger, P. and Larch, M. (2011). An assessment of the Europe agreements' effects on bilateral trade, GDP, and welfare. *European Economic Review*, 55(2):263–279.

Head, K. and Mayer, T. (2014). Gravity Equations: Workhorse, Toolkit, and Cookbook. In Gopinath, G., Helpman, E., and Rogoff, K., editors, *Handbook of International Economics. Volume 4*. North-Holland, Amsterdam.

Head, K., Mayer, T., and Ries, J. (2010). The Erosion of Colonial Trade Linkages after Independence. *Journal of International Economics*, 81(1):1–14.

Jayachandran, S. and Kremer, M. (2006). Odious Debt. *American Economic Review*, 96(1):82–92.

Krugman, P. (1980). Scale Economies, Product Differentiation, and the Pattern of Trade. *American Economic Review*, 70(5):950–959.

Lacy, D. and Niou, E. M. S. (2004). A Theory of Economic Sanctions and Issue Linkage: The Roles of Preferences, Information, and Threats. *Journal of Politics*, 66(1):25–42.

Lektzian, D. and Souva, M. (2003). The Economic Peace Between Democracies: Economic Sanctions and Domestic Institutions. *Journal of Peace Research*, 40(6):641–660.

Melitz, M. J. (2003). The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity. *Econometrica*, 71(6):1695–1725.

Melitz, M. J. and Redding, S. J. (2014). Missing Gains from Trade? *American Economic Review: Papers & Proceedings*, 104(5):317–321.

Pape, R. A. (1997). Why Economic Sanctions Do Not Work. *International Security*, 22(2):90–136.

Pape, R. A. (1998). Why Economic Sanctions Still Do Not Work. *International Security*, 23(1):66–77.

Samuelson, P. A. (1954). The Transfer Problem and Transport Costs, II: Analysis of Effects of Trade Impediments. *Economic Journal*, 64(254):264–289.

Santos Silva, J. . M. and Tenreyro, S. (2006). The Log of Gravity. *The Review of Economics and Statistics*, 88(4):641–658.

Whang, T. (2010). Structural estimation of economic sanctions: From initiation to outcomes. *Journal of Peace Research*, 47(5):561–573.

Zeng, K. (2002). Trade Structure and the Effectiveness of America's "Aggressively Unilateral" Trade Policy. *International Studies Quarterly*, 46(1):93–115.