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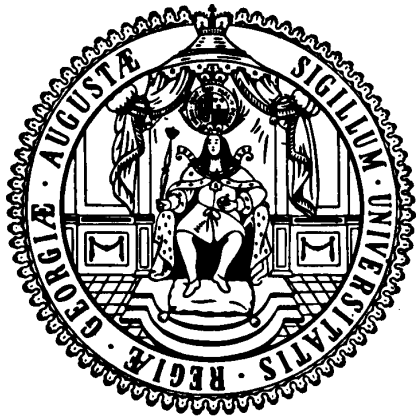

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Deeper Integration: What Effects On Trade?

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DEEPER INTEGRATION: WHAT EFFECTS ON TRADE?

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Deeper integration: What effects on trade?

Abstract

The focus of this paper is to estimate the effect of the different types of regional trade agreements on the volume of trade between country pairs. The analysis will employ the "empirical workhorse" of international trade; the gravity model. We hypothesize that the deeper agreements have a stronger effect on trade, especially when considering the extensive margin of trade. When controlling for the extensive margin of trade, the multilateral trade resistance terms, and the endogeneity bias we are able to obtain satisfyingly accurate treatment effects of the different types of regional trade agreements. Using a panel of 50 countries over the period 1980-1999, we find that customs unions, "deep" free trade agreements, and common markets have stronger effects on bilateral trade than simple free trade agreements.

Key Words: F1

JEL Codes: Regional trade agreements, Deep integration, International trade flows, Gravity equation, Panel data

1. Introduction

The focus of this paper is the effect of the different types of free trade agreements on the volume of trade between country pairs. National governments have been increasingly choosing to pursue open-trade policies and have been supported in this by the international community. The importance in the international economic agenda is undoubted, but the question remains on how to achieve free trade? There exist two major schools of thought in trade liberalization, which are multilateralism and regionalism. The approach that aims at achieving *global* free trade is multilateralism. Despite this noble intention it has proven difficult to implement. The Doha round, which is the current round of negotiations dealing with lowering barriers to trade on an international level, was temporarily suspended (in 2003), and its future remains uncertain. There exists a second (sometimes referred to as the second-

best) option, regionalism. In the regional approach trade is liberalized only between a select group of countries, rather than a multilateral decrease in barriers to all countries in the world. We have seen the emergence of European based bloc (the EU) and a North American bloc (NAFTA), which through their large size have strong bargaining power. The focus of freeing up trade between only a select group of countries, rather than on a global scale has other merits however. The notion of free trade has been in some ways reduced to international policy measures like tariffs and non-tariff barriers. Some authors have been stressing the importance of behind-the-border regulations that hinder international trade[2]. This issue has been taken up on a global level; it has received mention by the World Bank and the WTO[3], and it is precisely here where regionalism has an advantage over multilateralism. It enables the deeper integration of economies worldwide[4]. There seems to be a trade-off between the number of countries involved in trade liberalization and the depth achieved.

In this paper we employ the "empirical workhorse" of international trade; the gravity model. The gravity model has often been applied to studying the effects of reduced trade costs and trade liberalization. The study of economic integration using the gravity equation has focused on WTO membership, Free Trade Agreements in general[5], currency unions[6], or individual agreements, such as the European Union or NAFTA[7]. In this paper the preferential trade agreements will be grouped into four different kinds, modifying the classifications of the World Trade Organization. The agreements that will be covered are the European Union (EU-15), the European Free Trade Association (EFTA), the European Economic Area (EEA), the Common Market of the South (MERCOSUR), the Asian Free Trade Agreement (AFTA), the North American Free Trade Agreement (NAFTA), the Common Economic Relations Agreement (CER) between Australia and New Zealand, as well as various agreements signed

[2] For example, Lawrence (1996).
[3] „Behind-the border" and Regulatory Issues, World Bank.
[4] Lawrence (1996).
[5] For example Baier and Bergstrand (2007), Magee (2003).
[6] Rose (2000).
[7] Martínez-Zarzoso et al (2009).

between individual countries or by individual countries with regional blocs in the period 1980 to 1999. A full list is given in the appendix. The different types of agreements as stated by the WTO are Customs Unions (CU), Free Trade Agreements (FTA), Economic Integration Agreements (EIA), and Partial Scope Agreements (PS). As a whole they will be referred to as Preferential Trade Agreements (PTAs).[8]

This paper will therefore have a clear focus on the regional approach to free trade. The motivation is to examine the different trade policy options nations have when choosing to enter a preferential trade agreement. We hypothesize that the deeper agreements have a stronger effect on trade, especially when considering the extensive margin (the number of products traded).

The main novelty of this research is the use of recent developments in the theory of international trade and in the econometric analysis of gravity models to control for three common biases present in previous estimates of the effects of FTAs on bilateral trade flows. Those biases are related to the extensive margin of trade (Helpman, Melitz and Rubinstein, 2008), the multilateral trade resistance terms (Anderson and van Wincoop, 2003), and endogeneity bias (Baier and Bergstrand, 2007).

Using a panel of cross-section time-series data from 1980 to 1999 for 50 countries, our empirical results suggest three important conclusions. First, deeper agreement cause more trade than the more shallow agreements. Second, the fears of PTAs causing trade diversion effects are not confirmed. Third, our findings indicate that the endogeneity bias and the "extensive margin" omitted variable bias are strongest for the deeper agreements, especially the common market.

Section 2 will review some of the relevant literature. Section 3 will introduce the theoretical Gravity Model of Trade, followed by the empirical model specifications and a discussion of the data in Section 4. The results will be presented in Section 5. The last section concludes.

[8] Bhagwati (2008).

2. Literature Review

The literature on the gravity model is extensive to say the least. The focus here will be on a handful of papers that are relevant to the study of preferential trade agreements and their effect on trade flows. They are part of what could be called a revival of the gravity model, which has improved its theoretical specification.

The results found by estimations of the ex-post effect of preferential trade agreements on trade flows have varied and seem to rely heavily on the specification on the model. The intuitive effect of a trade agreement is an increase in trade flows, since it aims to reduce trade barriers which are negatively related to trade flows. Yet the size of this effect, has sometimes been found to be very small (as little as a 5% increases in trade flows)[9], or even statistically insignificant effects up to doubling trade within 10 years[10].

This section will focus on three recent papers (and relevant follow-ups) that directly concern the study undertaken here. These are: Anderson and van Wincoop (2003) (from now on referred to as AvW2003), Helpman, Melitz and Rubinstein (2008) (HMR2008) and Baier and Bergstrand (2007) (BB2007).

The major improvement in the specification of the gravity model has been the introduction of multilateral trade resistance terms. Representing resistance to trade with all trading partners, they put bilateral trade resistance (and our PTA dummies) into a new perspective. We follow the specifications of Anderson and van Wincoop (2003) and the extension to panel data by Baldwin and Taglioni (2006). They helped to solve the so-called Border Puzzle, forwarded by McCallum (1995), which was a strong overestimation of bilateral trade resistance. The study of PTA's is strongly susceptible to endogeneity bias of the variable of interest and bilateral trade flows. This has been well-documented in the literature (Baier and Bergstrand, 2007;

[9] Baldwin and Taglioni (2006).
[10] Baier and Bergstrand (2007).

Magee, 2003; Trefler, 1993). Whereas earlier work drew on instrumental variable techniques to solve this problem, we now have panel data at hand.

Baier and Bergstrand (2004), claim to be the first authors to estimate the probability of two countries signing a PTA. They find that factors that contribute to welfare gains by a PTA increase the likelihood of countries signing a PTA. Incidentally these are similar to those factor that determine trade flows, such as geographic distance, remoteness of the pair to the rest of the world, larger and more similar GDPs of the two countries, differences in the capital/labor ratios of the countries, and the difference in these ratios relative to the rest of the world.[11] Using this set of variables they correctly predict just shy of 90% of PTAs in place at the time. In general, they claim, countries have "chosen well" when entering PTAs. Additional to these economic determinants, there also exists a political economy of PTA determination, which is summarized by Magee (2003). He finds that economies are more likely to select into PTAs if they are both democracies and are on the same side of the world median of the capital/labor ratio and also if they are natural trading partners.

These findings raise doubts on the causality of preferential trade agreements. Do PTAs cause trade, or does trade cause PTAs. The intuition is simple, countries which trade a lot with each other are intuitively more inclined to lower barriers to trade, so that they can take advantage of cheaper imports and reap welfare gains.

BB2007 also point out that this endogeneity could be due to domestic regulations in the countries. They argue that restrictive domestic regulations can also affect the decision to enter a PTA since this is an opportunity to harmonize them and so make them less restrictive.

Whereas Magee (2003) is limited to using instrumental variable techniques to address the issues of endogeneity since his data is cross-sectional, panel data has some distinct advantages in dealing with this reverse causality. By assuming that the underlying reasons for countries being "natural" trading partners (for example contiguity, common language and a low

[11] Page 30 BB2004.

geographic greater circle distance between them) are time-constant in nature, using fixed effect regressions can wipe out this endogeneity. This is preferred to instrumental variable techniques since they rely heavily on the instruments used. BB2007 therefore argue that the determinants of PTAs are most likely to be cross-sectional in nature, and good instruments are often, and also in the case here, hard to come by. Domestic regulations on the other hand are not always time-constant. Thinking back to AvW2003 and the multilateral trade resistance, it is plausible to think that domestic regulations can be an unobserved component of the MTRs. High levels of regulation, such as stiff competition laws, high product standards, rigid labor markets, restrictive internal shipping regulations and the like will affect trade with all countries. Hence controlling for the MTRs will also control for this "new" endogeneity issue raised by BB2007. There could also be an unobserved component that is pair-specific time-variant, such as the difference in domestic regulations between two countries. Since wiping out this heterogeneity would also wipe out the PTA dummy, we unfortunately cannot control for this.

All authors that have addressed the issue of endogeneity in the study of PTAs or NTBs have found that the effect eliminating or at least reducing the endogeneity pushes coefficients upwards. The endogeneity bias is therefore *downward*. In this study there is a differentiation between the types of trade agreements according to depth. We therefore surmise that the estimated effects of deeper agreements are more likely to be affected by endogeneity bias, for all of the reasons above. The stronger trade-relations are between countries the higher are the gains by deeper integration.

Finally, HMR2008 proposed a new method for incorporating the so-called extensive margin of trade into the gravity model. This method is based on a dynamic industry model forwarded by Melitz (2003) which allowed for firm-level heterogeneity in a trade model based on monopolistic competition by the likes of Krugman (1980). Melitz devised a model which could explain the entry and exit of firms in the domestic and exporting sector, with explicit

modeling of firm productivity. In order to profitably export, firms have to be able to cover the fixed costs of trade with their revenues. Later, HMR2008 showed that the factors entry and exit in and out of the exporting sector has an effect on the volume of trade between countries. This was done with a two-step empirical model that can exploit differences in firm-level productivity without actually needing firm-level data. This has some important implications for the estimation of a gravity model. First of all it allows for the presence of zero trade flows between countries. This had previously found consideration by Silva and Tenreyro (2006). Zero trade flows between countries can occur quite often, especially between developing countries. The same factors that explain positive trade flows should be able to explain zero trade flows also; not considering them will therefore leave out a considerable amount of information when empirically estimating a gravity model, and make the results also susceptible to sample selection bias. Some unobserved heterogeneity not covered by the extensive margin may remain and determine selection into positive trade flows. With the explicit introduction of firm-productivity and fixed costs of trade, it is possible that countries do not trade, because no firm can profitably export to foreign markets given the country characteristics and costs of trade. Other work on the exporting sector, by Roberts and Tybout (1995) for example, find that firms face considerably large sunk (or fixed) costs of trade. In previous estimations of the gravity models, such as in AvW2003, the costs of trade all enter into the price, and are so passed on to the importer. However, as in production some costs are necessarily sunk to enter a market. The export market is no different.

When estimating variables related to trade barriers there is omitted variable bias if the extensive margin is not controlled for. HMR2008 show that preferential trade agreements have a statistically significant effect on the extensive margin as well as on the volume of trade between countries. In a follow-up paper by Martinez-Zarzoso et al (2009) the effect of the EU is increased compared to the same specification without the extensive margin.

One must note that HMR2008 use a cross-section of countries, here we will apply the same method to our panel data set.

When controlling for the extensive margin of trade, the multilateral trade resistance terms, and the endogeneity bias we expect to find satisfyingly accurate estimates treatment effects of the different types of PTAs. As mentioned above the problem of endogeneity is expected to be larger for the deeper trade agreements. Similarly, the bias due to omission of the extensive margin is assumed to be larger for the deeper agreements, since the deeper agreements are expected to have a larger effect on the fixed costs of trade such as legal and regulatory or language costs.

When studying the trade effects of PTAs it is essential to refer to what Viner (1950) called the trade creation and trade diversion effects. Carrère (2006) proposes a set of dummies to capture these trade creation and diversion effects, these will be introduced in Section 4.

3. The Gravity Model of Trade

The gravity model of trade is the most relied on model to study the pattern of international trade flows. It has a long history dating back to the 1950's and 1960's when it was used by Tinbergen (1962) to study the trade effects of the European Community. It lends its name from Newtonian gravity theory, because of its similar form, which can be rewritten for trade in a very simplified way as:

$$X_{ij} = G\frac{Y_i Y_j}{D_{ij}} \tag{1}$$

On the left hand side of the equation is the trade flow between two economies i and j. Y_i and Y_j stand for the size of the economies (GDP) and D_{ij} is the distance between the two. The larger the distance the lower the bilateral trade-flow, and the larger the economies, the larger the trade flows, depending on a factor of proportionality G. If one thinks of the two economies as masses the analogy to the physical gravity theory is obvious. G is a gravitational

(un)constant which can stand for any sort of trade resistance factors.There will be trade from i to j and vice-versa.

The major advantage of the gravity model has proven to be its strong fit to the data, even in its early applications where a theoretical justification was still lacking. Its explanatory power for international trade flows is high; R-squares of around 70% are common. Further, it can be applied when assuming different underlying theories of trade and because of this it should not be used to determine which theory works best.[12] Since Anderson (1979) there has been an increasingly better theoretical foundation of the gravity model. Since then almost all work using the gravity model has included price terms that incorporate equilibrium conditions of the trading countries.

First let us turn to monopolistic competition that is underlying theory for the gravity model as applied here. The "new trade theory" as formed by Krugman 1980, is based on the monopolistic competition models of Dixit and Stiglitz (1977). Krugman showed that under monopolistic competition there can be welfare gains by trade due to economies of scale, and a love of variety by consumers. Through trade firms can take advantage of bigger markets and drive down their average costs, whereas consumers have a larger spectrum of goods to choose from.

At the heart of the gravity model is the consumer utility function. The Dixit-Stiglitz consumer utility function shows a love of variety with a constant elasticity of substitution between goods.

$$U_j = \left(\int_0^n q_j\,(k)^{\rho} dk\right)^{\frac{1}{\rho}} 0 < \rho < 1 \qquad (2)$$

Consumers in country j derive a utility U by consuming goods $q(k)$ from a continuum of goods n. Note that the number of goods available for consumption will be lower than the number of potential products. The theory only deals with the amount of goods that are

[12] Deardorff (1998).

actually produced. p is a parameter for the degree of substitution. For ease of notation, $\varepsilon = \frac{1}{(1-p)}$ will be the elasticity of substitution, which is assumed constant. This means all firms are facing the same residual demand function.

The quantity demanded for any given good k depends not only on the price, but also on the ratio of the price to the overall price-level, i.e. the relative price. This can be written as:

$$q_j(k) = \frac{p_j(k)^{-\varepsilon} Y_j}{P_j^{1-\varepsilon}} \tag{3}$$

The price level $P_j^{1-\varepsilon}$ can be expressed as

$$P_j = \left[\int_0^n p(k)^{1-\varepsilon} dk\right]^{\frac{1}{1-\varepsilon}} \tag{4}$$

It is so determined by the prices of all goods consumed in a country. Some of the products are produced in the home country whereas others are imported, implying that i could be equal to$j$. Since each country has a different set of firms, and each firm produces a distinct variety there are $\sum_{j=1}^{J} N_j$ firms or varieties. The share of the importing countries income spent on goods from the exporter so depends on the price of the imported good relative to the price level present in importing country.

Looking at the production side we can now form the price of the product as it leaves the producer. It is assumed that firms use only one factor of production, labor[13]. The costs of labor are country specific and are so the same for all companies. Due to monopolistic competition each producer can sell his distinct product with a mark-up. This depends on the elasticity of substitution, α. The mark-up is smaller the larger is the demand elasticity. A high demand-elasticity means consumers will react more to changes in prices which will force firms to charge a lower mark-up. The mark-up is often assumed to be one for ease of notation. The price charged when a good leaves the producer is therefore given by $p_j(k) = \frac{c_j}{\alpha}$.

[13] As in Krugman 1980.

When a good is traded, the trade costs must be added. The so-called landed price of the good, as it reaches the consumer in the destination market is $p_j(k) = \tau_{ij}\frac{c_j}{\alpha}$.[14] Trade costs therefore follow the melting iceberg specification in that τ_{ij} goods must be exported in order for one to arrive. For example internal trade (no trade costs) would show $\tau_{ij} = \tau_{ii} = 1$.

The gravity model is basically an expenditure function, in which the expenditure of a foreign country (as a share of its total expenditure) on the goods of the domestic country are matched with the prices and quantities offered. This is given by the market clearing condition, where $Y_j = \sum_n p_{ij}\, x_{ij}$ is the income of j, which must equal the revenues of all produced goods, given that i can be equal to j; only a fraction thereof is sold overseas. This fraction is determined by the share of expenditure of the importer as in the above demand function.

Multiplying by the amount of firms or varieties N_j allows us to drop the summation sign and we get aggregate bilateral trade which will be given by M_{ij}.

$$M_{ij} = \frac{Y_i Y_j}{Y_W} \frac{\left(\frac{\tau_{ij}}{P_i}\right)^{1-\varepsilon} V_{ij}}{\sum_{h=1}^{J}\left(\frac{\tau_{hj}}{P_h}\right)^{1-\varepsilon} V_{hj} s_h} \tag{5}$$

This is the gravity model as it will be estimated. V_{ij} is equal to unity if there is trade between the two countries and zero if not, following Helpman et al (2008). It is determined by a firm profit function à la Melitz 2003, and is shown below. This equation is the same as in HMR2008. It is a more flexible version than the one presented in AvW2003, and is therefore preferred. HMR2008 show how the above is also valid under the symmetry assumption of bilateral trade barriers to be the same as the simplified gravity model presented in AvW2003.

3.1 Multilateral Trade Resistance

MTRs capture the resistance of a country to trade with all countries. Some countries are more likely to trade than others given their economic conditions, and apart from geographic aspects. MTRs can be expressed as the country's price level:

[14] In AvW2003 the mark-up is set as one, which is plausible since under monopolistic in the long-run profits=average costs due to free entry and exit.

$$\left(P_j\right)^{1-\varepsilon} = \sum_i \theta_i \left(\frac{\tau_{ij}}{P_i}\right)^{1-\varepsilon}, \text{ where } \theta_i = \frac{Y_i}{Y_w} \quad (6)$$

and,

$$(P_i)^{1-\varepsilon} = \sum_j \theta_i \left(\frac{\tau_{ij}}{P_j}\right)^{1-\varepsilon}, \text{ where } \theta_j = \frac{Y_j}{Y_w} \quad (7)$$

Trade between all countries is therefore subject to these equilibrium conditions. According to AvW2003, given their gravity model trade can be decomposed into three components. The bilateral resistance between country i and j, which are the trade costs τ_{ijt} and the resistance of i to trade with all countries, and the resistance of country j to all countries. This can be written as,

$$M_{ij}\left(\varphi_i \varphi_j \varphi_{ij}\right)^{1-\varepsilon} \quad (8)$$

This is somewhat limited since it implies that zero trade flows would be due to one of these trade barriers being infinite. This can hardly be the case. In order to define V_{ij} , which can explain the existence of zero trade flows we will now turn to define the extensive margin of trade.

3.2 The extensive margin of trade

HMR2008 and Melitz (2003) add an additional parameter which varies over firms. The price of good k, as it leaves production in their specification is given by $p_{ij}\tau_{ij}\frac{c_j a}{\alpha}$, where α is the number of input bundles used in order to produce one unit. This number of input bundles determines the productivity of firms, which can be written as $1/a$. The productivity is firm specific and relative to the other firms present in that country; it assumed to be known by the firm.[15] Following a relevant literature the distribution of firm productivity in industries is given by a pareto distribution truncated at zero. This represented here by the cumulative distribution function $G(a)$ subject to the lower and upper bounds, $[a_L, a_H]$. This distribution is assumed to be the same in all countries. Note that productivity is time-constant, since they

[15] Since we are only dealing with the selection into export markets, not selection into production from scratch, firms are already in production and so have gained knowledge of their productivity.

draw from the distribution only once, when they started production, and they then make their decision to export.[16]

We can so define firm profits as

$$\pi_{ij}(a) = (1-\alpha)\left(\frac{\tau_{ij}c_j a}{\alpha P_i}\right)^{1-\varepsilon} Y_i - c_j f_{ij} \quad (9)$$

Note that fixed costs of trade $c_j f_{ij}$ enter explicitly. Firm specific profits and revenues compared to other firms depend *only* on the firm's productivity[17].

The term $(1-\alpha)\left(\frac{\tau_{ij}c_j a}{\alpha P_i}\right)^{1-\varepsilon} Y_i$ gives revenues[18]. When a good is sold in the domestic market these fixed costs equal zero, $f_{jj} = 0$. This means all firms eligible to export are selling in the home market, since they will all be able to earn positive profits. Firms with higher productivity can produce the same product at a lower cost, or a product of higher quality at equal costs compared to other firms. More productive firms will therefore be more likely to cover the fixed costs that are necessarily sunk to break into a foreign market. This is in line with the empirical findings of Pavcnic (2001). Rearranging (9) and setting it equal to zero,

$$(1-\alpha)\left(\frac{\tau_{ij}c_j a_{ij}}{\alpha P_i}\right)^{1-\varepsilon} Y_i = c_j f_{ij} \quad (10)$$

shows that there exists a cut-off productivity $\frac{1}{a_{ij}}$ at which a firm exactly breaks-even by exporting. All firms with a productivity higher than $\frac{1}{a_{ij}}$ will profitably serve the foreign markets; they will be able to cover the fixed trade costs with their revenues and earn positive profits. The cut-off productivity is determined by the country characteristics of the importer and exporter and bilateral trade costs as well as income of the importer.

This also means that there will only be trade when $a_{ijt} \leq a_L$, meaning that the cut-off productivity is included in the range of productivities. It could be that some of the trade costs are so prohibitive and the cost characteristics of the exporter are so high, that the cut-off

[16] Melitz (2003).
[17] Melitz (2003).
[18] It is equivalent toPQ, where Y_i is the expenditure of the importing country.

productivity is well out of range. Given the below choice diagram this can explain the existence of zero trade flows.

$$V_{ij} = \begin{cases} \int_{a_L}^{a_{ij}} a^{1-\varepsilon} dG(a), \text{if } a_{ij} \geq a_L \\ 0 \quad \text{otherwise} \end{cases} \tag{11}$$

Notably different to previous specifications of the gravity model we see here an introduction of the fixed costs of trade, and that these are important in determining the profitability of companies entering the exporting sector. In AvW2003 all trade costs, be they fixed or variable, enter into the price, and so are passed on from the exporter to the importer who pays for the good. In HMR2008, only variable trade costs enter into the price term. As we saw in the section on trade costs and in the literature, fixed costs of trade can be high. Especially when taking notice of domestic barriers to trade. This model is therefore the preferred choice.

Having introduced the theoretical basis of this study we will now turn to the empirical specifications that will provide us with some results on the role of preferential trade agreements in determining trade.

4. Model specification and empirical estimation

The above theory leaves us with the following gravity equation, presented here in its multiplicative form:

$$X_{ijt} = \alpha_0 Y_{it}^{\alpha_1} Y_{jt}^{\alpha_2} POP_{it}^{\alpha_3} POP_{jt}^{\alpha_4} DIST_{ij}^{\alpha_5} T_{ijt}^{\alpha_5} u_{ijt} \tag{12}$$

Y_{it} and Y_{jt} are the incomes of the importing and exporting countries respectively. A higher GDP of the exporter is likely to increase trade, since the level of production is higher, and there are so more goods available for exporting. The GDP of the importing country is also likely to have a positive effect on trade flows, since the importing country has more buying power and so the demand level is higher. The traditional estimates of Y_{it} and Y_{jt} on the flow of goods is somewhere close to unity. The POP_{it} and POP_{jt} terms capture the effect of the populations size of the exporting and importing countries. Population size can affect the

capital/labor ratio of countries, which can determine trade flows. Countries with large populations tend to have a low capital to labor ratios, which can determine the structure of trade and can either have a positive or negative effect. Large countries are likely to engage more in internal trade, and are not so dependent on international trade as for example small countries. T_{ijt} is a variable related to any other trade frictions.

Correct modeling of trade costs is essential for proper estimation of the effects of reducing trade barriers, such as PTAs, since otherwise these trade costs will enter into the error term making $E(PTA, u_{ij}) \neq 0$, causing a bias in the estimated coefficients. Here only the log of distance is included since it often used to proxy for all variable trade costs, when the melting iceberg specification is used. All other trade costs factors enter into T_{ijt}, for now.

Standard in gravity model work is also the inclusion of a common language dummy (equal to 1 if both countries share the same official language), a colony dummy (equal to one if they were ever in a colonial relationship), and a contiguity or adjacency dummy (equal to one if two countries share a common national border). They aim to capture language, cultural and geographic trade costs respectively. Sometimes a landlocked variable is included, which is one if goods must cross at least one national border before they can reach a port of sea. An island dummy can also be included which is equal to unity if a country is an island state, or religion dummies that indicate whether two countries share the same religion and also capture cultural effects on trade. Most of these variables are time-invariant in nature, and as the preferred model eliminates all time fixed heterogeneity this makes them inestimable. This study does not set out to estimate the effects of being an island state, or a landlocked country on trade flows, and so we will only maintain the four aforementioned standard gravity model dummies.

4.1 Regional Trade Agreements and their economic effects

Central to this paper is the differentiation between the types of regional trade agreements. There are four general types of agreements that are available to policy makers as defined by the WTO: Partial Scope, Free Trade Agreement (FTA), Economic Integration Agreement (EIA) and Customs Union. A partial scope agreement involves a reduction in tariffs and non-tariff barriers that only covers a limited range of goods. It is not expected to have a very large effect on aggregate trade flows, and will not be considered further here. An example is the South Pacific Regional Trade and Economic Cooperation Agreement (SPARTECA).

A FTA is the most straightforward regional trade arrangement. It is often signed by only two countries and only covers trade in goods. It is defined in the GATT under Article 8 i) which states that "*duties and other restrictive regulations of commerce (…) are eliminated with respect to substantially all the trade between the constituent territories of or free trade area or at least with respect to substantially all the trade in products originating in such territories."* This means all tariff and non-tariff barriers are removed between the contracting parties. Substantial product coverage usually refers to about 80% - 90%, where some sensitive industries can be left out. FTAs are easier to negotiate than an EIA or CU (explained below). Often countries enter into FTAs because of complementary good availability, like for example raw materials and high tech goods. This way one country can secure raw materials that it might not have itself whilst the other can import technology it cannot locally produce. An EIA relates to trade in services and is often signed together with an agreement covering trade in goods, or builds on such an agreement that is already in place. An EIA includes directives on the movement of people, financial services, and telecommunications[19].

"…economic integration agreements (EIAs) may be defined as agreements that facilitate international trade and cross-border movement of the factors of production[20]."

[19] GATS 1994

[20] Investment Provisions in Economic Integration Agreements UNCTAD

We hypothesize that these can also affect costs of trade in *goods*, by facilitating knowledge of foreign markets and business practices across national borders. By being closer to the destination market it will be easier (and cheaper) to adapt products to that market, learn about new regulations, take advantage of local knowledge and increase security of investments. Production could still be occurring at home, and only some internal services would be relocated abroad. Especially the free movement of capital will facilitate relations. It enables foreign direct investment, which allows the establishment of foreign offices, and supplier industries to name a few. Companies can also invest in their own distribution networks, and easily outsource other supplier services. In this way, an EIA is expected to address trade costs that arise from behind-the-border regulations, more than an agreement only covering trade in goods. Finally, a customs union is defined under GATT Article 8 in the same way as a free trade area, differing only in the respect that includes the creation of common external tariff. Article 8 ii): *"…substantially the same duties and other regulations of commerce are applied by each of the members of the union to the trade of territories not included in the union;"*

In this way it has a stronger regional emphasis in that trade policies toward third countries must be aligned with the other nations. This requires the creation of supra-national institutions to coordinate such policies. Fears exist that if countries maintain their individual trade policies to third countries goods will be exported to one-member country with lower external tariffs and from there be sent over the "free" border to the intended destination market of another member, thereby saving on duties. This is dealt with in rules of origins directives, which are sometimes difficult to implement, or by a common external tariff. Apart from that, within the union, there is a focus on the reduction of tariff and non-tariff barriers.

Having introduced the different types of trade agreements that are notified to the WTO, it should be noted that in reality there may be combinations, especially of agreements covering trade in goods and agreements covering trade in services. NAFTA is an example of this. It is a FTA under GATT Art XXIV combined with an EIA according to GATS Art. V. This

constitutes a much stronger integration between the contracting parties that simply an agreement in the trade in goods. Whilst keeping sovereignty over trade policy towards non-members this constitutes the creation of common internal market. This will be referred to as a *deep FTA*. When there is free movement of goods, persons, capital and services *and* a common external tariff one can speak of a *common market*. Deep FTAs and Common Markets entail the so-called four freedoms; the free movement of goods, capital, persons and services.

Finally there are also economic and *monetary* unions. Currently the EU is such an agreement, but since the data only spans until 1999, this will not receive any treatment. For a study of the effect of currency unions we refer to Rose (2000).

The terms Free Trade Agreement, or Economic Integration Agreement are used extensively in the literature, and at times their meanings are ambiguous. Some studies which address FTAs, have however included all types of preferential trade agreements. The definitions given in this section will apply throughout; they are summarized in Table 1.

Table 1. Classification of Regional Integration Agreements

The specific agreements and their members and also what type of agreements they are, are listed in Appendix B.

In our empirical model, the PTA_{ijt} variable represents a set of dummies set to unity when both the importer and exporter are in some sort of preferential trade agreement.

$$PTA_{ijt} = \sum(CM_{ijt}, CU_{ijt}, FTAd_{ijt}, FTA_{ijt}), \tag{13}$$

according to the classification in Table 1. Partial scope agreements have been left out, since they do not apply to aggregate trade. Some preliminary results had shown highly insignificant coefficients, which was expected.

Apart from capturing the intra-bloc trade effects, the study of the preferential trade agreements ever since Viner's work in 1950 should include trade creation and trade diversion effects caused by regional trading blocs. As proposed by Carrére 2006, and amongst others

before her by Limao and Venables 2001 the Vinerian effects of trade creation and trade diversion can be quite easily captured by a set of dummies.

The lowering of trade costs (and therefore prices of imported goods) between selected groups of countries are likely to change the structure of trade in the global trading system. The analysis here will refer to trade between two countries in the agreement, and a third non-member country, which is akin to the rest of the world.

The set of dummies that can capture trade creation and trade diversion effects is composed of three separate sets.

$$\ln(X_{ij}) = \Psi_{ij} + \sum_n \gamma_I PTA_{ij} + \sum_n \gamma_M PTA_{hi} + \sum_n \gamma_X PTA_{jh} \quad (14)$$

Where Ψ_{ij} is a vector of all other RHS variables used in the gravity, but omitted here for simplicity. PTA_{ij} is set to unity if the trading partners i and j are in the same trading bloc and is otherwise 0. The dummy PTA_{hi} is set to 1 if the importer i is in a trading bloc but the trading partner h is not and is otherwise 0. The variable PTA_{jh} is 1 if j is in a trading bloc but its trading partner k not and is otherwise zero. The dummies refer to intra bloc trade $\sum_n \gamma_I PTA_{ij}$, importer effects $\sum_n \gamma_M PTA_{jh}$ and exporter effects $\sum_n \gamma_X PTA_{hi}$. The subscripts: I, $M$and X stand for intra-bloc, imports and exports. The signs of these coefficients can give insight on the trade creation and diversion effects of PTA's.

If the coefficient on intra bloc trade is positive, this means there is more trade within the bloc compared to the reference. This can either be due to domestically produced goods for any given member country, or at the expense of imports from 3rd countries, given the same level of consumption. If there are positive intra-bloc trade effects and positive extra-bloc import effects this means there is trade creation of imports. However, if $\gamma_I > 0$and $\gamma_M < 0$ there is trade creation and diversion. Trade creation and trade diversion can be a contraction of imports from outside the region and an expansion of exports, or vice versa. The welfare gains will be determined by this. If the increase in γ_I is larger than the decrease in γ_M, the higher

level of trade within the bloc was at the expense of imports from the RoW. If the decrease in extra bloc imports offsets the increase in intra bloc trade $\gamma_I < (-\gamma_M)$ one can speak of pure trade diversion of imports. If $\gamma_I > 0$and $\gamma_X > 0$ there is trade creation of exports. If however $\gamma_X < 0$ then there is trade creation together with export diversion, so long as the negative export to RoW effect is smaller than the positive intra-bloc effect. It is likely that exports from a given country inside the bloc are now sold within the bloc and not to 3rd countries. This is a welfare loss for non-members. If this is not the case then there is only export diversion. This latter case would be a decrease in welfare for the non-member countries. Their imports from countries now within the bloc have decreased. The PTA_{ijt} dummy will in the following refer to this entire set of dummies, including the exporter and import dummies.

4.2 A short note on unobserved heterogeneity and measurement error bias

More difficult to model are the mentioned regulatory barriers, tariffs, and NTBs. Apart from tariff data they are largely unobserved; even tariffs are difficult to measure. More importantly they are correlated with the PTA dummies. In using panel data we have more opportunity to control for unobserved heterogeneity.

In the literature review we have identified three different types of heterogeneity that may cause biased estimates. These are time-constant heterogeneity $\mathfrak{C}_i$, country and time heterogeneity $\mathfrak{D}_{it}^1$ and $\mathfrak{D}_{jt}^2$, time-variant pair specific heterogeneity $\mathfrak{F}_{ijt}$ and time-variant heterogeneity that affects all countries and pairs $\mathfrak{R}_t$. Anything time-constant that is specific to the individuals (here trading pairs) will difference out of the equation when using fixed effects. The country and time heterogeneity, which includes the MTRs and domestic regulations, will remain, but can be controlled for by the set of interaction dummies proposed by Baldwin and Taglioni (2006). The time-variant heterogeneity can be controlled for with time dummies. This leaves pair specific time-varying heterogeneity remaining. Some of which could be unobserved, such as bilateral regulations (not domestic regulations). However

variation of this type will also include the PTA dummies, so removing this also would not allow us to estimate the variables of interest. However regulations that are specifically directed at one trading partner are not expected to be very common.

A further bias that can occur is a measurement bias of the variables of interest. This received some mention in BB2007. PTAs need not necessarily be strongly correlated with the underlying policy barriers that they are trying to measure. There are many examples for this; a well documented one has been the case of MERCOSUR[21]. The formal signing of a trade agreement will not automatically implement all of its directives and so decrease the trade costs they intend to decrease. Rather the signing of a preferential trade agreement is merely a formal commitment to doing so. Although there are legal constraints on non-compliance these are as is often the case in international issues difficult to implement. This is made even worse if none of contracting nations' governments show a will to do so. Governments and other agents can often find ways to surpass the directives of PTAs, and use health or environment standards to "boycott" certain imports. The date of entry-into-force of the trade agreement as notified by the WTO will not always mean that all of these barriers will disappear in that year. They may never disappear at all or it could be that regulations and tariffs have been adjusted beforehand, and the notification of the agreement is merely a formality. Head and Mayer (2000) find that border barriers within the European Union gradually decreased from 1976-1995, rather than in 1986 alone when the Single Market Directive was introduced.[22] In the ASEAN (the Association of South East Asian Nations) community the signing of an FTA (AFTA) occurred much later than the establishment of the community. Since the stated aims of ASEAN also included economic cooperation, it is likely that some barriers to trade were already removed prior to the official creation of the Asian Free Trade Area, AFTA. These are forms of measurement error that could bias the estimates of the PTA dummies. In the latter

[21] Preusse (2001).
[22] Head and Mayer (2000).

case the effect of the PTA would be underestimated, since what it is aiming to measure has already occurred.

Another aspect is the time allowed for agreements to phase-in. PTAs entail a vast set of legal documents and provisions that in some countries can take long to put into practice. Some agreements therefore include phase-in periods in which countries are given a deadline by which the directives must be adopted. This is often the case when developing countries are involved since they might lack strong institution to do so.

Also, the knowledge of an upcoming PTA might make firms change their behavior in light of the new regulations before they are already in place. The measurement bias could therefore be upward or downward. Here the date of entry-into-force will be used as given by the WTO for the lack of a better alternative and as is common in the literature.

In some cases however, for example AFTA, the date of entry-into-force is set as 1992. Scrutinizing other sources[23] found that the actual date set was 1993, rather than 1992, and that Vietnam, and Laos Peoples Democratic Republic only entered much later, in 1995, and 1998 respectively (a third country Myanmar also accessed later, but is not in the sample). Using the 1992 date therefore led to some very strong negative effects of AFTA, which were somewhat reduced when the proper dates were used. As a check for such measurement bias we will run a separate set of regression including dummies for each of the large regional blocs in the data. The various single agreements will not be considered. Looking at the specific dummies can give hints towards measurement bias. Such measurement bias has an effect on the average treatment of the type of agreement they are a part of, it will be informative to check whether there are reasons to believe that this is the case.

[23] http://www.aseansec.org/ Internet presence of the ASEAN Community

4.3 Data

The trade data is taken from the Trade and Production database from the French Center for International Economics (CEPII) website[24]. It is largely based on the World Bank dataset by the same name. The flows were aggregated into total trade in manufactured goods, according to ISO Revision 2 standards. Gravity model variables such as distance, language and contiguity are also taken from CEPII. The GDP and population figures are taken from the World Bank Development Indicators, available on the website.[25] Both trade flows and GDP are nominal and in current $US.

There is a choice between using nominal or real GDP and trade flow data. This involves normalizing the data by the CPI of local countries (found for example in the Penn World Tables). Authors such as Baldwin and Taglioni (2006) have found no significant differences in their estimates using nominal and real data. Here we will use nominal data for both trade flows and GDP.

The data will also be subject to inflation or deflation of the local currencies. This is time-varying, so that there will be a bias in the estimates if it is not controlled for. Inflation occurs has been shown to have global trends, so this will affect all trade figures and cause spurious correlation in the data. According to Rose (2000) and Baldwin and Taglioni (2006) this is easily controlled for with the inclusion of time dummies that capture time-variation that affect all countries and trading pairs.

The panel consists of 50 countries (as listed in the Appendix) based on data availability. This unfortunately means that the former communist countries of Eastern Europe were left out, since many countries were lacking data prior to 1990. Many Eastern European countries are currently undergoing or have completed integration processes with the old EU countries (EU-15) and amongst themselves. The time period covers the years 1980-1999 in which trade

[24] http://www.cepii.fr.
[25] Worldbank.org.

liberalization enjoyed new found fame (it was the time of the Uruguay round, and considerable trade liberalization in Latin America, East Asia, and Europe where the Single Market Directive was signed). There is a total of exactly 49,000 observations. All countries are grouped into trading pairs (except of course if importer=exporter), giving 2450 pairs in total. There are only 4726 observations with zero trade flows, amounting to about 10% of the sample.

4.4 Model Specifications

Traditional estimations of the gravity model have been done using Ordinary Least Squares (OLS) on a cross-section of countries. Following the relevant literature presented earlier these results are assumed to be heavily biased since there are strong indications that in cross-sections we have strong endogeneity of PTAs. We will follow Baier and Bergstrand (2007) and make use of the panel data we have at hand. We will use pooled OLS on the entire sample to provide some first-off estimates. Pooled OLS simply uses normal OLS techniques while pooling all the data together. In this way it does not differentiate between the individual trading pairs. This means that if there are individual specific effects that are unobservable pooled OLS will be biased.[26] There is reason to believe that the natural trading partner hypothesis (the determinants of which are likely to be time-constant), the restrictiveness of regulations between countries, and other determinants of PTAs and trade that are mostly cross-sectional in nature will enter into the error term making the results biased and inconsistent. We do not expect very plausible coefficients from these preliminary regressions.

In order to address the endogeneity problem which is caused by time-constant unobserved heterogeneity, we use fixed effects regressions. Fixed effects are commonly preferred to random effects.[27] This is confirmed in the sample used here using the Hausman test. Fixed

[26] Baltagi Chapter 1.
[27] Martinez-Zarzoso et al (2009) for example.

effects will also control for the time-invariant part of Baldwin and Taglioni's (2006) "gold-medal" error.

Following Baldwin and Taglioni 2006, there are several remedies for multilateral resistance when using panel data. They are pair and time dummies, nation and time dummies, and time-varying nation dummies. The estimated model using pair and time dummies is given by:

$$lnX_{ijt} = \gamma_{ij} + \delta_t + \alpha_1 lnY_{it} + \alpha_2 lnY_{jt} + \alpha_3 lnPOP_{it} + \alpha_4 lnPOP_{jt} + \alpha_m PTA_{ijt} + u_{ijt} \quad (15)$$

Time dummies will control for all year specific effects that affect all countries and trading pairs. This includes de/inflationary effects of the currencies. In addition, the nation and time dummies on the other hand leave bilateral specific time-constant unobserved heterogeneity uncontrolled for. The most appropriate control for the MTRs according to Baldwin and Taglioni 2006 would be to use also time-varying nation dummies, i.e. interaction terms of nation and year. This completely controls for the MTRs. However, this does not allow for the estimation of any nation and year specific effects such as GDP or Population, since they themselves are country specific and time-varying. The estimated model using these country and time interaction effects can be written as such:

$$\ln (X)_{ijt} = \alpha_{ij} + \alpha_m PTA_{ijt} + \mathfrak{D}_{it}^1 + \mathfrak{D}_{jt}^2 + \epsilon_{ijt} \quad (16)$$

The major drawback is the large set of dummies that it incorporates. In total there are (2NT=2*50*20=) 2000 dummies. Since the sample contains a large amount of observations (2N(N-1)T), there are (2*50*49 *20=) 98000 degrees of freedom, which will easily suffice.

Until recently this would have provided us with the most unbiased results achievable, suggested by the literature. The final bias that will be considered here is that of omitting the extensive margin.

4.4.1 The Helpman, Melitz and Rubinstein 2-Step Model

The HMR2008 model consists of a two-step estimation. First a selection equation is estimated, which allows predictions of the probability of positive trade flows between country i and country j given the set of observables. The motivation is that the variables which determine the volume of trade are largely the same as those that determine the probability of trade between any two countries. The model suggests that country specific effects (such as the cost characteristics) should be included since there are fixed effects of importers and exporters also. They will at least capture the time invariant aspects of the cost characteristics. Since the estimation here is an expansion of HMR2008 to panel data, the inclusion of time dummies is also warranted. The vector of PTA dummies is also included.

Following Heckman (1979) and Wooldridge (2002)[28], there must be an exclusion restriction in such two step estimation methods. This is some variable that is related to the determination of a trade relationship but not to the amount to countries trade. Otherwise the system will be completely identified. We will use common language since we do not believe that the use of a common language will determine how much countries trade once a trade relationship is established. HMR2008 also use language as the exclusion restriction, as well as Martínez-Zarzoso et al (2009).

The selection equation will be estimated by a random effects probit method. Random effect method uses more information in that it also uses variation between the different pairs rather than only within the pairs. The variation of dependent variable, whether or not there are positive trade flows between the two countries, is not expected to vary much *per trading pair.*

The system is specified as such:

$$z_{ijt} = \alpha_{01} + \alpha_{11} lnY_{it} + \alpha_{21} lnY_{jt} + \alpha_{31} lnPOP_{it} + \alpha_{41} lnPOP_{jt} + \alpha_{51}\xi_j + \alpha_{61}\zeta_i + \alpha_{71} d_{ij} + \alpha_{81}\phi_{ijt} + \alpha_{m1} PTA_{ijt} + \alpha_{10} P_{jt}^{1-\varepsilon} + \alpha_{11} P_{it}^{1-\varepsilon} + u_{ijt} \quad (17)$$

[28] Chapter 10.

$$\rho_{ijt} = Pr\left(\mathfrak{T}_{ijt} = 1 | set\ of\ observables\right) = \Phi(\gamma_0^* + \xi_j^* + \zeta_i^* + \iota_t^* - \gamma^* d_{ij} - \kappa^* \phi_{ij}) \quad (18)$$

The fixed costs of trade f_{ij}, from the theoretical model will be captured by the importer and exporter fixed effects $(\xi_j^* + \zeta_i^*)$, and the pair specific fixed effects such as the log of distance, language and contiguity $(\gamma^* d_{ij} - \kappa^* \phi_{ij})$. These are expected to influence the fixed costs of trade and the variable costs of trade. The GDPs and populations of the countries will also enter into the selection equation, in the same way as in the previous specifications. $\mathfrak{T}_{ijt}$ is equal to unity if there are trade flows between country i and j. As in other sample selection models á la Heckman there is a problem of correlation between the error terms of the selection equation and the second-step gravity equation. z_{ijt} is an unobserved variable that is positive when there are positive trade flows, it is related to ρ_{ijt} . According to Helpman et al (2008), before adding z_{ijt} into the final equation it should be divided by the standard deviation from the selection equation to obtain ω_{ijt}. This will give a consistent estimation of the proportion of firms trading. The selection effect is corrected for by the inverse Mills ratio:

$$\eta_{ijt}^* = \frac{\phi(z_{ijt}^*)}{\Phi(z_{ijt}^*)} \quad (19)$$

The firm-level heterogeneity is also subsumed in the ω_{ijt}, since the probability of trade is an increasing function of the productivities of firms in a country, following Pavcniv (2001) and the model specification by Melitz (2003) and also Helpman et al (2008).

The second step gravity equation will be estimated once with nation fixed effects and time dummies, and once with nation and time interacted dummies.

$$lnM_{ijt} = \alpha_{02} + \alpha_{12} lnY_{it} + \alpha_{22} lnY_{jt} + \alpha_{32} lnPOP_{it} + \alpha_{42} lnPOP_{jt} + \lambda_j + \chi_i + \Re_t + \alpha_{72} d_{ij} + \alpha_{m2} PTA_{ijt} + \omega_{ijt} + \eta_{ijt}^* + e_{ijt} \quad (20)$$

Full consideration of the MTRs is given by:

$$lnM_{ijt} = \alpha_{03} + \mathfrak{D}_{it}^{1} + \mathfrak{D}_{jt}^{2} + \alpha_{m3}PTA_{ijt} + \omega_{ijt} + \beta_{u\eta}\eta_{ijt}^{*} + e_{ijt} \quad (21)$$

What is new compared to previous panel data regressions is the inclusion of the extensive margin ω_{ijt}. η_{ijt}^{*} is the Inverse Mills Ratio proposed by Heckman (1979).

5. Main Results

We will move along the different model specifications using a stepwise approach, gradually improving the specification. The results are listed in Table 3.

Using pooled OLS we find that the trade agreements customs union, deep FTA and common market have statistically significant and *negative* effects. FTAs are insignificant in predicting trade flows. This is obviously not what is expected. The reasons are likely to be the presence of endogeneity bias, and omitted variable bias of not considering the extensive margin. The inclusion of time dummies does not have a large effect, although the negative effects are reduced somewhat. The coefficients on standard gravity model variables like distance and contiguity are as expected. The log of distance reduces trade by about -1 (similar to what we found in the cross-section analysis). The GDP coefficients are also around unity which is suggested by the theoretical literature and what has been found by priors. Employing fixed effects and time dummies move the coefficients closer to 0. The customs union and deep FTA effect is now not statistically different from zero, hinting that these types of agreement are probably subject to some downward endogeneity bias, which has kept their effect below what it should be[29]. Completely taking care of gold-medal error of ignoring multilateral trade resistance induces some strong change in the coefficients. Whilst now the time-constant endogeneity bias and the endogeneity bias given by domestic regulations are controlled for we

[29] This was also found to be the case in Magee (2003) and BB2007.

see that the customs union and deep FTA have statistically significant positive effects on trade. These are economically large. We expect the deep FTA as well as the customs union to be particularly affected by the domestic regulation effect because of the deeper integration achieved. The common market is unaffected by the inclusion of MTRs, and its effect on trade is pushed downward again. FTAs remain insignificant.

We can see that introducing the extensive margin affects all coefficients upward. Leading to believe that there is some correlation with the amount of firms that trade and the existence of a PTA. Interestingly the effect on trade flows is pushed upward. All but the common market (which is insignificant) have a strong effect on trade now. The FTA coefficient shows the smallest effect on trade, which is consistent with the hypothesis that deeper agreement cause more trade than the more shallow agreements. The extensive margin itself enters positively and significant, although its economic effect is quite small. It is similar to the effect found in the original paper by Helpman et al (2008). There is a strong selection bias effect, which is surprising since there are not many zero trade flows in the sample.

In our preferred and final model that combines the complete inclusion of the MTRs as well as the extensive margin we find that common markets suddenly have stronger positive and statistically significant effect on trade volumes. All other types of agreements enter significantly and positively. The strongest effect, being that of a customs union, is expected to more than double trade compared to the reference group. Apart from that we see stronger effects of the deeper agreements than of the FTA, which only has a small economic effect. The Common Market effect is similar to that of the FTA, which is surprising. Post 1992 only Austria, Finland and Sweden join the common market. The EU-effect which can be seen in Appendix C, is on the other hand quite small. One reason for the Common Market effect to be so small could be that trade amongst these mainland European countries could have been largely saturated already. The extensive margin remains more or less the same in its effect.

The results confirm that the endogeneity bias and the Helpman omitted variable bias are strongest for the deeper agreements. The multilateral trade resistance correction affects all types of agreements in a similar way.

The results for the individual trading blocs are given in Appendix C. We can see that AFTA has had a strong negative effect on the bilateral trade flows within the bloc. This might pull down the FTA coefficients reported above. This could be due to the measurement error mentioned earlier.

The average treatment effect of PTAs is a 57% increase in trade ($0.57 = [e^{0.45425} - 1] * 100$), is close to the average treatment effect found by Baier and Bergstrand (2007) in their sample covering 60 years and 96 countries in Table 5 of their published paper. It is much larger than the effect found in Helpman et al 2008, leading to believe that endogeneity bias has provided for underestimated coefficients in their estimations using cross-sectional data. Our results are also comparable to Magee (2008) who found and average impact of an RTA on intra-bloc trade of 42%, although he did not considered the inclusion of the extensive margin and focused instead on the anticipatory effects of RTAs on trade.

In general we expect there to be trade creation effects within the regional bloc. The export and import effects with the RoW are not easily predicted. In general the rise in trade within the bloc should decrease trade outside the bloc.

Table 2. Gravity-panel data estimates

This effect can be reduced through increases in income which raise trade levels in general. The imports from the RoW by member countries are however more likely to decrease than the exports. Consumer within the bloc will now have goods available for lower prices from within the bloc.

The signs for import and export effects of PTAs change under the different model specifications. Looking only at results of our preferred model, the Helpman et al model with

interaction terms, we see that the fears of PTAs causing trade diversion effects are not confirmed. All but exporter effects of common markets and exporter and importer effects of deep FTAs show significant and *positive* signs, which is clear indication of trade creation effects. Although this is an indication that deeper trade agreements tend to show less trade creation effects than the more shallow agreements. The other three are insignificantly different from zero. In the specification including interaction terms, but not including the extensive margin we have negative import and export effects, but also negative intra-bloc effects. Surprising are the import and export effects for standard FTAs. Whereas the intra-bloc coefficient is significant yet economically small, and in some specifications even insignificant, the export effects are strongly significant and economically large and positive. The same counts for the import effects. We attribute this to measurement bias of the AFTA agreement, and the fact that the FTA dummies consist mostly of agreements signed between single countries, where the scope for substitution from extra-bloc trade to intra-bloc trade is not as large as in agreements that include many countries.

6. Conclusion

Previous results which showed that preferential trade agreements have positive effects on bilateral trade flows have been confirmed using our sample. Further by disseminating between the different types of agreements, we have found that the deeper agreements, customs unions, "deep" free trade agreements, and common markets have stronger effects on bilateral trade. This highlights the role of domestic regulations in international trade flows, and shows that economic integration on a regional basis provides a good platform to harmonize such policies. We have also confirmed that deeper integration agreements are especially affected by two latter biases, namely the extensive margin of trade and the endogeneity bias.

According to our results, the trade diversion effects on extra-bloc trade are lower than expected. The fears that regional blocs will create strong regional preference and harm third

countries are therefore not entirely justified, although there is still some trade diversion for the deeper agreements.

Given the proliferation of regionalism in the last decades, the study of preferential trade agreements and their effect on trade flows is bound to gain even more importance in aiding the decisions of policy makers, especially in light of the recent advances made in providing more reliable results.

As a suggestion for future research on this topic we propose the estimation of our final and preferred model using dynamic panel data techniques (preferably a dynamic two-step selection model). Also disaggregate trade data could be informative since the structure of trade is likely to differ greatly between country pairs. The structure of trade between countries is also likely to affect their decision to enter preferential trade agreements, as well as their effect on trade flows. Some studies have been undertaken using data disaggregated on a level of firms, this is a field which could yield interesting results regarding the extensive margin of trade and the role of preferential trade agreements.

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Table 1. Classification of Regional Integration Agreements

Type of Agreement	**Dummy Label**	**Removal of Tariffs & NTBs**	**Free movement of factors of production**	**Common External Tariff**
Free Trade Agreement	FTA	Yes		
Deep Free Trade Agreement	FTAd	Yes	Yes	
Customs Union	CU	Yes		Yes
Common Market	CM	Yes	Yes	Yes

Source: own figure, created by scrutinizing several sources.

Table 2. Gravity-panel data estimates

	OLS	OLS time	FE time	FE it jt	Helpman time	Helpman it jt
lnYe	1.363***	1.380***	0.176***		0.240***	
	166.077	167.643	7.612		10.207	
lnYi	0.992***	1.011***	0.646***		0.657***	
	126.513	128.366	28.352		28.856	
lnPe	-0.164***	-0.173***	3.004***		2.383***	
	-18.298	-19.366	30.933		22.979	
lnPi	-0.090***	-0.094***	1.286***		1.080***	
	-10.598	-11.043	13.732		11.409	
CM	-0.637***	-0.355***	-0.317***	-0.028	-0.129**	0.156*
	-9.827	-5.265	-7.473	-0.464	-2.819	2.503
CMe	-0.497***	-0.396***	-0.118***	-0.316***	-0.025	-0.535***
	-12.538	-9.784	-4.367	-3.909	-0.896	-6.907
CMi	-0.505***	-0.327***	-0.296***	-0.125	-0.194***	0.177*
	-13.644	-7.891	-10.301	-1.544	-6.607	2.189
CU	-0.275***	-0.353***	-0.084	0.720***	0.237***	1.010***
	-4.605	-5.882	-1.56	4.341	3.822	6.034
CUe	0.207***	0.173***	-0.324***	0.724***	-0.308***	0.694***
	5.845	4.833	-10.488	4.045	-9.968	3.887
CUi	0.351***	0.234***	0.249***	0.06	0.202***	-0.085
	10.716	6.343	8.469	0.924	6.82	-1.287
FTAd	-0.626***	-0.518***	0.009	0.441	-0.009	0.515*
	-5.16	-4.257	0.115	1.867	-0.108	2.184
FTAde	-0.318***	-0.187***	-0.062*	0.337	-0.074**	0.315
	-8.016	-4.596	-2.212	1.363	-2.622	1.275
FTAdi	-0.145***	0.001	0.059*	-0.039	0.015	-0.081
	-3.62	0.023	2.017	-0.159	0.513	-0.332
FTA	0.09	0.068	0.049	0.058	0.110*	0.146*
	1.885	1.419	1.02	0.976	2.277	2.423
FTAe	0.214***	0.230***	0.449***	0.993***	0.453***	0.924***
	9.021	9.652	20.306	15.961	20.537	14.668
FTAi	-0.195***	-0.009	0.053	0.894***	0.02	0.694***
	-8.351	-0.245	1.862	10.708	0.691	8.533
contig	0.379***	0.403***				
	7.597	8.125				
comlang	1.025***	1.052***				
	35.245	36.232				
colony	0.175***	0.119*				
	3.571	2.448				
lnD	-1.029***	-1.015***				
	-85.294	-84.269				
zhat					0.049***	0.071***
					9.788	12.213
Inverse mills					-0.492***	0.092
					-8.387	1.365
cons	-19.757***	-20.267***	-75.787***	8.637***	-63.689***	8.402***
	-106.762	-106.416	-31.322	-209.475	25.287	168.77
R2_a	0.726	0.729	0.385	0.499	0.389	0.501
N	44277	44277	44277	44277	44277	44277
ll	-87624.04	-87419.19	-60329.95	-54777.73	-60182.07	-54707.26
rmse	1.7516	1.7436	0.9726	0.8776	0.9696	0.876

Note: Y denotes GDP at current US$ and P denotes population. Ln preceding the name of a variable indicates that natural logs have been taken. CU denotes Customs Union, CM denotes Common Market, FTA denotes Free Trade Agreement, FTA denotes Free Trade Agreement, FTAd denotes Deep Free Trade Agreement, e and i denote exporter and importer, respectively. Contiguity is a dummy that takes the value of one when the trading countries share a border. Comlang_off is a dummy that takes the value of one when the trading countries share official language. D denotes physical distance between trading countries and Colony is a dummy that takes the value of one when a pair of countries has ever had a colonial relationship. Zhat is a proxy for the extensive margin of trade. *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

APPENDIX A

Table A.1

List of Countries

Argentina	El Salvador	Japan	Portugal
Australia	Finland	Korea, Rep.	Singapore
Austria	France	Kuwait	Spain
Bolivia	Germany	Lao PDR	Sweden
Brazil	Greece	Malaysia	Switzerland
Brunei Darussalam	Hong Kong, China	Mexico	Thailand
Canada	Hungary	Morocco	Tunisia
Chile	Iceland	Netherlands	United Arab Emirates
Colombia	Indonesia	New Zealand	United Kingdom
Costa Rica	Ireland	Norway	United States
Denmark	Israel	Peru	Uruguay
Ecuador	Italy	Philippines	

APPENDIX B

Agreements and accessions signed between 1980 and 2000:

-EC Treaty of Rome 1957, Customs Union and Common Market in 1992

Members prior to 1980: Belgium, Denmark, France, Germany, Ireland, Italy, Luxembourg, Netherlands, United Kingdom

Accessions:

1981: Greece

1986: Spain and Portugal

1995: Austria, Finland, Sweden

-EFTA: Norway, Switzerland, Liechtenstein, Iceland

-EEA, EIA between EFTA (excluding Switzerland) & EU members. Considered as a deep FTA, since there is a common market, yet no common external tariff

-MERCOSUR 1994: Argentina, Brazil, Paraguay, Uruguay

-CER with EIA: Australia and New Zealand. Had previously been a FTA.

-AFTA: Brunei Darussalam, Cambodia Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam

-NAFTA: Canada, USA, Mexico

Table B.1 Grouped according to type of agreement and including the agreements between single countries or single countries and regional blocs.

Common Market	Customs Union	Deep FTA	FTA
EC, post 1992	MERCOSUR (1994)	NAFTA (1994)	EFTA (1960)
	EC-Turkey (1996)	CER (1995)	AFTA (1993)
		Costa Rica & Mexico (1995)	US & Israel (1985)
		Canada & Israel (1997)	EC & Sitzerland (1972)
		Canada & Chile (1997)	EC & Iceland (1972)
		Mexico & Nicaragua (1998)	EC & Norway (1972)
		Chile & Mexico (1999)	EFTA & Turkey (1992)
		EEA (1994)	EFTA & Isreal (1992)
			Turkey & Israel (1997)
			EC & Tunisia (1999)
			EFTA & Morocco (1999)

Source: World Trade Organization RTA gateway, and internet presences of individual agreements.

APPENDIX C

Table C.1 Panel Data Estimations for single Regional Blocs

	OLS	OLS time	FE time	FE it jt	Helpman time	Helpman it jt
lnYe	1.389***	1.440***	0.161***		0.228***	
	168.264	173.171	6.803		9.541	
lnYi	1.002***	1.055***	0.592***		0.619***	
	122.174	127.481	25.606		26.716	
lnPe	-0.189***	-0.229***	2.962***		2.302***	
	-20.137	-24.489	30.663		22.005	
lnPi	-0.109***	-0.150***	1.263***		1.016***	
	-11.77	-16.234	13.35		10.61	
EU	-0.662***	-0.595***	0.241***	0.313***	0.417***	0.586***
	-11.117	-10.085	3.783	5.273	6.236	9.245
EUe	0.315***	0.195***	-0.028	-1.000***	0.014	-0.700**
	11.021	6.767	-0.768	-4.121	0.388	-2.965
EUi	0.238***	0.118***	0.038	1.242***	0.04	0.808***
	8.326	4.084	1.045	5.205	1.088	3.482
EFTA	1.524***	1.525***				
	9.233	9.345				
EFTAe	-0.091*	-0.186***				
	-2.275	-4.686				
EFTAi	-0.421***	-0.512***				
	-10.533	-12.917				
EEA	0.683***	0.374***	0.055	0.081	0.079	0.188***
	8.469	4.58	1.053	1.679	1.475	3.791
EEAe	-0.505***	-0.082	-0.032	0.749*	0.073*	0.374
	-12.71	-1.774	-1.048	2.556	2.333	1.279
EEAi	-0.681***	-0.259***	-0.152***	0.322	-0.037	0.296
	-17.15	-5.647	-4.97	1.106	-1.18	1.017
MERC	0.505	0.382	-0.135	-0.2	0.411	0.585**
	1.519	1.163	-0.63	-1.018	1.861	2.865
MERCe	-0.262***	0.042	-0.388***	-0.414	-0.331***	-0.009
	-3.834	0.608	-8.444	-1.62	-7.178	-0.036
MERCi	-0.415***	-0.113	0.598***	2.484***	0.573***	1.850***
	-6.042	-1.612	12.747	9.558	12.252	7.558
CER	0.843**	0.756*	-0.193	-0.225	0.532	0.830*
	2.77	2.514	-0.44	-0.563	1.204	2.042
CERe	0.362***	0.398***	0.048	0.049	0.066	0.291
	7.792	8.629	0.744	0.21	1.032	1.279
CERi	0.019	0.069	0.107	1.091***	0.064	0.792**
	0.41	1.468	1.569	4.263	0.945	3.166
AFTA	0.111	-0.062	-0.641***	-0.769***	-0.597***	-0.676***
	0.929	-0.525	-7.959	-10.381	-7.411	-9.113
AFTAe	1.094***	1.463***	0.890***	1.125***	0.907***	1.277***
	25.93	32.899	28.337	4.734	28.955	5.503
AFTAi	0.329***	0.689***	0.298***	2.397***	0.327***	1.884***
	7.738	15.442	9.443	8.313	10.308	6.637
NAFTA	0.527	0.413	0.447*	0.374*	0.808***	0.916***
	1.745	1.382	2.226	2.034	3.963	4.881
NAFTAe	-0.828***	-0.596***	0.005	1.390***	0.120**	1.483***
	-12.93	-9.168	0.119	5.56	2.721	6.08
NAFTAi	-0.365***	-0.137*	0.130**	3.061***	0.196***	2.488***
	-5.722	-2.106	2.988	12.11	4.51	10.047
contig	0.399***	0.386***				
	7.997	7.809				
comlang	1.044***	1.088***				
	35.966	37.86				

colony	0.117*	0.051				
	2.43	1.075				
lnD	-1.038***	-1.040***				
	-86.611	-87.628				
zhat					0.045***	0.070***
					8.91	13.057
Inverse mills					-0.535***	-0.124
					-9.127	-1.88
Constant	-19.777***	-19.942***	-73.392***	9.140***	-60.336***	8.873***
	-104.758	-104.832	-29.965	179.658	-23.48	153.22
R^2_a	0.7338476	0.7400529	0.3924139	0.4928667	0.3962182	0.4954643
N	44277	44277	44277	44277	44277	44277
ll	-87011.68	-86479.91	-60023.14	-55033.29	-59883.03	-54919.05
rmse	1.727313	1.707058	0.9658551	0.8824074	0.9628267	0.8801447

Note: Y denotes GDP at current US$ and P denotes population. Ln preceding the name of a variable indicates that natural logs have been taken. PTA dummies correspond to the abbreviations given in Appendix B, e and i denote exporter and importer, respectively. Contiguity is a dummy that takes the value of one when the trading countries share a border. Comlang_off is a dummy that takes the value of one when the trading countries share official language. D denotes physical distance between trading countries and Colony is a dummy that takes the value of one when a pair of countries has ever had a colonial relationship. Zhat is a proxy for the extensive margin of trade. *** p<0.01, ** p<0.05, * p<0.1. t-values reported below each coefficient.