ECONOMIC DETERMINANTS OF REGIONAL TRADE AGREEMENTS

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Abstract

The literature concerning the economics of regional trade agreements (RTAs) has evolved from a theoretical perspective to an empirically based approach over the past decade. Specifically, this report examines the various empirical studies on the economic determinants of RTAs and the likelihood of RTAs between country-pairs. Scott L. Baier and Jeffrey H. Bergstrand (2004) or BB (2004) provide us the first empirical work on the economic determinants of RTAs. Their model predicts fairly accurately, 85% of the 286 RTAs in 1996 among 1431 country-pairs, and 97% of the remaining 1145 pairs with no RTAs based on economic features. In this report, we begin with an introduction to RTAs, and then we will explore the contribution of BB (2004), as well as other economists' empirical findings on the economics of RTAs, using empirical strategies similar to BB's (2004) study.

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Chapter 1-Introduction

Various governments are more likely to form regional trade agreements (RTAs) if the benefits surpass the costs (Lawrence, 1998, p.59). In view of this, most of the earliest economic literatures on RTAs primarily focused on theoretical welfare gains or losses from RTAs for country-pairs (and non-member countries). In the 1990s, Krugman (1991 a, b), Frankel (1997), and Frankel et al. (1995, 1996, 1998) delineated on the economics of RTAs based on geography in addressing the relative merits of RTAs that will inform social planners' decisions to either form or avoid RTAs. However, underlying the formation of RTAs may well be driven by some economic fundamentals that are superb in explaining or predicting RTAs between pairs of countries, even though these economic fundamentals may have effects on welfare (BB 2004).

By way of providing empirical evidence to the economic factors influencing the likelihood of an RTA, BB's (2004) study analyzed econometrically cross-sectional determinants of RTAs using a formal economic model. In the case of their framework, the empirical model predicted accurately based on economic characteristics 85% of the 256 RTAs existing among 1431 country-pairs in 1996, and 97% of the remaining 1145 country-pairs without RTAs. Since then, their empirical work sparked other economists to empirically study the interdependence of RTAs, and the determinants of bilateral investment treaties (BITs) using BB's (2004) groundbreaking paper as a benchmark.

The remainder of the report is as follows: Chapter 2 is mainly an introduction to RTAs. Chapter 3 primarily discusses the empirical contribution of BB (2004) on the economic

determinants of RTAs. Chapter 4 examines the empirical work of other economists on RTAs and

BITs while making use of BB's (2004) contribution. Chapter 5 concludes with final remarks.

Chapter 2 – Regional/Preferential Trade Agreements

2.1 What are Regional Trade Agreements?

According to the World Trade Organization (WTO), regional trade agreements (RTAs) are defined as reciprocal trade agreements between two or more countries, where the participants agree to reduce quotas, tariffs, and other restrictions on trade between them. The WTO also refers to RTAs as preferential trade agreements (PTAs), since each individual member country offers special treatments or benefits to other member countries. Conversely, the WTO fosters multilateral rounds of negotiations where countries would decrease their barriers of trade against imports among all their member countries, instead of reducing trade barriers to only a subset of countries, as in the case of RTAs.

RTAs can be classified as free trade areas (FTAs) or customs unions (CUs) (WTO). In the case of FTAs, member countries eliminate tariffs among themselves, but maintain their individual external tariffs on imports from the rest of the world (Krugman, Obstfeld, and Melitz 2015, P.263). For example, the North American Free Trade Agreement (NAFTA)- an FTA which consists of Canada, Mexico and the United States (Feenstra 2015, P.187); we will elaborate on NAFTA under Section 2.3. On the other hand, customs unions permit member countries to eliminate tariffs among themselves and to set a common external tariff on imports from the rest of the world (Krugman, Obstfeld, and Melitz 2015, P.263). For instance, the European Union (EU)- a political and an economic union between twenty-eight European countries (Feenstra 2015, P.187); in much detail we present the EU under Section 2.3. In addition, a CU

may evolve either into a "common market" if member countries apply common external tariffs among members, and allow for factor movements across countries (Markusen, Melvin, Kaempfer and Maskus 1994, P.313), or into a "monetary union"- if member countries create a single monetary currency for the group. For example, the Maastricht treaty signed by the EU members in 1992, recommended the usage of a single European currency (Steve 2011, P.580).

In the WTO, agreements cover trade in goods, and services. In this report, our focus is on trade in goods. The formation of RTAs either in goods or services correspond to some specific rules under the WTO. We shall present a case spelling out the ways by which RTAs are formed.

2.2 Formation of RTAs under the WTO

The WTO's two major pillars are the "most favored nation" (MFN) principle, and the principle of reciprocity. The former necessitates RTAs to be formed under the guiding principle of non-discrimination, outlined in Article I of the General Agreements on Tariffs and Trade (GATT), also commonly known as the MFN principle, which mandates that all countries under GATT should be treated equally. Thus, if the U.S. reduces tariffs for European goods, equally, it must do the same for goods coming from other member countries. Under the MFN principle, discrimination or preferential treatment for some countries is not allowed. Albeit, countries can charge higher tariffs for non-WTO members (Krugman, Obstfeld, and Melitz 2015, P.264). The latter generally refers to "the ideal of mutual changes in trade policy which brings about changes in the volume of each country's imports that is of equal value to changes in the volume of its exports" (Bagwell and Staiger 2002, P.57). Simply put, mutual changes in trade policy which correspond to the principle of reciprocity does not cause the world price to change.

There are two applications of reciprocity notable within the WTO/GATT: first, governments seek a "balance of concessions and obligations" based on a negotiated agreement (Jackson 1997, P.113). Second, the application involves the way in which trade agreements can be negotiated (Bagwell and Staiger 2002, P.65).

RTAs clearly represents a potential violation of the MFN principle since it requires that countries under GATT should be treated equally. However, the WTO permits its member countries to form RTAs when Article I of GATT is compromised under some specific conditions evidenced from the following rules: Article XXIV of GATT (facilitates the formation and operation of both CUs and FTAs involving trade in goods [WTO]) and the Enabling Clause (i.e. a representation of preferential trade agreements of trade in goods between developing country members [WTO]). Since setting up CUs and FTAs could violate the MFN principle, Article 24 of GATT allows them to be formed given that these special criteria are met "if a free trade area or customs union is created, duties and other trade barriers should be reduced or removed on substantially all sectors of trade in the group. Non-members should not find trade with the group any more restrictive than before the group was set up" (WTO).

Nonetheless, it is worth mentioning that the WTO also provides information on unilateral preferential agreements. However, this will not be deeply addressed in this report, since they are non-reciprocal by their nature. As the name suggests, these are agreements where a member of the WTO (developed country) offers unilateral preferential access to its market (WTO). Unilateral trade agreements differ from RTAs by virtue of the fact that they are non-reciprocal preferential schemes. According to the WTO, the history of these agreements is linked to the adoption of the Enabling Clause in the 1970s, which allowed preferential trade

agreements in trade, particularly in goods between developing country members. Examples of these agreements in force are: The Caribbean Basin Economic Recovery Act (CBERA, provided by the U.S.), Andean Trade Preference Act (provided by the U.S.), African Growth and Opportunity Act (provided by the U.S.), Common Wealth Caribbean Countries Tariff (provided by Canada), Duty-free treatment for LCDs- China (provided by China), and many others.

According to the WTO, there are several RTAs in existence, however, in this report we shall only consider to provide a few details on the major agreements that are recognized by the WTO.

2.3 Major RTAs in the WTO

Although the WTO has a lengthy list of RTAs in force covering both trade in goods and services, the prevailing ones are worth mentioning. Table 1 provides details on some of the major agreements in the WTO.

Table 1: List of major RTAs from the WTO

RTA name	Coverage	Type	Date of notification	Notification	Date of entry into force	Status
ASEAN (AFTA)	Goods	FTA	30/10/1992	Enabling Clause	28/01/1992	In force
MERCOSUR	Goods & Services	CU & EIA	17/02/1991 (G) 05/12/2006 (S)	Enabling Clause & GATS Art. V	29/11/1991 (G) 07/12/2005 (S)	In force
NAFTA	Goods & Services	FTA & EIA	01/29/1993(G) 01/03/1995(S)	GATT Art. XXIV & GATS Art. V	01/01/1994	In force
EFTA	Goods & Services	FTA & EIA	14/11/1959 (G) 15/07/2002 (S)	GATT Art. XXIV & GATS Art. V	03/05/1960 (G) 01/06/2002 (S)	In force
EU (28) Enlargement	Goods & Services	CU & EIA	25/04/2013	GATT Art. XXIV. & GATS Art. V	01/07/2013	In force

Source: The WTO.

According to Table 1, the Association of Southeast Asian Nations (ASEAN) Free Trade Area (AFTA) is a well-recognized RTA in East Asia (WTO). The official webpage of ASEAN indicates that the group was established on 8th August, 1967 in Bangkok, Thailand, by signing of the ASEAN Declaration (Bangkok Declaration) by its founding members- Indonesia, Malaysia, Philippines, Singapore and Thailand. Through the passage of time, Brunei Darussalam, Viet Nam, Lao PDR, Myanmar, and Cambodia all joined the group respectively, giving rise to its ten member states (asean.org). Under the WTO, the group is an FTA, covering trade in goods through the Enabling Clause (as indicated in Table 1).

The Southern Common Market (MERCOSUR) as shown in Table 1, is another well-known RTA in South America. In reference to the WTO, the group represents both CU and economic integration agreement (EIA- an agreement whereby countries agree to eliminate or reduce tariffs and non-tariff barriers allowing free flow of goods and services [Steve 2011, P.587]). The group was originally formed in 1995 by Argentina, Brazil, Paraguay and Uruguay (Steve 2011, P.589). Overtime, the group was joined by Venezuela and Bolivia, while Bolivia is still in the accession (a new party trying to join an already existing agreement [WTO]) process (Feenstra 2015, P.187). As outlined in Table 1, the WTO reports that MERCOSUR in the beginning covered trade in goods under the Enabling Clause, and has subsequently been extended to trade in services through the GATS Art. V.

We have also, the North American Free Trade Agreement (NAFTA), in North America. According to the WTO, NAFTA is functional as an FTA and EIA, which was formed in 1994 between Canada, Mexico, and the United States. According to Table 1, NATFA initially started as

an FTA with emphasis in goods making use of GATT Art. XXIV, and has later broadened in scope to cover trade in services based on GATS Art. V.

The European Free Trade Association (EFTA)- according to the WTO, this arrangement is operational as FTA and EIA, founded in 1960 as an intergovernmental organization to benefit its four member states (Iceland, Liechtenstein, Norway and Switzerland) and as well promote closer economic ties between Western European countries. As depicted from Table 1, EFTA began as an FTA with concentration in goods (GATT Art. XXIV), afterwards, the group developed into covering services (GATS Art. V) in trade.

Another major RTA on the list is the European Union (EU (28)). The EU (28) is a unique political and economic union consisting of twenty-eight European countries (WTO). According to the EU, the union was formed following World War II, as an attempt to bolster economic cooperation- the notion being that countries that trade with one another will become interdependent economically, and as such likely to avoid conflict (europa.eu). This, in reference to the EU led to the creation of the European Economic Community (EEC) in 1958 (EC Treaty), strengthening economic cooperation among Germany, Belgium, France, Italy, Luxembourg and the Netherlands. The EEC at its birth covered trade in goods (GATT Art. XXIV) as a CU, until the year 1995 when it finally incorporated trade in services (GATS Art. V) becoming a CU and an EIA (WTO).

The EU over the course of time has passed through some stages of enlargement: according to the WTO, in 1973, Denmark, Ireland, and United Kingdom joined what was then the European Community (EC), marking the first accession event (EC (9) Enlargement). The

WTO again notes that in 1981, the EU saw her membership ticked up upon the accession of Greece (EC (10) Enlargement) to the union. Then, in 1986, the trend continued- the accession of Portugal and Spain (EC (12) Enlargement) to the EU took effect (WTO). The year 1995 witnessed the accession of Finland, Sweden, and Austria (EC (15) Enlargement) to the EU, according to the WTO. Thus, the historical year (1995) in which the EC (15) Enlargement initiated the EU as a CU and EIA covering trade in goods and services (WTO). Thereafter, in 2004, the EU recorded the accession of Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovak Republic, and Slovenia (EC (25) Enlargement). As a union that continued to grow, Bulgaria and Romania joined the EU in 2007 (EC (27) Enlargement), as the WTO reports. Today, the EU (28) as shown in Table 1, embodies the accession of Croatia which happened during the year 2013, giving rise to its current stature. However, based on media reports the EU could see her membership reduced due the recent referendum in Britain.

Following the formation of the EU, the union continues to grow towards its full potential: the group became a monetary union upon the implementation of the Maastricht treaty in 1992 (Steve 2011, P.580). As well, it is noted in history that the EU was established as a common market by the Treaty of Rome in 1957, although it took some time, eventually the transition came to fruition in 1993 allowing the movement of goods, services, people and money through the union (Steve 2011, P.581).

2.4 RTAs Notified to the WTO/GATT

Evidence from the WTO indicates that RTAs have become common dating back from the early 1990s. The uptick in RTAs signals a core feature of international trade (WTO). As at 1st July,

2016, a total of 635 notifications (counting for goods, services and accession separately) was reported as received by the WTO/GATT. Out of these, 423 are in force. Table 2 shows all RTAs in force, classified by type of agreement:

Table 2: RTAs classified by agreement type

Agreement Type	Enabling Clause	GATS Art. V	GATT Art. XXIV	Grand total
Custom Union	8	-	11	19
Custom Union-Accession	1	-	9	10
Economic Integration Agreement (EIA)	-	135	-	135
EIA- Accession	-	6	-	6
Free Trade Agreement	15	-	219	234
Free Trade agreement- Accession	0	-	2	2
Partial Scope Agreement	16	-	-	16
Partial Scope Agreement- Accession	1	-	-	1
Grand Total	41	141	241	423

Source: The WTO.

According to Table 2, out of the 423 RTAs in force, 241 notifications are made under GATT Article XXIV, and 41 under the Enabling Clause.

2.5 Why are RTAs Important?

The WTO reports that RTAs can in fact contribute towards the WTO's multilateral trading system. As a result, RTAs may seem as a pathway to free trade, even though this issue is far

from being settled. The major preferential agreements are bilateral in nature given the size of

the economies and the number of countries involved. As reported by the World Bank, the year

2015 recorded a world GDP of $73.434 trillion, out of these, the EU (28) accounted for $16.229

trillion, equivalent to 22% of the world GDP. In like manner, the members of NAFTA had a

combined GDP of $20.642 trillion, equivalent to 28% of the world GDP.

Nevertheless, RTAs differ from free trade as explained above. As a result, the welfare

effects is unclear as it creates a distortion in which only certain countries benefit duty free

access on a preferential basis while non-members are not eligible to it. Viner (1950) explains

that the welfare effects of an RTA depends on two terms: "trade creation," versus "trade

diversion." Countries from the group can benefit by setting up customs union or free trade

areas- especially when such agreements result in trade creation (when two countries within the

customs union start to trade with each other, in which they previously produced the good in

particular for themselves [Feenstra 2015, P.200]), or lose, when they generate trade diversion

(a scenario where two countries begin to trade within the union, in which one of these

countries had previously imported the good outside of the union [Feenstra 2015, P.200]).

Chapter 3- Empirical Study on the Economic Determinants of RTAs.

Fundamentally, trade between pairs of countries is driven by economies of scale (a production process whereby average production costs fall as the scale of production rises [Steve 2011, P.63]), and comparative advantage (a country having a lower opportunity costs in producing a good as compared to any other country [Steve 2011, P.67]) (Krugman, Melitz and Obstfeld 2015, P.25). In reference to BB (2004), the formation of RTAs in part depends on some core economic features between country-pairs. Unfortunately, in the 1990s most studies failed to delineate empirically on these core economic features that determines RTAs.

Viner (1950) argued as to either RTAs on net increase or reduce welfare for economic agents, since then, almost all of the literatures on the economics of RTAs dwelled on the theoretical welfare gains or losses from RTAs for both member and nonmember countries. Even though in theory, the presence or absence of an RTA in a particular year relies upon the economic characteristics in that year (BB, 2004). No literature by then tried to analyze econometrically cross-sectional determinants of RTAs, in particular, one using a formal economic model.

In this chapter, BB's (2004) seminal article which attempts to empirically analyze the economic determinants of the formation of RTAs, and the tendency of RTAs between pairs of countries (applying a qualitative choice model) is presented. We therefore begin this topic by first reviewing the earliest theoretical studies on this topic.

3.1- Literature Review

Krugman, in his work on the economics of RTAs (1991 a, b), showed the relative benefits of RTAs using a static monopolistically-competitive framework, however he stressed on economic geography. He noted that, with a zero intercontinental transport costs, continental RTAs will decrease welfare unambiguously. Nevertheless, with prohibitive intercontinental transport costs, Krugman insinuated that those agreements enhance welfare unambiguously. Krugman (1991 b), concluded that since most RTAs are part of "natural" trading partners, the chance of trade diversion was less and "prospective moves towards regional free trade would almost surely do more good than harm to the members of the free trade areas" (p.21).

Krugman's work precipitated Frankel (1997), and Frankel et al. (1995,1996,1998) to study the effects of zero and prohibitive intercontinental transport costs. First, they noted that for higher intercontinental transport costs, natural RTAs (RTAs between countries on the same continent) are more likely to be formed due to possible trade creation. Second, given any level of intercontinental transport costs, unnatural RTAs (RTAs between countries geographically distant or on separate continents) will motivate pairs of countries to avoid RTAs, due to potential trade diversion.

Nonetheless, BB (2004) criticized the Krugman and Frankel, Stein, Wei (FSW) findings as hopelessly inadequate: first, they pointed out that the Krugman and FSW theoretical outcomes originated from a model far from reality- embedded with similar economies, one industry, plus zero intracontinental transport costs. While it's impractical in the world to make countries identical, especially in terms of relative factor endowments or economic size, not either, are intracontinental transport costs amount to zero (BB, 2004).

Second, the Krugman and FSW conclusions suffered another critic because the models they used etched on a supposition of a world with only one factor and one industry, which typically contradicts traditional comparative advantages, particularly the Heckscher-Ohlin trade, as pointed out by Deardorff and Stern (1994). Without comparative advantage the model in large part maybe dependent on imperfect substitution among products to the disadvantage of bilateralism BB (2004).

3.1.1 Summary of BB's (2004) Theoretical Model

BB (2004) generalized the model in Frankel (1997), Frankel et al., (1995,1996,1998), where there could be asymmetries between countries and the various sectors, alongside intra- versus inter-continental transport costs. They used this theoretical model as the foundation for establishing a computable general equilibrium (CGE) in their analysis, to demonstrate the connections between net utility gains (losses) emerging from an RTA and relative transport costs, national outputs, and factor endowment ratios. These connections according to them induce the likely key empirical economic determinants of RTAs between pairs of countries.

From their analysis, international trade within each of the two monopolistically-competitive sectors is generated based on the interactions of consumers having taste for variety, while production is characterized by economies of scale. Two factors of production are assumed (capital and labor), in which each factor is completely mobile between sectors (goods and services) and each immobile internationally.

By allowing asymmetry on regionalism, BB (2004) assumed three continents (indexed 1,2,3) where there are two countries on each continent (countries indexed as A, and B), thus,

six countries in total (1A, 1B, 2A, 2B, 3A, 3B). The countries according to them vary in terms of

absolute and relative factor endowments of capital and labor. Also, we are told that the two

sectors differ in relative factor intensities, tastes for variety and trade barriers. BB noted that,

earlier CGE models captured relative welfare benefits of regionalism, however, they failed to

take into account direct intercontinental and intracontinental transport costs, as in the case of

the Krugman and FSW models- world geography. Before looking into the main findings of BB

(2004), we begin by first presenting a summary of the major theoretical components from their

study which bridges the Krugman and FSW conclusions:

3.1.2 Consumers

They assumed that every country has a representative consumer who obtains utility by

consuming goods and services based on Cobb-Douglas preferences where the weights

represent the share of income spent in each of the two sectors. In each sector, choice across

varieties depend on constant elasticity of substitution preferences. There is a nested utility

function (U_i) for the representative consumer in each of the six countries (i= 1A, 1B, 2A, 2B, 3A,

3B). Where U_i connotes the utility of the representative household in i, and, U_i is subject to a

budget constraint in country i BB (2004).

3.1.3 Firms

BB (2004) assumed the presence of an industry producing goods and an industry producing

services. In the goods industry, every firm is expected to produce output (g_i) based on an

available technology. Where g_i represents output of the representative firm in this particular

industry in country i, g_i is a function of capital, labor, fixed costs facing each firm, plus an exogenous productivity term for goods producers.

Based on their model, all firms in the services industry are presumed to have an identical technology. Where S_i depicts output of the service industry in country i. S_i has analogous components as g_i, but their factor intensities could differ BB (2004). Firms maximize profits and the equilibrium depends on the usual conditions for production under monopolistic completion: first, profit maximization facilitates that prices are markup over marginal costs. Second, firms make zero economic profits BB (2004).

3.1.4 Factor Endowment Constraints

BB (2004) assumed that capital (K_i) and labor (L_i) endowments are inelastically supplied and are internationally immobile. At full employment, the model shows that K_i is equals the sum of capital used in both sectors. In similar fashion, L_i equals the sum of labor used in both sectors BB (2004).

3.1.5 Equilibrium

In equilibrium, it's observed that the total number of firms coupled with the product varieties in each country and industry, the factor employments together with prices in each industry and country, the consumption of each good, product prices, initial transport costs, tariffs, and factor endowments can all be obtained in unique manner BB (2004).

3.1.6 The Social Planner

In order to make a comparison with the FSW model, BB (2004) supposed that each country's social planner sets an initial tariff rate of 30%. Such that, forming an RTA will

eliminate tariffs between members, subjecting nonmember countries' products at 30% tariff

rate (this is a very strong assumption they have assumed under this context). When changes

occur in the utility for agents of two countries from an RTA are positive, then BB presumed that

each social planner will decide to form an RTA with other country's social planner. That is, for a

bilateral RTA to be formed, the change in utility must be positive for the agents of both

countries. Otherwise, the RTA is not formed.

3.2 Econometric Issues

BB (2004) adopted a qualitative choice model of McFadden (1975,1976) in order to

support their empirical work. According to them, the qualitative choice model is obtained from

a probit (latent variable) model- the model describes the relationship between a non-negative

dependent variable and an independent set of variables. BB's (2004) econometric model

represents the latent variable as **Y*** (as in Wooldridge 2004). According to them, **Y*** in the

present context denote the difference in the levels of utility from a course of action (RTA

formation). The probit model according to BB (2004) is expressed as:

Y*=β₀ + xβ +e   (1)

From their point of view, **x** serves as vector of explanatory variables (economic characteristics),

β is a vector of parameters, while **e** is presumed to be independent of **x** having a standard

normal distribution. More formally, they represented their econometric model as **Y***=min (ΔUi,

ΔUj). Implies, the latent variable (**Y***) is equal to the minimum change in the utility of both

country i and country j upon forming an RTA. As a result, consumers from both countries have

to benefit from an RTA to warrant their prospective governments to form an RTA (BB, 2004).

Given that **Y*** is unobservable, BB (2004) specified a binary variable (RTA) taking on the value 1 when two countries have in existence an RTA (meaning **Y***>0), and 0 otherwise (implies **Y***≤0). They have also provided an RTA's response probability (P) as P(RTA=1) = P(y*>0) = G(β_0 + xβ). Where they defined G(β_0 + xβ) as the standard normal cumulative distributive function (cdf), ensuring that P(RTA=1) falls within 0 and 1. Also, we are told that the standard errors of the estimates of **β** are asymptotically normally distributed; the z-statistics in the next section (3.2.2) will make evident if the estimates of β are statistically significant. "while the statistical significance of the probit estimates can be determined, the coefficient estimates can only reveal the sign of the partial effects of changes in **x** on the probability of an RTA, due to the nonlinear nature of G(β_0 + xβ)" BB (2004).

3.2.1 Data Issues

BB (2004) in their cross-sectional analysis used a binary variable to determine the presence or absence of RTAs between a pair of countries in 1996. From their study, variable RTA$_{ij}$ gets the value 1 for a pair of countries (i, j) with an RTA in 1996, and 0 if no RTA. They paired 54 countries (1431 pairings) and generated the variable for all, using summary information from Lawrence (1996) and Frankel (1997), coupled with RTAs notified to the WTO through GATT Art. XXIV (Enabling Clause) as at May 2002.

BB (2004) pointed out that the driver for transport costs is bilateral distance. As such, they calculated 1431 bilateral distances among the 54 countries' economic centers. To identify countries' economic centers, they used Linnemann (1966). They computed the distances in nautical miles employing the US Department of Navy Oceanographic Office (1965) for sea

distances, and Road Atlas of Europe (1988) for land distances (to account for the transport costs

differences between land and sea transport, they multiplied the latter by a standard factor of

2).

BB (2004) measured both closeness (direct measure), and "remoteness "for a pair of

continental trading partners from the ROW. BB (2004) expressed REMOTE as,

REMOTE$_{ij}$

$$= \text{DCONTijx} \left\{ \frac{[\log(\sum_{k=1,k\neq j}^{N} \text{Distance},ik \,/(N-1)) + \log\,(\sum_{k=1,\,k\neq i}^{N} \text{Distance},jk/(N-1))}{2} \right\} \quad \textbf{(2)}$$

They interpreted REMOTE as: DCONT, a binary variable taking the value 1 given that both

countries are on the same continent, and 0 otherwise. When two countries (i, j) are found on

the same continent, REMOTE computes the average of the mean distance of country i from all

of her trading partners apart from j as well as the mean distance of country j from all of its

partners apart from i. However, REMOTE is equal to zero when two countries (i, j) are on

different continents. The measure of "remoteness" according to BB (2004) propels the

formation of natural RTAs (since it measures how far two countries on the same continent are

from other countries), but for unnatural trading partners it has no value.

Lastly, they obtained data on per worker physical capital stocks and real GDPs (all in

international dollars) from Baier et al. (2000). The explanatory variables in the vector **x** from Eq.

(1) are measured using data for 1960 to avoid reverse causality from the formation of RTAs on

data related to economics variables. The data on tariff rates for countries are obtained from the

World Bank (2000).

3.2.2 Numerical analysis and Empirical results from BB (2004)

Below is a tabular representation of their probit results for the probability of an RTA formation by estimating Eq. (1). We also explore the seven theoretical hypotheses regarding the connections between the net gains from an RTA and some economic features of country-pairs.

Table 3: Probit results for the probability of an RTA

Variable:	Specification:						
	1	2	3	4	5	6	7
Constant	13.42*** (20.29)	9.76*** (12.46)	4.31*** (3.48)	3.49*** (2.72)	4.22*** (3.05)	4.22*** (3.05)	7.90*** (4.92)
NATURAL	1.74*** (21.21)	1.36*** (14.29)	1.49*** (13.97)	1.52*** (13.74)	1.64*** (13.59)	1.65*** (13.59)	1.76*** (13.43)
REMOTE		0.15*** (10.37)	0.15*** (9.86)	0.16*** (9.98)	0.17*** (10.28)	0.17*** (10.24)	0.18*** (10.03)
RGDP			0.19*** (5.33)	0.23*** (5.94)	0.22*** (5.28)	0.22*** (5.27)	0.17*** (3.67)
DRGDP				−0.25*** (−4.29)	−0.27*** (−4.68)	−0.28*** (−4.69)	−0.34*** (−5.45)
DKL					0.43*** (5.42)	0.49** (2.10)	0.85*** (7.37)
SQDKL						−0.02 (−0.27)	
DROWKL							−1.29*** (−5.53)
Pseudo R2	0.571	0.647	0.668	0.683	0.704	0.704	0.728
Log likelihood	−306.9	−252.5	−237.4	−227.1	−211.7	−211.7	−194.4
Number of observations	1431	1431	1431	1431	1431	1431	1431

Source: BB (2004) Table 1. Notes: ***, Denotes statistically significant z-statistic at 1% level in two-tailed test. **, Denotes statistically significant z-statistic at 5% level in two-tailed test. Standard errors are in the parenthesis.

Hypothesis 1: "The net gain from an RTA between two countries increases as the distance between them decreases" BB (2004)- a lucid revelation from Krugman (1991b), and Frankel et al. (1995,1996,1998) studies is that natural RTAs are unambiguously more welfare enhancing than unnatural RTAs, therefore the social planners from both countries will aspire to form an RTA given that the distance between them is relatively small. From Table 3, the first testable hypothesis reveals that the probability of an RTA is higher when the distance between the countries' economic centers diminishes. Column 1 in Table 3 confirms our first hypothesis- when two countries are more natural (closer in distance), their tendency of forming an RTA is larger.

Hypothesis 2: "The net welfare gain from an RTA for two continental trading partners increases as their remoteness from the ROW increases" BB (2004)- another crucial lesson learned from the FSW model is that the greater are intercontinental transport costs (**b**) in terms of intracontinental transport costs (**a**), the net welfare gain from continental RTA tend to increase. Therefore, trading less with remote countries yields less trade diversion, so forming a continental RTA will lead to the elimination of tariff distortion for countries in the same continent that trade more and generates greater utility gains for them BB (2004).

To determine the situation under which a pair of continental trading partners will form an RTA under this hypothesis, BB (2004) provide us their second testable hypothesis "for a given distance of two countries from one another- two continental trading partners will have a higher probability of forming an RTA the more remote the countries are from ROW" (in this case remote is measured by REMOTE$_{ij}$). From Table 3, Column 2 supports the fact that REMOTE is related positively to the probability of an RTA. More importantly, the coefficient estimate is statistically significant at the 1% level.

Hypothesis 3: "The net welfare gain from an RTA between a pair of countries increases the larger are their economic sizes (i.e. average real GPDs)" BB (2004)- in line with this hypothesis BB (2004) noted that two countries with larger economies will experience more trade, which will trigger a huge net demand expansion and a major boost in real income. Consequently, BB (2004) third testable hypothesis is that the probability of an RTA is higher the larger the trading partners are economically. From Table 3, RGDP$_{ij}$ quantifies the total sum of the logs or real GDPs of countries i and j in 1960 (BB, 2004). Column 3 in Table 3 shows that country-pairs

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having larger average real GDPs have a higher probability of an RTA. In addition, the coefficient estimate is significant at the 1% level.

Hypothesis 4: **"The net welfare gain from an RTA between a pair of countries increases the more similar are their economic sizes (i.e. real GDPs)"** BB (2004)- according to BB (2004) greater similarity between two countries' market sizes attracts larger gains from an RTA. In view of this, the fourth testable hypothesis from BB (2004) revealed that the probability of an RTA is higher the more similar are the trading partners economically. From Table 3, variable DRGDPij measures the logs of real GDPs differences for countries i and j in 1960 in absolute terms BB (2004). Column 4 of Table 3 tells us that pairs of countries having smaller differences in terms of real GDPs shows a higher probability of an RTA. Moreover, the coefficient estimate is reported as significant at the 1% level.

Hypothesis 5: **"The net welfare gain from an RTA between a pair of countries decreases the larger is the economic sizes of countries outside the RTA (ROW's real GDP)"** (BB, 2004)- the main message under this hypothesis is that the economic size of the ROW is also crucial in determining an RTA formation BB (2004). In plain context, BB (2004) argued that trade diversion for a country pair having an RTA is less given that ROW's absolute factor endowment size is smaller.

Regrettably, according to BB (2004), the fifth hypothesis is complex to empirically evaluate. From their cross-section of country-pairs, ROW's GDP did not differ much across the 1431 observations. As a result, they found the variance of this to be trivial and eventually excluded it.

Hypothesis 6: "The net welfare gain from an RTA between a pair of countries increases with wider relative factor endowments, but might eventually decline due to increased specialization (if intercontinental costs are low)" (BB, 2004)- asymmetries between industries is introduced under this hypothesis. Without any transport costs, the gains from an RTA for a pair of countries enhances if they have wider relative factor endowments, as traditional comparative advantages will be well exploited BB (2004). However, for low intercontinental transport costs, BB (2004) showed that net welfare gains from an RTA will initially increase with wider relative factor endowments, before ultimately declining. According to them, this represents the tension between intra versus inter-industry trade.

BB's (2004) sixth testable hypothesis is that "the probability of an RTA is higher the larger the difference between the two countries relative factor endowments, but only up to a point." From Table 3, variable DKL$_{ij}$ measures the absolute value of the difference between the logs of the capital-labor ratios of countries i and j in 1960 BB (2004). Also, from Table 3, SQDKL$_{ij}$ according to BB (2004) measures the square of DKL (DKL is positively related to the probability of two countries having an RTA (P[RTA=1]), but SQDKL is negatively associated with it). Column 5 in Table 3 shows that DKL actually has a positive effect. Therefore, larger relative factor endowments differences between country-pairs bears a positive and statistically significant relationship with the probability of an RTA BB (2004).

According to column 6 of Table 3, the variables demonstrate the expected quadratic relationship with P(FTA=1), however, the statistical significance for the coefficient estimate of DKL diminishes; the coefficient estimate for the quadratic term bears the expected negative

sign and statistically significant. The explanatory power of the quadratic term is quite negligible, and was ignored as such BB (2004).

Hypothesis 7: "The net welfare gain from an RTA between a pair of countries decreases the larger is the difference between the relative factor endowment of the pair and that of the ROW" (BB 2004)- the loss in welfare from an RTA for a country-pair will be higher given that more Heckscher-Ohlin trade is forgone with the ROW (up to a point) (BB, 2004). On this theory, the testable hypothesis is that "the probability of an RTA declines the wider is the (absolute) difference between the capital-labor ratios of the member countries and the ROW's capital-labor ratio due to potential trade diversion" (BB, 2004). Based on this, the variable of interest is DROWKLij from Table 3. DROWKLij is expressed as:

DROWKLij=

$$\left\{ \frac{|\log[(\sum_{k=1,k\neq j}^{N} Kk)/(\sum_{k=1,\ k\neq i}^{N} Lk)]-\log[\frac{Ki}{Li}]|+|\log[(\sum_{k=1,\ k\neq j}^{N} Kk)/(\sum_{k=1,\ k\neq i}^{N} Lk)]-\log[\frac{Kj}{Lj}]|}{2} \right\} \text{ (BB, 2004), (3).}$$

From Table 3, Column 7 points out that DROWKL has an inverse (negative) association with the probability of an RTA. Its coefficient estimate is statistically significant, in part, due to the potential inter-industry trade diversion (BB, 2004).

Above all, the probit model on net works fine. From Table 3, all the six right-hand-side (RHS) variables under Column 7 are well behaved (i.e. having appropriate signs), moreover the coefficient estimates are statistically significant (BB, 2004). The pseudo-R^2 component from Table 3 provides a summary measure in terms of explanatory power, therefore Column 7 'explains' 73% RTA variation among 1431 country pairings for the year 1996.

By using an alternative measure of goodness-of-fit for probit models: 'percent correctly predicted,' as in Wooldridge (2004), BB (2004) came out with some good results. With a sample of 1431 pairs, 286 pairs with an RTA and 1145 pairs with no RTAs, they correctly predicted 243 of the 286 RTAs (84.97%). In addition, they correctly predicted 1114 of the 1145 pairs with no RTAs (97.29%).

3.3 Partial (marginal) effects of RHS variables on response probabilities

According to BB (2004) the probit estimates cannot show quantitatively the marginal effect of the RHS variables from Table 3 on the probability of an RTA. From this regard, they specified that at the mean level of all the RHS variables, the probability of an RTA among natural partners is 0.867 (86.7%), and 0.012 (1%) for unnatural trading partners. As such, a one percent change in the standard deviation (S.D.) for each RHS variable on the partial response probabilities for natural and unnatural trading partners will have different consequences (BB, 2004). Based on this, we present both scenarios under this section.

3.3.1 Marginal response probabilities for natural trading partners

By making use of the fact that the probability of an RTA among natural trading partners (86.7%) at the mean level of all the RHS variables, a one percent S.D. increase or decrease in the closeness of such partners will in effect increase or decrease this probability by a margin of 12% (BB, 2004). According to them, a S.D. change has both economic and statistical significant effect on the probability of an RTA for natural trading partners.

On the same note, one percent S.D. increase (decrease) in the remoteness for two natural trading partners from the ROW increases (decreases) the probability of an RTA by 0.6% (BB, 2004). Clearly, we can see from this point that the marginal effect here is much lower than the case for natural partners.

Furthermore, it is certainly the case that geographic nearness is not the only issue driving the probability of an RTA. As a case in point, a one percent S.D. increases in the level of real GDPs increases our response probability by 5.9%, almost half the magnitude of a one percent S.D. increase in closeness (BB, 2004).

lastly, a one percent S.D. change in the difference between real GDPs as well as the differences between capital-labor ratios all bear economically and statistically significant impacts, almost similar to that of real GDP levels (BB, 2004).

3.3.2 Marginal response probabilities for unnatural trading partners

As we mentioned earlier, at the mean level of the RHS variables the probability of unnatural RTA is approximately 0.012 (1%). A one percent S.D. increase in closeness enables this probability to rise from 0.012 (1%) to 0.086 (8.6%), outlining the gravity of economic geography in the likelihood of an RTA; statistically the effect of this is significant (BB, 2004).

The role of economic factors influencing the likelihood of unnatural RTA cannot be ignored. A one percent S.D. rise with respect to the level of real GDPs increases the probability of an RTA by a margin of 1.6%, the effect is both economically and statistically significant (BB, 2004).

Changes in the absolute difference between the real GDPs of unnatural trading partners is also an imminent issue. An S.D. reduction by one percent in the absolute difference between real GDPs of unnatural trading partners is both economically and statistically significant, which increases the probability of an RTA by 6% (BB, 2004).

We cannot fail to mention that the differences between capital-labor ratios also play a considerable role. According to BB (2004), an increase in the differences between capital-labor ratios essentially have economically and statistically significant effects on the probability of an RTA.

The above marginal response probability estimates suffice the fact both economic characteristics and geography clearly have economically and statically significant effects on the probability of an RTA.

3.3.3 Conclusions and comments of BB (2004)

From the above empirical results, the economic determinants confirm their predicted effects.

Chapter 4- Empirical Findings of Other Economists

From chapter three we showed empirically how the probability of RTA formation varies based on some economic determinants. However, the formation of RTAs is not an end in itself. According to Baldwin (1993), the formation of RTAs between country-pairs could trigger a ripple effect on non-member countries to participate in an existing RTA (domino theory of regionalism). Furthermore, due to a possible presence of political resistance, accession to an existing RTA might not be feasible which can induce countries to form new RTAs with other non-member countries having similar motives (Yi, 1996).

As a form of evidence on Baldwin's (1993) theory of regionalism and Yi's (1996) proposition, we will present an empirical analysis from Peter Egger and Mario Larch (2008) showcasing the interdependence in RTA formation.

4.1 Econometric strategy of Egger and Larch (2008)

Analogous to BB's (2004) econometric model, Egger and Larch (2008) in their empirical modeling of interdependence of RTA decisions adopted a qualitative choice model using a panel data set. They specified **RTA*$_{ij}$= min(ΔU$_i$, ΔU$_j$):** where **RTA*$_{ij}$** is latent; **RTA*$_{ij}$ > 0** if the two countries belong to the same RTA, otherwise **RTA*$_{ij}$ ≤ 0**; **ΔU** represents the membership-to-non membership utility differential for two potential members of an RTA (Egger and Larch, 2008).

4.1.2 Interdependence with Panel data (Egger and Larch, 2008)

Egger and Larch (2008) obtained the information on RTAs from the WTO. In the panel data analysis, they used data on membership events for eleven years (with five year intervals)

between 1955 and 2005 covering 10,585 country-pairs. In the construction of the explanatory

variables, they obtained a large panel data set covering variables based on real GDP,

population, and geographical distance collected from Maddison (2003). Below is a probit model

used in predicting RTA membership probability levels and changes with panel data by Egger and

Larch (2008):

$$RTA^*_t = \rho Wt_{t-5}.RTA_{t-5} + X_{t-5}\beta + \rho \overline{W}.\overline{RTA} + \overline{X}.\overline{\beta} + e_t \quad (2)$$

$$RTA_{t-5} = 1[RTA_{t-5}^* > 0]$$

The variables are defined as follows:

- **RTA_t^*** is a vector (n_t x1) of unobservable membership-to-non-membership utility differential for all country-pairs at time t.

- **$RTA_t = 1[RTA_t^* > 0]$** is an n_t x1 indicator variable vector for RTA membership in period t.

- **W_t** (n_t x n_t) is a weighting matrix to aggregate all third country pairs into one artificial pair reflecting RTA membership of all pairs at time t; the elements of **W_t** are inversely related to the distance between country-pairs; each row of **W_t** sum up to unity and zero for the diagonals at time t.

- **ρ** captures the strength of interdependence (**ρ** >0 for joining existing RTA/ a new RTA).

- **X_{t-5}** is a matrix (n_t x k) of economic fundamentals (involving a time-specific constant).

- **β** is a vector (kx1) of unknown parameters; **e_t** is a vector (nx1) of disturbances

- Bars show time averages of variables and their respective parameters devoid of time variation.

4.1.3 Empirical analysis of Egger and Larch (2008)

Egger and Larch (2008) adopted a specification similar to the one used in BB (2004). As a result, they employed the following variables with their respective signs in parenthesis:

- Natural (+) measures the log of the inverse of the great circle distance between two trade partners' capitals.

- DCONT (+) represents a dummy variable having the value one given that two countries are on the same continent and zero otherwise.

- REMOTE (+) is remoteness of a pair of natural trading partners from the ROW.

- Total bilateral market size $RGDPsum_t = \log(RGDP_{it} + RGDP_{jt})$ (+) where $RGDP_{it}$, and $RGDP_{jt}$ represent real GDP of countries i, and j at year t.

- $RGDPsim = \log\{1-[RGDP_{it}/(RGDP_{it} + RGDP_{jt}]^2 - [RGDP_{jt}/(RGDP_{it} + RGDP_{jt}]^2\}$ (+) measures similarity between two countries in terms of their real GDP.

- $DKL=|\log(RGDP_{it}/POP_{it})-\log(RGDP_{jt}/POP_{jt})|$ (+) represents the difference in real GDP per capita; $SQDKL= DKL^2$ (-) is the square of DKL.

- DROWKL (-) indicates the relative factor endowment differences between the ROW and a given country-pair.

4.1.4 Empirical results of Egger and Larch (2008)

The major empirical results of Egger and Larch (2008) are presented in Table 4 by estimating Eq. (2).

Table 4 :Probit results for the probability of new PTA memberships (non-spatial and spatial models)

Variables	Theory	None-spatial Probits			Spatial Probits		
		All RTAs (1)	RTA Foundations (2)	RTA Enlargements (3)	All RTAs (4)	RTA Foundations (5)	RTA Enlargements (6)
$W_{t-5} . RTA_{t-5}$	+	−	−	−	2.509***	1.109***	2.082***
		−	−	−	(0.127)	(0.272)	(0.152)
NATURAL	+	0.581***	0.632***	0.556***	0.452***	0.593***	0.361***
		(0.020)	(0.05)	(0.020)	0.023	(0.051)	(0.026)
RGDPsum	+	0.893***	0.843***	0.842***	0.773***	0.835***	0.683***
		(0.076)	(0.184)	(0.076)	(0.076)	(0.207)	(0.078)
RGDPsim	+	0.026	0.645***	0.066	− 0.040	0.656***	0.006
		(0.059)	(0.172)	(0.059)	(0.061)	(0.181)	(0.061)
DKL	+	-0.571***	0.314	− 0.599***	− 0.583***	0.530**	− 0.599***
		(0.066)	(0.244)	(0.066)	(0.067)	(0.248)	(0.067)
SQDKL	−	0.106***	− 0.024	0.112***	0.130***	− 0.079	0.124***
		(0.025)	(0.088)	(0.025)	(0.025)	(0.092)	(0.026)
DCONT	+	0.651***	− 0.226**	0.637***	0.569***	− 0.363***	0.525***
		(0.03)	(0.105)	(0.031)	(0.032)	(0.113)	(0.032)
REMOTE	+	16.536***	9.507***	15.287***	15.668***	10.036***	15.107***
		(0.739)	(1.696)	(0.757)	(0.758)	(1.861)	0.795
DROWKL	−	0.559***	− 0.338*	0.544***	0.460***	− 0.459**	0.448***
		(0.093)	(0.182)	(0.093)	(0.095)	(0.206)	0.098
Pseudo-R2		0.548	0.534	0.535	0.561	0.545	0.552
Log-likelihood		-849.1138	-581.335	-8345.512	-7875.224	-550.355	-7693.834
Log-likelihood for constant only		-18770.172	− 596.812	-17955.409	-18770.172	-596.812	-17955.409

Source: Egger and Larch (2008), Table 2. Notes: There are 93,323 observations and 10,585 country-pairs. Figures below are standard errors. All estimated models assume heteroskedastic disturbances. *, **, *** denotes significance at 10%, 5% and 1% respectively.

According to Table 4, each column (1, 2, and 3) provides us with the coefficient estimates and their standard errors for the empirical model without controlling for the interdependence of RTAs. The probit model for column 1 gives similar results to the ones in BB (2004): countries located on the same continent demonstrate higher probability of new RTA membership (precisely, $\hat{\beta}_{NATURAL} > 0$, $\hat{\beta}_{DCONT} > 0$). Likewise, country-pairs that are relatively remote from the ROW are more likely to enter an RTA (as $\hat{\beta}_{REMOTE} > 0$). Moreover, economies that are larger and similar in size easily become new RTA members (since $\hat{\beta}_{RGDPsum} > 0$, $\hat{\beta}_{RGDPsim} > 0$). The point estimates of the relative factor endowments qualitatively matched with those from BB (2004) ($\hat{\beta}_{DKL} < 0$, while $\hat{\beta}_{SQDKL} > 0$). Further, the coefficient of the relative factor endowments ($\hat{\beta}_{DROWKL} > 0$) opposes that in BB (2004). Apart from the fact that DCONT and DROWKL have negative effects on the probability of RTA foundations (column 2), the models for new RTA foundations and new RTA enlargements (i.e. column 3 from Table 4) qualitatively have similar results.

On the spatial models that control for interdependence in RTA membership from Table 4, new RTA memberships in year t-5 influences the probability of other new memberships to take effect in year t (since $\hat{\beta} \, \mathbf{W}_{t-5}.\mathbf{RTA}_{t-5} > 0$) (Egger and Larch, 2008). In column 5 and 6, there is a slight difference in the parameters of the economic fundamentals employed in the simple

probits. However, Egger and Larch (2008) discovered significant positive interdependence supporting their study.

4.1.5 Conclusion

By using panel data set, the simple probit model generates results that are similar to the ones in BB (2004). The outcome of the spatial models indeed confirms the important role played by interdependence in RTA formation.

4.2 Are RTAs Contagious? (Baldwin and Jaimovich, 2012)

The application of spatial econometrics to the dynamic process of RTA formation and enlargement by Egger and Larch (2008) elicited another two international trade economists (Richard Baldwin and Dany Jaimovich) to use a broad panel of countries to empirically test the notion that RTAs are contagious (i.e. a new RTA between nations A and B increases the tendency that nation will C will sign a new RTA with A or B [Baldwin and Jaimovich, 2012]). The major contribution of Baldwin and Jaimovich's (2012) empirical strategy is the use of a theoretically driven 'contagion index' that determines the level to which an RTA between nation-j and nation-k alters nation-i's interest in terms of signing up for a new RTA with either j or k. Below, we shall present the empirical strategy and main results of Baldwin and Jaimovich (2012).

4.2.1 Spatial definition of a contagion index (Baldwin and Jaimovich, 2012)

From the theoretical model of Baldwin and Jaimovich (2012), the contagion comes from the threat of trade diversion. Therefore, the number of RTAs signed among a nation's trade

partners and the importance of those markets to the nation's exporters are essential to the measure of the contagion index (Baldwin and Jaimovich, 2012). For an N-country setting, the overall contagion that a nation (nation-1) is exposed to from nation-j having several RTAs is expressed by Baldwin and Jaimovich (2012) as:

Contagion$_{1j, t}$

$$\equiv \sum_{k \in \Omega j, t} \{(\text{bilateral exports}_{1j}/\text{total exports}_1)(\text{bilateral exports}_{kj}/\text{total imports}_j)\}\text{RTA}_{jk} \quad (3).$$

From Eq. (3), nation-1 is subject to a contagion when nation-j provides tariff preferences to imports from nation-k; the variable **RTA$_{jk}$** is a binary variable that is zero when there is no RTA between k and j, and unity otherwise; **$\Omega_{j,t}$** is the sum of all RTAs signed by nation-j up to year t weighted by the export share of j in 1 and import share of k in j (Baldwin and Jaimovich, 2012).

Baldwin and Jaimovich (2012) defined a distance based weighting matrix **W** (nxn) (i.e. spatial interdependence) in the contagion index, where each element in **W** measures distance between country-pairs. According to them, **W** is asymmetric (i.e. trade diversion will be different for each country in the pair) and theoretically sparse (i.e. country-pair's probability to form an RTA will not be affected by RTA signed by countries outside the dyad). However, for the empirical part they specified a spatial weighting matrix **W$_t$**, in which a different matrix will be created for every period. But from Eq. (3), the import and export shares are time-invariant, but are predicted shares from a gravity equation with fixed effects using information from a base year, which helps in reducing the simultaneity between RTAs and market shares (Baldwin and Jaimovich, 2012).

4.2.2 Econometric specification of Baldwin and Jaimovich (2012)

The empirical specification according to Baldwin and Jaimovich (2012) is set to determine the variables that affect the probability that an RTA will be formed, possibly due to the role of contagion. Based on this, they used a dummy variable to reflect the presence of a particular RTA as the dependent variable, with the major explanatory variables representing the contagion index from Eq. (3) while controlling for economic, geographic and institutional determinants of RTAs. Considering the dynamic nature of a contagion, Baldwin and Jaimovich (2012) adopted a panel data set to specify their econometric model:

$$\text{Pr(switch)} = G(\beta_0 + \rho W_{t-1} RTA_{jk.t-1} + \beta_1 X_{ij,t-1} + \beta_2 X_{i,t-1} + \beta_3 X_{t-1}) \qquad (4).$$

Where i and j denote trading partners, t denotes time, and the variables are defined as:

- **Pr(switch)** is the probability to switch status from non-RTA to RTA, depending on the logistic cumulative distributive function **G(.)** of a linear vector of lagged explanatory variables **X** for different levels.

- $W_{t-1}RTA_{jk.t-1}$ (empirical Contagion Index) is the spatial lag, W_{t-1} is a one-period lagged weighting matrix, and $RTA_{jk.t-1}$ is vector of all RTAs signed by nation j with third countries at time t-1.

- ρ is a coefficient that captures the effect of the Contagion Index.

According to Eq. (4), the model is built using only not-yet-switched pairs. As a result, dyads stay in the panel until an RTA is signed, afterwards it is eliminated from the panel to avoid simultaneity problems between the Contagion Index and dependent variable (endogeneity problem) (Baldwin and Jaimovich, 2012).

4.2.3 Data issues and sample controls (Baldwin and Jaimovich, 2012)

Baldwin and Jaimovich (2012) obtained their data on RTAs from Hufbauer and Schott (2009) covering the period 1977-2005, with a total of 105,927 observations representing 4,609 country-pairs. To distinguish the effect of the contagion index, Baldwin and Jaimovich (2012) introduced a variable (General Interdependence), a time-lagged spatial lag, derived from a weighting matrix based on geographical distance.

As in BB (2004), Baldwin and Jaimovich included gravity-like variables as well as the differences in relative factor endowments to predict RTA formation. The panel nature of Baldwin and Jaimovich's (2012) paper allowed them to include other important economic determinants that could not be captured in the cross sectional analysis of BB (2004). From Egger and Latch (2008) they adopted the absolute value of the log difference in real GDP as proxy, called GDPPC DIFFERENCE.

4.2.4 Empirical results of Baldwin and Jaimovich (2012)

From below, Baldwin and Jaimovich's (2012) main empirical results are presented in Table 5 by the estimation of Eq. (3) and (4).

Table 5: Main empirical results

	(1)	(2)	(3)	(4)	(5)
	Indirect dyad contagion	Spatial Contagion index	Pure FTA	Conditional logit	Duration model
Contagion index		0.017***	0.020**	0.190***	0.014***
		(0.002)	(0.002)	(0.037)	((0.002)
General interdep.	0.001*	0.004	0.010 **	0.007	0.017**
	(0.005)	(0.005)	(0.005)	(0.024)	(0.003)
GDP sum	0.229***	0.219***	0.209***	10.02***	0.182***
	(0.025)	(0.026)	(0.024)	(1.833)	(0.019)
GDP Difference	−0.235***	−0.231***	−0.152***	6.390***	−0.197***
	(0.040)	(0.041)	(0.037)	(1.600)	(0.030)
GDPpc difference	−0.112**	−0.09*	−0.089*	5.934***	−0.051
	(0.050)	(0.052)	(0.049)	(2.017)	(0.040)
Distance	−1.417***	−1.351***	−1.196***		−1.306***
	(0.079)	(0.083)	(0.075)		(0.054)
Remote	0.005	0.016	0.031*		0.046***
	(0.017)	(0.017)	(0.016)		(0.012)
Bilateral trade	0.0357***	0.043***	0.032***	0.185	0.035***
	(0.013)	(0.013)	(0.009)	(0.134)	(0.013)
GDP growth	−0.026**	−0.033***	−0.050***	−0.084***	−0.020**
	(0.011)	(0.011)	(0.011)	(0.024)	(0.010)
Relative growth	−0.626***	−0.632***	−0.422***	−0.639***	
	(0.098)	(0.098)	(0.093)	(0.156)	
WTO members	−0.019	−0.017	−0.025	0.022	
	(0.023)	(0.023)	(0.020)	(0.041)	
RTA coverage	0.008***	0.009***	0.011***	0.082***	0.007***
	(0.001)	(0.002)	(0.002)	(0.023)	(0.001)
Observations	105,972	105,972	112,995	7476	105,660
Pseudo R^2	0.320	0.327	0.323	0.604	

Source Baldwin and Jaimovich (2012) Table 2. Notes: Standard errors are clustered at dyad level in parentheses. Six duration dependence splines, time trend and FTA density used in the estimation but not displayed in the table. ***$p<0.01$. **$p<0.05$. *$p<0.1$.

Column 1 in Table 5 shows the estimation of Eq. (4) using the variable 'GENERAL INTERDEPENDENCE' (to account for RTA interdependence) plus other control variables. It's obvious that $\hat{\beta}$GENERAL INTERDEPENDENCE >0 and statistically significant at the 10% level. Column 2 (Eq. 3) shows Baldwin and Jaimovich's (2012) main results using their CONTAGION INDEX. The index has a positive coefficient and significant at the 1% level. Besides, $\hat{\beta}$GENERAL INTERDEPENDENCE is insignificant, implying that the distance-based weighting matrix has no effect on RTA contagion upon controlling for trade diversion effects with the CONTAGION INDEX (Baldwin and

Jaimovich, 2012). In column 3, the regression on data involving only "pure FTAs" and CUs in the Hufbauer-Schott database yields positive and significant results for β^$_{\text{CONTAGION INDEX}}$ and β^$_{\text{GENERAL}}$ $_{\text{INTERDEPENDENCE}}$. Column 4 is a conditional logit estimation to tackle unobservable heterogeneity where the sample is limited to switchers (since we have no switchers from Eq. 4) (Baldwin and Jaimovich, 2012). Therefore, column 4 shows that, β^$_{\text{CONTAGION INDEX}}$ >0 and significant at the 1% level; but, β^$_{\text{GENERAL INTERDEPENDENCE}}$ is insignificant. Column 5 according to Baldwin and Jaimovich (2012) confirms their results in relation to the Contagion Index.

It's clear from Table 5 that all the geographical and economic determinants have the expected signs and significance. From column 3, β^$_{\text{DISTANCE}}$, β^$_{\text{GDP DIFFERENCE}}$ and β^$_{\text{GDPPC DIFFERENCE}}$ are all negative and significant (except for the case in column 4 where β^$_{\text{GDP DIFFERENCE}}$ and β^$_{\text{GDPPC}}$ $_{\text{DIFFERENCE}}$ are both positive and significant). For the country level variables- β^$_{\text{BILATERAL TRADE}}$ demonstrates that the partner's past trade level is a significant predictor of RTAs (Baldwin and Jaimovich, 2012). Moreover, β^$_{\text{RTA COVERAGE}}$ is positive and significant, implying that a country having more RTAs, is more likely to sign others (Baldwin and Jaimovich, 2012).

4.2.5 Conclusion

From the analysis, it is apparent that these results justify the notion that RTAs are contagious and should be measured in line with Baldwin and Jaimovich's (2012) theoretically driven contagion index. However, the significance of the undirected measure of spatial dependence (GENERAL INTERDEPENDENCE) is not robust.

4.3 What Determines Bilateral Investment Treaties (BITs)? (Bergstrand and Egger, 2013)

BITs are international agreements establishing the terms and conditions for private investment by nationals and companies of one state into another state (Legal Information Institute). BITs have become prevalent over the past 50 years, in part, due to several expropriations of FDIs and the limitation of GATT to only trade (WTO). In reference to the United Nations Conference on Trade and Development (UNCTAD), BITs are simply agreements for foreign direct investments (FDIs). By using the empirical work of BB (2004) on the economic determinants of RTAs as a benchmark, Bergstrand and Egger (2013) provide us with the first systematic empirical analysis on the economic determinants of BITs and the possibility of BITs between country-pairs using a qualitative choice model, at the same time as explaining RTAs.

4.3.1 Econometric specification of Bergstrand and Egger (2013)

Similar to BB (2004), Bergstrand and Egger (2013) adopted a qualitative choice model. However, they considered a bivariate probit model due to a possible correlation among the error terms. From below, they specified the latent variable **(Y_1*)** for a BIT and **(Y_2*)** for an RTA as:

$Y^*_{1ij} = X_{1ij}\beta_1 + e_{1ij}$ (Bergstrand and Egger, 2013**) (5), and $Y^*_{2ij} = X_{2ij}\beta_2 + e_{2ij}$** (Bergstrand and Egger, 2013) **(6).**

The above variables are defined as: **X_{1ij} (X_{2ij})** represents a vector of explanatory variables for country-pair ij, **β_1 (β_2)** is a vector of parameters, **e_{1ij}** and **e_{2ij}** are assumed to be independent of **X_{1ij}** and **X_{2ij}** but could be correlated with each other, while having a bivariate normal distribution (Bergstrand and Egger, 2013). They defined Eq. (5) formally as **$Y^*_{1ij} = \Delta U_{1i} + \Delta U_{1j}$** where **$\Delta_{1i}$ (Δ_{1j})**

connotes a utility change for a representative consumer in i (j) from a BIT, and analogously for an RTA. Hence, Y_{1ij}^* (Y_{2ij}^*) has to be greater than zero for prospective governments to form a BIT or RTA (Bergstrand and Egger, 2013).

As Y_{1ij}^* and Y_{2ij}^* are unobservable, Bergstrand and Egger (2013) defined an indicator variable for each, BIT_{ij} and RTA_{ij} respectively, with the response probabilities:

Pr (BIT_{ij} =1, RTA_{ij} =1) = Φ_B ($X_{1ij}\beta_1$, $X_{2ij}\beta_2$, ρ) (Bergstrand and Egger, 2013) **(7).** Where Φ_B **(.)** represents the bivariate normal distribution and **ρ** captures the covariance between the vectors of **e_1** and **e_2** (Bergstrand and Egger, 2013). From this specification, the ultimate concern for Bergstrand and Egger (2013) is to obtain four probabilities**: Pr(BIT_{ij}=1, RTA_{ij} =1), Pr(BIT_{ij} =1, RTA_{ij} =0), Pr(BIT_{ij}=0, RTA_{ij} 1), and Pr(BIT_i=0, RTA_{ij} =0)**, based on economic (and political) fundamentals.

4.3.2 Data Description of Bergstrand and Egger (2013)

Bergstrand and Egger (2013) used a cross-section data in their study with a sample of 12,880 country-pairs. Their data includes the state of RTAs and BITs for the year 2000. The explanatory variables they used are averages of five years prior to the year 2000. The information on BITs in force as at the year 2000 was obtained from United Nations Conference on Trade and Development (UNCTAD). The data on RTAs (CUs, FTAs and others) are received from the WTO.

The data on real GDP in US dollars, labor force, gross fixed capital formation at constant US dollars for the year 2000 were obtained from the World Bank's Development Indicators (2005). The data on distance between economic centers of countries ($Distance_{ij}$), a common land

boarder indicator (Adjacency$_{ij}$) and a common language indicator (Language$_{ij}$) are obtained

from CEPII. These variables are exactly the same in the estimation of both Eq. (5) and Eq. (6).

4.3.3 Empirical results of Bergstrand and Egger (2013)

Table 6 represents the main empirical results from Bergstrand and Egger (2013) by the

estimation of both Eq. (5) and Eq. (6). From below, we use "a" to represent a specification

associated with BIT$_{ij}$ and "b" connotes results in line with RTA$_{ij}$.

Table 6 : The determinants of BITs and PTAs in seemingly unrelated bivariate probit models

Determinants	Acronym	Model 1		Model 2		Model 3		Model 4	
		BITs	RTAs	BITs	RTAs	RITs	RTAs	BITs	RTAs
Log sum of i's and j's real GDPs	GDPSum$_{ij}$	0.374***	0.147***	0.327***	0.160***	0.353***	0.203***	0.286***	0.129***
		(0.010)	(0.007)	(0.011)	(0.008)	(0.012)	(0.010)	(0.014)	(0.012)
Log similarity of i's and j's real GDPs	GDPSim$_{ij}$	0.035***	0.058***	0.029***	0.060***			0.124***	0.124***
		(0.008)	(0.007)	(0.008)	(0.007)			(0.012)	(0.0126)
Log bilateral distance between i's and j's economic centers	DIST$_{ij}$	−0.529***	−0.617***	−0.509***	−0.614***	−0.475***	−0.542***	−0.472***	−0.775***
		(0.022)	(0.020)	(0.022)	(0.021)	(0.023)	(0.021)	(0.030)	(0.028)
Adjacency indicator between i and j	ADJ$_{ij}$	−0.341***	0.398***	−0.242**	0.342***	−0.233*	0.280***	−0.429***	0.008
		(0.116)	(0.099)	(0.123)	(0.100)	(0.126)	(0.101)	(0.14)	(0.116)
Common official language indicator between i and j	LANG$_{ij}$	−0.091*	0.087**	−0.087	0.048	−0.064	0.091**	0.081	−0.042
		(0.053)	(0.041)	(0.054)	(0.042)	(0.056)	(0.046)	(0.060)	(0.053)
Political stability between i and j	PolStab$_{ij}$	−	−	0.017***	−0.005***	0.015***	−0.007***	0.018***	−0.001
		−	−	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Inverse expropriation risk between i and j	IExpRisk$_{ij}$							−0.051***	0.007
								(0.013)	(0.012)
Log distance of i and j to the rest of the world	REMOTE$_{ij}$							−0.109	0.759***
								(0.142)	(0.130)
BITs of i and j other than with each other (third-country BITs)								0.024***	0.0099***
								(0.001)	(0.001)
PTAs of i and j other than with each other (third-country PTAs)								0.004***	0.0168***
								(0.001)	(0.001)
Constant		−6.436***	0.296	−6.679***	0.334	−7.018***	−0.333	−4.717***	−4.352***
		(0.272)	(0.233)	(0.286)	(0.236)	(0.299)	(0.253)	(1.112)	(1.015)
Observations		12,880		12,561		11,325		11,325	
Countries		161		159		151		151	
Correlation between disturbances in BITs and RTA processes		0.219		0.222		0.161		0.099	
Standard error of correlation coefficient above		0.023		0.024		0.025		0.025	
Log-likelihood of model		−8123.94		−7972.69		−7434.08		−6676.72	
Log-likelihood of constant-only model		−9968.14		−9968.14		−9312.86		−9312.86	
McFadden pseudo-R^2		0.185		0.200		0.202		0.283	

According to Table 6, specification 1a and 1b examine the effects on the likelihood of BIT and RTA using measures such as economic size, economic similarity, distance, natural and investment costs. The sum and similarity of two countries' GDPs ($\hat{\beta}_{GDPSum_{ij}}$ and $\hat{\beta}_{GDPSim_{ij}}$) are positive and statistically significant, which influences the probability of forming both a BIT and an RTA. $\hat{\beta}_{Distance_{ij}}$ from 1a and 1b are both negative and statistically significant, hence, impacting bilateral trade flows and FDI flows negatively (Bergstrand and Egger, 2013). Also, $\hat{\beta}_{Adjacent_{ij}}$ and $\hat{\beta}_{Language_{ij}}$ from 1a are both negative and statistically significant for the BIT equation, but both coefficients are positive in the RTA equation (1b). Implies, the likelihood of an RTA is higher for two country-pairs the lower their trade costs, while lower trade costs discourage horizontal FDI (but would probably encourage vertical FDI) (Bergstrand and Egger, 2013).

From Table 6, specification 2a and 2b augment specification 1a and 1b by including a measure of natural investment costs (PolStab$_{ij}$: political stability in a less stable country) (Bergstrand and Egger, 2013). Specification 2a shows that greater PolStab$_{ij}$ induces FDI with lower natural investment costs enabling country-pairs to be more willing to form a BIT; PolStab$_{ij}$ has an opposite impact on the likelihood of an RTA from specification 2b (Bergstrand and Egger, 2013). Finally, Bergstrand and Egger (2013) added three additional variables in the last specification (model 4) in Table 6: from specification 4a, $\hat{\beta}_{IExpRisk_{ij}}$ (inverse expropriation risk)<0 and statistically significant, has a negative effect on the probability of a BIT but insignificant for an RTA; REMOTE$_{ij}$ from specification 4a has no statistically significant effect on the likelihood of

a BIT$_{ij}$, but it does for an RTA (4b); by constructing a ten-year-lagged indexes of "third-country"

BITs and RTAs specification 4a and 4b shows that interdependence matters since the indexes

are positive and statistically significant for the probabilities of both BIT$_{ij}$ and RTA$_{ij}$ formation.

4.3.4 conclusion

It is noticeable from the above empirical analysis that the economic determinants of

RTAs, in particular, those from BB (2004) share some stricken similarities to those of BITs. By

using the economic fundamentals outlined above and the appropriate empirical model,

Bergstrand and Egger (2013) have been able to predict correctly 88% of all pairs with a BIT and

an RTA, 81% with a BIT but no RTA, and 84% with an RTA but no BIT, and 57% for pairs without

a BIT and an RTA.

Chapter 5- Remarks and Conclusions

A careful analysis of BB's (2004) and other economists' empirical study on the economics of RTAs generated similar results on the economic determinants of RTAs and the likelihood of RTAs between country-pairs. In part, the likeness of their results on the economic determinants of RTAs is attributable to the adoption of some of the economic fundamentals employed by BB' (2004): distance between trading partners, remoteness of a pair of continental trading partners from the ROW, total bilateral market size, the similarities of country-pairs in terms of their real GDP, and relative factor endowments.

However, each paper from the other economists adds a unique contribution to our knowledge (the economic determinants of RTA). By making use of spatial econometrics, we found evidence that RTAs are interdependent (domino theory of regionalism): pre-existing RTAs increase the probability that a country pair will form an RTA and that this effect decreases with distance (Egger and Larch, 2008). From Baldwin and Jaimovich (2012), the empirical results from their work confirmed that RTAs from their data set are indeed contagious based on their theoretical driven 'contagion index.' On the proliferation of BITs, we presented the first empirical paper based on an econometric model that explains the economic determinants of BITs, at the same time as explaining RTAs (Bergstrand and Egger, 2013). The econometric model seemed important based on its prediction of BITs and RTAs at the same time.

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