The Impact of International Economic Sanctions on Trade
An empirical Analysis

Raul Caruso*

Università Cattolica del Sacro Cuore di Milano

raul.caruso@mi.unicatt.it

Abstract:

International economic sanctions appear to be a common and recurring feature of political interactions between states. In particular, the United States is the country which has most frequently applied negative economic sanctions after World War II. In a parallel way, several measures, imposed by a multilateral organisation like the United Nations have taken place in recent years. This paper provides, through a gravity model approach, an estimation of the impact of economic negative sanctions on international trade.
First, the study reports panel gravity estimates of bilateral trade between the U.S. and 49 target countries over the period 1960-2000, inclusive. The results show that extensive and comprehensive sanctions have a large negative impact on bilateral trade, while this is not the case for limited and moderate sanctions. A second estimation focuses on the impact of unilateral U.S. sanctions on bilateral trade volume between target countries and the other G-7 countries over the same period. The results show that unilateral extensive sanctions have a large negative impact, while limited and moderate ones induce a slight positive effect on other G-7 countries bilateral trade. Thus, in the first case the hypothesis of negative 'network effects' is confirmed, while in the latter the sanctions-busting argument should be defended. In both estimations, however, multilateral sanctions demonstrate a large negative impact on trade flows.

Keywords: International negative sanctions, international trade, gravity model.

International economic sanctions appear to be a common and recurring feature in political interactions between states. The United States, in particular, has been the major country imposing economic sanctions after World War II. In a parallel way, several sanctions imposed by a multilateral organisation like the United Nations have been used in recent years and some of them are still in force. In fact, since the Berlin Wall fell, sanctions have become a common instrument of the United Nations Security Council.

The phenomenon of international negative sanctions is generally studied in relation to its effectiveness. Many scholars have devoted their efforts to distinguishing characteristics of degrees of success and failure of the economic punishment[1]. However, the efficacy of sanctions as an instrument of foreign policy is still in great doubt. One of the main features in this kind of works is the focus on the costs of sanctions. The common rationale behind the imposition of these measures is that the higher are the costs for the target countries the higher will be the probability that their government behaviour could be affected because of welfare losses. Boycotts and embargoes, for instance, should deprive the target country of some of the gains of trade and therefore induce a lower welfare. The costs for target countries are commonly assumed to be positively related with the degree of integration with sender country. The more the economies are integrated, the more the economic interactions should be affected. On the other hand, the sender country could also be affected by imposing sanctions. In fact, commercial and financial linkages with target country agents are threatened, suspended or blocked.

Another main feature is the focus on the behaviour of third countries. In case of multilateral sanctions, it is often argued that the economic punishment should be more effective, since more countries are involved in a co-operative and coercive behaviour. Whenever sanctions are unilaterally imposed, the impact could be questionable. On one hand, third countries agents, both public and private, may capture the gains of diverted trade. On the other hand, the expected negative effects of sanctions could spill-over to third countries.

This paper deals with these aspects of negative sanctions. Firstly, it focuses on the impact on bilateral trade between the U.S., as the main sender country of the recent years, and target countries. Secondly it examines the impact on third countries, supposed to be competitors of the U.S. Finally , it analyses the effects of multilateral sanctions. In particular, through a panel gravity approach, this study provides an estimation of the impact of economic negative sanctions on international bilateral trade flows. The paper is organised as follows: (a) a first part is devoted to defining sanctions and predicting their

---

[1] For examples of studies on the effectiveness of sanctions see among others Baldwin (1985), Hufbauer et al. (1990), Martin (1992), Van Bergeijk (1989,1994,1995), Pape (1997), Bonetti (1998), Mastanduno (1999), Drezner (2000).

impact on trade; (b) a second part deals with the description of the gravity model used in the estimation; (c) data, estimation and results are presented for the U.S. *vis-à-vis* 49 target countries; (d) a second estimation on bilateral trade between other G-7 countries and the same panel of target countries is described; (e) results of a counterfactual experiment are presented; (f) other recent empirical works on the same topic are mentioned.

1. DEFINING SANCTIONS AND THEIR IMPACT ON TRADE.

Scholars usually distinguish between negative and positive sanctions. Negative sanctions are the best-known economic instruments of diplomacy. They are imposed in order to inflict an economic damage to one or more countries. Otherwise, positive sanctions are measures devoted to foster co-operation among some countries. Since this study deals with the impact of international negative sanctions on trade, for simplicity the expression 'economic sanctions' will be used to indicate roughly only negative sanctions. As it is common in the existing literature, by the expression 'sender' and 'target' I denote respectively the country that imposes sanctions and the country that receives the economic punishment. It is possible to look at economic sanctions regarding: (i) objective; (ii) actors involved; (iii) object of sanctions.

As regards objectives of sanctions, following Barber (1979) it is possible to group them into three categories. There are 'primary objectives' concerned with the actions and behaviour of governments against whom the sanctions are directed. The 'secondary objectives' are related to status, behaviour and expectations of governments imposing sanctions. Finally the 'tertiary objectives' are concerned with the broader international considerations, relating either to the structure of international system as a whole, or to some parts of it. These three categories do not exclude each other but can coexist and overlap in some cases.

Another way to look at sanctions is to note the number of states involved. Most of the times the initiative in imposing international sanctions rests on one government. Indeed they can take shape of both unilateral and multilateral. In the first case, sanctions are imposed by only one country against a target country. In the second case, sanctions are imposed by more than one country. On one hand, it is possible that other countries follow a 'promoter' country. Otherwise, the choice of an economic punishment can be adopted within the framework of an international organisation.

Looking at the object of sanctions, we can distinguish three kinds of sanctions: boycotts, embargoes and financial sanctions. A boycott is a restriction of imports of one or more goods from the target country. It takes place to lower the demand for certain products from the target country. Moreover, it attempts to reduce the target's foreign exchange earnings and therefore its ability to purchase goods. It also aims to induce a damage to a particular industry or sector of the target country. They are usually criticised as ineffective because target countries are able to find alternative markets or arrange triangular purchases to circumvent import controls. Otherwise an embargo restricts exports of certain products to the target country. This is the most common technique. The prohibition on exports may be partial or complete. It is usually enforced by a system of export licenses and supporting measures. Finally, financial sanctions restrict or suspend lending and investing

into target economy. They also impose additional restrictions on international payments in order to prevent sanctions-busting. Moreover foreign assets of the target economy may be frozen.

Sanctions depress trade but, as other quantitative restrictions, they are characterised by a phenomenon of rent-seeking. The graph below simply describes the impact of sanctions on trade volume and prices. Let the curve D represent target country import demand curve. The target country is assumed to be a small open economy and, therefore it cannot affect the world price but it is a price taker on the world market. Therefore, the supply curve is a flat line. In the absence of any impediments or transportation costs the perfect competition equilibrium will be reached at point E. Consumers purchase the quantity q_1 at the world price p_w.. Suppose now that a sender country imposes an export embargo on exports to the target country, restricting them until q^*. The vertical line represents the quantitative restriction. Since the embargo restricts supply it also raises import prices to p^* in the importing country. The wedge in the price ($p^*- p_w$.) reflects the quantitative restriction. A rent that can be distributed either to the government or to the private agents equals (p^* - p_w.) $\cdot q^*$.
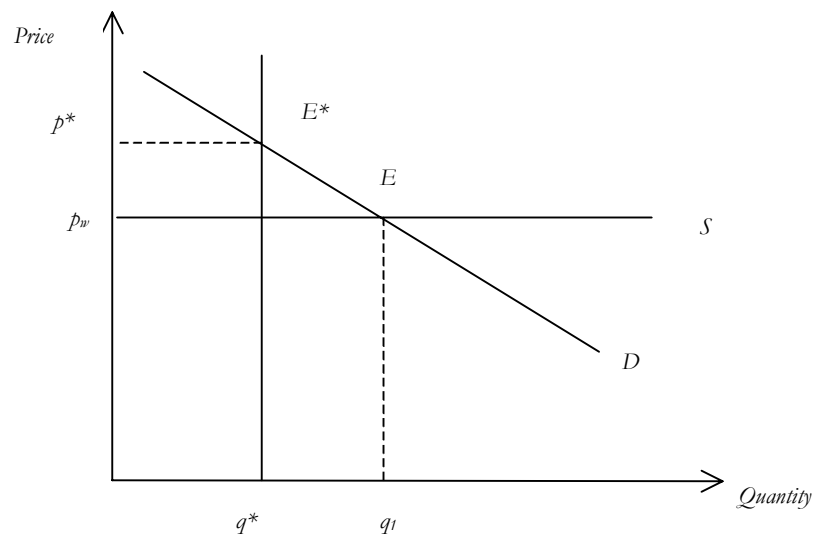

Figure 1. The Impact on trade

Sinc e it is enforced trough a system of licenses, an export embargo is operationally indistinguishable from a *Voluntary Export Restraint (VER)* and includes a rent that either pertains to the foreign exporters or is taken over by the government. In fact, the rent could be captured by the sender country's government if exporting licenses were competitively auctioned off for their premium value. Otherwise, the free issuing of licenses would transfer the rent

to exporters who managed to obtain them. As Jones (1984) pointed out regarding the political economy of a VER, exporters are likely to collude in order to capture the monopoly rents. At the same time an important implication is that the supply restriction requires state-sponsored collusive activity with cartel discipline maintained by the administrative powers of the government. Moreover, the shortfall in supply caused by the embargo could also benefit exporters not involved in the conflict between sender and target country. Third countries producers, in fact, could allow non-restraining exporters to increase deliveries to the importing country expanding their market share. However, like in any other trade restriction, the greatest burden is imposed on consumers of importing country, i.e. the target country. In fact they must pay a higher domestic price for the good that results from its scarcity premium.

2. SOME KEY THEORETICAL CONTRIBUTIONS

There are several ways economists have analysed the phenomenon of negative sanctions. This section is a brief review of the main contributions. Interest in sanctions is diversified upon some characteristics: the response of economy sanctioned, the nature and importance of goods included in sanctions list, and the role of business and interest groups among others.

In a seminal work, Bhagwati and Srinivasan (1976) note that the phenomenon of a trade embargo on a country's imports can be analysed as a market-disruption phenomenon. To investigate the optimal response policy intervention required when a trade disruption occurs, they consider a two-commodity (exportable and importable) model of international trade. Then they assume a two-period horizon and also include adjustment costs. The results are applied to a situation when an embargo is imposed. The probability that an embargo can take place is an increasing function of the importing level of the importing country (the target country). The rationale for this assumption is that the probability may depend upon 'import dependence' of the importer. In this case, the optimal response of target country should be a trade tariff if there were no adjustment costs, and a trade tariff plus production tax-cum-subsidy if there were adjustment costs. Optimal response of an economy does not depend only upon government choices (e.g. tariffs or subsidy), but also upon the behaviour of individuals consumers and producers.

Tolley and Wilman (1977) also consider the response of private individual agents. They use a partial equilibrium framework to analyse the impact of a trade disruption threat. First, they focus on the objective of trade to allow for the presence of an embargo threat. Given an embargo frequency and a probability distribution of embargo length the objective is the maximisation of expected welfare. Dividing goods in 'safe' and 'unsafe' and noting how short-run demand curve is less elastic than the long-run curve, they look at the private decisions to face the embargo threats. Particularly domestic suppliers

and demanders will make decisions based on expected price taking into account embargo and non-embargo periods. In non-embargo periods domestic suppliers will increase production and demanders will decrease consumption. The marginal value of consumption raises less than the marginal cost of production. Furthermore, unemployment and foreign policy externalities are considered: they provide reasons for public interventions to reduce imports in non-embargo periods by a greater amount than occurs under private decisions. Expressions are derived for optimal adjustment, including an optimal tariff and an equivalent optimal quota. Particularly an optimal tariff is proportional to foreign dependence, inversely proportional to elasticity of external embargo loss, varies directly with embargo probability and depends more complexly on other parameters.

The importance and the distinction between private and public policy choices are also analysed by Van Bergeijk (1994, ch.6). He develops an expected utility model that deals with the short-term consequences of trade uncertainty due to boycotts and embargoes that can be imposed unexpectedly and raise the level of uncertainty in trade patterns. The model focuses on a small open economy that produces, consumes and trades two goods, whose price is set exogenously. Its utility function is strictly concave. Economic agents take into account the possibility of some trade disruption due to diplomatic climate and, therefore, they take decisions about the extent of their specialisation. This choice will be a point between a situation of complete autarky and absolute free trade situation. A deterioration of diplomatic climate induces a lowering of free trade. The model shows that in a centrally-planned economy *vis-à-vis* a market economy the extent of specialisation is lower. Looking at the nature of goods a market economy will specialise more in goods with a relative comparative advantage.

A simple two-commodity model is also presented by Frey (1984, ch. 6). He considers the production possibility frontier of economy and community homothetic indifference curves. The two commodities are internationally traded at international prices. The negative impact on income depends on losses of gains of trade. More in detail, this negative effect depends on the production possibility curve and the indifference curves of target country consumers. The more rigid is the production structure of an economy the larger is the welfare loss. Likewise, the more inflexible are consumers' preferences the higher the loss will be. Flexibility of demand and supply curves is strictly linked with the nature of goods. The larger is the importance of a particular good for an economy the more rigid is its demand curve.

The significance of the nature and characteristics of goods is the focus of Gray (1986). He points out the relevance of considering non-competitive goods in trade warfare. First, he defines four categories of non competitive goods: a) a first 'pure' category of goods that cannot be produced in the target country because the essential production factor is a natural resource not available; b) a second 'pure' category of good that cannot be produced because of lack of a production-prerequisite other than natural resources (technology,

human capital); c) a hybrid category that requires a production factor available only in limited quantities. Its supply is positive but almost rigid; a d) goods for which domestic capacity does not exist because the limited size of the local market precludes the availability of important economies of scale. The results of the model show that per-unit average gains from trade from the importation of non-competitive goods are likely to exceed those derived from trade in competitive goods. Indeed, he argues that the only way to inflict a severe economic punishment is to be able to withhold non-competitive imports from the target state. In fact, if competitive goods are withheld the target economy moves over its production possibility to a worse position, but the magnitude of damage will be far less than that induced if restrictions on non-competitive goods are imposed.

Another topic that has been emphasised is the role of interest groups into the managing of sanctions. Lunborg (1987) argues that an export embargo is operationally indistinguishable from a *Voluntary Export Restraint (VER)*. The distinction between a VER and an embargo is characterised by a) the political motivation; b) the will of sender country to punish the target country. Furthermore, he also notes that quantitatively effects on importing country are expected to be different: in the case of a VER, welfare in the importing country is expected to increase; in the case of an export embargo it is expected to fall. The crucial consideration is that the export contraction is usually imposed on goods and commodities that cannot be produced in the importing country (now the target country). Therefore, as in the case of the VER, the analysis of the export embargo includes a rent. Taking into consideration the effect both on target and sender an optimal solution should be the reduction of exports at the point where exports' monopoly profits are maximised.

In the same optic Bayard et al. (1983) have pointed out that the potential economic effectiveness of sanctions depends on their oligopoly power in restricting sales and raising prices. The larger is the share of exports controlled by a cartel of exporters, the easier it is to inflict damage. Since the costs of reaching an agreement depends on the number and size of participating exporters, the smaller the number of agents in the cartel and the larger their collective share of total world exports of the commodity, the easier it will be to reach an agreement. Thus, sanctions are likely to be more effective if they do not need to rely on many small exporters to control a large share of world exports.

In that regard an interesting interpretation is given by Kaempfer and Lowenberg (1988). They argue that sanctions are imposed in order to respond to an internal political pressure by interest groups. Thus, the types of sanctions observed are likely to be those that serve the interests of influential pressure groups within the polity of sender country and are unlikely to be designed in order to impose maximum damage to target countries. Since sanctions can be interpreted as a signal towards the opposition groups in target countries, therefore groups that are interested in a political change in target countries can ally with other groups that may benefit from sanctions. The economic harm

would not be the crucial factor in determining the package of measures. The authors, also, point out that this approach might be used to explain why sender countries restrict imports to target countries rather than export to it. Leidy (1989) criticised this position, arguing that Kaempfer and Lowenberg failed to incorporate some essential information about the legal, institutional and strategic framework in which sanctions decisions are made. In particular, he noted that evidence clearly indicates that there is an unequivocal bias against the use of import restrictions in favour of export controls. On the path of public choice approach, Dorussen and Mo (2001) developed a model of the well-known war-of-attrition game in which ending sanctions becomes the objective of interstate bargaining. States are not treated as unitary decision makers so as to introduce explicitly the effects of domestic politics. They argue that sanctions endure because governments commit themselves to domestic institutions. These institutions function as constraints in international bargaining. Thus, they take into consideration the literature on two-level games in addition to the public-choice perspective on international sanctions.

3. THE GRAVITY MODEL

As indicated above, this study uses a gravity approach to explain the impact of sanctions on trade. The empirical evidence based on gravity equation affirms that bilateral trade flows are related to the size of countries and geographic variables. Particularly, bilateral trade is supposed to be positively related to the size of countries and negatively related to distance between them. These factors have analogies respectively with the attraction force and resistance force in Newtonian physics, giving the gravity model its name. The gravity model explains bilateral aggregate trade flows by using a single log-linear equation:

$$ln\ TRADE_{ijt} = \beta_0 + \beta_1\ ln\ GDPit + \beta_2\ ln\ GDPjt + \beta_3\ ln\ POPit + \beta_4\ ln\ POPjt + \beta_5\ ln\ DIST_{ij} + \beta_6 A_t + u_{ijt}$$

where $TRADE_{ijt}$ denotes bilateral trade flows between country i and country j at time t, $GDPit$ and $GDPjt$ country i and j's gross domestic products, $POPit$ $POPjt$ their populations, $DIST_t$ the distance between countries, and finally A_t a variety of other factors (commonly dummy variables) either aiding or resisting trade between countries and u_{ij} the usual random error term. Another common specification takes GDP and GDP per capita instead of GDP and population. In the traditional specification of gravity equation prices are not considered.

The first attempt to apply the gravity equation to trade had been made by Isard (1954). Tinbergen (1962) firstly introduced the logarithmic form of the model. His purpose was to determine the normal or standard pattern of international trade that would prevail in the absence of discriminating trade impediments. Linneman (1966) argued that the gravity model is a reduced form

from a four-equation partial equilibrium model of export supply and import demand.

Albeit its notorious success in empirical works, the gravity equation lacked of sound theoretical underpinnings. Firstly Anderson (1979) has provided a theoretical explanation for the gravity equation applied to commodities. He argued that the gravity equation can be derived by the properties of expenditure systems. Helpmann and Krugman (1985, ch. 8) have developed a gravity-like equation in a simple model of intra-industry trade. Since economies of scale are expected to lead more specialisation the gravity equation will tend to fit the trade pattern better, the more important are increasing returns. Bergstrand (1985) presents a general equilibrium model of world trade derived from utility- and profit-maximising agent behaviour and assuming a single factor of production in each country. Thus, the trade flow depends upon the resources availability for a given year as well as trade barriers among all pairs of countries. Therefore he derives a gravity model making certain simplifying assumptions. Furthermore, Bergstrand (1989) has extended his previous work to incorporate the Heckscher-Olin factor-proportion theory and verifies the Linder hypothesis, according to which countries with similar per capita incomes will have similar demands. Deardoff (1995) derived bilateral trade from two cases of the Heckscher-Olin model and Evenett and Keller (1998) analysed the Heckscher-Olin theory and the Increasing Returns theory, by examining whether they account for the empirical success of the gravity equation.

I estimate an augmented gravity model adding to the standard model some dummy variables in order to distinguish the effects of political conflicts. The estimated equation is:

$$ln\ TRADE_{ijt} = \beta_0 + \beta_1\ ln\ GDP_{it} + \beta_2\ ln\ GDP_{jt} + \beta_3\ ln\ POP_{it} + \beta_4\ ln\ POP_{jt} + \beta_5\ ln\ DIST_{ij} + \beta_6\ LMSANC + \beta_7\ XSANC + \beta_8\ MULTSANC + \beta_9\ INTERWAR + \beta_{10}\ INTRAWAR + u_{ijt}$$

In evaluating sanctions, some distinctions should be made. First, sanctions are not all equal. Most of them imply trade restrictions to reduce trade-exports or imports or both; But some of them imply financial restrictions too. In this study financial sanctions are also considered and included in the same dummy variables. In fact they may also reduce trade by denying investment, foreign exchange or credit to the target country or by raising its cost of credit. In a parallel way, we can distinguish them regarding the magnitude and the severity of restrictions. There are several examples of minor financial and trade sanctions, and also cases of comprehensive trade and financial ones such as those against Iran or Nicaragua. I distinguish two categories. For simplicity, partial trade restrictions and financial sanctions will be included in 'moderate', and extensive trade and financial restrictions will be considered 'extensive'. Therefore *LMSANC* and *XSANC* denote moderate and extensive sanctions respectively.

Sanctions often are expected to be more effective if taken at multilateral level. When other countries than the U.S. impose sanctions, the trade linkages are expected to be more worsened, and therefore sanctions more effective. *MULTSANC* denotes the situation where more countries are involved.

In the gravest cases sanctions could not be disentangled from military disputes that also affect trade linkages. In many cases the target country is involved in a military conflict with a third country. Take Ethiopia under the Mengistu government. The U.S. sanctions had been imposed in 1976 while it was about to begin a war in 1977. In a few other cases economic sanctions are intertwined with military interventions. The former Yugoslavia for instance was already under sanctions regime when war occurred with the U.S. active participation in 1996. Moreover, trade can be limited also by the self-interested actions of businessmen, even without government sanctions. Entrepreneurs, as rational actors, can reduce trade when they see their goods or their lives are endangered by military hostilities. At a minimum, they will seek a greater margin of profit or more complete insurance coverage to compensate for the risk; but these actions raise costs and lower demand, reducing commerce.

Since wars take many forms in the contemporary era, I adopt a distinction that has been developed in the "Correlates of War Project" held at Pennsylvania State University. Serious military conflicts between states are defined 'inter-state war' and armed conflicts and civil wars within states are defined 'intra-state war'. Therefore, *INTERWAR* is used to depict the situation in which an inter-state war had occurred for the target country and *INTRAWAR* when an intra-state conflict had occurred. Both variables equal 1 if a war broke out, 0 otherwise. They are also expected to decrease trade.

4. *THE DATA, THE ESTIMATION AND THE RESULTS*

At the first step the study reports panel gravity estimates of bilateral trade between the U.S. and 49 target countries over the period 1960-2000, inclusive. The bilateral trade data are taken from OECD Statistical compendium 2001 and are expressed in nominal dollars. Following the existing literature, I drop the observations where recorded bilateral trade is zero. As Baldwin (1994) pointed out once panel data are to be used, it is necessary to use real data. Therefore, trade data are to be deflated. Following previous studies (Rose, 1999**)** I adopt the GDP chain price index to deflate the nominal trade values. It measures the average of the prices of the goods and services that are contained in the GDP. Since 1996 it has replaced the GDP deflator as the principle index reported by the index of the U.S. Department of Commerce[2]. Real GDP per

---

[2] The index is available *on line* at the website of Bureau of Economic analysis of Department of commerce. See www.bea.gov

capita and population figures are primarily taken from the *Penn World Table 6*[3]. They are expressed in constant prices (base year 1996). Furthermore I filled the missing data by using an extended dataset of the Penn World Tables provided by Gleditsch (2002)[4]. The panel, however, is unbalanced.

For the measurement of distance, I use the most common approach in the literature, the straight-line distances (expressed in kilometres) between capitals of countries. They are implicitly assumed to be the economic centres of a country[5]. To calculate the distances I used a software tool available on the Web[6]. Cases on international sanctions[7] are extracted from Hufbauer et al. (1990) dataset and from website of Institute of International Economics that published an updated version of Hufbauer dataset[8]. Further cases are extracted by official sources of the U.S. government[9]. The United Nations official documents archive has been also used[10]. Unfortunately because of the lack of data some important cases are not considered in the sample[11]. The main source with regard to interstate and intrastate wars is the dataset of Correlates of War project available on the website of Pennsylvania State University[12].

Analysing panel data imposes to make a choice between the random effects estimator and the fixed effects one. The random effects model requires that intercept terms and the error terms are mutually independent. It is consistent if the above-mentioned orthogonality conditions are fulfilled. The fixed effects approach is conditional upon the values of intercept terms and it implies that individuals in the sample are considered 'one of a kind'. This appropriation should be the most appropriate when individuals denote countries (Verbeek, 2000). The fixed effects model, in fact, should be more useful in capturing some unobservable country-specific factors. For instance in terms of standard trade models such factors might reflect the relative preference that an importing country's consumer has for an exporter's goods. In addition other fixed factors such as historical links, cultural similarities that are difficult to quantify are captured by each trading-pair intercept (Wall, 1999). Egger (2002) and Matyas (1997) also suggest that the fixed effect model performs better in gravity-approach analyses.

---

[3] Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 6.1, Center for International Comparisons at the University of Pennsylvania (CICUP), October 2002.

[4] the dataset is available on line at the website http://www.yale.edu/unsy/jcr/jcrdataoct02.htm

[5] In the case of Brazil Rio de Janeiro had been considered instead of Brasilia; in the case of South Africa Johannesburg instead of Pretoria.

[6] A distance calculator is available at www.indo.com/distance

[7] See appendix for the list of target countries considered.

[8] See http://www.iie.com/research/topics/sanctions/sanctions-timeline.htm

[9] See www.ustreas.gov/offices/enforcement/ofac/sanctions/index.html

[10] see http://www.un.org/sc/committees/sanctions/index.html

[11] Lybia, North Korea, Yugoslavia and Vietnam.

[12] see http://cow2.la.psu.edu/

The decision between the fixed effects model and the random effects model can be based on the Hausman test. It tests whether the fixed effects and random effects are significantly different. A significant difference suggests that the null hypothesis of no correlation between explanatory variables and individual effects is unlikely to hold. In this case the resulting Hausman χ^2 test statistic equals 121.99 that is statistically significant. Therefore we reject the null hypothesis of no correlation between the intercept terms and explanatory variables. However, the random effects estimation is reported in the appendix, in comparison with fixed effects results.

The regression coefficient on a continuous logarithmic variable can be interpreted as an elasticity, that is, as the ratio of the percentage change in the dependent variable for each one percent change in the independent variable. The coefficients of dummy variables have a percentage interpretation. More precisely it can be interpreted as a percentage shift in the dependent variable when the dummy equals 1 versus when it equals 0, holding all other factors fixed. Findings of two regressions are shown in Table 1. In the first one all the variables are included less the 'war' dummy variables that are in the latter regression. The model performed quite well. Most of the results are as expected and seem quite reasonable. Firstly, GDP, as expected, has a significant impact on trade both in the U.S. and in the target country. Target country population has a negative effect. In the fixed effects distances are subsumed into the trading-pair intercept. Wall (1999) noted that this is particularly important for studies that include the United States, which has several economic centres on and between the two coasts.

Moderate and limited sanctions, albeit expected to have also a negative impact on trade, show a positive coefficient but insignificantly different from zero. An explanation for this result could be found in the variety of sanctions considered and in their magnitude, since minor and partial restrictions, both on trade and financial side, have been included in this category. On the other hand extensive and multilateral sanctions surely disrupt bilateral trade. For these variables coefficients are always statistically significant. In such a case imposing a sanction fosters a decrease in bilateral trade flows by 89 percent.

Extending the regressions with interstate and intra-state conflicts results do not change their signs. Anyway, the interstate war coefficient, albeit negative, is not statistically significant while intrastate wars affect negatively significantly bilateral trade flows. The impact of intrastate wars however is not higher than negative impact of sanctions and, moreover, sanctions coefficients do not change.

Table 1. The impact of sanctions

	Coeff.	Standard error	P-Value	Coeff.	Standard error	P-Value
LnGDPi	1.99	0.94	0.04	2.02	0.94	0.03
LnGDPj	0.66	0.1	0.00	0.65	0.1	0.00
Ln POPi	-4.9	3.11	0.12	-4.78	3.11	0.13
Ln POPj	-0.41	0.19	0.03	-0.4	0.19	0.03
LnDIST			*Dropped*			
LMSANC	0.13	0.08	0.13	0.15	0.08	0.08
XSANC	-0.89	0.17	0.00	-0.87	0.17	0.00
MULTSANC	-0.82	0.13	0.00	-0.82	0.13	0.00
INTERWAR	-	-	-	0.00	0.15	0.98
INTRAWAR	-	-	-	-0.23	0.08	0.01
Constant	44.3	32.49	0.17	41.44	32.54	0.2
Observations			1876			1876
R^2 within			0.17			0.18
R^2 between			0.58			0.57
R2 Overall			0.42			0.42

5. DOES SANCTIONS-BUSTING WORK?

An argument that is often remarked analysing the sanctions is the possibility that the sender country should face a phenomenon of trade diversion. It has been argued that *sanctions-busting* is always likely to occur. Sanctions are able to create powerful incentives for evasion. Trade can be diverted trough new ingenious relationships devised by domestic and third-country firms. Particularly Drezner (2000) distinguishes if the sender country is unable to enforce the application of sanctions due to defections by private rent-seeking actors (sanctions-busting) or by nation-states (backsliding). This phenomenon is often indicated as one of the main reason of failure of the economic punishment. Take Nicaragua in 80^s under the Sandinista government. After the United States, under the Reagan administration, imposed sanctions on it, other western countries disagreed with American policy. Canada, for instance, permitted Nicaragua to move its Miami-based foreign trade office to Toronto, stating that it had 'a perfect right'[13] to sell Nicaragua anything it wants to buy. This is the rationale that very often led to diplomatic efforts for multilateral co-operation in sanctions enforcing. It is also behind the Helms-Burton Act and the Iran/Libya Sanctions Act, which threatens to punish third-country corporations that conduct business in Cuba, Iran, and Libya. Therefore, according to this point of view it could be argued that U.S. competitors trade with U.S.-targeted countries capturing the business when the United States imposes unilateral sanctions. Hufbauer (1997) found positive evidence of this hypothesis.

A different argument is expounded by Van Bergeijk (1995). He points out that, after sanctions have been imposed, changes in the world economic system occur. These changes also influence the economic opportunities of countries that are in no way involved in the conflict. These are the 'network effects' of sanctions. In many cases the impact of boycotts and embargoes does spill-over to the trade partners (and to the trade partners' trade partners and so on). Therefore, other countries will suffer from the trade disruption caused by sanctions. It would appear obvious that these arguments could be stressed if sanctions are unilaterally imposed. When sanctions are multilateral it would be expected that the trade disruption phenomenon occurs at least for all countries involved in.

I analyse the effects of sanctions on G-7 countries other than the United States. These are supposed to have a similar exporting capability to the United States. Trying to capture the presence of this phenomenon I apply the gravity equation to a new panel of countries. Particularly, I report panel gravity estimates of bilateral merchandise trade between other G-7 countries[14] and the 49 sanctions-targeted countries over the period 1960-2000, inclusive. The gravity equation is exactly the same. As before, the dummy variables denote if

---

[13] Statement by Canadian Foreign Minister Joe Clark, quoted by Hufbauer (1990).
[14] Canada, Japan, France, Germany, Italy, United Kingdom

the United States imposed the sanctions or not. If other industrialised countries evade the sanctions, coefficients are expected to be of opposite sign compared to those of the U.S.-bilateral trade flows regression. Effects on bilateral trade flows of industrialised countries with target countries are assumed to proxy the impact of the U.S. sanctions on third countries bilateral trade flows.

The findings are shown in table 2. All the variables are highly statistically significant. The impact of U.S. sanctions on third countries is diversified. Limited and moderate sanctions show a slightly positive impact. Roughly, other G-7 countries increase their bilateral trade with the U.S. sanctions-targeted countries. Thus it seems that sanctions-busting works.

On the other hand, comprehensive and extensive sanctions induce a disruption of trade for other countries too. In such a case the network negative effects affect other countries' trade. The estimated negative effect is very large. A negative effect is also obviously recorded when sanctions are multilateral. Interstate and intrastate wars also affect trade flows, but as in the first regression, their impact is lower than sanctions.

Table.2 The impact of sanctions on other G-7 countries bilateral trade

	Coeff.	Standard error	P-Value	Coeff.	Standard error	P-Value
LnGDPi	0.79	0.07	0.00	0.81	0.68	0.00
LnGDPj	0.86	0.33	0.00	0.85	0.03	0.00
Ln POPi	0.79	0.63	0.00	0.78	0.06	0.00
Ln POPj	-1.24	0.79	0.00	-1.21	0.08	0.00
LnDIST	-1.15	0.23	0.00	-1.15	0.02	0.00
LMSANC	0.16	0.03	0.00	0.18	0.03	0.00
XSANC	-0.71	0.06	0.00	-0.69	0.06	0.00
MULTSANC	-0.97	0.05	0.00	-0.97	0.05	0.00
INTERWAR	-	-	-	-0.08	0.05	0.14
INTRAWAR	-	-	-	-0.17	0.03	0.00
Constant	-14.3	0.75	0.00	-14.74	0.75	0.00
Observations	10950			10950		
R^2 within	0.50			0.51		
R^2 between	0.00			0.00		
R2 Overall	0.10			0.11		

6. A COUNTERFACTUAL EXPERIMENT

How much more would countries have traded if sanctions had not been imposed? To compute this, I apply the data (GDP, population and distance) in the estimated equation, employing the coefficients estimated trough the fixed effects model. Through this first calculation I obtain the 'explained trade'. Furthermore I compute the 'simulated trade', i.e. the amount that the United States and the other G-7 countries would have exchanged without sanctions, imposing dummy variables equalling zero. In both calculations I exclude non-significant coefficients. Thereafter, I take anti-logs and I compute a ratio. The results are shown in table 3, and are divided into the two categories of sanctions. Positive signs denote that trade volumes would have been higher without sanctions and *vice versa.*

Table.3 A counterfactual experiment

		U.S.	other G-7 countries
Limited and moderate			
	Unilateral (U.S.)	-	-0.17
	Multilateral	0.56	0.56
Extensive			
	Unilateral (U.S.)	0.59	0.51
	Multilateral	0.82	0.81

Ratio is computed through: (simulated trade-explained trade/simulated trade)

Look at the U.S. imposing unilaterally extensive sanctions. In such a case bilateral trade volumes with target countries would have been 59 percent higher without the sanctions. The negative ratio for other G-7 countries in case of limited and moderate unilateral U.S. sanctions confirms the hypothesis of sanctions-busting. In fact, if sanctions had not been imposed other G-7 countries would have traded less by 17%. Otherwise, in case of unilateral extensive measures other G-7 countries would have traded 51 percent more. In this case the hypothesis of negative 'network effects' is confirmed. Multilateral sanctions, if extensive, reduced trade by 81 percent and, when moderate by 56 percent.

In the existing literature there are few works regarding an overall analysis of costs provoked by sanctions. Here, I mention the method and the results of two recent works.

Hufbauer et al. (2003, 1997) apply a gravity analysis in order to investigate the impact of sanction on the U.S. trade. The main difference between the two papers is in the database used. In their more recent work they use Rose's gravity model database, while in the first study a smaller sample of countries was included. I briefly quote the most recent work's method and findings. Apart from the standard gravity model variables (GDP, GDP per capita and distance as in Rose's specification), they include several other explanatory variables that can be expected to influence trade flows—such as common language, common border, and membership in regional trading blocs. Moreover dummy variables to denote sanctions are included. Particularly they are divided into three categories: limited, moderated and extensive sanctions. They considered minor financial, export, cultural, or travel sanctions to be "limited". Examples include suspending or reducing bilateral aid, and imposing export restrictions on weapons or narrow categories of dual-use technologies. Broader trade or financial sanctions were classified as "moderate". The "extensive" category is reserved for comprehensive trade and financial sanctions such as those against Iraq or Serbia.

Sometimes, however, a combination of several "moderate" sanctions, such as U.S. export controls against the Soviet Union and Eastern Europe during the Cold War, together with denial of MFN status under the Jackson-Vanik amendment, were considered "extensive". To evaluate whether sanctions continue to adversely affect trade even after they have been lifted (an "after-life"), they included dummy variables representing cases where sanctions were not present in the year under analysis but had been in place at any time during the previous 10 years. The analysis focuses on two years, 1995 and 1999[15].

As expected, extensive sanctions show a large depressing effect on bilateral trade flows, and the coefficients are highly significant. Otherwise the estimated coefficients for limited and moderate sanctions, however, are not statistically significant at the usual levels of confidence. Moreover they find little evidence to support the argument that sanctions continue to suppress trade after they have been lifted. Furthermore they computed an estimate of losses due to sanctions.

Another recent empirical analysis is that one presented by Askari et al. (2003). They measure the economic impact on the United States, some selected major target countries, and some third countries – the European Union and

---

[15] The former analysis (Hufbauer et al. 1997) focused on three years, 1985, 1990, 1995 and on three different sample of countries: 88 pairs of countries, only OECD countries, and only U.S.

Japan. They also employ an augmented gravity model including dummy variables to investigate the impact of sanctions on trade. In this study, they intend to focus on the determinants of the U.S. trade flows (exports, imports, as well as total trade). Moreover, they use different classification or measures of the sanction variable to see whether the results are sensitive to different classifications. Specifically, they use 19 years (1980-1998) of annual data for the U.S. exports, imports, and bilateral trade. They apply an OLS estimation for any year considered. Their findings show that the impact of U.S. economic sanctions on U.S. trade (bilateral trade, exports alone, or imports alone) is very sensitive to how the sanctioned country list is identified and selected. This is particularly true for countries specified as targets of U.S. selective economic sanctions. For the three different classifications they have used, two of them show no consistent statistical significance. Using a sample that includes the formerly planned economies that have been long the target of U.S. economic sanctions in recent history, they have found that sanctions have a significant impact on U.S. exports, imports, and total trade. Furthermore, comprehensive economic sanctions have a significant negative impact on U.S. bilateral trade, exports, and imports with target countries subject to these sanctions.

They also investigated whether the *sanctions-busting* argument should be confirmed. They call it 'third country effect'. For the group of formerly planned economies, their trade (including bilateral trade, exports alone, and imports alone) with the E.U. and Japan has been similarly affected by U.S. economic sanctions as their trade with the U.S. On the other hand, in the case of countries subject to comprehensive economic sanctions imposed by the U.S., there is no significant impact on these countries' trade with the E.U. or Japan. In some cases, they found that these sanctions have actually promoted trade between these countries and the E.U. or Japan. They interpret this as a clear indication of sanctions-busting or (as in their words) third-country effect.

Van Bergeijk (1994, ch.7) uses also a gravity-approach in order to investigate the influence political relations on trade flows. He did not insert directly sanctions into the gravity equation. In fact, he constructs an index to denote co-operation and hostility between countries that has to be added to the standard gravity equation. Negative sanctions enter the construction of the index. The rationale of not using binary variables relies on the author's will to allow more differentiation than crude dummy variables deployed in some of the earlier studies on trade diplomacy. Hence individual indicators have been constructed for the 'amount' of conflict between a pair of nations and on the other hand on the amount of co-operation between these nations. He develops a cross-section gravity model that deals with the bilateral trade flows of 40 countries in 1986. The findings show that that the diplomatic climate strongly influences the pattern of international trade flows. In any case, the results show that the contribution of strictly economic variables exceeds the contribution of the indicators for the bilateral diplomatic climate.

CONCLUSION

By means of a gravity equation I estimated the impact of international negative economic sanctions on international trade. Since the U.S. are the most important sender of economic sanctions, the study first reports panel gravity estimates of bilateral trade between U.S. and 49 target countries. The results show that extensive and comprehensive sanctions have a large negative impact on bilateral trade, while this is not the case for limited and moderate sanctions. Furthermore, since it is often argued that sanctions-busting is always likely to occur and that factor also lowers the effectiveness of sanctions, a second estimation focuses on the impact of unilateral U.S. sanctions on bilateral trade volume between sanctioned countries and the other G-7 countries. The results show that unilateral extensive sanctions have a large negative impact, while limited and moderate ones induce a slight positive effect on other G-7 countries aggregate bilateral trade. In the latter case the hypothesis of 'sanctions-busting' works. Otherwise the different argument of negative 'network effects' should be defended. Other countries than the sender could experience a trade disruption induced by a unilateral economic punishment.

REFERENCES:

Anderson, J. E. (1979), A theoretical Foundation for the Gravity Equation, *American Economic Review*, vol. 69, n.1, pp.106-114.

Askari, H., Forrer J., Teegen H., Yang J. (2003), U.S. Economic Sanctions: An empirical Study, Occasional Paper Series, CSGOP-03-01, The George Washington Center for the study of Globalization.

Baldwin, D.A. (1985), *Economic Statecraft*, Princeton University Press, Priceton.

Baldwin, R. (1994), *Towards an Integrated Europe*, CEPR, London.

Barber, J. (1979), Economic Sanctions as a Policy Instrument, *International Affairs*, vol. 55, n.3, pp. 367-385

Bayard, T.O., Pelzman J., Perez-Lopez J. (1983), Stakes and Risks in Economic Sanctions, *World Economy*, vol. 6, no.1, pp. 73-87

Bergstrand, J. H. (1985), The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical evidence, *The Review of Economics and Statistics*, Vol. LXVII,3, pp. 474-481.

Bergstrand, J. H. (1989), The Generalized Gravity Equation, Monopolistic Competition, and the Factor-Proportions Theory in International Trade, *The Review of Economics and Statistics*, Vol. LXXI, 1, pp.143-152.

Bhagwati, J. N., Srinivasan T.N. (1976), Optimal trade policy and compensation under endogenous uncertainty: the phenomenon of trade disruption, *Journal of International Economics*, vol.6, no.4, pp. 317-336.

Bonetti, S. (1998), Distinguishing Characteristics of Degrees of Success and Failure in Economic Sanctions Episode, *Applied Economics*, vol. 30, 805-813.

Cyrus, T. (2002), Income in the Gravity Model of International Trade: Does endogeneity matter?, *International Trade Journal*, vol. 16, no.2, pp. 161-180.

Deardoff, A.V. (1995), Determinants of Bilateral Trade: Does Gravity work in a Neoclassical World?, NBER working paper no. 5377.

Drezner, D. W. (2000), Bargaining, Enforcement and Multilateral Sanctions: When Is Cooperation Counterproductive?, *International Organization*, vol. 54, n. 1, pp.73-102.

Dorussen, H., Mo J. (2001), Ending Economic Sanctions, Audience Costs and Rent-Seeking as commitment strategies, *Journal of Conflict Resolution*, vol. 45, no. 4, pp. 395-426.

Egger, P. (2002), An Econometric View on the Estimation of Gravity Models and the Calculation of Trade Potentials, *World Economy*, Vol.25, Issue 2, pp.297-313.

Estevadeordal, A., Frantz B., Taylor A. M. (2002), The Rise and Fall of World trade 1870-1939, National Bureau of Economic Research working paper no. 9318.

Evenett, S.J., Keller W. (1998), On Theories Explaining the Success of the Gravity Equation, NBER working paper no. 6529.

Frankel, J., Romer D. (1999), Does Trade Cause Growth?, *American Economic review*, vol. 89, n. 3.

Frey, B. (1984), *International Political Economics*, Basis Blacwell, Oxford.

Gleditsch, K.S. (2002), Expanded Trade and GDP Data, *Journal of Conflict Resolution,* Vol. 46, no.5, pp. 712-724.

Gray, P. H. (1986), Non Competitive Goods and Gains of Trade, *The International Trade Journal*, vol.1, no.2, pp.107-128.

Helpman, E., Krugman P.R. (1985), *Market structure and Foreign Trade: :Increasing returns, Imperfect competition and the International Economy,* MIT press, Cambridge, MA.

Hufbauer, G.C., Oegg B. (2003), The impact of Economic Sanctions on US Trade: Andrew Rose's Gravity Model, International Economics Policy briefs, PB03-4, Institute for International Economics.

Hufbauer, G.C., Elliott K.A, Cyrus T., Winston E. (1997), US Economic Sanctions: their impact on Trade, Jobs and Wages, working paper, Institute of International Economics.

Hufbauer, G.C., Schott J.J., Elliott K.A. (1990), *Economic Sanctions Reconsidered: History and Current Policy*, Second edition, Institute for International Economics, Washington D.C.

Isard, W. (1954), Location Theory and Trade Theory: Short-Run Analysis, *Quarterly Journal of Economics*, vol. 68, p. 305- 322.

Jones, K., (1984), The Political Economy of Voluntary Export Restraint Agreement, *Kyklos*, vol.37, no.1, pp. 82-101.

Kaempfer, W.H., Lowenberg A.D., (1988), The Theory of international economic sanctions: a Public Choice approach, *American Economic Revieew*, vol. 78, no. 4, pp. 786-93

Leidy, M.P. (1989), The Theory of International Economic sanctions, a Public Choice Approach: comment, *American Economic Review*, vol.79, no.5, pp. 1300-1304.

Linnemann, H. (1966), *An Econometric Study of International Trade Flows*, North Holland, Amsterdam.

Lundborg, P. (1987), *The Economics of Export Embargoes, The case of the US-Soviet Union Grain Suspension*, Croom Helm, New York.

Martin, L. L. (1992), *Coercive Cooperation*, Princeton University Press, Princeton.

Mastanduno, M. (1999), Economic Statecraft, Interdependence, and National Security: Agendas for Research, *Security Studies*, vol. 9, no.1, pp. 288-316.

Matyas, L. (1997), Proper Econometric Specification of the Gravity Model, *World Economy*, vol. 20, no.3, pp.363-369.

Pape, R., (1997), Why Economic Sanctions Do Not Work, *International Security*, vol.22, no.2, pp. 90-136.

Rose, A.K. (1999), One Money, One Market: Estimating the Effect of Common Currencies on Trade, NBER working paper no. 7432.

Tinbergen, J. (1962), *Shaping the World Economy, Suggestions for an International Economic policy*, New York, 1962.

Tolley, G.S., Wilman J.D. (1977), The Foreign Dependence Question, *The Journal of Political Economy*, vol. 85, no. 2, pp. 323-346.

Van Bergeijk, Peter A.G. (1995), The Impact of Economic Sanctions in the 1990s, *World Economy*, vol. 18, no. 3, pp. 443-55.

Van Bergeijk, Peter A.G. (1994), *Economic Diplomacy, Trade and Commercial Policy, Positive and Negative sanctions in a new World Order,* Edward Elgar Publishing, Aldershot.

Van Bergeijk, Peter A.G. (1989), Success and Failure of Economic Sanctions, *Kyklos*, vol. 42, no.3, pp. 385-404.

Verbeek, M. (2000), *A Guide to Modern Econometrics*, John Wiley & Sons, Chichester.

Wall, H. (1999), Using the Gravity Model to estimate the costs of protection, *Review*, Federal Reserve Bank of St. Louis, vol.81, Issue 1.

Target countries and years	
Extensive sanctions	
Cuba	1960-
Dominican Republic	1960-1962
Grenada	1992-1993
Iran	1979-2000
Iraq	1991-
Nicaragua	1981-1990
South Africa	1982-1994
Sudan	1989-
Uganda	1972-1979
Zimbabwe (Rhodesia)	1965-1979
Limited and Moderate sanctions	
Angola	1986-1996
Argentina	1977-1983
Bolivia	1979-1982
Brazil	1962-1964, 1977-1984
Burma (Myanmar)	1988-
Cameroon	1992-1998
Chile	1965, 1970-1989
China	1989-2000
Colombia	1996-1998
Ecuador	1995-1998
Egypt	1963-1965
El Salvador	1977-1981,1987,1990-1993
Ethiopia	1977-1992
Gambia	1994-1998
Guatemala	1977-1986, *1993*

Haiti	1987-1994
India	1965-1967, 1971, 1978-1992, 1998-2000
Indonesia	1963-1966-1991-2000
Iraq	1980-1990
Kenya	1990-1993
Liberia	1992-1998
Malawi	1992-1993
Nicaragua	1977-1980, 1992-1995
Niger	1996-1997
Nigeria	1967-70, 1993-1998
Pakistan	1971, 1979-
Panama	1987-1990
Paraguay	1977-1981,1996
Peru	1968-1974, 1991-1998
Rwanda	1994-1995
Romania	1983-1993
Somalia	1988-1998
South Africa	1962-1981
South Korea	1973-1977
Syria	1986-2000
Sudan	1989-1996
Taiwan	1976-1977
Togo	1992-1994
Turkey	1974-1978
Uruguay	1976-1981
Zaire	1990-1997
Zambia	1996-1998
Zimbabwe (Rhodesia)	1983-1988

Notes: Italics denote multilateral sanctions. Some countries are included in both extensive and moderate category for different years. Source: Hufbauer et al. (1990, 1997,1998,2003)

	Random effects						Fixed effects					
	Coeff.	Standard error	P-Value	Coeff.	Standard error	P-Value	Coeff.	Standard error	P-Value	Coeff.	Standard error	P-Value
LnGDPi	1.96	0.95	0.04	1.98	0.95	0.04	1.99	0.94	0.04	2.02	0.94	0.03
LnGDPj	0.77	0.09	0	0.76	0.09	0	0.66	0.1	0	0.65	0.1	0
Ln POPi	-5.97	3.13	0.06	-5.88	3.13	0.06	-4.9	3.11	0.12	-4.78	3.11	0.13
Ln POPj	-0.11	0.12	0.38	-0.09	0.12	0.46	-0.41	0.19	0.03	-0.4	0.19	0.03
LnDIST	-0.81	0.31	0.01	-0.82	0.3	0.01		*Dropped*				
LMSANC	0.1	0.08	0.23	0.12	0.09	0.15	0.13	0.08	0.13	0.15	0.08	0.08
XSANC	-1.06	0.17	0	-1.05	0.17	0	-0.89	0.17	0	-0.87	0.17	0
MULTSANC	-0.73	0.14	0	-0.73	0.14	0	-0.82	0.13	0	-0.82	0.13	0
INTERWAR	-	-	-	0.01	0.15	0.97	-	-	-	0	0.15	0.98
INTRAWAR	-	-	-	-0.23	0.09	0.01	-	-	-	-0.23	0.08	0.01
Constant	66.37	32.81	0.04	64.1	32.86	0.05	44.3	32.49	0.17	41.44	32.54	0.2
Observations		1876			1876			1876			1876	
R^2 within		0.17			0.17			0.17			0.18	
R^2 between		0.62			0.62			0.58			0.57	
R^2 Overall		0.48			0.48			0.42			0.42	

Table 2.1 The impact on the other G-7 countries bilateral trade

	Random Effects						Fixed Effects					
	Coeff.	Standard error	P-Value	Coeff.	Standard error	P-Value	Coeff.	Standard error	P-Value	Coeff.	Standard error	P-Value
LnGDPi	0.29	0.05	0.00	0.28	0.05	0.00	0.79	0.07	0.00	0.81	0.68	0.00
LnGDPj	0.91	0.03	0.00	0.9	0.03	0.00	0.86	0.33	0.00	0.85	0.03	0.00
Ln POPi	1.22	0.05	0.00	1.23	0.05	0.00	0.79	0.63	0.00	0.78	0.06	0.00
Ln POPj	-0.64	0.06	0.00	-0.58	0.06	0.00	-1.24	0.79	0.00	-1.21	0.08	0.00
LnDIST	-1.13	0.02	0.00	-1.12	0.23	0.00	-1.15	0.23	0.00	-1.15	0.02	0.00
LMSANC	0.14	0.03	0.00	0.16	0.03	0.00	0.16	0.03	0.00	0.18	0.03	0.00
XSANC	-0.71	0.06	0.00	-0.68	0.06	0.00	-0.71	0.06	0.00	-0.69	0.06	0.00
MULTSANC	-0.97	0.05	0.00	-0.97	0.05	0.00	-0.97	0.05	0.00	-0.97	0.05	0.00
INTERWAR	-	-	-	-0.09	0.05	0.86	-	-	-	-0.08	0.05	0.14
INTRAWAR	-	-	-	-0.18	0.03	0.00	-	-	-	-0.17	0.03	0.00
Constant	-19.16	0.62	0.00	-19.93	0.61	0.00	-14.3	0.75	0.00	-14.74	0.75	0.00
Observations	10950			10950			10950			10950		
R^2 within	0.5			0.5			0.5			0.51		
R^2 between	0.55			0.6			0			0		
R2 Overall	0.52			0.55			0.1			0.11		