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# European Union's Preferential Trade Agreements in Agricultural Sector: a gravity approach

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# **European Union's Preferential Trade Agreements in Agricultural Sector: a gravity approach**

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# **European Union's Preferential Trade Agreements in Agricultural Sector: a gravity approach**

## **Abstract:**

The European Union (EU) is the first target market for developing countries' and Least Developed Countries' agricultural exports. Preferential trade agreements, either reciprocal or not, play a central role in forming trade opportunities for numerous developing countries. Our objective is to measure the impact of eleven regional trade agreements (RTA) on European agricultural imports with an expanded gravity model. Also, in order to compare these RTAs and their effects we calculate the implied tariff equivalent. Results indicate that a large number of EU's RTAs support the agricultural exports of developing countries to the EU market. Thus, RTAs are generally an attractive alternative for countries wishing to speed up the move towards multilateral free trade in agriculture. Nevertheless, two most important and unilateral RTAs (Generalized System of Preference expanded by Everything But Arms) and the agreement with Mexico have the negative effect over agricultural exports to EU. We attempt to explain the reasons of their failure.

**JEL classification:** C10, F10, F15

**Keywords:** preferential trade agreements, gravity model, implied tariff equivalent, agricultural sector, LDCs, EU.

## **1. Introduction**

Developing countries mostly claim that their market shares in developed market remain limited, in spite of complex and sometimes extensive preferential access granted by rich countries to them. In particular, there are special regional trade agreements (RTAs) which permit to access easily to the rich countries markets. Those claims have been an important component of the arguments of developing countries in the recent trade liberalization talks and these argumentations over agricultural goods are more significant. The World Trade Organization (WTO) reports that the share of Least Developed Countries (LDCs) in total agricultural imports of Northern America was 2.6% in 1980 and 0.6% in 2000 in value. The corresponding figures for the Western Europe were 2.3% and 1.1%, Japan's figures were 1.4% and 0.9% (WTO, 2001).

The European Union (EU) is the biggest agricultural market in the world and has approximately 20% of total exports and imports of agricultural products during 1980-2004 (FAOSTAT online database). For the same period, the other big agricultural products importers like US, Japan, China, Canada and India had respectively 7.6%, 9.3%, 4.6%, 2.1% and 0.43% of the total value of agricultural goods imported in the world (author's calculation based on FAOSTAT online database). The EU is definitely an important target market for developing countries' and LDCs' agricultural exports in general and it is especially important for most former colonies of EU member states. The EU's trade preferences are thus potentially an important opportunity to increase the EU's market access. Actually, preferential trade agreements, either reciprocal or not, play a central role in forming trade opportunities for numerous developing countries, remarkably for the poorest ones. But EU's trade policy is fairly complex, and many trade partners benefit from various preferential agreements. For example, sub-Saharan Africa poor countries benefit from the Everything But Arms (EBA) program and the Cotonou agreement simultaneously. Moreover, EU has agreements with

developed countries like the US. The analysis of the preferences must therefore be adapted to this specific context, where in addition the administrative requirements and the rules of origin vary from one agreement to the other, included for a given partner. The consideration of a given preferential arrangement cannot be properly studied without taking into account whether an alternative preferential arrangement is offered or not to the exporters. It justifies the interest to take a broad view of preferential agreements offered by the EU, whether reciprocal or not.

So this study tries to explain whether EU's preferential trade agreements improve the EU's agricultural market access for developing countries especially for LDCs or not. Our objective in this research is to measure the impact of eleven RTAs on European agricultural imports with special attention to LDC countries.

In that prospect, the gravity model is a good candidate. It has performed remarkably well as an empirical framework for measuring the impact of RTAs (for example see, Frankel and Wei, 1993; Frankel, Stein and Wei, 1995; Finger, Ng and Soloaga, 1998). We follow the method of Anderson and Wincoop (2003) and develop it to provide new results focusing on the EU's agricultural market access. Commonly, the gravity models are applied to aggregate data and they are used for the whole of an economy (e.g. see, Aitken, 1973; Thursby and Thursby, 1987; Bergstrand, 1989; Frankel, Stein and Wei, 1993; Krueger, 1999; Soloaga and Winters, 2001; Greenaway and Milner, 2002; Ghosh and Yamarik, 2004a, 2004b; Elliott and Ikemoto, 2004; Mayer and Zignano, 2005; Lee and Park 2005; Carrère, 2006). Jayasinghe and Sarker (2008) with gravity modelling using disaggregate data find the positive effects for NAFTA (North American Free Trade Agreement) in trade of selected agricultural products.

We apply the gravity model to a group of less aggregated goods (i.e. the agricultural sector). This is made possible by the construction and use of a new database extending the

Trade and Production database recently issued by the COMTRADE (Commodity Trade Statistics of United Nation) and WB (World Bank) data to cover more countries and years. A specific characteristic of our study is to identify in the border effect measurement of trade volume, the part associated with observed direct protection (RTAs, common border, common language etc.). We incorporate dummy variables capturing the lower (or higher) impact of borders on trade inside each RTA, and thus characterizing the extent of integration of the zone, compared to trade taking place in the rest of the sample. We identify eleven actual EU's RTAs defined in table a1 in appendix. Since the evaluation of EU's RTAs is complex and ambitious, we calculate the implied tariff equivalent of EU's RTAs to simplify the comparison of RTAs and their effects. In other words, we try to show the effect of RTAs like a reduction (or increase) in import tariff.

The remainder of the paper is organized as follows. Section 2 reviews the European preferential trade agreements in agricultural field. Section 3 motivates the methodology. It describes the modified gravity approach for agricultural sector of EU. Data and results are described in section 4 and the final section concludes.

## **2. EU's Preferential Trade Schemes**

Undoubtedly, the EU is the first supplier of trade agreements worldwide, with more than 50 RTAs (WTO discussion papers, 2007). According to WTO (2007), the EU with 14 *north-south RTAs*<sup>1</sup> in goods is the first supplier among developed countries in 2006. It is followed by the US with 8 RTAs, Canada and Australia with 4 RTAs each one, Japan and New Zealand with 3 RTAs. As illustrated by Figure 1 in Appendix, even a simplified overview of the EU's trade policy remains quite complex. The political economy roots of this profusion of agreements belong to the heterogeneity of the EU, to the specific role-played by

its trade policy and by the strong demand from trading partners (Sapir, 1998; Lamy, 2002; Panagariya, 2002).

From the beginning two kinds of RTAs must be distinguished; reciprocal and unilateral. First, RTAs are bilaterally agreed with reciprocal commitments between the members. Second, non-reciprocal agreements are unilaterally granted by the EU to developing countries or LDCs. While the first kind is planned to be a tool of regional economic integration, the second allows more favourable market access to developing countries. Since the non-reciprocal agreements can be unilaterally changed, the nature of them involves uncertainty on the future. These numerous agreements can be also classified in a few categories. A first set includes close neighbourhood, reciprocal agreements within Europe, with in particular the EEA (European Economic Area) agreement, bilateral free-trade agreements with Central and Eastern European Countries (CEECs) untitled EU-Enlargement, and a few additional bilateral agreements like Euromed (Figure 1 in Appendix). For more details about the EU's RTAs, the date of sign and their member states, see table a1 in appendix.

Most of EU's preferential trade agreements with developing countries and LDCs are non-reciprocal. EU programs include the *Generalized System of Preferences* (GSP) program, which contains a special scheme for developing countries and LDCs known as the "*Everything But Arms*" Agreement (EBA); the *Cotonou* agreement with Africa, Caribbean and Pacific countries (ACP); and the *Euro-Mediterranean* agreements (EMA). The EU wants to help the poorest countries to increase their agricultural market access. Therefore, the EU has adopted an "*Everything but Arms*" (EBA) proposal that gives the LDCs duty-free and quota-free access for over 900 agricultural products with a limited preferential margin for so-called sensitive products.



The GSP is characterized by its temporary nature, with periodical revisions. Graduation measures are taken when beneficiary countries may have reached, in some sectors, a level of competitiveness that makes sure further growth without preferential access to the EU market (Candau and Jean, 2005). The GSP is associated with relatively stringent rules of origin. A special and more beneficial regime has in the past been granted to countries fighting drugs <sup>2</sup> (Coulibaly and Fontagné, 2004). Nevertheless, the duration of the EBA is unlimited, but the Cotonou Agreement will end in 2020.

The EU actually began offering nonreciprocal tariff preferences in the 1950s, providing preferential market access to former EU colonies for a larger set of products than the GSP program <sup>3</sup>. These preferences were included in the first *Lomé Convention*, signed in 1975 with 46 countries. Lomé arrangements were continued and expanded every 5 years, as in 2000 it was named *Cotonou* agreement and the number of countries grew to 73. Recently, the EU has new negotiations with ACP countries in order to sign a new agreement entitled *Economic Partnership Agreements* (EPAs). The aim is to make a free trade area between the EU and the ACP countries. The big problem of EPAs is that the non-reciprocal and discriminating preferential trade agreements offered by the EU are incompatible with WTO rules. Besides, the other problem of EPA scheme is the adaptation of EPAs with EBA agreement.

### **3. Methodology**

#### **3.1. International Trade Volume and Border Effects**

Mayer and Zignago (2005) claimed, “*International trade flows are not enough to measure international markets integration*”. This statement is based on the simple idea that two countries could be considered perfectly integrated if the national borders have no effect over the choice of consumers for their purchases and of producers for selling their products.

In fact, it is summarized as the whole idea of the EU's *Single Market* that aims to eliminate the economic effects of national borders.

The degree of international fragmentation of market is measured by the evaluation of the impact of national borders. To measure it, we have to consider both international trade flows and domestic good flows to compare them. The gravity equation is the ideal candidate to reach this aim. Indeed, even in the absence of flows between sub-national regions, you can still measure the total volume of trade occurring within a country. For a specified sector, you can measure the value of goods shipped from a country to its own consumers if you remove the total exports to the overall production of the country. This observation can then be inserted in a bilateral trade equation, together with all the international flows. Our framework also incorporates recent advances in the modelling of gravity equations (recent examples and surveys of those approaches include Feenstra, 2003; and Mayer and Zignago, 2005 and Minondo, 2007).

The border effect methodology has an important advantage in the study of trade volume. It was indeed measured for many issues. Take as an example the attempts to measure the impact of EU membership on trade flows. Aitken (1973) is one of the first to have made such a study. Frankel and Wei (1993), Frankel (1997), Soloaga and Winters (2001) and Mayer and Zignago (2005) are recent examples of such works. The border effect measure is also a useful methodology because it captures all barriers to trade related to the existence of the national borders (like common language, common frontier, technical barrier, non-tariff barriers, RTAs and so on) through their impacts on trade flows. Most of those impediments and barriers are hard to measure individually, so it is useful to consider them in a global picture. In the next section, we describe the theoretical gravity model and show the border effect.

### 3.2. A Gravity Model for EU Agricultural Sector

In order to estimate the effect of EU' RTAs on trade flows among EU and its trading partners we use the gravity model developed by Deardorff (1998) and Anderson and Wincoop (2003) with Armington's (1969) hypotheses.

Like Armington (1969) we assume that all goods are differentiated by place of origin, the supply of each being fixed and the consumer demand being defined by a CES utility function. In 1979, Anderson presented a theoretical foundation for the gravity model based on CES preferences and on goods that are differentiated by region of origin. We also assume, in this paper, that the consumer follows a two-step budgetary procedure. In the first step, the importing country's consumers define the import demand, choosing between domestic and imported products, in order to satisfy the total demand. In the second step, the import demand is differentiated by country of origin. Because we analyze the access to the European market, we only focus on this second step on the budgetary constraint, under the assumption that the first one is already done and that the total demand of imports is already defined. Thus, at the second step, like Anderson and Wincoop (2003) the representative consumer from country  $j$  (importing country) maximizes a utility function of CES type for the product  $k$ <sup>4</sup> with the geographical repartition of its imports from country  $i$  (exporting country):

$$U_{jk} = \left[ \sum_i b_{ik}^{\frac{1-\sigma}{\sigma}} q_{ijk}^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \quad (1)$$

where  $j$  denotes the importing country,  $i$  is its trading partners and  $k$  the exchanged product.  $q_{ijk}$  is the quantity of product  $k$  originating from country  $i$  consumed in country  $j$ , and  $\sigma$  is the elasticity of substitution between exporting countries ( $\sigma \neq 1$ ). The consumer in country  $j$  maximizes its utility subject to the budget constraint:

$$Y_{jk} = \sum_i p_{ijk} q_{ijk} \quad (2)$$

where  $Y_{jk}$  is the total expenditure of  $j$  for the imported product  $k$  and is defined in the first step of budgetary procedure.  $p_{ijk}$  is the price of product  $k$  from country  $i$ , paid by consumer in country  $j$ .  $p_{ijk}$  differs from exporter's supply price  $p_{ik}$  due to trade costs, which are not directly observable. Trade costs are broadly defined to include all costs incurred in getting a good to a final user other than the production cost of the good itself.

Assuming that trade costs are born by sellers and taking the "iceberg" form, the consumer price received by sellers in  $i$  (Anderson and Wincoop, 2003) is:

$$p_{ijk} = p_{ik} t_{ijk} \quad (3)$$

where  $t_{ijk}$  is the bilateral trade resistance (or in other words trade costs factor) for which the assumption was made that it encompasses tariffs, transport costs (proxied by distance), non-tariff barriers and other factors (they will be listed after).

Solving the consumer utility function (1) subject to the budget constraint (2) leads to the following equation:

$$X_{ijk} = p_{ijk} q_{ijk} = Y_{jk} \left( \frac{b_{ik} p_{ik} t_{ijk}}{\bar{P}_{jk}} \right)^{1-\sigma} \quad (4)$$

where  $\bar{P}_{jk}$  refers to country  $j$ 's CES price index for product  $k$ , related to  $j$ 's overall import price of product  $k$ . So the consumer price index for product  $k$  is calculated as:

$$\bar{P}_{jk} = \left[ \sum_i (b_{ik} p_{ik} t_{ijk})^{1-\sigma} \right]^{\frac{1}{1-\sigma}} \quad (5)$$

Anderson and Wincoop (2003) use market clearance condition (country  $i$ 's income should equal the value of its exports plus the value of the production sold in the domestic

market), and assume that trade barriers are symmetric, i.e.  $t_{ij} = t_{ji}$ . These assumptions allow, firstly, to define each country's consumers price index as a function of partners countries price indexes and trade barriers:

$$\bar{P}_{jk}^{1-\sigma} = \sum_i \theta_{ik} \left( \frac{t_{ijk}}{\bar{P}_{ik}} \right)^{1-\sigma} \quad (6)$$

where  $\theta_{ik}$  is country  $i$ 's share in the world income ( $Y_k^w$ ) of product  $k$  ( $\theta_{ik} \equiv \frac{Y_{ik}}{Y_k^w}$ ). Anderson and Wincoop (2003) refer to consumer price indexes as multilateral resistance, as they depend on all bilateral resistances.

Secondly, a gravity equation is derived:

$$X_{ijk} = \frac{Y_{ik} \cdot Y_{jk}}{Y_k^w} \cdot \left( \frac{t_{ijk}}{\bar{P}_{jk} \cdot \bar{P}_{ik}} \right)^{1-\sigma} \quad (7)$$

where  $Y_{ik}$  is the total income of country  $i$  for the product  $k$ ,  $\bar{P}_{jk}$  consumer price index for product  $k$  in country  $j$  and  $\bar{P}_{ik}$  is the consumer price index for product  $k$  in country  $i$ .

Then equation (7) is called gravity equation. As in traditional gravity equations, trade is supposed to depend positively on the size of each country and negatively on a trade barrier factor. But here, trade is also affected by the price indexes of both countries.

The next step is to model trade costs. Anderson and Wincoop (2003) assumed in their model that the trade cost factor consists on two terms corresponding to two different types of costs: non-border costs ( $d$ ), national border effects ( $bor$ ) i.e.:

$$t_{ijk} = d_{ij}^\rho \cdot bor_{ij} \quad (8)$$

They showed the border effect only with one dummy variable, i.e. if two countries are the same border  $bor_{ij}$  is equal to 1 and 0 otherwise. But the common border effect is also

affected by other factors like colony (C), regional trade agreements (RTA) between two countries'  $i$  and  $j$ . Consequently we define the border effects by:

$$bor_{ij} = e^{\theta_1 \cdot B_{ij} + \theta_2 \cdot Col_{ij} + \theta_3 \cdot L_{ij} + \theta_4 \cdot Land_{ij} + \theta_5 \cdot RTA_{ij}} \quad (9)$$

where  $B_{ij}$  is a dummy variable equal to 1 if countries  $i$  and  $j$  have common border and 0 otherwise,  $Col_{ij}$  is a dummy variable equal to 1 if countries  $i$  are the ancient colony of countries  $j$  and 0 otherwise,  $L_{ij}$  is a dummy variable equal to 1 if countries  $i$  and  $j$  speak a common language and 0 otherwise,  $Land_{ij}$  is a dummy variable equal to 1 if countries  $i$  are in landlocked group countries,  $RTA_{ij}$  is a dummy variable equal to 1 if both countries  $i$  and  $j$  are members of the RTA and 0 otherwise. As a result we redefine the trade cost by:

$$t_{ijk} = d_{ij}^{\rho} \exp[\theta_1 B_{ij} + \theta_2 Col_{ij} + \theta_3 L_{ij} + \theta_4 Land_{ij} + \theta_5 RTA_{ij}] \quad (10)$$

Transforming equation (7) in log terms and replacing the trade cost factor with equation (10) yields:

$$\begin{aligned} \ln(X_{ijk}) = & -\ln(Y_k^W) + \ln(Y_{ik}) + \ln(Y_{jk}) - (1 - \sigma) \cdot \ln(\bar{P}_{ik}) - (1 - \sigma) \cdot \ln(\bar{P}_{jk}) + \\ & (1 - \sigma)\rho \cdot \ln(d_{ij}) + (1 - \sigma)\theta_1 \cdot (B_{ij}) + (1 - \sigma)\theta_2 \cdot (Col_{ij}) + \\ & (1 - \sigma)\theta_3 \cdot (L_{ij}) + (1 - \sigma)\theta_4 \cdot (Land_{ij}) + (1 - \sigma)\theta_5 \cdot (RTA_{ij}) + e_{ijk} \end{aligned} \quad (11)$$

where  $X_{ijk}$  is the nominal value of agricultural exports from exporting countries  $i$  (here EU's trading partners) to the importing country  $j$  (here EU),  $Y_k^W$  is the world GDP of agricultural sector,  $Y_{ik}$  is the agricultural GDP in exporting country  $i$ .  $Y_{jk}$  is the agricultural GDP in importing country  $j$ ,  $\bar{P}_{ik}$  refers to export price index of exporting country  $i$ ,  $\bar{P}_{jk}$  refers to import price index of importing country  $j$ ,  $d_{ij}$  is the distance between capitals of country  $i$  and country  $j$ .

Therefore, for total agricultural products, the equations 12 and 13 are estimated by using panel data for the agricultural sector of EU.

$$\ln(X_{ijk}) = a_0 + a_1 \ln(Y_{ik}) + a_2 \ln(Y_{jk}) + a_3 \ln(\bar{P}_{ik} \cdot \bar{P}_{jk}) + a_4 \ln(D_{ij}) + a_5(B_{ij}) + a_6(Col_{ij}) + a_7(L_{ij}) + a_8(Land_{ij}) + \sum_r \gamma_r(RTA_{rij}) + e_{ijk} \quad (12)$$

$$\ln\left(\frac{X_{ijk} \cdot Y_k^W}{Y_{ik} \cdot Y_{jk}}\right) = b_0 + b_1 \ln(\bar{P}_{ik} \cdot \bar{P}_{jk}) + b_2 \ln(D_{ij}) + b_3(B_{ij}) + b_4(Col_{ij}) + b_5(L_{ij}) + b_6(Land_{ij}) + \sum_r \theta_r(RTA_{rij}) + e_{ijk} \quad (13)$$

Although in traditional gravity equation (equation 7) the coefficients of income variables ( $Y_{ik}$ ,  $Y_{ij}$  and  $Y_k^w$ ) equal one, most of empirically studies relax this restriction and estimated general form (equation 12) (For example see McCallum, 1995; Ghosh and Yamarik, 2004a and 2004b and Carrère, 2006). Also, the restricted form, with the income coefficient equal to one (equation 13), was used in some studies (e.g. Anderson and van Wincoop, 2003). In this study, both forms (equations 12 and 13) are estimated.

The aggregate prices ( $\bar{P}_{ik}$  and  $\bar{P}_{jk}$ ) mostly are not accessible so many researchers suggested to proxy them. Traditionally, remoteness variables are used, which are presumed to reflect the distance of a country from its alternative trading partners (for example, Wei, 1996 and Anderson and Wincoop, 2003). We substitute the price indexes terms by two types of proxy. First, price indexes terms are proxied by FAO indices for total agricultural products. These value indices represent the change in the current values of export (f.o.b.) and of import (c.i.f.), all expressed in US dollars.  $\bar{P}_{jk}$  is substituted by “import value index” ( $IM_j$ ) and  $\bar{P}_{ik}$  is substituted by “export value index” ( $EX_i$ ). Therefore, this new variable (PI) is defined by:

$$PI = EX_i \cdot IM_j$$

Second, like many researchers (e.g. Wei, 1996; Anderson and Wincoop, 2003) we substitute the price index terms with remoteness variable, which is supposed to reflect the distance

between a country and its trading partners. This variable represents bilateral distances weighted by GDP with alternative trading partners. It is defined as follows:

$$RIM_i = \sum_{m \neq j} \frac{D_{im}}{Y_{mk}}$$

where country  $m$  is an alternative trading partner (or the other target markets for country's  $i$ ),  $D_{im}$  is the distance between country's  $i$  and  $m$ ,  $Y_m$  is the income of country  $m$  in the sector of  $k$ . US and Japan constitute approximately 20% of world agricultural imports. Hence, we consider these countries like alternative trading partners. Consequently,  $m$  refers to these two countries.

We expect to find a positive sign for  $RIM_i$ . If the country's  $i$  is far from the alternative target markets, there are more chance to export to the EU. Also, if the countries'  $m$  are rich the opportunity of exporting towards EU decreases because these alternative trading partners buy more products from countries  $i$ .

## 4. Data and Estimations

### 4.1. Data description

The values of imports (total agricultural sector) are collected from Commodity Trade Statistics of United Nation (COMTRADE) for 5 years from 2000 to 2004. The Agricultural GDP and population are collected by World Bank (WB) data. During this period, the total agricultural imports are considered for the EU with 15 member states. The system of classification SITC (Standard International Trade Classification) has *1-digit* code for the agricultural sector. Trade and agricultural GDP are expressed in *US* dollar (\$). Distances between the capitals (by kilometres, Brussels is supposed to be the capital of the EU) and dummy variables (common border, common language, landlocked countries, and ancient



colony) are collected with the CEPII data file. 167 countries (all EU's trading partners) are considered (table a2 in appendix). The “*export value index of agricultural goods*” for exporting countries (country  $i$ ) and the “*import value index of agricultural goods*” for importing countries (country  $j$ , here the EU) are collected with the FAOSTAT database.

The examined trade agreements are the following: African-Caribbean and Pacific States (**COTONOU**), Generalized System of Preferences (**GSP**), Everything But Arms (**EBA**), European Economic Area (**EEA**), European Union-Chile Association Agreement (**EUCAA**), Central and Eastern European Countries or EU-Enlargement (**EUEN**), Euro-Mediterranean Agreement (**Euromed**), European Union Caribbean Economic partnership agreement (**EU/Caribbean-EPA**) is a new agreement with Central American Common Market countries (**CACM**) and **Andean** Group (**ANDEAN**), Mexico-European Union Free Trade Agreement (**MEUFTA**) and Trade Development Cooperation Agreement with South Africa (**TDCA**) (for more details about EU's RTAs see table a1 in appendix).

## 4.2. Econometric results

Table 1 reports the econometric results from equations 12 and 13, based on the specifications discussed above (columns 1 and 3 correspond to the estimation with  $RIM$  as a price proxy and columns 2 and 4 correspond to the estimation with  $PI$  as a price proxy). The results after remedy of heteroscedasticity are shown. According to this table, the implied income elasticity (agricultural GDP for exporting countries  $LnYAG_i$ ) is positive and significant in all cases. The positive effect for exporter countries ( $LnYAG_i$ ) shows that the high- agricultural income countries export more. Besides, the magnitudes of these estimates are similar to those found in the literature for all tradable goods (for example in Anderson and Wincoop (2003)'s and Carrere (2006)'s papers, it is around 1.10 and in Ghosh and Yamarik (2004a) it is 0.90). As this coefficient for agricultural sector is smaller (0.88), it confirms the

results of Feenstra et al. (2001). They estimated gravity equations in three cases (export of differentiated goods, export of reference priced goods and export of homogenous goods): their results show that the income elasticities (coefficients of GDP) for homogenous goods are less than other types.

### **Insert Table 1**

The EU's agricultural GDP ( $LnYAG_{EU}$ ) is significantly positive when the equation is estimated with the remoteness variable (column 1). It shows that the exports of agricultural products increase with increase in the EU's agricultural GDP. Results concerning the distance show the negative effect over import of agricultural products but this coefficient is less than the estimates found in the literature for all tradable goods. For example, McCallum (1995), Feenstra et al. (2001) and Anderson and Wincoop (2003) find this coefficient is around one. Although these studies consider entire tradable goods, Feenstra et al. (2001)'s found when they use the homogenous goods that distance coefficients decrease (it is around 0.7). Here we find the same signal: using data of agricultural sector increases the degree of homogeneity. In the other side, this may reflect the fact that many agricultural products are shipped by huge transportation.

The common border, landlocked countries, common language and EU's old colonies coefficients have the expected sign and are significant at 5% level. The agreements of COTONOU, EEA, EUEN, CACM, ANDEAN, TDCA and EUCAA show positive and significant effect over exports of agricultural commodities to EU market and GSP, EBA and MEUFTA show negative and significant effect at 5% level. The sign associated with Euromed agreement is not statistically significant. The estimates for each RTA are briefly discussed below.

In order to better compare the EU' RTAs, we calculate the implied tariff equivalent with different substitution elasticities ( $\sigma$ ). Table 2 shows the implied tariff equivalent for the EU's RTAs subject to three rates for substitution elasticity ( $\sigma = 2, 5, 10$ ).

The coefficient for COTONOU agreement (between ACP countries and EU) shows positive effects in all cases in table 1. Using a substitution elasticity, it is possible to calculate the implied tariff equivalent of the per-RTA border cost for all agricultural commodities. As an example, suppose an elasticity of substitution ( $\sigma=10$ ) and the estimated border effect coefficient of COTONOU agreement from the first estimation (0.64), so the tariff equivalent of this agreement is 7 percent [=100  $\times$  (exp[0.64/(1-10)]-1)] (for more details see Appendix 2). With a substitution elasticity of 5 ( $\sigma=5$ ) the per-RTA border is 15 percents. A similar pattern emerges for the imports of agricultural commodities from EEA, EUEN, CACM, ANDEAN, TDCA and EUCAA. Most of EU's RTAs are similar to a decrease in the tariff, except the three important RTAs (GSP, EBA and MEUFTA) for poor countries and developing countries that are equal to an increase in tariff (table 2). Namely, the GSP, EBA and MEUFTA increase respectively by 20%, 41% and 42% the tariff (if  $\sigma =5$ , based on first estimation) for trade in all agricultural commodities. In other words, the GSP, EBA and MEUFTA show the negative effect over trade (table 1). Because most of countries in these agreements are LDCs it may show that LDCs do not necessarily have a strong comparative advantage in agriculture products. In addition, it maybe shows that these kinds of RTAs (they are unilateral and they do not cover all agricultural products) are not so useful for LDCs countries.

### **Insert Table 2**

Finally, to take into account overlapped agreements, we completed the analysis. First we estimated the models with each RTA separately and we find the same results considering

the sign and the magnitude of coefficients. Second, we keep the eleven RTAs but we divided EBA and Cotonou dummies. We so distinguished countries which participate only to the EBA agreements from those which participate only to the Cotonou agreement and finally a dummy represent the case where countries participate to both. Results are reported in table a4 in appendix. We can notice that conclusions already expressed remain. The only exception concerns the case of Euromed. Indeed, this agreement shows positive and statistically significant effects. Nevertheless, this effect is not so surprising; it is also the result of some other studies (see for instance Peridy (2005)). We also run the estimations with and without the dummy for GSP but this last one does not change our results.

Let us now come back to the case of EBA. If the purpose of the EBA agreement is to provide increased market access through eliminating tariffs and quotas, it failed. Our calculation based on UN Comtrade database show that the market access of LDCs in the EU agricultural market from 3.0% decreased to 2.7% during the period of estimation (2000-2004). Also, Bureau et al (2006) show that EBA had the smallest rate of utilization between EU's non-reciprocal preferences (in 2002 the rate of utilization of EBA was 17% whereas it was 92.8% for Cotonou) (also refer to Bureau et al (2007)). Besides, the estimated results present a negative effect of this agreement over exports of EBA countries (tables 1, 2). So, few questions emerge: why does this agreement failure? Alternatively, why is EBA agreement similar to an increase in import tariff? Since EBA is an important agreement, for LDCs let us briefly explain this agreement and mention some failure reasons.

**EBA agreement and LDCs:** The EBA agreement is an extension of the EU's Generalized System of Preferences (GSP) that was entered into force in 2001. This unilateral agreement gives to 49 LDCs <sup>5</sup> into the world zero tariffs with no quantitative restrictions on all products, except arms, without reciprocity. This agreement keeps out sensitive products including rice,

sugar, and bananas. The EU preferential market access aspect of EBA aims to facilitate trade with the LDCs. The purpose of increased market access is to enhance trade with the aim to help the LDCs to expand their economies. Our data show that EU agricultural imports from the LDCs have been decreasing over the past years (2000-2004). In addition, the results of gravity model show the negative effect for this agreement. Few explanations can be found. First, the preferences under EBA are given in unlimited period and there is no guarantee for LDCs that their preferences will be retained. Second, the changes in standards and rules are not clear enough for LDCs. Third, the “*rules of origin*”<sup>6</sup> dictated by the developed countries in some cases are too complex, inflexible and they have massive administrative demands, besides it is often very costly to prove the origin.

The rules of origin restrictions in the EBA agreement are too restrictive and more than in the Cotonou Agreement. The rules of origin in the Cotonou agreement allow to the products to move within the ACP countries for supplementary processing before exporting to the EU. Although the original goods do not come from the ACP countries, they could still benefit the duty free access (Official Journal of the European Communities, L317/3 December 15, 2000). In addition, the rules of origin for fishing exports to the EU in the Cotonou agreement are much more flexible. To compare some of these rules between EBA and Cotonou see table a3 in appendix. The main explanation is that Cotonou agreement imposes less administrative constraints, or is more flexible regarding to the origin of the material used as inputs to exports than competing agreements. When exporters have the choice between two preferential agreements and one of them is more generous than others, they tend to favour particular agreements. Therefore, the members prefer exports under Cotonou agreement for using the preferences. In the other hand, the EBA members that are not included in the Cotonou agreement lose the competition to entrance in the EU market.

These preferences are much criticized by many other studies (e.g. Brenton, 2003; Panagaryia, 2003; Ozden and Reinhardt 2003, Topp, 2003).

Finally, although EU's sanitary and phytosanitary (SPS) regulations and import standards are not actually part of any specific agreement and that they are applied equally to all countries, obtaining these standards still keeping a comparative advantage is not easy for the LDCs farmers. Producers in developed countries have the luxury of technology and other aids but the producers in LDCs do not have the ability to pay for achieving to these standards.

Furthermore, preferential trading arrangements can create an artificial comparative advantage due to the duty-free access into the market. Economic theory advises that the producers should allocate resources to their most efficient uses. Another negative aspect of the GSP and EBA preferences is that it no longer gives preferences to the same country in every sector. It could lead to a move from these sectors towards a beneficial one.

Mexico is a member of NAFTA (North American Free Trade Agreement). So, this country benefits a quota-free and duty-free to export to the USA and Canada for some agricultural products. The reduction of exports to the EU can probably be explained by more Mexico's exports under the NAFTA agreements. The consideration of supply side needs more information and data.

## **5. Conclusion**

The evaluation and analyze of EU's RTAs are complex and ambitious. This paper investigates the potential impact of EU's RTAs on extra-trade flows. For this purpose, an expanded gravity model is used to estimate the impact of eleven RTAs (ten of them are with developing countries and poor countries) on trade patterns between EU and their trading partners. In order to compare these RTAs and their effects we calculate the implied tariff

equivalent of EU's RTAs. In other words, the effect of RTAs is shown like a reduction (or increase) in import tariff.

The empirical analysis undertaken in this paper indicates that, a large number of EU's RTAs support the agricultural exports of developing countries to the EU market. Thus, the EU's RTAs are often an attractive alternative for countries wishing to speed up the move towards multilateral free trade in agriculture. Nevertheless, we find the negative effect for two most important and unilateral RTAs (EBA and GSP) and the agreement with Mexico (MEUFTA).

The EU was the first to extend unilateral trade preferences to the LDCs, to engage in more trade with EBA countries than does any other country in the world. The aim of EBA agreement is an aid for economic growth and stability for the LDCs with increasing market access to the EU. Therefore, it would be expected that the EBA agreement would increase the agricultural market access for EBA countries because of duty-free market access. Nevertheless results of our estimations over the period 2000-2004 show that the EBA had the negative effect over the exports of EBA countries to EU market. Rigorous rules of origin, in terms of rigid cumulation rules, substantial processing and transport regulations are maybe some significant causes of the failure of this agreement. Furthermore, SPS regulations and heavy import standards can also largely decrease the exports to the EU. Also in EBA, the stability of preferences is not guaranteed. Additionally, another disadvantage of these unilateral preferences is that countries easily become dependent on the preferences and focus their economy around one product rather than allocating resources throughout the economy. Nevertheless, the main explanation is that Cotonou agreement and EBA are overlapped and Cotonou imposes less administrative constraints. So when exporters have the choice between

two preferential agreements and if one of them is more generous than others, they tend to favour particular agreements.

Recently, the EU has new negotiations with ACP countries for signing a new agreement entitled the Economic Partnership Agreements (EPAs). EPAs are a scheme in order to make a free trade area between the EU and the ACP countries. The big problem of EPAs is that the non-reciprocal and discriminating preferential trade agreements offered by the EU are incompatible with WTO rules. “How trade must be liberalized under the new EPAs” is still an extensively debated issue. Currently, the United Nations define 39 of the ACP countries as LDCs. As opposed to the other ACP countries, the group of LDCs will be asked to reject the EPAs and continue trade relations under the EBA regulation. While this provision facilitates the situation of the LDCs under the new trade scheme, it has also been criticised that the EBA initiative.

Already we mentioned that Cotonou (last agreement with ACP countries) overlap the EBA agreement and EBA countries prefer to export to EU under Cotonou agreement. But, all LDC countries are not in the Cotonou agreement. Most of these countries are very poor countries and have not bargaining power in negotiations with EU. According to our results and mentioned arguments above, the authors suggest that EU has to take into account the problem of overlapped agreements and if EU wants that agreements do not neutralize together, it has to separate them. Especially, LDCs could be taken into account in separated groups and some agreements could be made with these countries. Accordingly, the authors suggest that EU has to modify these agreements if the EU aims to help poor countries.



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## Appendix 1:

**Table a1-** The agreements between EU and the other trade blocs

Regional Trade Agreement	Members	The date of sign	Reciprocal (+) or Nonreciprocal (-)
<b>Cotonou</b> (with ACP African-Caribbean and Pacific Group of States)	Angola, Antigua and Barbuda, Bahamas, Barbados, Belize, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Brazzaville), Congo (Kinshasa), Cook Islands, Cuba, Dominica, Dominican Republic, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Federated States of Micronesia, Fiji, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, , Grenada, Guyana, Haiti, Jamaica, Ivory Coast, Kenya, Kiribati, Lesotho, Liberia, Marshall Islands, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Nauru, Niue, Palau, Papua New Guinea, Rwanda, Samoa, Solomon Islands, Sao Tome & Principe, St.-Kitts & Nevis, St.-Lucia, St.-Vincent, Suriname, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Trinidad & Tobago, Timor-Lets, Tonga, Tuvalu, Uganda, Vanuatu, Zambia, Zimbabwe.	2000	+
<b>ANDEAN</b> = (CAN) Andean Group	Bolivia, Colombia, Ecuador, Peru, Venezuela	1996	+
<b>CACM</b> = Central American Common Market countries	El Salvador, Guatemala, Honduras, Nicaragua, Costa Rica	1961	+
<b>EBA</b> = Everything But Arms	Afghanistan, Angola, Bangladesh, Benin,	2001	-

	Bhutan, Burkina Faso, Burundi, Cambodia, Cape Verde, Chad, Comoros, Ctrl.-Africa-Rep., Djibouti, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Eq., Guinea-Bissau, Haiti, Kiribati, Laos, Lesotho, Liberia, Madagascar, Malawi, Maldives, Mali, Mauritania, Mozambique, Nepal, Niger, Rwanda, Samoa, Sao, Sierra Leone, Solomon-Isl., Somalia, Sudan, Tanzania, Togo, Tome, Tuvalu, Uganda, Vanuatu, Yemen, Zambia.		
<b>EEA</b> = European Economic Area	Iceland, Liechtenstein, Norway	1994	+
<b>EUCAA</b> = European Union-Chile Association Agreement	Chili.	2002	+
<b>EUEN</b> = Central and Eastern European Countries or EU-Enlargement	Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia	2004	+
<b>EUROMED</b> = Euro-Mediterranean Agreement	Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestinian Authority, Syria, Tunisia, Turkey.	1995	+
<b>GSP</b> = Generalized System of Preferences	All developing countries	1971, 2006 (new GSP)	-
<b>MEUFTA</b> = Mexico-European Union FTA	Mexico	2000	+
<b>TDCA</b> = Trade Development Cooperation Agreement with South Africa	South Africa	1999	+

**Table a2-** The list of trade partners (167 countries):

Albania	Congo-Dem. Rep	Indonesia	Mozambique	Slovenia
Algeria	Congo	Iran	Myanmar	Solomon Islands
Angola	Costa Rica	Iraq	Namibia	Somalia
Antigua & Barbuda	Cote d'Ivoire	Israel	Nepal	South Africa
Argentina	Croatia	Jamaica	New Caledonia	Sri Lanka
Armenia	Cuba	Japan	New Zealand	Sudan
Aruba	Cyprus	Jordan	Nicaragua	Suriname
Australia	Czech Rep.	Kazakhstan	Niger	Swaziland
Azerbaijan	Djibouti	Kenya	Nigeria	Switzerland
Bahamas	Dominica	Kiribati	Norway	Syria
Bahrain	Dominican Rep.	Rep. of Korea	Oman	Tajikistan
Bangladesh	Ecuador	Kuwait	Pakistan	Tanzania
Barbados	Egypt	Kyrgyzstan	Panama	Thailand
Belarus	El Salvador	Lao	Papua New Guinea	Togo
Belize	Equatorial Guinea	Latvia	Paraguay	Tonga
Benin	Eritrea	Lebanon	Peru	Trinidad and Tobago
Bhutan	Estonia	Lesotho	Philippines	Tunisia
Bolivia	Ethiopia	Liberia	Poland	Turkey
Bosnia Herzegovina	Fiji	Libya	Qatar	Turkmenistan
Botswana	French Polynesia	Lithuania	Romania	Uganda
Brazil	Gabon	Macedonia	Russian Federation	Ukraine
Bulgaria	Gambia	Madagascar	Rwanda	United Arab Emirates
Burkina Faso	Georgia	Malawi	Saint Kitts & Nevis	USA
Burundi	Ghana	Malaysia	Saint Lucia	Uruguay



Cambodia	Grenada	Maldives	Saint Vincent and the Grenadines	Uzbekistan
Cameroon	Guatemala	Mali	Samoa	Vanuatu
Canada	Guinea	Malta	Sao Tome and Principe	Venezuela
Cape Verde	Guinea-Bissau	Marshall Islands	Saudi Arabia	Viet Nam
Central African	Guyana	Mauritania	Senegal	Yemen
Chad	Haiti	Mauritius	Serbia and Montenegro	Zambia
Chile	Honduras	Mexico	Seychelles	Zimbabwe
China	Hungary	Moldova, Rep.	Sierra Leone	
Colombia	Iceland	Mongolia	Singapore	
Comoros	India	Morocco	Slovakia	

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**Table a3-** The regulations in COTONOU and EBA agreements in fishing sector

<b>Cotonou Agreement</b>	<b>EBA agreement</b>
The vessel can be registered in the EU or in any ACP country, independent of which country the products are exported from.	The ship must be registered to the EU or the direct beneficiary country.
The vessel can sail under the flag of any ACP country or the EU.	The vessel must sail under the flag of the EU or the direct beneficiary country.
The master and officers along with 50 percent of the crew must be nationals of ACP countries or the EU.	The master and officers along with 75 percent of the crew must be from the beneficiary or the EU.

Source: Official Journal of the European Communities website

**Table a4-** Results of gravity models considering overlapped agreements (panel data, 2000-2004)

Variables	(1)		(2)		(3)		(4)	
	Eq. 12		Eq. 12		Eq. 13		Eq. 13	
	Coefficients	t-values	Coefficients	t-values	Coefficients	t-values	Coefficients	t-values
LNYAG <sub>i</sub>	0.91*	95.12	0.90*	92.67	---	---	---	---
LNYAG <sub>EU</sub>	1.10*	2.57	-0.39	-0.72	---	---	---	---
LNPI	---	---	0.48*	4.67	---	---	0.66*	6.06
LNRIM	0.85*	7.81	---	---	0.62*	2.70	---	---
LNDIS	-0.17*	-11.45	-0.15*	-15.34	-0.19*	-12.37	-0.18*	-15.62
BOR	1.96*	19.64	1.99*	16.56	1.95*	18.73	1.94*	15.06
LAND	-1.01*	-15.75	-0.97*	-14.00	-1.03*	-14.19	-0.96*	-13.89
LANG	1.24*	15.83	1.20*	17.77	1.19*	15.07	1.16*	18.47
COL	1.12*	23.05	1.21*	24.58	1.15*	20.71	1.23*	24.45
EBA <sub>only</sub>	-0.26*	-3.64	-0.21*	-2.81	-0.10	-0.80	-0.09	-1.12
EBA <sub>&amp;Cotonou</sub>	-1.02*	-3.27	-0.88*	-2.79	-0.72*	-2.20	-0.64	-1.95
COTONOU <sub>only</sub>	0.85*	4.70	0.95*	5.01	1.06*	5.50	1.20*	6.30
EUROMED	0.17*	5.33	0.21*	7.11	0.18*	5.31	0.20*	6.38
EEA	3.50*	39.32	3.45*	47.12	3.52*	40.21	3.49*	50.34
EUEN	0.98*	10.74	0.96*	10.38	1.03*	10.99	1.01*	10.87
CACM	1.07*	15.53	1.19*	28.67	1.18*	18.76	1.31*	42.68
ANDEAN	0.46*	6.72	0.65*	9.48	0.53*	6.68	0.69*	9.42
TDCA	0.93*	5.83	0.81*	4.85	0.70*	4.10	0.52*	3.29
MEUFTA	-1.55*	-39.94	-1.45*	-53.05	-1.75*	-40.15	-1.69*	-50.74
EUCAA	1.32*	3.01	1.66*	2.89	1.60*	3.76	1.68*	2.97
CONSTANT	-17.52	-1.54	3.78	0.27	59.87*	16.87	43.98*	42.35
R <sup>2</sup>	0.61		0.61		0.38		0.39	

\* denotes significance at the 5% level

Note: the results are shown after correction of heteroscedasticity.

$EBA_{only}$  = dummy variables equal to 1 if country  $i$  participates only to the EBA agreements,  $COTONOU_{only}$  = dummy variables equal to 1 if country  $i$  participates only to the Cotonou agreements and  $EBA_{\&Cotonou}$  = a dummy represent the case where country  $i$  participates to both agreements (EBA and Cotonou).

## Appendix 2:

Consider a simplified semi-logarithmic regression equation of the form:

$$\ln(Y) = \alpha + \sum_s \beta_s \ln X_s + \sum_r \zeta_r D_r + \varepsilon_{ij}$$

$$\zeta_r = \kappa_r \cdot (1 - \sigma)$$

where  $X_s$  represent continuous explanatory variables and  $D_r$  is a set of dummy variables.  $s$  is the number of explanatory variables and  $r$  is the number of dummy variables. The coefficient of a continuous variable is:

$$\beta_s = \frac{\partial \ln Y}{\partial \ln X_s} = \frac{\partial Y}{\partial X_s} \cdot \frac{X_s}{Y}$$

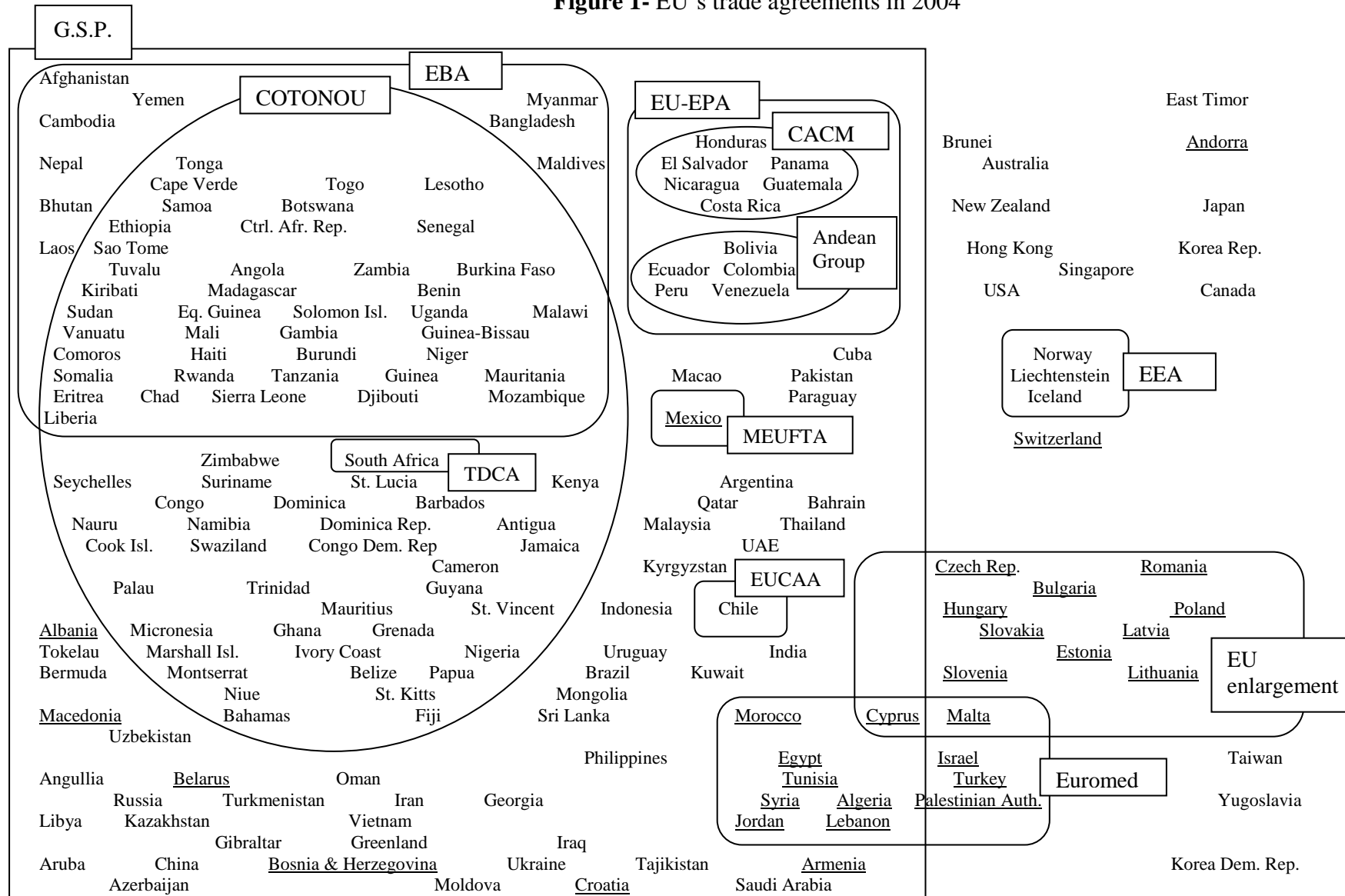
Thus, the coefficient of a continuous variable is the elasticity of  $X$  for a small change in the explanatory variable  $X_s$ . However, a dummy variable is a discontinuous variable and the derivative of  $X$  with respect to a small change in  $D_r$  does not exist. Instead, we can calculate the percentage change in  $X$  going from  $X_0$  to  $X_1$  for a discrete change in  $D_r$  from 0 to 1 as:

$$\left[ \frac{Y_1 - Y_0}{Y_0} \right] = \left[ \frac{\exp(\alpha + \sum_i \beta_i \ln X_i + \zeta \times 1 + \varepsilon_i) - \exp(\alpha + \sum_i \beta_i \ln X_i + \zeta \times 0 + \varepsilon_i)}{\exp(\alpha + \sum_i \beta_i \ln X_i + \zeta \times 0 + \varepsilon_i)} \right] * 100 = [\exp(\hat{\zeta}) - 1] * 100$$

Thus,

$$\text{implied tariff equivalent} = \left[ \exp\left(\frac{\kappa_r}{1 - \sigma}\right) - 1 \right] * 100$$

**Figure 1- EU's trade agreements in 2004**



Source: based on Bouët et al (2002), Candau and Jean (2005) and Bouët et al. (2005).

The underlined countries have a bilateral agreement with EU.

**Table 1-** Results of gravity models (with panel data) for EU (2000-2004)

Variables	(1)		(2)		(3)		(4)		
	Eq. 12		Eq. 12		Eq. 13		Eq. 13		
	Coefficients	t-values	Coefficients	t-values	Coefficients	t-values	Coefficients	t-values	
LNYAG <sub>i</sub>	0.88*	92.35	0.88*	92.08	---	---	---	---	
LNYAG <sub>EU</sub>	1.04*	2.89	-0.34	-0.68	---	---	---	---	
LNPI	---	---	0.44*	4.08	---	---	0.63*	5.93	
LNRIM	0.83*	7.81	---	---	0.60*	2.70	---	---	
LNDIS	-0.15*	-9.09	-0.13*	-12.93	-0.18*	-10.30	-0.17*	-14.90	
BOR	1.62*	19.26	1.65*	15.26	1.64*	17.77	1.63*	13.54	
LAND	-0.97*	-15.86	-0.94*	-14.36	-1.00*	-14.07	-0.94*	-14.28	
LANG	1.04*	13.47	1.01*	14.43	1.01*	12.71	0.98*	14.70	
COL	1.19*	23.33	1.28*	24.98	1.22*	21.11	1.30*	24.77	
RTAs {	GSP	-0.73*	-12.73	-0.74*	-15.67	-0.61*	-11.07	-0.62*	-14.46
	EBA	-1.38*	-5.04	-1.32*	-4.76	-1.27*	-4.08	-1.31*	-4.66
	COTONOU	0.64*	6.30	0.73*	6.74	0.86*	7.33	0.98*	8.71
	EUROMED	-0.05	-1.40	0.004	-0.12	-0.03	-0.69	-0.01	-0.30
	EEA	2.84*	35.26	2.79*	37.36	2.96*	36.82	2.92*	40.39
	EUEN	0.56*	4.98	0.53*	4.97	0.69*	6.14	0.66*	6.39
	CACM	1.11*	13.39	1.23*	25.11	1.21*	15.23	1.33*	34.31
	ANDEAN	0.52*	9.57	0.71*	12.66	0.56*	7.78	0.71*	11.37
	TDCA	1.22*	11.83	1.12*	10.66	0.93*	7.75	0.77*	7.81
	MEUFTA	-1.41*	-36.16	-1.32*	-37.04	-1.70*	-49.22	-1.65*	-58.51
EUCAA	1.40*	3.04	1.74*	2.91	1.64*	3.77	1.71*	3.00	
CONSTANT	-15.35	-1.60	4.02	0.31	60.23*	17.26	44.95*	45.07	
R <sup>2</sup>	0.60		0.60		0.36		0.38		

\* denotes significance at the 5% level

Note: the results are shown after correction of heteroscedasticity.

$YAG_i$  = the agricultural GDP of exporting country,  $YAG_{eu}$  = the agricultural GDP of importing country (EU),  $PI$  = the price indexes,  $RIM$  = the remoteness variable,  $DIS$  = the distance between the capital of two countries (capital of exporting country and Brussels as the capital of EU),  $BOR$  = Dummy variable equal to 1 if countries  $i$  and  $j$  have a common border,  $LANG$  = Dummy variable equal to 1 if countries  $i$  and  $j$  have the same language,  $LAND$  = Dummy variable equal to 1 if countries  $i$  are in landlocked group countries,  $COL$  = Dummy variable equal to 1 if countries  $i$  are the ancient colony of countries  $j$ ,  $RTA$  = dummy variables equal to 1 if countries  $i$  are in the agreement.



**Table 2-** The implied tariff equivalent (%) of the EU's Per-RTA with trade blocs

Agreements	(1)			(2)			(3)			(4)		
	$\sigma = 2$	$\sigma = 5$	$\sigma = 10$	$\sigma = 2$	$\sigma = 5$	$\sigma = 10$	$\sigma = 2$	$\sigma = 5$	$\sigma = 10$	$\sigma = 2$	$\sigma = 5$	$\sigma = 10$
<b>GSP</b>	108*	20*	8*	110*	20*	9*	84*	16*	7*	86*	17*	7*
<b>EBA</b>	297*	41*	17*	274*	39*	16*	256*	37*	15*	271*	39*	16*
<b>COTONOU</b>	-47*	-15	-7*	-52*	-17*	-8*	-58*	-19*	-9*	-62*	-22*	-10*
<b>EUROMED</b>	5	1	1	0	0	0	3	1	0	1	0	0
<b>EEA</b>	-94*	-51*	-27	-94*	-50*	-27*	-95*	-52*	-28*	-95*	-52*	-28*
<b>EUEN</b>	-43*	-13*	-6*	-41*	-12*	-6*	-50*	-16*	-7*	-48*	-15*	-7*
<b>CACM</b>	-67*	-24*	-12*	-71*	-26*	-13*	-70*	-26*	-13*	-74*	-28*	-14*
<b>ANDEAN</b>	-41*	-12*	-6*	-51*	-16*	-8*	-43*	-13*	-6*	-51*	-16*	-8*
<b>TDCA</b>	-70*	-26*	-13*	-67*	-24*	-12*	-61*	-21*	-10*	-54*	-18*	-8*
<b>MEUFTA</b>	310*	42*	17*	274*	39*	16*	447*	53*	21*	421*	51*	20*
<b>EUCAA</b>	-75*	-30*	-14*	-82*	-35*	-18*	-81*	-34*	-17*	-82*	-35*	-17*

\* Significance at the 5% level

## Footnotes

- 1- The RTA between developed countries and developing countries or LDCs.
- 2- In 2001, only Central American and Andean Pact countries were concerned.
- 3- These preferences have their roots in the *Treaty of Rome*, which established the European Economic Community (which later became the EU) in 1957 and provided for trading and other arrangements with former colonial territories. The European Development Fund was established to help the economic development of those former colonies.
- 4- In this study, we suppose that  $k$  represents the sum of agricultural goods i.e. the total value of agricultural goods of country  $i$  exported to country  $j$ . Anderson and Van Wincoop (2003) have applied their model for the whole economy, so their model is based on total GDP. Here, we use their model for the agricultural sector). Thus, we have introduced the  $k$  index for this sector and we use agricultural GDP.
- 5- The 49 least developed countries are those categorized within the United Nations classification format as “least developed.” The UN uses three criteria: low national income (under \$900 GDP per capita); weak human assets; and high economic vulnerability (an index measuring instability of agricultural production and exports, inadequate diversification, and economic smallness).
- 6- The theory behind *rules of origin* is to avoid trade deflection (or re-export) from countries non-benefited from special preferences through another country benefited from preferences and into the final market in order to use the trade preferences given to the LDCs.