IS THERE A CONTINENTAL BIAS IN TRADE?

Salvador Gil-Pareja*
Rafael Llorca-Vivero
José Antonio Martínez-Serrano
University of Valencia

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Abstract

Geography is an important determinant of bilateral trade volumes. This paper investigates the potential existence of a *continental bias* in world trade flows on a sample of 182 countries over the period 1990-2006. Using traditional estimation techniques and recent developments in the econometric analysis of the gravity equation, we find robust evidence of an economically significant *continental bias* in trade. Further, a continent-by-continent analysis reveals that Oceania, America, Europe and Asia are behind this result, whereas for Africa the results are not conclusive.

Key words: Continental bias, gravity equation, intercontinental and intra-continental trade costs.

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*Corresponding author: Salvador Gil Pareja, Facultad de Economía, Departamento de Estructura Económica, Av. de los Naranjos s/n, C.P. 46022, Valencia, Spain. Email: Salvador.Gil-Pareja@uv.es; Tel. 34963828349. Fax 34963828354. We are extremely grateful to Marc Melitz for invaluable help with the implementation of the Helpman, Melitz and Rubinstein (2008) estimator. We also thank Silviano Esteve for valuable comments. This study is part of a research project financed by *Ministerio de Ciencia y Tecnología* (projects SEJ2006-07238/ECO and ECO2009-08181) and has been part-founded by the European Regional Development Fund (ERDF). We also thanks financial support from the Generalitat Valenciana (GVPROMETEO2009-098). A previous version of this article was published as Working Paper No 440/2009 of FUNCAS.

1. Introduction

Continental boundaries matter for policy makers. While no continental-wide trade agreement is into force, the creation of transcontinental free trade agreements has long been an ideal. Since the early 1960s, by the establishment of the Organization of African Unity, African countries where encouraged to combine their economies into sub-regional markets that would ultimately form an African-wide economic union. This goal was translated into concrete form with the signature of the African Economic Community Treaty (into force since May 1994), which establishes a 6 stage process over 34 years ending with a continent-wide economic and monetary union (and thus also a free trade area within this continent). In the Americas, the first specific plan for a hemisphere-wide trade agreement goes back to the First International Conference of the American States in 1889. The most recent attempt is the Free Trade Area of the Americas (ongoing since 1994) that would create a continental-wide free trade agreement including all democracies in the Western Hemisphere.[1] The dream of the European integration started six decades ago. Since then, the number of countries participating in the European Union (EU) has increased from 6 in the 1950s to 27 in 2007. Additionally, countries like Turkey, Croatia and Macedonia have gained candidate status whereas other European countries like Albania, Serbia and Montenegro formally have applied for membership in the EU.[2] Moreover, the European Economic Area (into force since 1994) has created a free trade agreement between remaining European Free Trade Association (EFTA) members (except Switzerland) and the EU. In Asia, the major countries in the region are rigorously pursuing preferential trade

[1] Nowadays, the successful conclusion of the negotiations among the 34 democracies participating in the Americas process remains in doubt.

[2] According to Article 49 of the Maastricht Treaty any European state that respects the principles of liberty, democracy, respect to human rights and fundamental freedoms may apply to join the EU.

agreements, which may eventually lead to an Asian-wide trade bloc.[3] In fact, there is currently intense debate in Asian policy circles about the impact of the process of Pan-Asian integration on insiders and outsiders (Francois *et al*, 2009). Finally, in Oceania, business communities have proposed to extend the Australia-New Zealand Closer Economic Relations Trade Agreement to other Pacific Island nations.

The relationship between geography and trade has long been a central topic in international economics. Since the first application of the gravity equation to international trade in the early 1960s (Tinbergen, 1962), a vast empirical literature has documented the importance of geographical variables as determinants of bilateral trade flows. In addition to the geographical distance (one of the two basic variables of the gravity models that serves to reflect transportation costs), other variables, such as adjacency (common land border), remoteness of countries, insularity, or the landlocked status of trading partners has been used to capture geographical factors influencing trade costs. An important geographical factor that may have an effect on international trade, and that has not properly been considered by the empirical literature, is the location of countries within the same continent.[4] The goal of this paper is to investigate the possible existence of a *continental bias* in trade based on differences in trade costs between and within continents.[5]

[3] The ASEAN-China agreement of November of 2004, the ASEAN-India Trade in Goods Agreement (in force since January of 2010) and the more ambitious proposals of China-India and the ASEAN+3 (ASEAN plus China, Japan and South Korea) are examples to the trend towards regionalism in Asia.

[4] Frankel, Stein and Wei (1993) also draw the boundaries at continental bloc level, but they do not consider all the countries in each continent. In their paper the continents are The Americas (including only 13 countries), the European Community (11 countries) and East Asia (10 countries).

[5]Our paper is related to another strand of the empirical gravity literature: the so-called *border effect* (*home bias*) literature, which documents that political borders contribute significantly to overall trade costs strongly diminishing inter- versus intra-national shipments. See, in addition to the seminal work by McCallum (1995), Helliwell (1996, 1997, 1998), Wei (1996), Anderson and Smith (1999a, 1999b),

The existence of differences in trade costs between continents and within them has been considered by the economic geography literature in the context of the theoretical welfare analysis of preferential trade agreements (PTAs). In particular, the relationship between intra-continental and intercontinental trade costs is a crucial element of the hypothesis of "natural" trading partners with clear theoretical welfare implications.[6] With zero intercontinental transport costs, PTAs along continental lines decrease welfare (Krugman, 1991a). With prohibitive intercontinental transport costs, such agreements increase welfare (Krugman, 1991b). However, in the intermediate realistic case where intercontinental transportation costs are neither zero nor prohibitive (but greater than transportation costs within continents) the relationship between intercontinental and intra-continental transportation costs determines the net impact of PTAs on welfare (Frankel, Stein and Wei, 1993, 1995 and 1996).

According to the hypothesis of natural trading partners, in order to limit the risk of trade diversion and the associated loss of welfare, trade blocs should be formed including countries that already traded disproportionately more in the absence of a preferential trade agreement. If there is a positive *continental bias* in trade, that is, if *ceteris paribus* countries located within the same continent trade more with each other than with countries located in other continents, countries inside a continent can be considered "natural" trading partners and, therefore, preferential trade agreements among them are more likely to be welfare-improving.[7] On the contrary, the evidence of

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Nitsch (2000), Head and Mayer (2000), Hillberry (2002), Anderson and van Wincoop (2003), Evans (2003), Chen (2004), Gil *et al* (2005), or Gil, Llorca and Martínez-Serrano (2006), among others,

[6] 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 and Egger and Larch, 2008).

[7] The term natural trading partner goes beyond pure distance arguments and, therefore, by transport costs we refer to any kind of trade costs.

a negative *continental bias* in trade would suggest that continental preferential agreements may be welfare decreasing. Continental trading blocs that reduce welfare are called "super-natural".[8]

In particular, this paper aims at answering two main questions. First, all other things equal, countries within the same continent trade more with each other than countries located on different continents? Second, are there differences in the size and sign of the *continental bias* across continents? In addition to the academic interest of these questions, they are especially important for policy reasons**.** During the last two decades there has been a dramatic rise in the number of economic integration agreements all over the world. Most of these trade and monetary agreements are continental blocs, *i.e.* blocs formed by two or more countries within the same continent.[9] Moreover, as mentioned above, there are well documented initiatives to create continental-wide free trade agreements. The analysis in this paper may shed some lights about the convenience of such sort of agreements. In particular, the existence of a positive *continental bias* in trade would both give support to the implementation of regional trading blocs along continental lines, and provide arguments in favour of transcontinental projects.

In order to explore *continental bias* in trade we estimate gravity equations using both traditional estimation techniques and two recently developed econometric approaches: the fixed effects vector decomposition technique suggested by Plümper and Troeger (2007) and the two-stage estimation procedure proposed by Helpman, Melitz

[8] 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 costs within them. According to these authors the term "super-natural" refers to a continental PTA that is welfare-reducing on net due to relatively low intercontinental transportation costs.

[9] Notwithstanding, it is worth noting that an important trend in international economic integration in recent years is the proliferation of intercontinental trade agreements.

and Rubinstein (2008). The first technique allows the estimation of the coefficient of interest controlling for time-invariant omitted bilateral variables. The second framework allows to correct for selection bias and to account for exporter heterogeneity. The sample covers 182 countries over the period 1990-2006. To preview our results, we find robust evidence of a positive *continental bias* in trade. The analysis by continents reveals that Oceania, America, Europe and Asia are behind this finding. The results for Africa are not conclusive.

The paper is structured as follows. Section 2 presents the methodology. Section 3 describes the data. Section 4 discusses the estimation results. Finally, section 5 concludes the paper.

2. Methodology

The gravity equation of trade is considered to be one of the most successful empirical frameworks in international economics. It relates bilateral trade flows to economic size (GDP), distance and other factors that affect trade barriers.[10] In particular, the literature on the *border effect* has made use of the gravity equation to estimate the size of the *home bias* in trade. In this paper, we also use that methodology to assess the existence and magnitude of the *continental bias*.

The typical gravity equation estimated in the *border effect* literature can be written as follows for any given time period:

$$\ln Trade_{ij} = \beta_0 + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 \ln Dist_{ij} + \beta_4 Home_{ij} + Othercontrols + u_{ij} \quad (1)$$

[10] Initially the gravity model lacked theoretical foundation. However, since the end of the 1970´s the situation has changed and nowadays the gravity model is backed up by sound theory. See, among others, Anderson (1979), Bergstrand (1985 and 1989), Deardoff (1998), Evenett and Keller (2002), Anderson and van Wincoop (2003) and Helpman, Melitz and Rubinstein (2008).

where $Trade_{ij}$ is the bilateral trade flow between i to j, GDP_i and GDP_j are the gross domestic products, $Dist_{ij}$ denotes the distance between i and j, $Home_{ij}$ is a dummy variable that takes the value of one for trade flows within countries and zero otherwise, and *Othercontrols* are a set of variables that are included to capture variation in various trade costs, such as binary variables for the presence of a land border, a common language or being a member of the same trade agreement. In this set-up, the *border effect* is measured by the estimated coefficient of the dummy variable *Home*.

Despite being used in many studies on the *border effect*, equation (1) is likely to be mis-specified owing to ignoring theoretical foundations for the gravity equation. As Anderson and van Wincoop (2003) emphasize (in the context of the *border effect* literature) the gravity model theory implies that the researcher must take into account the role of relative prices ("multilateral resistance", in Anderson and van Wincoop's terminology).[11] The usual solution to the presence of such multilateral resistance is to include country fixed effects (CFE) for both the exporter and the importer countries when estimating gravity equations. However, following Anderson and van Wincoop (2004), in a panel framework, separate country fixed effects should be included for each year as multilateral resistance may change over time. The specialised literature refers to these estimates as country year fixed effects (CYFE).[12]

Time-varying country dummies should completely eliminate the bias stemming from the omission of multilateral resistance terms, but CYFE do not eliminate all kinds

[11] While the methodological contribution of Anderson and van Wincoop (2003) is made trying to provide a "solution" to the border puzzle, it is indeed important for the proper estimation of gravity equations in other applications of the international trade literature.

[12] Following Anderson and van Wincoop (2004) and Feenstra (2004), several 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) or Gil, Llorca and Martínez- Serrano (2008a).

of omitted variable bias (Baldwin and Taglioni, 2006). Time-invariant omitted variables that affect bilateral trade may still bias the estimates. In other words, time-varying country dummies do not remove the bias stemming from the correlation between the determinants of bilateral trade that have been included and the determinants that are unobservable to the researcher. Recognizing this, Baldwin and Taglioni (2006), Baier and Bergstrand (2007), Gil, Llorca and Martínez-Serrano (2008b, 2008c) and Eicher and Henn (2009) argue in favour of using time-invariant pair dummies in addition to time-varying country dummies. The problem with this estimation is that until recently there was not a satisfactory way for estimating time-invariant variables once country-pair fixed effects (CPFE) are included in the regression.[13] However, nowadays it is possible to consider the estimation of time-invariant variables accounting for unobserved bilateral heterogeneity by the use of the fixed effects vector decomposition technique suggested by Plümper and Troeger (2007).

More recently, Helpman, Melitz and Rubinstein (2008) (henceforth HMR) have developed a theoretical model that generalizes the Anderson and van Wincoop (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 (from *i* to *j* versus from *j* to *i*). Moreover, they also develop the empirical framework for estimating the gravity equation derived in their model.

[13] The conventional fixed effect "within" estimator in panel data does not allow the estimation of the coefficients of bilateral time-invariant variables. Hausman and Taylor (1981) developed a method of instrumental variables that solves this problem. However, as Plümper and Troeger (2007) point out, the Hausmann-Taylor procedure, in addition to have poor small sample properties, leaves researchers with a discretionary choice about which variables are endogenous that largely influence the results.

In this paper we estimate for the first time the potential existence of a *continental bias* in trade. To this end, we estimate the following general equation:

$$\begin{aligned}\ln X_{ijt} = {} & \beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln Dist_{ij} + \beta_4 Contiguity_{ij} \\ & + \beta_5 Island_{ij} + \beta_6 Landlooked_{ij} + \beta_7 Language_{ij} + \beta_8 Colony_{ij} \\ & + \beta_9 ComCountry_{ij} + \beta_{10} Creligion_{ij} + \beta_{11} PR_{it} + \beta_{12} PR_{jt} \\ & + \beta_{13} CU_{ijt} + \beta_{14} PTA_{ijt} + \beta_{15} SameCont_{ij} + u_{ijt}\end{aligned} \tag{2}$$

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

X_{ijt} are the bilateral export flows from *i* to *j*[14],

GDP denotes Gross Domestic Product,

Dist denotes the distance between *i* and *j*,

Contiguity is a dummy variable equal to one when *i* and *j* share a land border,

Island is the number of island nations in the pair (0, 1, or 2),

Landlocked is the number of landlocked areas in the country-pair (0, 1, or 2),

Language is a dummy variable which is unity if *i* and *j* have a common language,

Colony is a binary variable which is unity if *i* ever colonized *j* or vice versa,

ComCountry is a binary variable which is unity if *i* and *j* were part of a same county in the past,

Creligion 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*),

PR is an index of political rights on a 1 to 7 scale,

CU is a binary variable which is unity if *i* and *j* use the same currency at time t,

[14] 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.

PTA is a binary variable which is unity if *i* and *j* belong to the same preferential trade agreement,

SameCont is a dummy variable that takes the value of one for country pairs located within the same continent and zero otherwise, and

u_{ijt} is the standard classical error term.

The coefficient of interest to us is β_{15}. If the trading relations between countries within the same continent are stronger than those between countries located on different continents, then the estimated coefficient of *SameCont* would be positive and statistically significant.

We follow the norm in the border effect literature and we will begin by estimating the gravity equation (2) using conventional ordinary least squares (with a full set of year-specific intercepts added). Next we will run the gravity equation using both CFE and CYFE. The strategy of using CFE sufficiently addresses multilateral resistance in a cross section but, as noted before, CYFE are required to comprehensively control for multilateral resistance in panel datasets. However, a part of the force of the paper rests in employing two additional and recently developed econometric approaches: the fixed effects vector decomposition technique suggested by Plümper and Troeger (2007), which allows us to estimate the coefficient of interest controlling for time-invariant omitted bilateral variables, and the two-stage estimation procedure proposed by HMR (2008), which allows us to correct for selection bias and to account for exporter heterogeneity. None of them have been considered by the border effect literature. Both procedures are briefly outlined next.

The fixed effect vector decomposition technique proposed by Plümper and Troeger (2007) consists of three stages. In a first stage they obtain the unit fixed effects vector (country-pair fixed effects in the context of this paper) by estimating a fixed

effect model that excludes the (bilateral in our case) time-invariant variables. In a second stage, the fixed effects vector is decomposed into a part explained by the (bilateral) time-invariant variables and an error-term. Finally, in the third stage, this error-term accounts for the unobserved (bilateral) fixed effects and, thus, captures the potential of omitted variable bias.

The HMR (2008) estimation procedure consists in two-stages. In the first stage they estimate a probit equation that specifies the probability that country *i* exports to *j* conditional on the observable variables. In the second stage, predicted components of this equation are used to estimate the gravity equation. This procedure simultaneously corrects for two types of potential biases: a Heckman selection bias and a bias from potential asymmetries in the trade flows between pairs of countries.

More formally, in a first stage they estimate a probit equation of the type:

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

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.[15] Using the probit regression, they construct two variables that are included as regressors in the second stage estimation. One is the inverse of Mills ratio and the other is an expression that controls for firm size heterogeneity. In particular, the second stage

[15] 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.

consists in the estimation for a given year of the following non-linear equation for all country-pairs with positive trade flows:

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

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.[16]

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 built up by the International Monetary Fund (IMF). The data comprise bilateral merchandise trade between 182 countries and territories (see Table A1) over the period 1990-2006.[17] The DoT dataset 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 of countries (geographical coordinates), 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, common religion and common country background data are taken from the CIA's World Factbook. Data on political rights come from Freedom in the World Comparative and

[16] Since equation (3) is non-linear in δ, following HMR (2008) we estimate it using maximum likelihood.

[17] 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.

Hisorical Data, 2009. The indicators of preferential trade agreements have been built using 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. The indicators of currency unions are taken from Reinhart and Rogoff (2002), CIA's World Factbook and Masson and Pattillo (2005). The sample includes 192 preferential trade agreements (plurilateral and bilateral) and 17 currency unions.[18]

4. Empirical results

We begin by estimating the possible existence of *continental bias* in trade using some traditional estimation techniques: OLS, CFE and CYFE. Traditional estimates of the gravity equation use data on country pairs with positive volumes of trade. The results are reported in Table 1. Columns 1 to 3 present the results using pooled OLS including year dummies. The gravity equation is run first without taking into account the existence of economic integration agreements in order to check how the estimated coefficient of the variable of interest is affected by this fact (column 1). The gravity equation works well. The estimated coefficients are, in general, economically and statistically significant with sensible interpretations. The negative effect of a common religion is the only exception. Economically larger countries trade more and more distant countries trade less. Landlocked countries trade less, whereas sharing a common border or a common language increase trade. The existence of colonial ties encourages

[18] The list of preferential trade agreements considered appears in Appendix B (Tables B1 and B2). The expression PTAs in this paper refers also to other agreements involving a higher degree of economic integration. In fact, most economic integration agreements considered in the sample are free trade agreements. The list of currency unions appears in Table B3.

trade, as do being islands or part of the same country in the past. Finally, political rights also affect positively trade.[19]

In the gravity equation framework, if there was nothing to the notion of *continental bias*, then a dummy variable capturing whether two countries are both located on the same continent ought not to be statistically significant. However, as we show in this paper, this is not the case. In column 1, the estimated coefficient of the variable of interest is positive (0.358) and statistically significant at conventional levels suggesting that being on the same continent raises bilateral trade.

Since the early 1990s there has been a proliferation of economic integration agreements all over the world. An important feature of this wave of economic integration among countries is that most trade and monetary agreements has been created along continental lines.[20] Therefore, one may think that trade policy is likely behind the existence of a *border effect* at the continental level. In order to check if it is the case, in column 2 we control for the existence of PTAs and currency unions (CUs) around the world including two additional dummy variables: one for PTAs and the other for CUs. The estimated coefficients of both variables are positive (countries belonging to the same PTA trade more as do countries sharing a common currency), highly statistically significant and in line with estimates from the literature. Moreover, the inclusion of these variables in the equation reduces the magnitude of the coefficient of

[19] Political Rights are measured on a one-to-seven scale, with one representing the higher degree of freedom and seven the lowest. Therefore, according to the definition of this variable a greater value of this variable implies less political rights.

[20] The European Union (EU), the North America Free Trade Agreement (NAFTA), the Southern Cone Common Market (MERCOSUR) or the Association of South East Nations (ASEAN) are some examples of trade agreements among countries on the same continent. The Economic and Monetary Union (EMU) in Europe, the African CFA Franc in Africa or the East Caribbean Dollar in America, are examples of monetary unions along continental lines.

interest but only slightly. It continues being positive (0.281) and statistically significant at the 1% level.

Recently, Eicher and Henn (2009) show the importance of splitting the catch-all PTA and CU dummies into the individuals PTAs and CU arrangements. According to these authors, if individual PTAs and CUs do not generate identical trade benefits, as a large empirical literature has documented, estimating an average coefficient using a catch-all PTA or CU dummy generates biased results. Therefore, in column 3 we report the results allowing for individual PTAs and CUs effects.[21] This is our preferred specification. The results do not change in a significant way and, in particular, the estimated coefficient of the variable of interest remains nearly unaltered (0.284) and highly statistically significant. Therefore, there is evidence of a *continental bias* in trade and other factors different from the existence of economic integration agreements are likely behind this phenomenon. Henceforth, we will only report the results for the specification that includes the comprehensive set of individual PTAs and CUs dummies.

The next step of the estimation process was to run the gravity equation including exporting and importing country fixed effects (CFE). It controls for the multirateral resistance terms under the assumption that these terms do not vary over time. The results are reported in column 4. In almost all cases, the impact goes in the same direction. The only exception is the estimated coefficient of the variable common *religion* (that in this case is positive and statistically significant). In particular, the estimated coefficient of the variable of interest is again positive and statistically significant at the 1 per cent level (0.210).

As noted before, since multilateral resistance may change over time, we also have estimated the gravity equation including time-varying fixed effects for exporters

[21] Since our sample include more than 200 individual PTAs and CUs the estimated coefficients of these variables are not reported to save on space. The list of agreements considered appears in Appendix B.

and importers (column 5). The results are very similar to those obtained with CFE. In all cases the effect goes in the same direction and there is once again clear evidence of the existence of a positive *continental bias* in trade. According to the results two countries located at the same continent trade about 25% [exp(0.220)-1=0.246] more than two otherwise similar countries located at different continents.

The inclusion of time-varying exporting and importing country fixed effects properly addresses multilateral resistance in a panel data framework. However, it does not account for unobserved bilateral heterogeneity. Conventional panel data techniques allow controlling for unobservable country-pair individual effects. With panel data, whether the random effects model or the fixed effects model is the econometrically more appropriate setup depends on the potential correlation of the individual effects with the explanatory variables. If there is no such correlation the random effects model is both consistent and efficient. Moreover, it has the advantage of allowing the estimation of time-invariant variables. However, if individual effects, as is often the case, are correlated with the explanatory variables, only the fixed effects model is consistent.[22] The problem with the fixed effects model is that before Plümper and Troeger (2007)'s paper the estimation of time-invariant variables including country-pair fixed effects (CPFE) required the use of instrumental variables (Hausman and Taylor, 1981), leaving researchers with a discretionary choice about which variables are endogenous that largely influence the results.

In a trade dataset with 17 years (1990-2006), the estimation using the fixed effects vector decomposition (FEVD) procedure suggested by Plümper and Troeger (2007) is very computationally demanding. To solve this drawback, we estimate the gravity equation using data for five years of the sample period at four-year intervals

[22] In our empirical application the Hausman tests reject the null hypothesis of no correlation between the individual effects and the explanatory variables.

(1990, 1994, 1998, 2002 and 2006). Before discussing the results of the FEVD procedure it is important to check that the use of these five years does not affect the results in any significant way. Columns 1 to 3 of Table 2 report again OLS, CFE and CYFE estimates for the panel data set consisting of observations for every four years beginning in 1990. As we can observe, these results are very similar to those reported in columns 3 to 5 of Table 1 using the full sample period. In particular, the estimated coefficients of the variable of interest are nearly identical in all cases.

The estimation results of the FEVD procedure including time-varying exporter and importer fixed effects appear at the extreme right of Table 2 (column 4). The regression fits the data well and explains more than 90% of the variation in bilateral trade linkages. Most of the coefficients show the expected sign and are statistically significant at conventional levels. With respect to the estimated coefficient of the variable of interest it is once again positive, statistically significant and quite larger in magnitude than our previous estimates (1.012). Thus, the finding that being part of the same continent is associated with an economically and statistically significant increase in trade seems robust. However, a few comments are in order. Firstly, the estimated coefficients of the variables common language and common religion present a counterintuitive sign. Secondly, the coefficient of the variable distance is negative and statistically significant at the 1% level but smaller in magnitude than usual estimates.

The problem of all the above estimations is that 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, now we turn to the analysis of the results using the two stages estimation procedure suggested by HMR (2008). Table 3 reports the results. Since our sample has time dimension we include in this framework, for the first time to our

knowledge, country year fixed effects in order to capture the time-varying nature of trade costs in panel data.[23] The results for the probit regression are presented in column 1.[24] Before discussing the empirical results, it is worth noting that the estimation of equation (3) might be subject to the incidental parameter problem and introduce 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. These results compared with those found using CYFE in Table 2 clearly show that the same variables that impact export volumes in the traditional estimation with CYFE also impact the probability that country *i* exports to country *j*. In particular, the estimated marginal effect of the variable of interest is positive and statistically significant suggesting that being on the same continent raises the probability of bilateral trade.

Using the probit regression, as explained before, we construct two variables for correcting sample selection bias and firm heterogeneity. Both the non-linear coefficient δ and the linear coefficient for $\hat{\eta}_{ij}^{*}$ are precisely estimated. The results for the second stage can be seen in column 2 of Table 3. The variable *religion* has been excluded from the estimation for identification reasons.[25] The estimated coefficients show that the same determinants that affect the probability of bilateral exports also impact bilateral export volumes. At this stage, we once again find a positive and significant coefficient

[23] HMR (2008) applies their two stages estimation procedure to data from 1986 including in the regression exporting and importing CFE. 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 CFE and year fixed effects instead of CYFE.

[24] Following HMR (2008) we also have country pairs whose characteristics are such that their probability of trade is indistinguishable from 1. Therefore, we assign the same $\hat{z}_{ij}^{*}$ to those country pairs with an estimated $\hat{p}_{ij}^{*} > 0.9999999$.

[25] In a previous version of this paper, following HMR (2007, footnote 26), we used the variable common language for this purpose. It yields very similar results.

for the *continental bias* dummy variable. In particular, the estimated coefficient is 0.180 which suggests that two countries located on the same continent trade about 20% more than two identical countries located on different continents.

Overall, the evidence reported above strongly suggests that there is a positive *continental bias* in trade, that is, being part of the same continent affects positively trade. This finding is robust to the use of different estimation techniques and, in particular, to the use of recent developments in the econometric analysis of the gravity equation that controls for sample selection bias, unobservable firm heterogeneity and time-varying multilateral resistance terms.

The next natural step is the analysis of *continental bias* by continent. To do so, the *SameCont* dummy variable is replaced by continent-specific dummies so that five coefficients (one for each continent) are estimated. The results are reported in Table 4. Columns 1 to 3 present the results using OLS, CFE and CYFE, respectively. We focus in the latter approach since it comprehensively accounts for multilateral resistance and, therefore, it is the only fully in line with the theoretical foundations of the gravity equation. With the exception of Asia, every continent presents positive and statistically significant coefficients at conventional levels (for Africa only at the 10 per cent level). Thus, the *continental bias* is not driven by a particular continent. The largest value of the estimated coefficient is found for Oceania and the smallest for Africa. The point estimate of 0.331 for The Americas implies that when two countries of a pair belong to the Western Hemisphere, they trade 39% per cent [exp(0.331)-1=0.392] as much as would two other similar countries located on different continents. A similar result is found for Europe [exp(0.381)-1=0.464].

Columns 4 and 5 present the results for the two-stage estimation procedure proposed by HMR. On the one hand, the probit estimation reveals that for Africa,

America and Oceania the probability of trade between a pair of countries within these continents is positive, whereas this is not the case for Asia and Europe. For Asia the coefficient is negative and statistically significant. On the other hand, the second stage results indicate that Oceania, America, Europe and Asia, in descending order of magnitude, present positive and statistically significant coefficients at the 1 per cent level. In this case, Africa is the exception being its coefficient not statistically significant at conventional levels.

Finally, the results using the FEVD procedure (column 6) reveal, in line with the results of the second stage of the HMR (2008)'s procedure, that the estimated coefficients of the variable of interest are positive and statistically significant for Europe, America, Asia and Oceania. Moreover, the coefficient for Africa is negative and statistically significant. The result for Africa could be explained by several factors, such as, little complementarities and high trading costs among African economies, unfavourable geographical conditions, inappropriate transport policies or poor transport facilities (Yang and Gupta, 2005).

Conclusions

The purpose of this paper was to answer the two questions stated in the introduction: Firstly, is there a *continental bias* in trade? and secondly, are there differences across continents? The economic geography literature, in the context of the theoretical welfare implications of PTAs, clearly shows the relevance of the relationship between inter and intra-continental transportation costs. According to this literature, natural trading partners are those located on the same continent whereas unnatural partners are those located on different continents. Moreover, to the extent that

intercontinental costs were sufficiently low, natural partners may become "super-natural" making the corresponding PTAs welfare decreasing.

In this paper, we account for recent developments in the theoretical foundations of the gravity equation to estimate for the first time the possible existence of *continental bias* in trade. In order to explore empirically this issue we use both traditional estimation techniques and two recently developed econometric approaches: the fixed effects vector decomposition technique suggested by Plümper and Troeger (2007) and the two-stage estimation procedure proposed by Helpman, Melitz and Rubinstein (2008). Using a sample of 182 countries over the period 1990-2006 we find evidence of a positive *continental bias* in trade. That is, other things equal, countries located on the same continent trade more with each other than countries located on different continents. This finding is robust to controlling for (1) multilateral resistance only, (2) multilateral resistance and unobserved bilateral hetereogeneity, and (3) multilateral resistance, sample selection bias and unobservable firm heterogeneity.

What does this empirical result mean in the context of the welfare analysis for preferential trade agreements? The evidence of a positive *continental bias* suggests that countries inside a continent can be considered as natural trading partners and that preferential trade agreements along continental lines are more likely to be welfare-improving. A continent-by-continent analysis shows that Oceania, America and Europe are clearly behind this result. This is also the case of Asia when we use additional controls to multilateral resistance. However, for Africa the evidence is not conclusive. Therefore, with the exception of Africa, our results in addition to provide support to the implementation of regional trading blocs along continental lines give an argument in favour of the continental-wide free trade agreements projects.

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Table 1. OLS and fixed effects estimations of the *continental bias* in trade. Sample period 1990-2006

Variables	(1) OLS	(2) OLS	(3) OLS	(4) CFE	(5) CYFE
$LnGDP_{it}$	0.990	0.986	1.000	0.654	
	(0.006)***	(0.006)***	(0.006)***	(0.030)***	
$LnGDP_{jt}$	0.807	0.804	0.816	0.710	
	(0.006)***	(0.006)***	(0.006)***	(0.045)***	
$LnDist_{ij}$	-1.081	-0.984	-0.982	-1.254	-1.286
	(0.020)***	(0.021)***	(0.021)***	(0.026)***	(0.025)***
$Contiguity_{ij}$	0.971	0.842	0.772	0.500	0.535
	(0.078)***	(0.076)***	(0.079)***	(0.080)***	(0.081)***
$Island_{ij}$	0.743	0.688	0.503	0.453	0.522
	(0.081)***	(0.080)***	(0.085)***	(0.072)***	(0.065)***
$Landlocked_{ij}$	-0.505	-0.492	-0.491	-0.657	-1.044
	(0.026)***	(0.025)***	(0.026)***	(0.063)***	(0.061)***
$Language_{ij}$	0.576	0.526	0.470	0.469	0.408
	(0.038)***	(0.037)***	(0.038)***	(0.037)***	(0.036)***
$Colony_{ij}$	1.007	1.056	1.134	1.033	1.112
	(0.090)***	(0.090)***	(0.088)***	(0.082)***	(0.082)***
$ComCount_{ij}$	2.796	2.675	2.358	2.780	2.701
	(0.103)***	(0.096)***	(0.127)***	(0.128)***	(0.140)***
$Religion_{ij}$	-0.203	-0.202	-0.202	0.354	0.455
	(0.048)***	(0.047)***	(0.049)***	(0.046)***	(0.046)***
$PoliticalRights_{it}$	-0.041	-0.034	-0.035	-0.026	
	(0.006)***	(0.006)***	(0.006)***	(0.007)***	
$PoliticalRights_{jt}$	-0.034	-0.027	-0.028	-0.030	
	(0.005)***	(0.006)***	(0.006)***	(0.006)***	
CU_{ijt}		0.526			
		(0.106)***			
$PTAS_{ijt}$		0.590			
		(0.038)***			
$SameCont_{ij}$	0.358	0.281	0.284	0.210	0.220
	(0.037)***	(0.037)***	(0.039)***	(0.036)***	(0.036)***
Time dummies	Yes	Yes	Yes	Yes	No
No observat.	227,619	227,619	227,619	227,619	255,252
Adj-R^2	0.64	0.65	0.65	0.72	0.74

Notes:

Regressand: log of real bilateral exports. Robust standard errors (clustered by country-pairs) are in parentheses.* significant at 10%; ** significant at 5%; *** significant at 1%. Regressions in columns (3), (4) and (5) include more than 200 individual PTAs and CUs dummies. Estimated coefficients of these variables and fixed effects not reported for ease of presentation. The complete list of PTAs and CUs considered appears in Appendix B.

Table 2. OLS and fixed effects estimations of the *continental bias* in trade. Sample period 1990, 1994, 1998, 2002, 2006.

Variables	(1) OLS	(2) CFE	(3) CYFE	(4) FEDV with CYFE
$LnGDP_{it}$	1.037	0.792		
	(0.006)***	(0.035)***		
$LnGDP_{jt}$	0.820	0.728		
	(0.006)***	(0.053)***		
$LnDist_{ij}$	-1.013	-1.292	-1.306	-0.191
	(0.023)***	(0.027)***	(0.026)***	(0.010)***
$Contiguity_{ij}$	0.731	0.438	0.502	1.174
	(0.083)***	(0.085)***	(0.084)***	(0.030)***
$Island_{ij}$	0.457	0.469	0.518	-0.063
	(0.089)***	(0.076)***	(0.070)***	(0.028)**
$Landlocked_{ij}$	-0.458	-0.589	-1.100	-1.115
	(0.028)***	(0.069)***	(0.068)***	(0.028)***
$Language_{ij}$	0.483	0.507	0.418	-0.349
	(0.041)***	(0.040)***	(0.038)***	(0.015)***
$Colony_{ij}$	1.105	1.005	1.099	2.213
	(0.091)***	(0.086)***	(0.085)***	(0.036)***
$ComCount_{ij}$	2.529	2.818	2.708	1.078
	(0.130)***	(0.132)***	(0.143)***	(0.067)***
$Religion_{ij}$	-0.219	0.350	0.466	-0.435
	(0.052)***	(0.050)***	(0.051)***	(0.021)***
$PoliticalRights_{it}$	-0.024	-0.012		
	(0.006)***	(0.009)		
$PoliticalRights_{jt}$	-0.028	-0.026		
	(0.006)***	(0.008)***		
$SameCont_{ij}$	0.271	0.192	0.201	1.012
	(0.041)***	(0.039)***	(0.038)***	(0.015)***
eta				1
				(0.003)***
Time dummies	Yes	Yes	No	No
No observat.	65,586	65,586	74,443	74,443
Adj-R^2	0.67	0.75	0.74	0.92

Notes:

Regressand: log of real bilateral exports. Robust standard errors (clustered by country-pairs) are in parentheses.* significant at 10%; ** significant at 5%; *** significant at 1%. Regressions include more than 200 individual PTAs and CUs dummies. Estimated coefficients of these variables and fixed effects not reported for ease of presentation. The complete list of PTAs and CUs considered appears in Appendix B.

Table 3. HMR two-stage estimation with CYFE. Sample period 1990, 1994, 1998, 2002, 2006.

Variables	HMR two-stage estimation with CYFE		
	(1)		(2)
	Probit coefficient	Marginal effects	ML
$LnDist_{ij}$	-0.762	-0.255	-1.233
	(0.019)***	(0.006)***	(0.028)***
$Contiguity_{ij}$	0.177	0.056	0.497
	(0.100)*	(0.030)*	(0.084)***
$Island_{ij}$	0.278	0.086	0.495
	(0.042)***	(0.012)***	(0.069)***
$Landlocked_{ij}$	-0.412	-0.143	-1.088
	(0.042)***	(0.015)***	(0.068)***
$Language_{ij}$	0.450	0.135	0.434
	(0.024)***	(0.007)***	(0.038)***
$Colony_{ij}$	0.255	0.079	1.014
	(0.167)	(0.047)*	(0.086)***
$ComCount_{ij}$	1.281	0.248	2.565
	(0.162)***	(0.012)***	(0.142)***
$Religion_{ijt}$	0.203	0.068	
	(0.033)***	(0.011)***	
$SameCont_{ij}$	0.098	0.032	0.180
	(0.026)***	(0.008)***	(0.038)***
Time dummies	No		No
δ			0.062
			(0.024)***
$\hat{\eta}_{ij}^{*}$			1.213
			(0.041)***
No observat.	115,565		73,191
Pseudo R^2	0.51		

Notes:

Robust standard errors (clustered by country-pairs) are in parentheses.* significant at 10%; ** significant at 5%; *** significant at 1%. Regressions include more than 200 individual PTAs and CUs dummies. Estimated coefficients of these variables and fixed effects not reported for ease of presentation. The complete list of PTAs and CUs considered appears in Appendix B.

Table 4. Estimation of *continental bias* by continent. Sample period 1990, 1994, 1998, 2002, 2006.

Variables	Traditional estimation techniques			HMR two-stage estimation with CYFE		PT with CYFE
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	CFE	CYFE	Probit	ML	FEVD
$LnGDP_{it}$	1.033 (0.006)***	0.793 (0.035)***				
$LnGDP_{jt}$	0.814 (0.006)***	0.722 (0.053)***				
Ln $Dist_{ij}$	-1.026 (0.024)***	-1.255 (0.029)***	-1.260 (0.028)***	-0.709 (0.021)***	-1.186 (0.029)***	-0.031 (0.011)***
$Contiguity_{ij}$	0.724 (0.083)***	0.484 (0.085)***	0.553 (0.084)***	0.251 (0.098)***	0.550 (0.084)***	2.230 (0.030)***
$Island_{ij}$	0.208 (0.086)**	0.366 (0.075)***	0.407 (0.070)***	0.229 (0.043)***	0.389 (0.068)***	0.134 (0.029)***
$Landlocked_{ij}$	-0.475 (0.028)***	-0.591 (0.069)***	-1.095 (0.067)***	-0.421 (0.042)***	-1.088 (0.068)***	-1.254 (0.028)***
$Language_{ij}$	0.556 (0.042)***	0.495 (0.041)***	0.415 (0.038)***	0.438 (0.025)***	0.438 (0.038)***	-0.015 (0.015)
$Colony_{ij}$	1.060 (0.090)***	1.016 (0.085)**	1.115 (0.084)***	0.254 (0.166)	1.022 (0.085)***	3.773 (0.036)***
$ComCount_{ij}$	2.512 (0.130)***	2.826 (0.131)***	2.711 (0.142)***	1.288 (0.158)***	2.585 (0.142)***	1.227 (0.067)***
$Religion_{ijt}$	-0.178 (0.052)***	0.368 (0.051)***	0.493 (0.051)***	0.232 (0.033)***		-0.320 (0.021)***
$PoliticalRights_{it}$	-0.034 (0.007)***	-0.012 (0.009)				
$PoliticalRights_{jt}$	-0.038 (0.006)***	-0.026 (0.008)***				
$Africa_{ij}$	0.001 (0.074)	0.209 (0.005)***	0.139 (0.073)*	0.230 (0.036)***	0.031 (0.071)	-1.190 (0.028)***
$America_{ij}$	-0.230 (0.065)***	0.298 (0.082)***	0.331 (0.081)***	0.339 (0.056)***	0.386 (0.080)***	1.828 (0.033)***
$Asia_{ij}$	0.731 (0.067)***	0.048 (0.070)	0.003 (0.066)	-0.171 (0.049)***	0.124 (0.064)**	1.434 (0.025)***
$Europe_{ij}$	0.235 (0.062)***	0.232 (0.062)***	0.381 (0.063)***	-0.029 (0.063)	0.273 (0.062)***	2.023 (0.028)***
$Oceania_{ij}$	3.219 (0.229)***	2.314 (0.283)***	1.960 (0.221)***	1.299 (0.156)***	1.916 (0.214)***	0.840 (0.085)***
Time dummies	Yes	Yes	No	No	No	No
δ					0.066 (0.025)***	
$\hat{\eta}_{ij}^{*}$					1.229 (0.041)***	
No observat.	65,586	65,586	74,443	115,565	73,191	74,443
R^2 / Pseudo R^2	0.67	0.75	0.74	0.51		0.92

Notes: Regressand: log of real bilateral exports. Robust standard errors (clustered by country-pairs) are in parentheses.* significant at 10%; ** significant at 5%; *** significant at 1%. Regressions include more than 200 individual PTAs and CUs dummies. Estimated coefficients of these variables and fixed effects not reported for ease of presentation. The complete list of PTAs and CUs considered appears in Appendix B.

Appendix A

Table A1: 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 Gr.
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	United States of America
Comoros	Japan	Philippines	Uruguay
Congo, D.R.	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	

Appendix B

Table B1: Plurilateral Preferential Trade Agreements

Abbreviation	Name of PTA	Stars/ends	Member countries
AGADIR	Agadir Agreement	2005	Egypt, Jordan, Morocco, Tunisia.
AMU	Arab Maghreb Union	1989	Algeria, Libya, Mauritania, Morocco, Tunisia.
ANZERTA	Australia-New Zealand Closer Economic Relations Trade Agreement	1983	Australia and New Zealand.
ASEAN	Association of South East Asian Nations	1992	Brunei, Cambodia (joined 1999), Indonesia, Laos (joined 1997) Myanmar (joined 1997) Malaysia, Philippines, Singapore, Vietnam (joined 1995), Thailand.
BANGKOK_AG	Agreement (Formely Known) Asia Pacific Trade Agreement (APTA)	1976	Bangladesh, India, Laos, China (joined 2002), South Korea, Sri Lanka.
CAN	Andean Community	1969	Bolivia, Chile (left 1976), Colombia, Ecuador, Peru, Venezuela (1973-2005).
CAN_Mercosur	Andean Community - Mercosur	2004	
CARIFTA	Caribbean Free Trade Agreement	1968	Antigua and Barbuda, Bahamas, Barbados, Dominica, Grenada, Guyana, Haiti, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago.
CARICOM	Caribbean Community and Common Market	1973	Antigua and Barbuda, Bahamas, Barbados, Dominica, Grenada, Guyana, Haiti (suspended 2004-2006), Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago.
CAFTA-DR	Central American Free Trade Agreement	2006	Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, US.
CACM	Central American Common Market	1961	Costa Rica (joined in1966), Guatemala, El Salvador, Honduras (joined in 1966), Nicaragua.
CACM2	Central American Common Market	1990	Costa Rica, Guatemala, El Salvador, Honduras, Nicaragua.
CBI	Cross Border Initiative	1993	Burundi, Comoros, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Namibia, Reunion, Rwanda, Swaziland, South Africa (in observer status), Tanzania, Uganda, Zambia, Zimbabwe.

CIS	Commonwealth of Independent States	1994	Azerbaijan, Armenia, Belarus, Kazakhstan, Kyrgyz Rep., Moldova, Russia, Tajikistan, Turkmenistan (left 2005), Uzbekistan (joined 2000), Ucraine.
COMESA	Common Market for Eastern and Southern Africa	1983	Angola, Burundi, Comoros, Congo Dem. Rep., Djibouti, Egypt(joined 1999), Eritrea Ethipia, Kenya, Lesotho (left 1997), Libya (joined 2005), Madagascar, Malawi, Mauritus, Mozambique(left 1997), Namibia (left 2004), Rwanda, Seychelles (joined 2001), Sudan, Swaziland, Tanzania (left 2000), Uganda, Zambia, Zimbawe.
CUSFTA/ NAFTA	Canada-US FTA/ North American Free Trade Agreement	1989/ 1994	Canada, US/ Canada, Mexico, US.
EAC	East African Community	2000	Kenya, Tanzania, Uganda.
EAEC	Eurasian Economic Community	1997	Belarus, Kazakhstan, Kyrgyz Rep., Russia, Tajikistan, Uzbekistan (joined 2006).
ECCAS	Economic Community of Central African States	1992	Burundi, Congo Dem. Rep., Cameroon, Central African Republic, Chad, Rep. of the Congo, Equatorial Guinea, Gabon, Rwanda, Sao Tome and Principe.
ECOWAS	Economic Community of West African States	1975	Benin, Burkina Faso, Cape Verde, Cotê d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, (Mauritania (left in 2000), Nigeria, Senegal, Sierra Leone, Togo.
EFTA	European Free Trade Association	1960	Austria, Denmark, Norway, Portugal, Sweden, Switzerland, UK, Iceland (joined 1970), Denmark (left 1972), UK (left 1972), Portugal (left 1985), Finland (joined 1986), Austria (left 1995), Finland (left 1995), Sweden (left 1995).
EU	European Union	1958	Belgium, France, Germany, Italy, Luxembourg, and Netherlands, Denmark (joined 1973), Ireland (joined 1973), UK (joined 1973), Greece (joined 1981), Portugal (joined 1986) and Spain (joined 1986), Austria (joined 1995), Finland (joined 1995), Sweden (joined 1995), Cyprus (joined 2004), Czech Republic (joined 2004), Estonia (joined 2004), Latvia (joined 2004), Lithuania (joined 2004), Hungary (joined 2004), Malta (joined 2004), Poland (joined 2004), Slovakia (joined 2004), Slovenia (joined 2004).

EUEFTA / EEA	EU-EFTA Free Trade Agreement/ European Economic Area	1973/ 1994	Varies by countries. Varies by countries.
GAFTA	Great Arab Free Trade Area	1998	Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates, Yemen
GCC	Gulf Cooperation Council	1981	Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates
GROUPOF3	Group of Three	1995	Colombia, Mexico, Venezuela.
MELANESIAN (MSG)	Melanesian Spearhead Group	1994	Fiji, Papua New Guinea, Solomon Islands, Vanuatu.
MERCOSUR	Mercado Común del Sur	1991	Argentina, Brasil, Paraguay, Uruguay.
MRU	Mano River Union	1977	Sierra Leone, Liberia and Guinea (joined 1981).
NT	Northern Triangle	2001	El Salvador, Guatemala, Honduras.
PATCRA	Australia-Papua New Guinea	1977	
SACU	South African Customs Union	1970	Botswana, Lesotho, Namibia, South Africa, Swaziland.
SADC	Southern African Development Community	1980	Angola, Botswana, Congo Dem. Rep.(joined 1998), Lesotho, Madagascar (joined 2006), Malawi, Mauritius (joined 1996), Mozambique, Namibia (joined 1990), Seychelles, South Africa (joined (1995), Swaziland, Tanzania, Zambia, Zimbabwe.
SAFTA	SAFTA	1996	Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka.
UDEAC	Union Douanière et Économique de l'Afrique Centrale	1966-1998	Cameroon, Central African Rep., Chad, Congo, Equatorial Guinea, Gabon.

Note: Countries listed in agreements only include those in our sample of 182 countries listed in Table A1.

Table B2. Bilateral Preferential Trade Agreements

Albania-Bosnia and Herzegovina (2004)	Croatia-FYROM (2002)	Guatemala-Mexico (2001)
Albania-Croatia (2003)	Croatia-Moldova (2004)	Guatemala-Panama (1975)
Albania-FYROM (2004)	Croatia-Turkey (2003)	Honduras-Mexico (2001)
Albania-Moldova (2004)	Czech Rep-Turkey (1998)	Hungary-Israel (1996)
Albania-Serbia Montenegro (2004)	Czech-Israel (1996)	Hungary-Turkey (1998)
Armenia-Canada (1997)	Dom. Rep.-Panama (1987)	India-Nepal (1991)
Armenia-Cyprus (1996)	EFTA-Chile (2004)	India-Singapore (2005)
Armenia-Estonia (2002)	EFTA-Croatia (2002)	India-Sri Lanka (2001)
Armenia-Georgia (1998)	EFTA-FYROM (2002)	India-Thailand (2004)
Armenia-Iran (1997)	EFTA-Israel (1993)	Israel-Mexico (2000)
Armenia-Kazakhstan (2002)	EFTA-Jordan (2002)	Israel-Poland (1997)
Armenia-Kyrgyz Rep. (1995)	EFTA-Mexico (2001)	Israel-Romania (2001)
Armenia-Moldova (1995)	EFTA-Morocco (1999)	Israel-Slovak Rep (1996)
Armenia-Russia (1993)	EFTA-Singapore (2003)	Israel-Slovenia (1997)
Armenia-Swizerland (2000)	EFTA-Tunisia (2005)	Israel-Turkey (1997)
Armenia-Turkmenistan (1996)	EFTA-Turkey (1992)	Israel-US (1985)
Armenia-Ucraine (1996)	Egypt-Libya (1990)	Japan-Mexico (2005)
ASEAN-China (2003)	Egypt-Morocco (1999)	Japan-Singapore (2002)
Australia-Singapore (2003)	Egypt-Tunisia (1998)	Jordan-Morocco (1998)
Australia-Thailand TAFTA (2005)	El Salvador-Mexico (2001)	Jordan-Singapore (2005)
Australia-US (2005)	Estonia-Turkey (1998)	Jordan-Syria (2001)
Azerbaijan-Georgia (1996)	EU-Algeria (2005)	Jordan-US (2001)
Bangladesh-India (1980)	EU-Bulgaria (1995)	Kazakhstan-Kyrgyz Rep. (1995)
Bhutan-India (2005)	EU-Chile (2003)	Korea-Singapore (2006)
Bolivia-Mexico (1995)	EU-Croatia (2002)	Kuwait-Jordan (2001)
Bosnia Herzegovina-Bulgaria (2004)	EU-Czech Rep (1995)	Kyrgyz Rep.- Russia (1993)
Bosnia Herzegovina-Croatia (2005)	EU-Egypt (2004)	Kyrgyz Rep.-Moldova (1996)
Bosnia Herzegovina-FYROM (2002)	EU-Estonia (1995)	Kyrgyz Rep.-Ucraine (1998)
Bosnia Herzegovina-Moldova (2004)	EU-FYROM (2001)	Kyrgyz Rep.-Uzbekistan (1998)
Bosnia Herzegovina-Romania (2004)	EU-Hungary (1994)	Laos-Thailand (1991)
Bosnia Herz.-Serbia Montenegro (2002)	EU-Israel (2000)	Latvia-Turkey (2000)
Bosnia Herzegovina-Turkey (2003)	EU-Jordan (2002)	Lithuania-Turkey (1998)
Bulgaria-FYROM (2000)	EU-Latvia (1995)	Mercosur-Bolivia (1997)
Bulgaria-Israel (2002)	EU-Lebanon (2003)	Mercosur-Chile (1996)
Bulgaria-Moldova (2005)	EU-Lithuania (1995)	Mercosur-India (2004)
Bulgaria-Serbia Montenegro (2003)	EU-Mexico (2000)	Mercosur-SACU (2002)
CACM-Chile (1999)	EU-Moldova (1998)	Mexico-Nicaragua (1998)
Canada-Chile (1997)	EU-Morocco (2000)	Mexico-Uruguay (2004)
Canada-Costa Rica (2002)	EU-Poland (1994)	Moldova-Rumania (1994)
Canada-Israel (1997)	EU-Romania (1995)	Moldova-Serbia Montenegro (2004)
CARICOM-Colombia (1994)	EU-Slovakia (1995)	Morocco-Tunisia (1999)
CARICOM-Costa Rica (2004)	EU-Slovenia (1999)	Morocco-US (2006)
CARICOM-Dominican Republic (1998)	EU-South Africa (2000)	New Zealand-Singapore (2001)
CARICOM-Venezuela (1993)	EU-Syria (1977)	New Zealand-Thailand (2005)
Chile-Costa Rica (2002)	EU-Tunisia (1998)	Northern Triangle-Mexico(2001)
Chile-El Salvador (2002)	EU-Turkey (1963)	Pakistan-Sri Lanka (2005)
Chile-Korea (2004)	FYROM-Moldova (2005)	Poland-Turkey (2000)
Chile-Mexico (1998)	FYROM-Romania (2004)	Romania-Turkey (1998)
Chile-US (2004)	FYROM-Turkey (2000)	Singapore-US (2004)
China-Hong Kong (2004)	Georgia-Kazakhstan (1999)	Slovak Rep.-Turkey (1998)
China-Macao (2004)	Georgia-Russia (1994)	Slovenia-Turkey (2000)
Colombia-Costa Rica (1985)	Georgia-Turkmenistan (2000)	South Africa-US (2000)
Costa Rica-Mexico (1995)	Georgia-Ucraine (1996)	Tunisia-Turkey (2005)

Note: The date they entered into force appears in parentheses.

Table B3. Currency Unions

Multilateral CUs

Abbreviation	Name of CU	Stars/ends	Member countries
EURO	European Monetary Union	1999	Austria, Belgium-Luxembourg, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain, Greece (joined 2001).
WAEMU/UEMOA	West African Economic and Monetary Union	1962	Benin (joined 1984), Burkina Faso, Cotê d'Ivoire, Guinea-Bissau (joined 1996), Mali, Niger, Senegal, Mauritania (left 1995), Togo (joined 1996).
CEMAC/CAEMC (former UDEAC)	Economic and Monetary Union of Central Africa	1999	Cameroon, Central African Republic, Chad (left 1967, joined again 1984), Rep. of the Congo, Equatorial Guinea (joined 1984) and Gabon.
CMA	Common Monetary Area	1960	Bostwana (left 1973), Lesotho, Namibia, Swaziland, South Africa.
EASTCARIBEAN	East Caribbean Dollar	1965	Antigua and Barbuda, Barbados (left 1974), Dominica, Grenada, Guyana (left 1972), St. Kitts and Nevis, Sta. Lucia, St. Vincent, Trinidad and Tobago (left 1976).

Bilateral CUs

Abbreviation	Stars/ends	Member countries
ARU_NA	1960-1993	Aruba and Netherland Antilles
ARG_US	1992-2001	Argentina and United States
AUL_KIR	1980	Australia and Kiribati
AUL_TON	1960-1990	Australia and Tonga
AUL_SOL	1978	Australia and Solomon Islands
BAH_US	1966	Bahamas and United States
BER_US	1970	Bermuda and United States
ECU_US	2001	Ecuador and United States
HK_US	1984	Hong Kong and United States
IND_BHU	1991	India and Bhutan
PAN_US	1904	Panama and United States
QAT_UAE	1981	Qatar and United Arab Emirates