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TRADE EFFECTS OF CONTINENTAL AND INTERCONTINENTAL PREFERENTIAL TRADE AGREEMENTS

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ABSTRACT**. **The economic geography literature calls preferential trade agreements (PTAs) that are drawn along continental lines natural, to distinguish them from intercontinental PTAs, which are called unnatural. According to the natural trading partner hypothesis trade blocs formed along continental lines offer more hope to be welfare-improving in terms of trade than trade blocs that cross different continents. This paper examines the effect on trade of continental and intercontinental PTAs. To this end, using the gravity equation we estimate trade creation and trade diversion effects of both kinds of PTAs on a sample of 182 countries over the period 1960-2005. The use of the standard panel data techniques gives support to the natural trading partner hypothesis. However, the estimation using recent developments in the econometric analysis of the gravity equation do not provide support to this hypothesis leading us to conclude that the proliferation of both kinds of PTAs (continental and intercontinental) has positive effects on trade.

KEYWORDS: international trade, natural and unnatural trading partners, preferential trade agreements.

JEL classification: F14.

Introduction

During the last two decades there has been a dramatic rise in the number of preferential trade agreements (PTAs) all over the world.[1] In the "Americas", the Common Market of the South (MERCOSUR) and the North American Free Trade Association (NAFTA) were created in 1991 and 1994, respectively, and old PTAs like the Andean Pact and the Central American Common Market (CACM) started a process of renewal in the late 1980s and early 1990s.[2] The process of regionalism has also received a revived impulse in Africa by both the creation of new regional agreements (on the basis of old ones) and the broadening and deepening of existing agreements.[3] In Europe, the European Union (EU) has experimented successive enlargements (from 12 members until 1995 to 27 in 2007) and a

[1] In the period 1948-1994, the GATT received 124 notifications of preferential trade agreements (relating to trade in goods). Since the creation of the World Trade Organization (WTO) in 1995, near 300 agreements covering trade in goods and services have been notified to the WTO (as of December 2008).
[2] Baier, Bergstrand and Vidal (2007) examine trade effects of free trade agreements in the Americas.
[3] For example, in early 1990s the West African Economic and Monetary Union (WAEMU) was created out of the *Communaute Economique de l'Afrique Occidentale*; old integration agreements were revamped like the *Union Duanière et Economique de l'Afrique Centrale*. Moreover, others, like the Common Market of Eastern and Southern Africa (COMESA) revived and expanded the preferential trade area.

deepening in the economic integration process.[4] Additionally, the European Economic Area, an agreement that entered into force in 1994, has created a Free Trade Agreement between remaining European Free Trade Association (EFTA) members (with the exception of Switzerland) and EU.[5] In Asia, the Association of the Southeast Asian Nations (ASEAN)[6] broadened from 6 to 10 countries in the 1990s, and nowadays the major countries in the region are rigorously pursuing preferential trade agreements, which may eventually lead to an Asian-wide trade bloc. Finally, Oceania has not been an exception. The Australia-New Zealand Closer Economic Relations Trade Agreement (into force since 1983) has totally eliminated tariffs and quantitative restrictions between the two countries in 1990 and business communities from both countries have proposed to extend the agreement to other Pacific Island nations.

An important feature of the aforementioned wave of regionalization is that many PTAs are continental trade blocs, *i.e.* trade blocs formed among countries on the same continent.[7] However, in recent years, there has been an increasing number of PTAs including countries located on different continents; in fact, nowadays the main trend in international economic integration is the proliferation of transcontinental trade agreements. In particular, about 30 per cent of the around 200 PTAs existing over the sample period are of the intercontinental sort. The Aghadir agreement, the Great Arab Free Trade Area, the PTAs between Israel and the US, Canada and Mexico, Jordan and Morocco, South Africa and US, New Zealand and Singapore, or Mexico and the EU are examples of PTAs that cross different continents.

The economic geography literature calls PTAs that are drawn along continental lines *natural*, to distinguish them from intercontinental PTAs, which are called *unnatural*. According to the natural trading partner hypothesis (see, for example, Wonnacott and Lutz, 1989; Krugman, 1991a; Summers, 1991; and Frankel Stein and Wei, 1995 and 1996) trade blocs formed along continental lines offer more hope to be welfare-improving in terms of trade (in the sense that trade creation dominates trade diversion) than trade blocs that cross different continents.[8] Notwithstanding, it is worth noting that trade creation may be lower than trade diversion in continental PTAs. The specialised literature refers to such continental agreements as "super-natural".[9]

Krishna (2003), using a general equilibrium model and US trade data for the period 1964-95, analyses whether regional trading arrangements are "natural" finding no support for the natural trading partner hypothesis. Moreover, a great number of studies have investigated whether economic integration agreements create or divert trade.[10] However, to the best of our knowledge, no study has tried to investigate this issue empirically distinguishing between continental and intercontinental PTAs.

[4] Austria, Finland and Sweden joined the EU in the fourth enlargement in 1995. The fifth enlargement took place in May 2004 with the inclusion of 10 new members (Cyprus, Czech Republic, Estonia, Latvia, Lithuania, Hungary, Malta, Poland, Slovakia and Slovenia) and the sixth one in January 2007 with the adhesion of Bulgaria and Romania. Moreover, in 1993 the EU celebrated the completion of the Single Market and most of their member States formed a Monetary Union in 1999.

[5] An agreement on free trade in manufactures between the EU and EFTA was in effect since 1973.

[6] ASEAN comprises Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam.

[7] All the PTAs cited until now are of this kind.

[8] Trade creation refers to the increment on trade of goods that are more efficiently produced within the bloc. Trade diversion refers to substitution of imports previously produced efficiently from non-member countries for imports sourced inefficiently by bloc members.

[9] Frankel Stein and Wei (1993, 1995 and 1996) set up a trade theory model of many countries that are grouped into continents with high trade costs across continents and low ones within them. In these papers, the term super-natural refers to a continental PTA that is welfare-reducing on net due to low intercontinental transportation costs.

[10] See, for example, Adams *et al.* (2003), Dee and Gali (2003), Ghosh and Yamarik (2004a and 2004b), Holmes (2005), Medvedev (2006), Carrère (2006), Baier and Bergstrand (2007), DeRosa (2007), Baier, Bergstrand and Vidal (2007), Gil, Llorca and Martinez-Serrano (2008a), or Lee, Park and Shin (2008).

The aim of this paper is to determine the effect on trade of both continental and intercontinental PTAs. To this end, we apply developments in the econometric analysis the gravity equation -some well-known and others more recent- to estimate trade creation and trade diversion effects for both kinds of PTAs using a sample of 182 countries over the period 1960-2005 (at five-year intervals). We attempt to answer two questions in this paper. First, are continental PTAs in the real world natural or super-natural blocs? Second, is the recent movement towards the formation of trading blocs across different continents good or bad? In addition to the academic interest of these questions, they are especially important for policy reasons. If continental PTAs are welfare enhancing on net (because large intra-continental trade creation dominates the potential intercontinental trade diversion) this evidence would provide support to the implementation of this kind of agreements. However, if continental PTAs are super-natural, policymakers should avoid such PTAs. In a similar way, if we find that intercontinental PTAs (unnatural PTAs) are welfare decreasing (because the welfare loss from intra-continental trade diversion exceeds the welfare gain from intercontinental trade creation) these should be avoided.

To preview our results, we find that despite conventional panel data techniques gives support to the natural trading partner hypothesis, recent developments in the econometric analysis of the gravity equation do not provide support to this hypothesis. It allows us to conclude that the proliferation of both kinds of PTAs (continental and intercontinental) has positive effects on trade.

The remainder of the paper is organised as follows. Section 2 summarises the background. Section 3 presents the methodology. Section 4 describes the data. Section 5 discusses the estimation results. Finally, section 6 concludes the paper.

1. Background

Pioneered by Viner (1950), international economists have studied and debated intensely the question of PTAs over near sixty years. However, as is well known, the theoretical analysis of PTAs is ambiguous on their effects on trade, welfare, as well as multilateral trade liberalization making the empirical work on PTAs critical in evaluating their effects.[11] Moreover, this theoretical ambiguity has stimulated an active discussion about conditions to ensure positive welfare effects from PTAs. In this context, since the beginning of the 1990s, the economic geography literature has analyzed the theoretical welfare gains and losses from PTAs on the base of the existence of differences in trade costs between and within continents. Such differences are a central issue of the hypothesis of "natural" trading partners with clear welfare implications.[12]

Paul Krugman's works in the early 1990s considered the two extreme assumptions about intercontinental transport costs: zero and infinite. These assumptions lead to diametrically opposite conclusions. With zero intercontinental transport costs, continental PTAs decrease welfare (Krugman, 1991b). However, when intercontinental transport costs are infinite, such agreements increase welfare (Krugman, 1991a). The intuition is immediate: to the extent that trade follows the natural lines dictated by proximity, there is no intercontinental trade to divert, and the formation of regional trading blocs is good for welfare.

[11] For a survey about the theory of PTAs see Panagariya (2000).

[12] The literature on the economic determinants of the formation of PTAs also explicitly considers intercontinental and intra-continental transportation costs among multiple countries on multiple continents (see, for example, Baier and Bergstrand, 2004; Egger and Larch, 2008).

Frankel, Stein and Wei (1993, 1995 and 1996) have investigated the continuum between zero and prohibitive transport costs. According to these authors, for the intermediate realistic case where intercontinental transportation costs are less than infinite but greater than zero, (and greater than transportation costs within continents) the relationship between intercontinental and intra-continental transportation costs determines the net impact of PTAs on welfare. For high intercontinental transport costs, continental or natural PTAs are welfare-improving, because larger intra-continental trade creation would dominate smaller intercontinental trade diversion. However, as intercontinental transport costs fall, continental PTAs may become welfare-reducing on net. As noted before, such continental trading blocs that reduce welfare are called "super-natural".[13] On the other hand, for any level of intercontinental transport costs, PTAs between countries geographically distant or on separate continents, that is, unnatural PTAs, are welfare decreasing as the welfare loss from intra-continental trade diversion exceeds the welfare gain from intercontinental trade creation.

The Krugman and Frankel, Stein and Wei theoretical results were derived in a model with the assumptions of identical economies, one factor, one industry and zero intra-continental transport costs. Moreover, the results rest on the assumptions about intercontinental transportation costs. Neither these authors nor others in the literature provide supportive evidence about the effects on trade of continental and intercontinental PTAs. Our paper is concerned with providing evidence of trade creation and trade diversion for both kinds of PTAs in the real world.

2. Methodology

The international trade literature provides two approaches to analysing the effects of PTAs: *ex ante* studies and *ex post* studies. The *ex ante* approach uses computable general equilibrium (CGE) models.[14] In contrast, *ex post* analyses of PTAs measure trade creation and trade diversion effects by means of regression techniques. In this paper, we study the *ex post* effects of both continental and intercontinental PTAs on intra and extra-bloc trade.

The gravity equation has emerged as the empirical workhorse in international trade for examining the *ex post* effects of PTAs on bilateral trade flows. It relates bilateral trade flows to economic size (GDP), distance and other factors that affect trade barriers. In order to analyse the effects of PTAs on trade using panel data, a specification like gravity equation (1) bellow is normally estimated:

$$\ln Trade_{ijt} = \beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln Dist_{ij} + \beta_4 PTAboth_{ijt} + \beta_5 PTAone_{ijt} + Othercontrols + \alpha_{ij} + \lambda_t + u_{ij} \quad (1)$$

where *i* and *j* denote trading partners, *t* is time and the variables are defined as: $Trade_{ijt}$ are the bilateral trade flows between *i* and *j*, GDP_i and GDP_j are the Gross Domestic Products, $Dist_{ij}$ denotes the distance between *i* and *j*, $PTAone_{ij}$ and $PTAboth_{ij}$ denotes dummy variables for preferential trade agreements (the suffix "*both*" indicates that *i* and *j* belong to the same

[13] Despite Frankel *et al.* model allows for transport costs within continents, for simplicity they assume that these costs are zero. This is clearly an unrealistic assumption that is not innocuous. Nitsch (1996) finds that the phenomenon of super-natural trade blocs may disappear when intra-continental transport costs are allowed for. In fact, intra-continental distances are important. The average bilateral distances are 2,259 miles within Africa, 1,891 (America), 2,511 (Asia), 1,069 (Europe) and 2,083 (Oceania).

[14] These models take into account all relative price changes and not only the partial impact on two countries' trade (disregarding the feedback effects of other price changes). One advantage of these models is that they can be used to draw direct inferences about consumption, output and welfare. However, one major limitation of CGE models is that they use restrictive assumptions and very simple characterisations of real-world PTAs.

PTA and the suffix "*one*" denotes that either *i* or *j* (but not both) is a member of a particular PTA)[15], *Othercontrols* are variables included to capture variation in various trade costs (for instance, binary variables for the presence of a common land border or the use a common language), α_{ij} represents country-pair individual effects, λ_t are time dummies, and u_{ijt} is the standard classical error term. In this set-up, the effect of PTAs on bilateral trade flows between member countries and between members and non-members is measured by the estimated coefficients of the dummy variables *PTAboth* and *PTAone*, respectively. If trade is created when both countries are members of a PTA, the estimated coefficient of the dummy variable *PTAboth* should be positive; if trade is diverted from non-members, then the estimated coefficient of *PTAone* should be negative.

Equation (1), despite being a typical specification to estimate the effect of PTAs on trade flows, ignores the theoretical foundations for the gravity equation that have developed since 1979 (see, among others, Anderson, 1979; Bersgtrand, 1985; Deardoff, 1998; Eaton and Kortum, 2002; and Anderson and van Wincoop, 2003). In particular, Anderson and van Wincoop (2003) illustrate the omitted variables bias introduced by ignoring the role of relative prices ("multilateral resistance" terms, in Anderson and van Wincoop's terminology). In cross-section, the usual method for accounting for such multilateral resistance terms is to include country fixed effects (for both the exporter and the importer) when estimating gravity equations. However, in a panel framework, Anderson and van Wincoop (2004) point out that separate country fixed effects should be included for each year as multilateral resistance terms may change over time.[16]

More recently, Helpman, Melitz and Rubinstein (2008) (henceforth HMR) have developed a theoretical model that generalizes the Anderson and van Wincoop's (2003) framework in two ways. Firstly, they account for non-observable firm heterogeneity and fixed trade costs in line with the so-called new-new trade theory (Melitz, 2003). Secondly, they account for asymmetries in the volume of bilateral exports between countries depending on the direction of export flows (including the possibility of zero trade flows in either direction or in both). Moreover, they also develop the empirical framework for estimating the gravity equation derived in their model.

Following the norm in the literature we will begin by estimating the gravity equation using conventional panel data techniques. The exact specification of the gravity equation used bellow is:

$$\begin{aligned}\ln EXP_{ijt} = {} & \beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln Dist_{ij} + \beta_4 Contiguity_{ij} \\ & + \beta_5 Island_{ij} + \beta_6 Landlooked_{ij} + \beta_7 Language_{ij} + \beta_8 Colony_{ij} \\ & + \beta_9 ComCountry_{ij} + \beta_{10} Creligion_{ij} + \beta_{13} CU_{ijt} \\ & + \beta_{14} PTAContBoth_{ijt} + \beta_{15} PTAIntercontBoth_{ijt} \\ & + \beta_{16} PTAContOne_{ijt} + \beta_{17} PTAIntercontOne_{ijt} + \alpha_{ij} + \lambda_t + u_{ijt}\end{aligned} \quad (2)$$

where *i* and *j* denote trading partners, *t* is time, and the variables are defined as follows:

[15] See, for example, Rose (2004) or Lee, Park and Shin (2008).

[16] Following Anderson and van Wincoop (2003 and 2004) and Feenstra (2004), many recent studies include country year fixed effects in the estimation of gravity equations for international trade flows. See, among others, Klein and Shambaugh (2006), Baier and Bergstrand (2007) and Gil, Llorca and Martinez-Serrano (2008a, 2008b).

X_{ijt} are the bilateral export flows from i to j at time t[17],

GDP denotes Gross Domestic Product,

$Dist_{ij}$ denotes the distance between i and j,

$Contiguity_{ij}$ is a dummy variable equal to one when i and j share a land border,

$Island_{ij}$ is the number of island nations in the pair (0, 1, or 2),

$Landlocked_{ij}$ is the number of landlocked areas in the country-pair (0, 1, or 2),

$Language_{ij}$ is a dummy variable which is unity if i and j have a common language,

$Colony_{ij}$ is a binary variable which is unity if i ever colonized j or vice versa,

$ComCountry_{ij}$ is a binary variable which is unity if i and j were part of a same county in the past,

$Creligion_{ij}$ is an index of common religion (% Protestants in country i * % Protestants in country j) + (% Catholics in country i * % Catholics in country j) + (% Muslims in Country i * % Muslims in country j),

CU_{ijt} is a binary variable which is unity if i and j use the same currency at time t,

$PTAContBoth_{ijt}$ ($PTAIntercontBoth_{ijt}$) is a binary variable which is unity if i and j belong to the same continental (intercontinental) preferential trade agreement,

$PTAContOne_{ijt}$ ($PTAIntercontOne_{ijt}$) is a binary variable which is unity if i or j (but not both) belong to the same continental (intercontinental) preferential trade agreement,

α_{ij} represents country-pair individual effects,

λ_t are time dummies, and

u_{ijt} is the standard classical error term.

Equation (2) is our benchmark specification. However, as noted before, the problem of the estimation of a gravity equation like (2) using conventional panel data techniques is twofold. Firstly, equation (2) does not account for multilateral resistance terms (Anderson and van Wincoop, 2003, 2004). Secondly, conventional regressions disregard countries that do not trade with each other (HMR, 2008). Both drawbacks may produce biased estimates. From an econometric point of view, a great part of the force of the paper rests in employing, in addition to the well-known fixed-effects and random-effects estimators for panel data, two recently developed econometric approaches. The first implies to add country year fixed effects (CYFE) for both exporter and importer countries in the gravity equation (see, for example, Baier and Bergstrand, 2007). It properly addresses multilateral resistance terms in addition to account for unobserved bilateral heterogeneity. The second approach is the two-stage estimation procedure proposed by HMR (2008) including country year fixed effects (instead of country fixed effects) in order to capture the time-varying nature of trade costs in panel data.[18] It simultaneously corrects for time-varying multilateral resistance terms, sample selection bias and unobservable firm heterogeneity. This latter approach is briefly outlined next.

HMR (2008) propose to estimate, in the first stage, a probit equation that specifies the probability that country i exports to j conditional on the observable variables. More formally, for a given time period they estimate a probit equation of the type:

$$\Pr ob(T_{ij} = 1 / observed\ \text{var}iables) = \Phi(\chi_i, \lambda_j, X_{ij}, Z_{ij}, \varepsilon_{ij}) \quad (3)$$

[17] Many authors treat the average of two-way bilateral trade as the dependent variable. However, all theories that underlie a gravity-like specification yield predictions on unidirectional bilateral trade rather than two-way bilateral trade. In this paper, we use unidirectional trade data. Hence, our specification is more closely grounded in theory.

[18] HMR (2008) applies their two stage estimation procedure to data from 1986 including in the regression exporting and importing country fixed effects. The working paper version of this article (HMR, 2007) also presented the results for a large sample that covered all the 1980s. However, they also used in these regressions country fixed effects and year fixed effects instead of country year fixed effects.

where T_{ij} is an indicator variable equal to 1 when country *i* exports to *j* and zero when it does not, Φ is the cumulative distribution function of the standard normal distribution, χ_i and λ_j are exporter and importer fixed effects, X_{ij} are variables which affect both the probability and the volume of trade, and Z_{ij} represents variables that are used for the exclusion restriction, that is, those that affect the probability of observing a positive volume of trade but do not impact the volume of trade if this were to be positive.[19]

In the second stage, predicted components of the probit regression are used to estimate the gravity equation. One of these components is the inverse of Mills ratio and the other is an expression that controls for firm size heterogeneity. In particular, the second stage consists in the estimation for a given year of the following non-linear equation for all country-pairs with positive trade flows:

$$\ln EXP_{ij} = \beta_0 + \lambda_j + \chi_i - \gamma X_{ij} + \theta \hat{\eta}^*_{ij} + \ln\left\{\exp\left[\delta(\hat{z}^*_{ij} + \hat{\eta}^*_{ij})\right] - 1\right\} + \varepsilon_{ij} \quad (4)$$

where $\hat{\eta}^*_{ij}$ is the inverse Mills ratio and $\hat{z}^*_{ij} = \Phi^{-1}(\hat{p}_{ij})$ in which $\hat{p}_{ij}$ are the estimates from the probit equation.[20] Since equation (4) is non-linear in δ, we will estimate it following HMR (2008) using maximum likelihood.

3. Data

The trade data for the dependent variable (export flows from country *i* to country *j*) come from the "Direction of Trade" (DoT) dataset developed by the International Monetary Fund (IMF). The sample covers bilateral merchandise trade between 182 countries and territories (see *Table A*) over the period 1960-2005 (at five-year intervals)**.** [21] The DoT data set provides FOB exports in US dollars. These series are converted into constant terms using the American GDP deflator taken from the Bureau of Economic Analysis (US Department of Commerce).

The independent variables come from different sources. GDP data in constant US dollars are taken from the World Development Indicators (World Bank). For location (geographical coordinates) of countries, used to calculate Great Circle Distances, and the construction of the dummy variables for physically contiguous neighbours, island and landlocked status, common language, colonial ties and common country background data are taken from the CIA's World Factbook. The indicator of currency unions is constructed from Reinhart and Rogoff (2002), CIA's World Factbook and Masson and Pattillo (2005). In order to create the indicators of preferential trade agreements, we use data from the World Trade Organization, the Preferential Trade Agreements Database (The Faculty of Law at McGill University) and the web site http://ec.europa.eu/trade/issues/bilateral/index_en.htm. More specifically, the sample includes 196 preferential trade agreements (plurilateral and bilateral), 135 at the intra-continental level and 61 including countries located at different continents.[22]

[19] In this set-up, parameter identification requires the existence of a variable that affects the probability of observing a non-zero flow between two countries but not the volume. Alternatively, a variable which affects both decisions in opposite directions would also work.
[20] Since equation (4) is non-linear in δ, we estimate it following HMR (2008) using maximum likelihood.
[21] It is noteworthy that not all the areas considered are countries in the conventional sense of the word. We also include some dependencies, territories and overseas departments in the data.
[22] The list of preferential trade agreements considered is available from the authors upon request. As noted before, the expression PTAs refers not only to preferential trade agreements but also to more profound economic integration agreements. In fact, most trade agreements considered in the sample are free trade agreements.

Table 1. Sample of countries

Albania	Dominica	Lebanon	Senegal
Algeria	Dominican Republic	Lesotho	Serbia and Montenegro
Angola	Ecuador	Liberia	Seychelles
Antigua and Barbuda	Egypt	Libya	Sierra Leone
Argentina	El Salvador	Lithuania	Singapore
Armenia	Equatorial Guinea	Macedonia	Slovak Republic
Australia	Eritrea	Madagascar	Slovenia
Austria	Estonia	Malawi	Solomon Islands
Azerbaijan	Ethiopia	Malaysia	Somalia
Bahamas	Fiji	Maldives	South Africa
Bahrain	Finland	Mali	Spain
Bangladesh	France	Malta	Sri Lanka
Barbados	French Polynesia	Mauritania	St. Kitts and Nevis
Belarus	Gabon	Mauritius	Sta. Lucia
Belgium-Luxembourg	Gambia	Mexico	St. Tome and Principe
Benin	Georgia	Moldova	St. Vincent and The Grenadines.
Bermudas	Germany	Mongolia	Sudan
Bhutan	Ghana	Morocco	Suriname
Bolivia	Greece	Mozambique	Swaziland
Bosnia and Herzegovina	Grenada	Myanmar	Sweden
Botswana	Guatemala	Namibia	Switzerland
Brazil	Guinea	Nepal	Syria
Bulgaria	Guinea Bissau	Netherlands	Tajikistan
Burkina Faso	Guyana	Netherlands Antilles	Tanzania
Burundi	Haiti	New Caledonia	Thailand
Cambodia	Honduras	New Zealand	Togo
Cameroon	Hungary	Nicaragua	Tonga
Canada	Iceland	Niger	Trinidad and Tobago
Cape Verde	India	Nigeria	Tunisia
Central African Republic	Indonesia	Norway	Turkey
Chad	Iran	Oman	Turkmenistan
Chile	Iraq	Pakistan	Uganda
China - Mainland	Ireland	Panama	Ukraine
China – Hong Kong	Israel	Papua New Guinea	United Arab Emirates
China – Macao	Italy	Paraguay	United Kingdom
Colombia	Jamaica	Peru	USA
Comoros	Japan	Philippines	Uruguay
Congo, Democratic Republic	Jordan	Poland	Uzbekistan
Congo, Republic of	Kazakhstan	Portugal	Vanuatu
Costa Rica	Kenya	Qatar	Venezuela
Croatia	Kiribati	Reunion	Vietnam
Cyprus	Korea	Romania	Yemen
Czech Republic	Kuwait	Russia	Zambia
Côte d'Ivoire	Kyrgyz Republic	Rwanda	Zimbabwe
Denmark	Laos	Samoa	
Djibouti	Latvia	Saudi Arabia	

Source: selected by the authors.

4. Empirical results

We begin by estimating the gravity equation (2) using conventional panel data estimators (random effects and fixed effects). The equation includes a full set of year-specific intercepts. This specification makes it possible to control for unobservable country-pair individual effects, as well as for idiosyncratic year-specific effects. Columns 1 and 2 in *Table 2* present the results for random and fixed effects (country-pair specific) estimations (RE and CPFE, respectively). As is well known, the random-effect model has the advantage of allowing the estimation of time-invariant variables and is more efficient when individual effects are not correlated with regressors. However, if individual effects are correlated with the explanatory variables random-effect estimates are not consistent.

The estimated coefficients of the random effects estimator are, in general, economically and statistically significant with sensible interpretations. The negative estimated coefficient of the variable common religion is the only exception. Economically larger countries trade more and more distant countries trade less. The existence of a landlocked country in the pair reduces trade, whereas sharing a common border, a common language, colonial ties, a common currency and being islands or part of the same country in the past increase trade. With regard to the variables of interest they record a positive impact on trade between members for both continental and intercontinental trade agreements, being the effect in the first kind of agreements larger than in the second. With respect to the effect on trade with third countries a small and significant positive impact is found for continental trade agreements whereas for transcontinental PTAs the estimated coefficient is negative and statistically significant.

The results for the country-pair fixed effects estimator (column 2) reveal again that continental PTAs have a larger positive impact in terms of trade than intercontinental PTAs. In particular, continental trade blocs boost trade between members and with non-members. However, intercontinental trade agreements do not create trade between partners and, at the same time, divert trade with third countries. The Hausman test, as it is usual in the literature, rejects the null hypothesis of no correlation between individual effects and explanatory variables. This result also happens in the rest of estimations reported in *Table 2*.

In summary, according to our benchmark specification trade blocs formed along continental lines offer more hope to be welfare-improving in terms of trade than trade blocs that cross different continents. But, an econometrically mis-specified model can lead to biased estimates and incorrect inferences regarding the PTAs effects on trade. Specifically, as noted earlier, equation (2) may suffer from an omitted variables bias as a result of ignoring multilateral resistance terms. In order to account for multilateral resistance we run the gravity equation including exporting and importing country year fixed effects (CYFE). Results are reported in columns (3) and (4). Once again, continental trade blocs boost trade between members and with third countries. The novelty in this case is that this result also applies for intercontinental agreements. Moreover, the impact on trade with non-members is larger for transcontinental PTAs.

All the estimations have an additional problem. In those regressions we use the sample of countries that have only positive trade flows between them. HMR (2008) argue that disregarding countries that do not trade with each other may produce biased estimates. Therefore, we also use the two stage estimation procedure suggested by HMR (2008).

Table 2. Fixed and random effect estimates of gravity equation (2). Dependent variable: log of bilateral exports. Sample period: 1960-2005 (at five-year intervals)

	(1)	(2)	(3)	(4)
Variables	RE	CPFE	RE and CYFE	CPFE and CYFE
lnY_i	1.008 (0.006)***	1.275 (0.032)***		
lnY_j	0.887 (0.006)***	1.105 (0.031)***		
Ln $Dist_{ij}$	-1.196 (0.018)***		-1.275 (0.017)***	
$Contiguity_{ij}$	0.850 (0.084)***		0.665 (0.067)***	
$Island_{ij}$	0.864 (0.071)***		0.685 (0.063)***	
$Landlocked_{ij}$	-0.421 (0.028)***		-0.721 (0.057)***	
$Language_{ij}$	0.527 (0.037)***		0.443 (0.033)***	
$Colony_{ij}$	1.517 (0.104)***		1.822 (0.085)***	
$ComCount_{ij}$	2.828 (0.153)***		2.669 (0.142)***	
$Religion_{ij}$	-0.269 (0.054)***		0.210 (0.047)***	
$CurrencyUnion_{ijt}$	0.164 (0.087)**	-0.253 (0.099)***	0.444 (0.078)***	-0.076 (0.089)
$PTAContBoth_{ijt}$	0.367 (0.028)***	0.171 (0.032)***	0.921 (0.037)***	0.317 (0.042)***
$PTAIntercontBoth_{ijt}$	0.163 (0.061)***	0.024 (0.068)	0.431 (0.067)***	0.344 (0.073)***
$PTAContOne_{ijt}$	0.012 (0.002)***	0.153 (0.003)***	0.142 (0.008)***	0.052 (0.009)***
$PTAIntercontOne_{ijt}$	-0.162 (0.022)***	-0.260 (0.026)***	0.141 (0.040)***	0.307 (0.044)***
Time dummies	Yes	Yes	No	No
R^2 (overall/within)	0.61	0.49	0.69	0.36
Test de Hausman	1,198.74 (0.000)		14,288.93 (0.000)	
No observations	85,298		98,994	

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. The regressions in columns (3) and (4) include exporting and importing country year fixed effects.

Source: compiled by the authors.

Table 3 reports the results. The estimated equations include exporting and importing country-year fixed effects. The results for the probit regression are presented in column 1. Before discussing the empirical results, it is worth noting that the estimation of equation (3) might be subject to the incidental parameter problem introducing a bias in the coefficients of the rest of variables (X_{ij} and Z_{ij}). However, as pointed out by Fernández-Val (2007), this bias does not affect the estimated marginal effects and, therefore, the predicted values obtained for the dependent variable. The estimated marginal effects are again economically and statistically significant with sensible interpretations. More distant countries are less likely to trade. In a similar way, the existence of a landlocked country in the pair reduces the probability of a trade link. On the contrary, we find that sharing a common border, a common language, a common religion, a common currency, colonial ties and being islands or part of the same country in the past increase the probability of trade.

Table 3. HMR (2008) two-stage estimation. Sample period 1960-2005 (at five-year intervals)

	(1)		(2)
Variables	Probit coefficients	Marginal effects	ML
Ln $Dist_{ij}$	-0.783 (0.012)***	-0.300 (0.005)***	-1.183 (0.025)***
$Contiguity_{ij}$	0.203 (0.069)***	0.075 (0.025)*	0.353 (0.080)***
$Island_{ij}$	0.369 (0.034)***	0.132 (0.011)***	0.548 (0.072)***
$Landlocked_{ij}$	-0.390 (0.028)***	-0.152 (0.011)***	-0.659 (0.060)***
$Language_{ij}$	0.447 (0.019)***	0.161 (0.006)***	0.437*** (0.036)
$Colony_{ij}$	0.694 (0.096)***	0.224 (0.024)***	1.314 (0.101)***
$ComCount_{ij}$	1.535 (0.199)***	0.353 (0.015)***	2.380 (0.130)***
$Religion_{ij}$	0.207 (0.026)***	0.079 (0.010)***	
$CurrencyUnion_{ijt}$	0.688 (0.113)***	0.223 (0.028)***	0.920 (0.114)***
$PTAContBoth_{ijt}$	0.997 (0.044)***	0.382 (0.017)***	0.659 (0.052)***
$PTAIntercontBoth_{ijt}$	0.375 (0.119)***	0.133 (0.038)***	0.279 (0.063)***
$PTAContOne_{ijt}$	0.309 (0.011)***	0.118 (0.004)***	0.051 (0.010)***
$PTAIntercontOne_{ijt}$	0.125 (0.041)***	0.047 (0.016)***	0.166 (0.041)***
δ			0.441 (0.033)***
$\hat{\eta}_{ij}^{*}$			1.411 (0.040)***
No observations	180,091		98,994
Pseudo R^2	0.50		

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%.The regressions include exporter and importer country-year fixed effects. Robust standard errors (clustering by country pair) are in parentheses.

Source: compiled by the authors.

Finally, focusing on the variables of interest (*PTAContBoth* and *PTAIntercontBoth*) we find that common membership in both continental and intercontinental PTAs increase the probability of trade. The estimated coefficients for the variables that measure the effect of both kinds of PTAs on trade with third countries (*PTAContOne* and *PTAIntercontOne*) are also positive and statistically significant at conventional levels.

Using the probit regression, as discussed earlier, we construct two variables for correcting sample selection bias and firm heterogeneity. The results for the second stage can be seen in column (2) of *Table 3*. The variable common religion has been excluded from the estimation for identification reasons (see the methodological section). The estimated coefficients show that all determinants that affect the probability of bilateral exports also impact bilateral export volumes. With respect to the variables of interest, at this stage, we once again find a positive and significant coefficient for both *continental* and intercontinental *PTAs* dummy variables. In particular, the estimated coefficients suggest that the positive

effect on trade between members is larger for continental blocs than for intercontinental ones. However, the opposite result applies with respect to the impact on trade with non-members.

Conclusions

One of the major international developments in the last two decades has been the dramatic rise in the number of preferential trade agreements. Most existing trade blocs are made up of countries located on the same continent. However, in recent years, there has been an increasing number of PTAs including countries located on different continents. The proliferation of PTAs has led to an increasing number of studies investigating whether PTAs are trade creating or diverting. This paper applies developments in the econometric analysis of the gravity equation, some well-known and others more recent, to estimate the effects of PTAs on trade distinguishing, for the first time, between continental and intercontinental PTAs. To this end, we use a panel of cross-section time-series data at five-year intervals from 1960 to 2005 for 182 countries.

Until recently, conventional panel data techniques were considered the most appropriate way to exploit the panel data nature of a data set for studying the *ex post* effects of PTAs on trade. Therefore, our paper begins by estimating the gravity equation using the standard random and fixed effects models. The results suggest that continental PTAs have a positive impact on trade both between members and with non-members whereas this is not the case for intercontinental PTAs. In particular, according to those estimates, transcontinental agreements do not create trade between members and, in addition, they divert trade with non-members. These results are in line with the natural trading partner hypothesis.

However, recent developments in the econometric analysis of the gravity equation have made clear that it is important to control for multilateral resistance terms and to account for the fact that there are countries in the sample that do not trade with each other. Both drawbacks of the conventional approach may generate biased estimates, as it has shown in this paper. Controlling for unobserved bilateral heterogeneity and multilateral resistance terms we find again that continental trade blocs boost trade between members and with third countries. However, with the inclusion of multilateral resistance terms, this result also applies for intercontinental agreements, being the positive impact on trade with non-members even larger for intercontinental than for continental PTAs. These findings are robust to controlling for multilateral resistance, sample selection bias and unobservable firm heterogeneity. Thus, in contrast to conventional panel data techniques, recent developments in the econometric analysis of the gravity equation do not provide support to the natural trading partner hypothesis. It leads us to conclude that the proliferation of both kinds of PTAs (continental and intercontinental agreements) has positive effects on trade.

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KONTINENTINIŲ IR TARPKONTINENTINIŲ PREFERENCINIŲ PREKYBOS SUTARČIŲ PADARINIAI PREKYBAI

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SANTRAUKA

Per praėjusius du dešimtmečius pastebėtas dramatiškas preferencinių prekybos sutarčių (PPS) skaičiaus didėjimas visame pasaulyje. Šios regionalizacijos bangos ypatybė yra, tai, kad dauguma PPS yra prekybos blokai, suformuoti tarp šalių, esančių tame pačiame kontinente. Tačiau, pastaraisiais metais svarbiausia tarptautinės ekonominės integracijos tendencija yra tarpkontinentinių prekybos sutarčių gausėjimas. Ekonominės geografijos literatūra nagrinėja PPS, kurios yra sukurtos pagal natūralias kontinentines ribas, tam, kad atskirtų juos nuo tarpkontinentinių PPS, kurias pavadina nenatūraliomis.

Remiantis natūralaus prekybos partnerio hipoteze, prekybos blokai, suformuoti pagal kontinentines ribas, turi daugiau vilties būti prekybos gerinimo šaltiniu, negu prekybos blokai, kurie kerta skirtingus kontinentus. Šis straipsnis nagrinėja padarinius prekybai, atsižvelgiant tiek į kontinentines, tiek į tarpkontinentines PPS.

REIKŠMINIAI ŽODŽIAI: tarptautinė prekyba, natūralūs ir nenatūralūs prekybos partneriai, preferencinės prekybos sutartys.