# Trade Effects of the EU-Mexico Free Trade Agreement

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**Abstract:**

The Free Trade Agreement between Mexico and the 15 member countries of the European Union officially entered into force on July 1, 2000. In this empirical study we use a gravity model for import and export flows to quantify the trade effects of the EU-Mexico FTA. Besides the fixed effects approach we apply the instrumental variables estimator developed by Hausman and Taylor (1981). This method - unlike random effects - does not require independence of unobserved and observed characteristics, and allows us to study variables that are fixed over time. Our results indicate that the EU-Mexico FTA had a positive trade creation effect for imports. Moreover there is no evidence for trade diversion; the FTA generated a positive effect on imports with non-members. Finally, other triangular FTAs - a country with which both the US and the EU have signed a FTA - tend to have a negative impact on both imports and exports of the EU and Mexico.

*Keywords:* Gravity Equation, Panel Econometrics, Free Trade Agreement, Mexico, EU.

*JEL classification:* F14, F15, C23

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# 1 INTRODUCTION

The Free Trade Agreement (FTA) between Mexico and the 15 member countries of the European Union officially entered into force on the 1st of July 2000. Following the signature of the EU-Mexico FTA at the European Council in Lisbon on March 23, 2000, tariff dismantling between the EU and Mexico allowing for preferential access for European and Mexican exporters into their respective markets began on 1 July 2000. The EU-Mexico FTA covers a broad spectrum of economic aspects. The comprehensive preferential market access agreement not only secures liberalized trade in goods and services, it also covers public procurement, competition, intellectual property rights and dispute resolution. In this paper we will concentrate on the effects of the agreement on trade between the member countries.

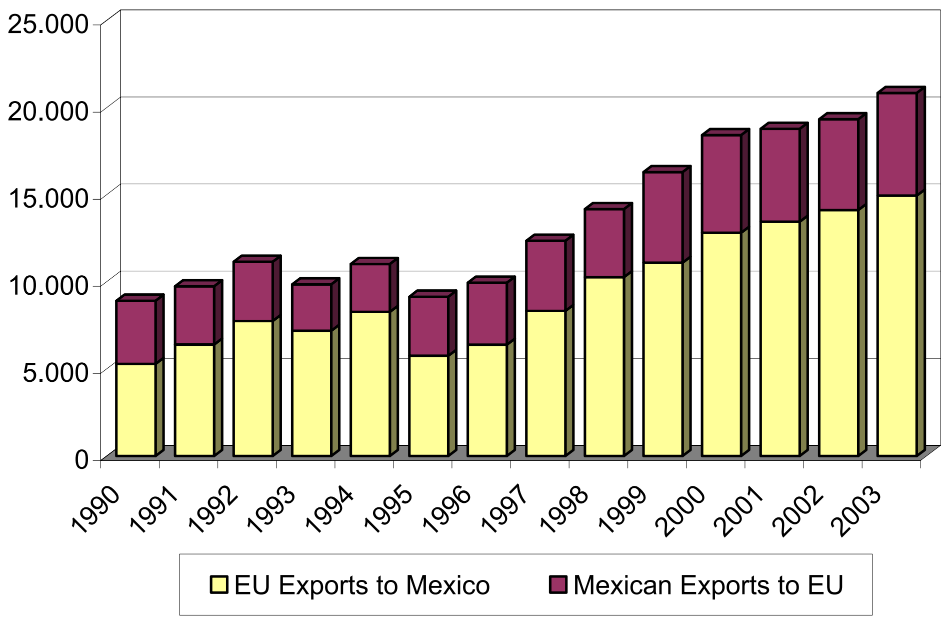
In the first section we give an overview of some essential features of the EU-Mexico FTA to gain better understanding of the agreement's effects. Moreover, the influence of the United States and the North American Free Trade Agreement (NAFTA) on the relationship between 15 members of the European Union and Mexico is taken into consideration. In the second section we outline a gravity framework of bilateral trade flows to quantify the trade effects of the EU-Mexico FTA. Following Bayoumi and Eichengreen (1995) we use a combination of dummy variables in the gravity model that allows us to separate the trade creation effects from the trade diversion effects. Moreover, we include an additional dummy to analyse the impact of triangular free trade agreements on the trade between Mexico and the European Union. Besides the fixed effects approach we apply the instrumental variables estimator developed by Hausman and Taylor (1981) to estimate the gravity equation. This approach permits us to study variables that are fixed over time, while controlling in an efficient way for the individual effects.

# 2 THE EU-MEXICO FREE TRADE AGREEMENT

The EU-Mexican FTA liberalised over 96 percent of total trade in goods between the parties. In industrial goods, Mexico achieved immediate duty-free access to the European market for 82 percent of its exports, and the remaining 18 percent was fully liberalized by 2003. On the other hand, 60 percent of the export of the European Union could immediately enter Mexico duty free, while the remaining 40 percent has a maximum tariff level of 5 percent and will be eliminated by 2007. The general structure and provisions of the EU standard protocol were followed in the EU-Mexico FTA. As a result, over 90 percent of the rules of origin follow the EU harmonized rules, thus simplifying the movement of goods between Mexico and Europe. Over 95 percent of Mexican exports obtained rules of origin benefiting national production sectors. Preferential access to the EU for Mexican production requires that a certain proportion of the product must be produced in Mexico or the EU.[1]

The European Union saw a decline in its export to Mexico in 1995, largely reflecting the impact of the coming into force of the NAFTA (Figure 1). Afterwards, trade in both directions has increased continuously. Since the coming into force of the EU-Mexico FTA, Mexican imports from the EU grew by 32% while their imports from the rest of the world grew by only 8%. The same is true when we look at the data of EU source. Whereas imports from the rest of the world expanded by nearly 15%, imports from Mexico grew by 41%. As a consequence, the share of trade in their respective total trade has grown as well.[2]

**Figure 1: Mexican and EU Exports, US$ mio (1990-2003)**



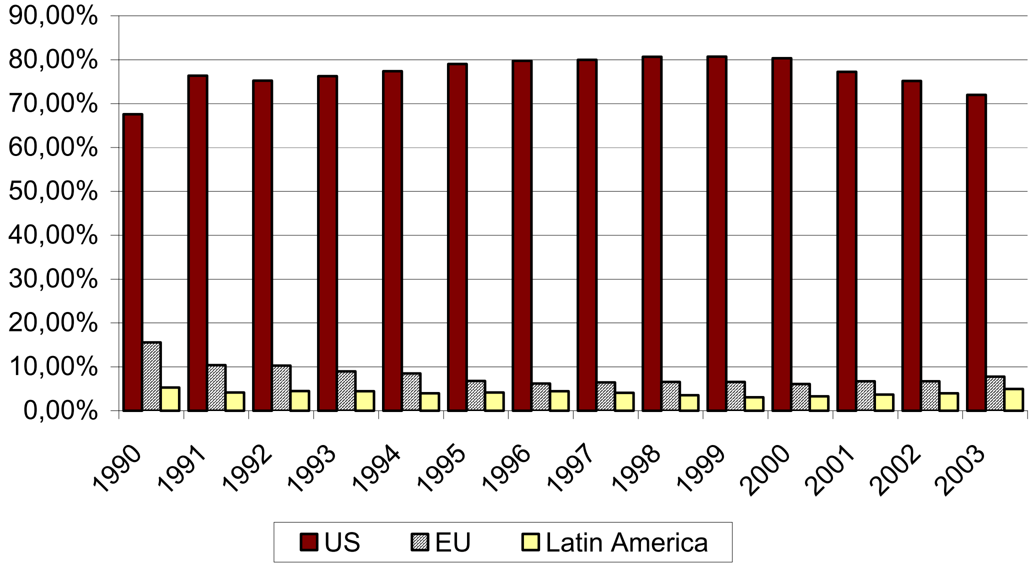

*Source:* IMF/Direction of Trade Statistics

From the Mexican point of view, the agreement offers a possibility for diversification and the establishment of a counterweight against the strong influence of the United States in the Mexican economy. As shown in Figure 2, the share of US trade with Mexico amounts up to 80% of Mexico's total trade at the end of the nineties and started shrinking in 2000.

[1] See EU (2000), Free Trade Agreement in Goods
[2] Figures given in this paragraph are the author's own calculations based on IMF/Direction of Trade Statistics.

Although the EU is Mexico's second largest trading partner, bilateral trade accounts for only 7,7% of Mexico's total trade with the world.

**Figure 2: Share of Mexican Total Trade, in Percentage (1990-2003)**



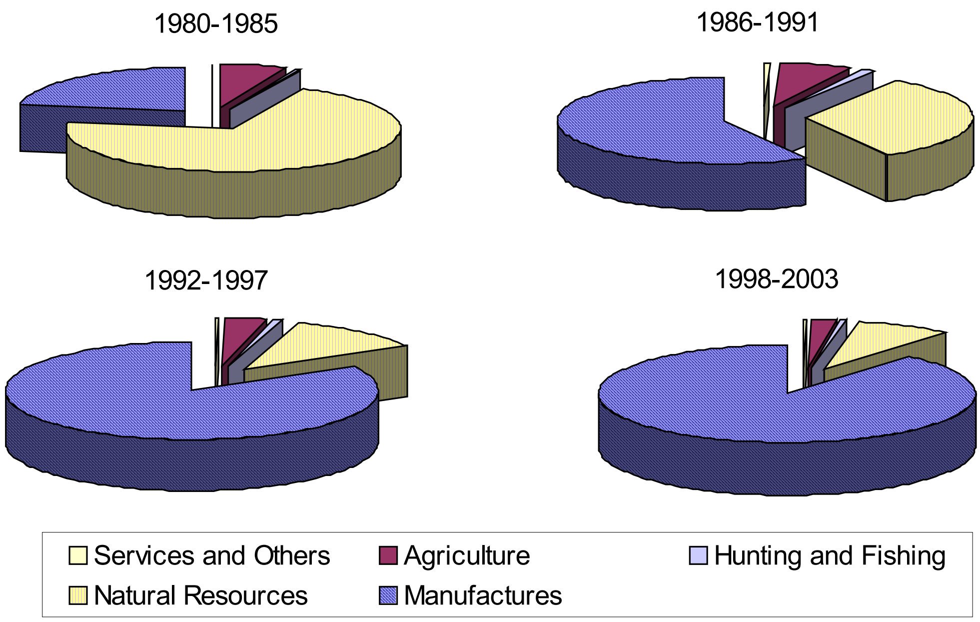

*Source:* Author's own calculations based on IMF/Direction of Trade Statistics data

The main objective for Mexico was to secure access for its industrial products sector into the lucrative European market. Given that the largest component of Mexico's total exports is manufactured goods (around 87 percent) and that the Maquiladora industry generates the majority of these (54 percent), it is clear that the EU-Mexico FTA has important implications for Mexico in general, and for the Maquiladoras in particular.[3] The industrial products sector has become highly competitive under the NAFTA, transforming the foundation of the Mexican economy from one based on resources to one based on industrial products export. At the beginnings of the eighties, the sector of natural resources accounted for more than 70% of total Mexican exports, while the share of manufactures was around 23% (see Figure 3). Nowadays the composition of Mexican exports has reversed completely, with the share of natural resources and manufactures being around 8% and 87% respectively. Indeed, one of the effects of the NAFTA was to rationalize North American industrial production by integrating the manufacturing processes of companies across the Mexican

[3] The Maquiladora industry is an industrial sub-sector that is dedicated to international subcontracting operations. The firms operate under the Maquiladora program established by the Mexican government in 1965, which is an investment attraction and export promotion scheme that offers benefits to qualified firms regarding import duties and other taxes.
Data on the composition of Mexican exports come from the Instituto Nacional de Estadística, Geografía e Informática (INEGI).

border. As a result, many component parts for incorporation into final production in the United States are made in Mexico.

**Figure 3: Composition of Mexican Total Exports, in Percentage (1980-2003)**




*Source:* Author's own calculation based on data from the Instituto Nacional de Estadística, Geografía e Informática (INEGI)

From the European perspective, the main objective was to re-establish the competitiveness of the European exports to Mexico. As shown in Figure 2 the EU perceived a decline in its market share in Mexico at the beginning of the nineties. In 1990 European trade accounted for more than 15% of Mexican total trade, while its share shrank to only 6 % in 2000. A restoration of the competitiveness required securing access to the Mexican market equivalent to that enjoyed by products originating from the NAFTA countries. Effectively, the extremely quick liberalizing calendar placed the European goods on an equally preferential basis with the US and Canadian products. Nevertheless, the EU companies cannot easily take advantage of the NAFTA rules of origin, nor are US companies able to produce goods destined for the EU without substantial Mexican content and labour. The rules of origin are designed to keep the benefits of the trade arrangements within the members and therefore Mexican participation is essential for either the United States or the EU to gain preferred access into each other's markets. Nonetheless, the Mexico-EU FTA offers EU firms the opportunity of increasing sales into the US market. Products that have content from both

Mexico and the European Union have a tariff advantage compared with products either coming directly from the EU of from other parts of the world.

## 3 EMPIRICAL EVALUATION

### 3.1 The Standard Gravity Model

To identify the effects of the FTA it is important to disentangle the effects of regional integration from other changes in the economy. A standard way to control for these other effects is to run a gravity model, and see whether the estimated relationships change as a consequence of implementing the FTA.[4] The 'standard' gravity model estimates bilateral trade between countries and explains trade as a function of their GDPs, populations, the distance between them, and additional factors such as sharing land border and common language. Furthermore a dummy is included to capture the integration effect of the FTA. A positive and significant coefficient on the FTA dummy is taken as evidence that during these years the countries traded more than would be suggested by other factors.

The specification of the standard gravity equation takes the following form:

$$\ln T_{ijt} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln P_{ijt} + \beta_4 \ln D_{ij} + \beta_5 \ln \overline{D_i} + \mu_{ijt}$$

where all variables are expressed in logs:

$T_{ijt}$ = Total bilateral trade (sum of imports and exports) between countries *i* and *j* at time *t,* with $i \neq j$ (Source: IMF/Direction of Trade Statistics);

$Y_{it}$ = Gross domestic product of country *i* at time *t* (IMF, expanded with WB/WDI data);

$P_{ijt}$ = Joint population of country *i* and country *j* at time *t* (IMF, expanded with WB/WDI data);

[4] Theoretical foundations of the gravity model are provided by Deardorff (1984), Helpman and Krugman (1985), and Helpman (1987). For a comprehensive overview of the empirical literature see Frankel (1997), and Harrigan (2002).

$D_{ij}$ = Distance between country *i* and country *j* (Geodesic distances from Centre d'Etudes Prospectives et d'Informations Internationales, CEPII);[5]

$\overline{D}_i$ = Remoteness, which is the average distance between country *i* and its exports markets in other countries, weighted by the GDP;

$\mu_{ijt}$ = Residual term;

Trade is viewed as being positively affected by the economic mass of trading partners (larger economies are likely to trade more), and negatively by population. A larger population is expected to reduce trade orientation by increasing the size of the domestic market and making economic activity more inwardly oriented. Distance between trading partners is used as a proxy for the cost of international transaction of goods and services and is expected to affect trade negatively. In addition to the absolute level of bilateral distance we include a measure of the remoteness of a country. An exporter's remoteness is defined as its average distance from its trading partners, using the partners' GDP as weights. The hypothesis is that the bilateral distance between two countries relative to the distances to their other trading partners has a positive effect on bilateral trade. For example, the distance between New Zealand and Australia is the same as the distance between France and Turkey. While France and Turkey have lots of other natural trading partners close by, New Zealand and Australia do not. We might thus expect the latter country pair, who have less alternatives, to trade more with each other, ceteris paribus, than France and Turkey.

Besides distance there are other factors influencing the cost of doing business at a distance. Linneman (1966) called this "physic distance" or "cultural unfamiliarity", which refers to the lack of familiarity with another country's laws, institutions, habits, and languages. Hence we include several dummies to capture these additional features of a country pair.[6]

$L_{ij}$ = Dummy that equals 1 if country *i* and country *j* have the same language, zero otherwise;

$A_{ij}$ = Dummy that equals 1 if country *i* and country *j* have a common border, zero otherwise;

[5] The geodesic distances are calculated following the great circle formula, which uses latitudes and longitudes of the most important cities/agglomerations (in terms of population).

[6] The two dummies indicating the adjacent borders and a common language between countries are obtained from the Centre d'Etudes Prospectives et d'Informations Internationales, CEPII.

Since linguistic affinity and shared borders tend to reduce the cultural distance and therefore encourage bilateral trade, we expect $\beta_6$ and $\beta_7$ to be positive. The new equation becomes:

$$\ln T_{ijt} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln P_{ijt} + \beta_4 \ln D_{ij} + \beta_5 \ln \overline{D}_i + \beta_6 L_{ij} + \beta_7 A_{ij} + \mu_{ijt}$$

Following Bayoumi and Eichengreen (1995) we include extra variables to capture third-country effects. Besides the real exchange rate vis-à-vis the US dollar ($ER_{it}$), as used by Bayoumi and Eichengreen (1995), we add the GDP of the US ($Y_{USt}$) as well. Since the Mexican economy is highly dependent on the US economy, changes in the GDP of the US might have important effects on Mexican trade. Omitting these two extra variables would lead to an omitted-variables bias in our gravity equation. The standard gravity model assumes that bilateral trade depends only on economic conditions in the two countries considered. In practice, however, bilateral trade also depends on competitiveness relative to other countries and markets.

In order to capture the trade effect of the EU-Mexico FTA we extend the standard gravity equation and add a dummy that equals one if both countries belong to the EU-Mexico FTA and zero otherwise. The estimated efficient of this dummy variable is the sum of the trade-creation and the trade-diversion effects of the EU-Mexico FTA. A positive coefficient indicates that the FTA tends to generate more trade to its members.

$$\ln T_{ijt} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln P_{ijt} + \beta_4 \ln D_{ij} + \beta_5 \ln \overline{D}_i + \beta_6 L_{ij} + \beta_7 A_{ij} + \beta_8 Y_{USt} + \beta_9 ER_{it} + \beta_{10} EUMexFTA_t + \mu_{ijt}$$

### 3.2 Empirical Results

The database used in estimating the gravity model contains panel data for 179 countries over the period 1980-2003. We use panel data to take into account the critic of Mátyás (1997). He argues that the traditional cross-section approach is affected by a severe problem of misspecification. The most natural representation of bilateral trade flows is a three-way specification and eliminating one of the three dimensions (e.g. time) ignores the presence of exporter and importer effects. Egger (2002) adds to this argument that a panel framework the most appropriate methodology is for disentangling time-invariant and country specific effects.

We estimate the model with fixed effects (FE) and with random effects (RE). Whereas the FE model is always consistent in the absence of endogeneity or errors in variables, the RE model is only consistent if the individual effects are uncorrelated with all other explanatory variables. In that case, RE estimators have the advantage to be more efficient than FE estimators. If these conditions do not hold, only the FE approach is consistent since it cleans out all the time-invariant effects ($\alpha_i$). The Hausman (1978) specification test is used to test for correlation between the whole set of explanatory variables and the country-specific effects. As shown in table 1, the null hypothesis of zero correlation is rejected in all specification tried, which indicates that the RE estimates are biased.

The results of our gravity estimation are reported in table 1. Dhar and Panagariya (1999) argue that using total trade as dependent variable constrains the coefficients for imports and exports to be equal. Instead they propose to estimate separate equations for exports and imports. On the other hand, according to Frankel (1997) aggregating imports and exports influences only slightly the results. Moreover, he argues that it has the advantage to cancel out the effect of a real appreciation or depreciation on exports and imports and thus justifies the omission of a term for the real exchange rate. To check the validity of our estimation results, we compare the estimates of separate equations for imports ($\ln M_{ijt}$), exports ($\ln X_{ijt}$), and aggregate trade ($\ln T_{ijt}$). As reported in table 1, the difference between the import elasticity and export elasticity is substantially large. Constraining them to be equal and using total trade as dependent variable would therefore be inappropriate. Consequently, for the remaining of the paper the difference in coefficients will be taken into account, and the results will be discussed for imports and exports separately.

Furthermore we include a linear time trend term to control for the observed tendency that international trade grows over time. The trend term turns out to be statistically significant, and moreover the results change in important ways. The *R*-squared of the regressions with time trend is considerably higher compared to *R*-squared of the regressions without time trend, both for exports and imports.

**Table 1: Gravity Model Estimates, using FE (1980-2003)**

| Variable | $\ln T_{ijt}$ | $\ln T_{ijt}$ | $\ln X_{ijt}$ | $\ln X_{ijt}$ | $\ln M_{ijt}$ | $\ln M_{ijt}$ |
|---|---|---|---|---|---|---|
| C | -15.748*** | -79.425*** | -13.577*** | -105.038*** | -21.394*** | -125.603*** |
| | (1.870) | (5.687) | (2.112) | (6.410) | (2.748) | (8.348) |
| $Y_{it}$ | 0.147*** | 0.179*** | 0.053 | 0.102*** | 0.359*** | 0.412*** |
| | (0.034) | (0.034) | (0.038) | (0.038) | (0.049) | (0.049) |
| $Y_{jt}$ | 0.854*** | 0.883*** | 0.836*** | 0.876*** | 0.809*** | 0.856*** |
| | (0.021) | (0.021) | (0.024) | (0.024) | (0.031) | (0.031) |
| $D_{ij}$ | dropped | dropped | dropped | dropped | dropped | dropped |
| $\overline{D}_i$ | 0.000*** | -0.000 | 0.000*** | 0.000 | 0.001*** | 0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| $L_{ij}$ | dropped | dropped | dropped | dropped | dropped | dropped |
| $A_{ij}$ | dropped | dropped | dropped | dropped | dropped | dropped |
| $P_{ijt}$ | -1.040*** | -0.859*** | -1.691*** | -1.437*** | -0.683*** | -0.392* |
| | (0.141) | (0.142) | (0.159) | (0.160) | (0.207) | (0.208) |
| $Y_{USt}$ | 0.399*** | 2.530*** | 0.727*** | 3.791*** | 0.027 | 3.516*** |
| | (0.045) | (0.185) | (0.051) | (0.209) | (0.067) | (0.272) |
| $ER_{it}$ | 0.000*** | 0.000*** | 0.000** | 0.000*** | 0.000*** | 0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| $EUMexFTA_t$ | 0.009 | 0.103 | -0.076 | 0.059 | 0.090 | 0.244* |
| | (0.088) | (0.088) | (0.100) | (0.100) | (0.130) | (0.130) |
| *Trend* | | -0.127*** | | -0.183*** | | -0.208*** |
| | | (0.011) | | (0.012) | | (0.016) |
| Observations | 54478 | 54478 | 54944 | 54944 | 54663 | 54663 |
| $R^2$ | 0.2280 | 0.3714 | 0.0394 | 0.1684 | 0.1457 | 0.3561 |
| F-statistic | 834.68*** | 749.87*** | 793.39*** | 725.76*** | 383.06*** | 358.13*** |
| Hausman test $\chi^2$ | 846.78*** | 522.48*** | 1112.83*** | 464.19*** | 730.22*** | 372.22*** |

*** Significant at 99% confidence level; ** significant at 95% confidence level; * significant at 90% confidence level.

As reported in table 1, all the coefficients have the expected signs and are statistically significant, with exception of $\overline{D}_i$ and the FTA dummy for exports.[7] Since the explanatory variables $D_{ij}$, $L_{ij}$, and $A_{ij}$ are time-invariant variables, they are wiped out by the FE estimator. As expected, exports and imports are positively affected by the log of GDP and negatively by the log of population. Both for exports and imports the GDP of the trading partner seems to have a relatively larger effect than a country's own GDP. The estimated coefficients for the log of GDP are less than one. This indicates that, though trade increases with size, it increases less than proportionately (ceteris paribus). This reflects that small economies tend to be more

[7] The effect of the FTA dummy on exports and imports will be further elaborated in the next section.

dependent on international trade than larger, more diversified economies. The effect of a country's remoteness on imports is positive and statistically highly significant, as one would expect, but is of little economic relevance. The effect on exports is nor statistically significant, nor economically significant. The same conclusion counts for the effect of the real exchange rate on exports and imports. Although the coefficient of the real exchange rate is statistically significant, the effect is practically very small. On the other hand, US GDP influences in a strong way exports and imports between countries and the coefficient is statistically significant. When the US GDP increases by 1%, the exports and imports between Mexico and the EU and their trading partners will increase on average by 3,8% and 3,5% respectively (ceteris paribus). US GDP turns out to be the most important basic factor in determining trade flows.

### 3.3 The EU-Mexico FTA in the Gravity Model

In this section we will look more into detail to the estimated effects of the EU-Mexico FTA. The basic gravity model framework to study the effect of FTA membership on trade flows includes a dummy that takes the value of one if both trading countries are members of the FTA at time *t*, and zero otherwise. As reported in table 1, the FTA dummy has the expected positive sign, yet the coefficient is statistically insignificant in the case of exports.

Several authors have challenged this approach. As Bayoumi and Eichengreen (1995) argue, the shortcoming of this approach is that a single variable cannot distinguish the trade-creation from the trade-diversion effects of the FTA. To enable these trade effects of FTAs to be separated, Bayoumi and Eichengreen (1995) and Frankel (1997) add a second dummy to the gravity equation ($ExtraBloc_t$). This dummy takes the value of one if only one country of the pair is a member of the FTA at time *t*, zero otherwise. A negative coefficient of the $ExtraBloc_t$ variable suggests evidence of trade diversion with regard to the rest of the world.

$$\ln T_{ijt} = \alpha_i + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln P_{ijt} + \beta_4 \ln D_{ij} + \beta_5 \ln \overline{D}_i + \beta_6 L_{ij} + \beta_7 A_{ij} + \beta_8 Y_{USt} + \beta_9 ER_{it} + \beta_{10} EUMexFTA_t + \beta_{11} ExtraBloc_t + \beta_{12} FTAs_t + \beta_{13} Triangular_t + \beta_{14} Trend + \mu_{ijt}$$

Furthermore we include two extra dummies to extent the analysis of the imports and exports between the 15 members of the EU and Mexico. First of all, the dummy $FTAs_t$ takes the value one if both countries of a country pair belong to a certain free trade agreement or custom union at time *t*, zero otherwise.[8] This dummy is introduced in the gravity model in order to capture the global impact of regional integration on trade between Mexico and the EU and their trading partners. According to the common finding from the regional integration literature that positive trade effects are associated with regional trade agreements, we expect the coefficient on $FTAs_t$ to be positive.

In addition, we include a second additional dummy ($Triangular_t$), which takes the value one if both the EU and the US have a FTA with a particular country at time *t*, zero otherwise. Gambrill (2002) argues that the trade between the EU and Mexico is characterized by triangular trade of European goods through Mexico into the US market, as well as a reverse triangular trade from third parties, such as the US or Asian countries, through Mexico into the EU market. Moreover, she argues that this trade pattern has been reinforced by the specific rules of origin defined in the EU-Mexico FTA. For example, on the one hand, goods subcontracted in Mexico by European Maquiladoras are often exported directly from Mexico to other countries such as the US. This indicates that the European subcontracting operations in the Maquiladoras is not 'outward processing', in which EU companies assemble goods in underdeveloped countries and then return them to the European market. On the other hand, European companies source intermediary goods in Asia and the US, bring them to Mexico, where they are processed, and export them to the EU. Of course, the rules of origin are designed to keep the benefits of the trade arrangements within the members, and thus Asian or US goods assembled in Mexico cannot easily receive the tariff benefits negotiated under the EU-Mexico FTA. Nevertheless, if the non-originating goods are transformed by more complex manufacturing processes, the status of originating products can be conferred to the intermediary goods coming from third countries.[9]

There is a possibility that the same triangular trade pattern exists for other countries with which both the US and the EU have signed a FTA, namely Israel and Jordan. On the one hand, the US signed a FTA with Israel in August 1985 and with Jordan in December 2001. On the other hand, the FTA between the 15 members of the EU, and Israel and Jordan officially entered into force in respectively November 2000 and December 2002, which

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[8] Other forms of integration arrangements, as preferential trading areas or services agreements, are not taken into account. The analysis is concentrated on more profound integration arrangements.

[9] Details on the Rules of Origin can be found in EU-Mexico Free Trade Agreement, Trade in Goods, Annex III. Available at: http://www.europa.eu.int/comm/trade/bilateral/mexico/fta.htm

means that since these dates the triangular trade pattern is open for Israel and Jordan.[10] The existence of possibility for an alternative triangular trade agreement would reduce the importance of the triangular trade between the EU and Mexico, since the EU companies have the possibility to export their goods through Israel or Jordan into the US market. Therefore, negative coefficient of the dummy $Triangular_t$ is expected.

The results of the gravity model with the additional FTA-dummies are reported in table 2. As we can see, the coefficient of $EUMexFTA_t$ for imports not only becomes bigger in economic terms, it is now statistically significant at a 95% confidence level. As the dependent variable is in logarithmic form, this implies that imports of the EU and Mexico are about 37,9% [exp(0,321) – 1 ≈ 0,379] higher than would have been expected by their economic characteristics and the average behaviour of countries in the sample. In addition, there seems to be no evidence of trade diversion. The coefficient of $ExtraBloc_t$ has a positive sign and is statistically significant at a 90% confidence level. This result indicates that membership of the EU-Mexico FTA did not only significantly expand imports between Mexico and the 15 members of the European Union, but also from the rest of the world. Greater trade with the rest of the world accompanied the tendency for greater intra-bloc trade, though of a smaller magnitude, about 8,1% [exp(0,078) – 1 ≈ 0,081]. As shown in table 2, the coefficients of $EUMexFTA_t$ and $ExtraBloc_t$ for exports have the expected signs, however they are statistically insignificant.

We now focus on the results of the two additional dummies that were included in the gravity model. As reported in table 2, both dummies have the expected sign and are statistically highly significant, for exports as well as for imports. Even when we control for other effects, being member of a free trade agreement, has a positive effect on the trade of Mexico and the EU. Moreover, as expected, other triangular trade agreements reduce trade between Mexico and the EU. This means that the European companies have alternatives, beside Mexico, to export their goods under preferential access to the US. Imports and exports are respectively about 38,1% and 49,0% lower than what would have been expected without the existence of the alternative triangular free trade agreements.

[10] See WTO (2000)

**Table 2: Gravity Model with Additional FTA Dummies, 1980-2003**

| Variable | $\ln X_{ijt}$ | $\ln X_{ijt}$ | $\ln M_{ijt}$ | $\ln M_{ijt}$ |
|---|---|---|---|---|
| C | -101.148*** | -110.426*** | -133.099*** | -140.965*** |
| | (7.365) | (7.396) | (9.583) | (9.632) |
| $Y_{it}$ | 0.095*** | 0.103*** | 0.424*** | 0.431*** |
| | (0.038) | (0.038) | (0.050) | (0.050) |
| $Y_{jt}$ | 0.874*** | 0.874*** | 0.859*** | 0.858*** |
| | (0.024) | (0.024) | (0.031) | (0.031) |
| $D_{ij}$ | dropped | dropped | dropped | dropped |
| $\overline{D}_i$ | -0.000 | -0.000 | 0.000*** | -0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| $L_{ij}$ | dropped | dropped | dropped | dropped |
| $A_{ij}$ | dropped | dropped | dropped | dropped |
| $P_{ijt}$ | -1.443*** | -1.240*** | -0.381* | -0.212 |
| | (0.160) | (0.161) | (0.208) | (0.210) |
| $Y_{USt}$ | 3.672*** | 3.861*** | 3.746*** | 3.908*** |
| | (0.237) | (0.237) | (0.308) | (0.309) |
| $ER_{it}$ | 0.000*** | -0.000*** | 0.000*** | -0.000** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| $EUMexFTA_t$ | 0.034 | 0.082 | 0.293** | 0.321** |
| | (0.103) | (0.106) | (0.134) | (0.137) |
| $ExtraBloc_t$ | -0.038 | -0.031 | 0.073 | 0.078* |
| | (0.035) | (0.035) | (0.046) | (0.046) |
| $FTAs_t$ | | 0.750*** | | 0.642*** |
| | | (0.062) | | (0.080) |
| $Triangular_t$ | | -0.674*** | | -0.480** |
| | | (0.185) | | (0.239) |
| *Trend* | -0.174*** | -0.190*** | -0.225*** | -0.238*** |
| | (0.015) | (0.015) | (0.019) | (0.019) |
| Observations | 54944 | 54944 | 54663 | 54663 |
| $R^2$ | 0.1705 | 0.2339 | 0.3430 | 0.3703 |
| F-statistic | 645.25*** | 542.84*** | 318.63*** | 266.89*** |
| Hausman test $\chi^2$ | 668.45*** | 620.86*** | 369.66*** | 352.25*** |

*** Significant at 99% confidence level; ** significant at 95% confidence level; * significant at 90% confidence level.

### 3.4 Hausman-Taylor Estimator

In most gravity analyses researchers have concentrated on the RE (assumes exogeneity of all the regressors and the random individual effects) and FE models (allows for correlation of the regressors and the individual effects). Since the hypothesis that the unobserved individual effects $\alpha_i$ are uncorrelated with the explanatory variables is rejected in most studies, the FE estimation has been the most used estimation method. The FE approach essentially eliminates the $\alpha_i$ from the model by transforming the data into deviations from their individual means. Unfortunately, all time-invariant variables are eliminated as well by the transformation, so that these coefficients cannot be estimated. Moreover, under certain circumstances, the FE estimator is not fully efficient, since it ignores variation across individuals in the sample. Hence, Hausman and Taylor (1981) provide an alternative that avoids the 'all or nothing' choice between FE and RE. The resulting instrumental variable estimator explicitly accounts for the fact that some explanatory variables are correlated with the country-specific effects $\alpha_i$ and others not.

To describe the general approach, consider a linear model with four groups of explanatory variables (Hausman and Taylor, 1981)

$$Y_{it} = \beta_0 + X_{1,it}\beta_1 + X_{2,it}\beta_2 + Z_{1i}\gamma_1 + Z_{2i}\gamma_2 + \alpha_i + \mu_{it},$$

The Hausman-Taylor estimator (denoted as HT hereafter) assumes that some of the explanatory variables are correlated with $\alpha_i$, but none with $\mu_{it}$. Their approach is based on the notion that we can divide the regressors into four categories: time varying ($X$) / time invariant ($Z$) and uncorrelated (index 1) / correlated with $\alpha_i$ (index 2). For example, $X_{2,it}$ are those time-varying regressors that are thought to be correlated with $\alpha_i$, but not with $\mu_{it}$. Under these assumptions, the FE estimator would be consistent for $\beta_1$ and $\beta_2$, but would not identify the coefficients for the time-invariant variables. Moreover, it is inefficient because $X_{1,it}$ is needlessly instrumented. The HT approach consists in using the explanatory variables that are uncorrelated with $\alpha_i$ as instruments for the correlated explanatory variables. That is, $X_{2,it}$ is instrumented by its deviation from individual means (as in the FE approach) and $Z_{2i}$ is instrumented by the individual average of $X_{1,it}$. The resulting HT estimator allows us to estimate the effect of time-invariant variables, even though the time-varying regressors are correlated with $\alpha_i$. The main advantage of the HT approach is that one does not have to use external instruments. Moreover, it combines the advantage of taking into account the fixed effect and keeping in the equation the time-invariant variables whose impact on trade we want to estimate. Despite these important advantages, the HT estimator plays a surprisingly minor role in current empirical work.

In order to obtain the coefficients of the time-invariant variables in our gravity model, we run the HT estimation. The first step consists in determining which variables are uncorrelated with the unobserved country effects ('*doubly* exogenous' variables) and which are correlated ('*singly* exogenous' variables).[11] The unobserved country-characteristics include several elements, which are difficult to measure, e.g. linguistic and cultural links, religious, and history. A priori we assume that $L_{ij}$ is correlated with the unobserved individual effects, since common language is actually used as a proxy for cultural, historical, and linguistic linkage. Besides common language, the signing of a free trade agreement is another possible candidate as *singly* exogenous variable.[12] The results of the HT regression for exports and imports with $L_{ij}$, $EUMexFTA_t$, $ExtraBloc_t$, $FTAs_t$, and $Triangular_t$ as *singly* exogenous variables are shown in the third column of table 3 and table 4 (HT1). On the other hand, according to Egger (2000), GDP and distance are the most important sources of correlation between explanatory variables and unobserved country-effects. Therefore we enlarge HT1 and add $Y_{it}$, $Y_{jt}$, and $D_{ij}$ to the set of *singly* exogenous variables (the fourth column of table 3 and table 4, HT2). This gives us the following classification for HT2: $X_{1,it}$ = ($Y_{USt}$, $\overline{D}_i$, $P_{ijt}$, $ER_{it}$, $Trend$), $X_{2,it}$ = ($Y_{it}$, $Y_{jt}$, $EUMexFTA_t$, $ExtraBloc_t$, $FTAs_t$, $Triangular_t$), $Z_{1i}$ = ($A_{ij}$), and $Z_{2i}$ = ($D_{ij}$, $L_{ij}$). The final decision about which variables are *doubly* exogenous and which are *singly* exogenous rests upon the HT test for over-identification together with a comparison of FE estimates with HT estimates and requiring that the latter should not differ too much from the former.[13]

First of all, $L_{ij}$, $MexFTA_t$, $ExtraBloc_t$, $FTAs_t$, and $Triangular_t$ indeed seem to be related to $\alpha_i$, which shows up in parameter estimates that are lying in between the RE and FE

[11] This terminology was introduced by Cornwell et al. (1992). '*Doubly* exogenous' variables are uncorrelated both with the statistical noise and the individual effects, while 's*ingly* exogenous' variables are uncorrelated with the statistical noise but correlated with the individual effects.

[12] See De Sousa and Disdier (2002).

[13] In the Hausman-Taylor specification test the hypothesis $E\left[\alpha_i \middle| X_{it}, Z_i\right] = 0$ is tested against the alternative $E\left[\alpha_i \middle| X_{it}, Z_i\right] \neq 0$. If the null-hypothesis holds, both the FE and the HT estimator are consistent, but the HT estimator is more efficient. The Hausman-Taylor test-statistic is defined as $\sigma_\mu^2 m$, where $\sigma_\mu^2$ is the variance of $\mu$ of the system of equations and where $m$ is defined as:

$m = \left(\hat{\beta}_{HT} - \hat{\beta}_{FE}\right)' \left[\mathrm{var}\left(\hat{\beta}_{FE}\right) - \mathrm{var}\left(\hat{\beta}_{HT}\right)\right] \left(\hat{\beta}_{HT} - \hat{\beta}_{FE}\right)$. Under $H_0$ $\sigma_\mu^2 m$ follows a $\chi_d^2$ distribution, where $d$ equals the number of *doubly* exogenous time-variant variables minus the number of time-invariant variables.

estimates. Comparing HT1 and HT2 we can see that the estimation results of the latter are far closer to the FE estimation results, both for imports and exports. In most cases, the estimated parameter values of HT2 are identical to the FE results at the second digit numbers after the comma. Moreover, in contrast to HT1, the HT test for over-identification does not reject the hypothesis of legitimacy of our set of instruments. The results indicate that not only language and the signing of a FTA are important sources of correlation between explanatory variables and unobserved country-effects, but also GDP and distance.

Furthermore, the HT approach allows us to estimate the impact of time-invariant effects on bilateral exports and imports, and in addition the coefficients are more efficient than the FE approach. According to the RE approach the coefficients of common border and common language have the expected positive sign and are statistically significant. Yet, the Hausman test revealed that these estimates are biased. Elimination of the correlation between some explanatory variables and the individual effects has as effect that both the common border and common language dummies lose their statistical significance.

Finally, as expected a priori, the estimation results show that distance has a negative effect on exports and imports, however negligible in economic terms. Remarkably is that once $Y_{it}$, $Y_{jt}$, and $D_{ij}$ are included in the set of *singly* exogenous variables, the impact of distance becomes insignificant. As Serlenga and Shin (2004) argue this result might be due to correlation between distance and common border, since these dummies both proxy geographical distance. However, in our gravity model the correlation between these dummies is not the problem (the correlation coefficient between distance and common border is about 0,19). On the other hand, Egger (2000) and De Sousa and Disdier (2002) find a coefficient for distance that is high in absolute value and statistically significant when applying the Hausman-Taylor estimator. However, these two studies have in common that they omit the language variable in their gravity model. As Frankel et al. (1995) show, common language is an important determinant of bilateral trade, and omitting this variable would lead to biased estimates of the gravity model. As a test we run the HT estimation again for both instrument sets HT1 and HT2, but this time without the common language variable (the results can be found in Appendix A). The results confirm our assumption; distance becomes significant in the case of HT1 as well as HT2, both for imports and exports.

Taking into account the specific characteristics of the Mexican trade, the insignificant results for the variable distance and the dummies language and border, are actually not surprising in this application. As said in the first section, the United States is Mexico's biggest trading partner, with 70 to 80 percent of Mexican total trade. As a consequence, the results of the regressions are highly influenced by the effects of trade between the US and Mexico. First of all, the US has a different language than Mexico, but is still Mexico's main trading partner, which leads to an insignificant coefficient of the language dummy. Secondly, the variable distance used in this application is calculated following the great circle formula, which uses latitudes and longitudes of the most important cities/agglomerations (in terms of population). In the case of Mexico and the US is the actual distance for trade much smaller, since most of the trade takes places at the border, dominated by the Maquiladoras. As a consequence, the coefficient of the distance variable also turns out to be insignificant.

## 4 CONCLUSION

In this empirical study we used a gravity model for import and export flows to quantify the trade effects of the EU-Mexico FTA. Besides the fixed effects approach we applied the instrumental variables estimator developed by Hausman and Taylor (1981). An important benefit of this approach is that it allows us to estimate time-invariant variables. Moreover this method uses instruments derived from the structural equation, and thus avoids using external instrumental variables. This permits controlling in an efficient way for the individual effects and offers a better estimation of the gravity model than the conventional approaches based on random effects or fixed effects.

Since our results clearly illustrated that the coefficients for imports and exports differ substantially, we analyzed the gravity equation separately for imports and exports. In particular, the results indicate that the EU-Mexico FTA had a positive trade creation effect on imports between Mexico and the 15 members of the EU. Moreover, there is no evidence for trade diversion, or put in other words, the trade creation effect did not come at the expense of lower extra-bloc imports. On the other hand, in the case of exports the results are not significant. Furthermore, our application confirms the common finding from the regional integration literature that regional trade agreements have positive trade effects. In addition, other triangular FTAs - a country with which both the US and the EU have signed a FTA - tend to have a negative impact on both imports and exports of the EU and Mexico. Finally, the time-invariant variables that we were able to estimate using the Hausman-Taylor estimator turned out to be insignificant for imports as well as for exports. In general, US GDP appears to be the most important factor in determining EU and Mexican trade flows.

**Table 3: Gravity Estimation Results with Log of Bilateral Imports as Dependent Variable (1980-2003)**

| Variable | RE | FE | HT1 | HT2 |
|---|---|---|---|---|
| C | -184.149*** | -140.965*** | -162.274*** | -131.626*** |
| | (8.787) | (9.632) | (8.866) | (12.302) |
| $Y_{it}$ | 0.741*** | 0.431*** | 0.549*** | 0.432*** |
| | (0.039) | (0.050) | (0.047) | (0.049) |
| $Y_{jt}$ | 1.078*** | 0.858*** | 0.923*** | 0.859*** |
| | (0.019) | (0.031) | (0.028) | (0.031) |
| $D_{ij}$ | -0.000*** | dropped | -0.000*** | -0.002 |
| | (0.000) | | (0.000) | (0.002) |
| $\overline{D}_i$ | -0.001*** | -0.000*** | -0.000* | 0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| $L_{ij}$ | 1.826*** | dropped | -3.417 | 90.362 |
| | (0.191) | | (4.645) | (83.017) |
| $A_{ij}$ | 1.378*** | dropped | 2.760 | -31.764 |
| | (0.403) | | (1.738) | (30.812) |
| $P_{ijt}$ | 0.601*** | -0.212 | 0.498*** | -0.191 |
| | (0.053) | (0.210) | (0.118) | (0.203) |
| $Y_{USt}$ | 4.833*** | 3.908*** | 4.254*** | 3.911*** |
| | (0.305) | (0.309) | (0.301) | (0.302) |
| $ER_{it}$ | 0.000 | -0.000** | 0.000** | 0.000** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| $EUMexFTA_t$ | 0.179 | 0.321** | 0.290** | 0.322** |
| | (0.136) | (0.137) | (0.134) | (0.134) |
| $ExtraBloc_t$ | -0.102** | 0.078* | 0.002 | 0.078* |
| | (0.043) | (0.046) | (0.044) | (0.045) |
| $FTAs_t$ | 0.815*** | 0.642*** | 0.679*** | 0.643*** |
| | (0.073) | (0.080) | (0.078) | (0.078) |
| $Triangular_t$ | -0.759*** | -0.480** | -0.583*** | -0.483** |
| | (0.236) | (0.239) | (0.234) | (0.234) |
| *Trend* | -0.313 | -0.238 | -0.269*** | -0.239*** |
| | (0.019) | (0.019) | (0.018) | (0.019) |
| Observations | 54663 | 54663 | 54663 | 54663 |
| Wald $\chi^2(14)$ | | | 3564.21 | 3066.05 |
| Hausman-Taylor Over-identification Test:[a)] | | | 132.27*** | 0.21 |

*** Significant at 99% confidence level; ** significant at 95% confidence level; * significant at 90% confidence level. [a)] $\chi^2_d$ with $d$ = 4 for HT1 and $d$ = 2 for HT2.

**Table 4: Gravity Estimation Results with Log of Bilateral Exports as Dependent Variable (1980-2003)**

| Variable | RE | FE | HT1 | HT2 |
|---|---|---|---|---|
| C | -157.476*** | -110.426*** | -144.84*** | -101.501*** |
| | (6.764) | (7.396) | (6.755) | (11.992) |
| $Y_{it}$ | 0.608*** | 0.103*** | 0.327*** | 0.103*** |
| | (0.029) | (0.038) | (0.035) | (0.038) |
| $Y_{jt}$ | 0.964*** | 0.874*** | 0.944*** | 0.875*** |
| | (0.015) | (0.024) | (0.021) | (0.024) |
| $D_{ij}$ | -0.000*** | dropped | -0.000*** | -0.002 |
| | (0.000) | | (0.000) | (0.002) |
| $\overline{D}_i$ | -0.001*** | -0.000 | -0.001*** | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| $L_{ij}$ | 2.105*** | dropped | 6.735*** | 98.647 |
| | (0.149) | | (2.520) | (103.207) |
| $A_{ij}$ | 1.168*** | dropped | -0.202 | -33.733 |
| | (0.313) | | (0.950) | (38.412) |
| $P_{ijt}$ | 0.126*** | -1.240*** | 0.014 | -1.225*** |
| | (0.041) | (0.161) | (0.073) | (0.157) |
| $Y_{USt}$ | 4.466*** | 3.861*** | 4.259*** | 3.861*** |
| | (0.235) | (0.237) | (0.232) | (0.232) |
| $ER_{it}$ | -0.000 | -0.000*** | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| $EUMexFTA_t$ | 0.055 | 0.082 | 0.085 | 0.083 |
| | (0.105) | (0.106) | (0.104) | (0.104) |
| $ExtraBloc_t$ | -0.126*** | -0.031 | -0.108*** | -0.031 |
| | (0.033) | (0.035) | (0.034) | (0.034) |
| $FTAs_t$ | 0.788*** | 0.750*** | 0.817*** | 0.751*** |
| | (0.057) | (0.062) | (0.061) | (0.060) |
| $Triangular_t$ | -0.804*** | -0.674*** | -0.845*** | -0.676*** |
| | (0.183) | (0.185) | (0.181) | (0.181) |
| *Trend* | -0.262*** | -0.190*** | -0.234*** | -0.190*** |
| | (0.014) | (0.015) | (0.014) | (0.014) |
| Observations | 54944 | 54944 | 54944 | 54944 |
| Wald $\chi^2(14)$ | | | 7548.58 | 6235.60 |
| Hausman-Taylor Over-identification Test:[a)] | | | 318.04*** | 0.17 |

*** Significant at 99% confidence level; ** significant at 95% confidence level; * significant at 90% confidence level. [a)] $\chi^2_d$ with $d$ = 4 for HT1 and $d$ = 2 for HT2.

## 5 BIBLIOGRAPHY

Bayoumi, T. and Eichengreen, B. (1995), "*Is Regionalism Simply a Diversion? Evidence from the Evolution of the EC and EFTA*", NBER Working Paper 5283, Cambridge, MA.

Cornwell, C., Schmidt, P. and Wyhowski, D. (1992), "*Simultaneous Equations and Panel Data*", Journal of Econometrics 51(1-2), pp. 151-181.

De Sousa, J. and Disdier, A. (2002), "*Trade, Border Effects, and Individual Characteristics: a Proper Specification*", Unpublished Manuscript, University of Paris 1.

Deardorff, A. (1984), "Testing Trade Theories and Predicting Trade Flows", in Jones, R. and Kenen, P. (eds.), *Handbook of International Economics 1*, Elsevier Science Publishers, Amsterdam.

Dhar, S. and Panagariya, A. (1999), "Is East Asia Less Open Than North America and the EEC? No." In Piggott, J. and Woodland, A. (eds.), *International Trade Policy and the Pacific Rim*, London, Macmillan.

Egger, P. (2000), "*On the Problem of Endogenous Unobserved Effects in the Estimation of Gravity Models*", WIFO-Working Paper 132/2000.

Egger, P. (2002), "*An Econometric View on the Estimation of Gravity Models and the Calculation of Trade Potentials*", The World Economy, 25, pp.297-312.

EU (2000), "*Decision No 2/2000 of the EU-Mexico Joint Council*", Official Journal of the European Communities, 2000/415/EC. Available at: http://europe.eu.int.

Frankel, J. (1997), "*Regional Trading Blocs in the World Economic System*", Institute for International Economics, Washington, D.C.

Frankel, J., Stein, E. and Wei, S. (1995), "*Trading Blocs and the Americas: The Natural, the Unnatural and the Super-Natural*", Journal of Development Economics (47), pp.61-95.

Gambrill, M. (2002), "International Subcontracting Trade in the EU-Mexico Free Trade Agreement", in Georgakopoulos, T., Paraskevopoulos, C., and Smithin, J., (eds.), *Globalization and Economic Growth: A Critical Evaluation*, APF Press, Toronto, Canada.

Harrigan, J. (2002), "Specialisation and the Volume of Trade: Do the Data Obey the Laws?" In Choi, K. and Harrigan, J. (eds.), *The Handbook of International Trade*, Blackwell.

Hausman, J. (1978), "*Specification Tests in Econometrics*", Econometrica 46(6), pp.1251-1271.

Hausman, J. and Taylor, W. (1981), "*Panel Data and Unobserved Individual Effects*", Econometrica 49(6), pp.1377-1398.

Helpman, E. (1987), "*Imperfect Competition and International Trade: Evidence From Fourteen Industrial Countries*", Journal of Japanese and International Economics 1, pp.62-81.

Helpman, E. and Krugman, P. (1985), "*Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition and the International Economy*", Cambridge, MIT Press.

Linneman, H. (1966), "*An Econometric Study of International Trade Flows*", North Holland, Amsterdam.

Mátyás, L. (1997), "*Proper Econometric Specification of the Gravity Model*", The World Economy 20(3), pp.363-368.

Serlenga, L. and Shin, Y. (2004), "*Gravity Models of the Intra-EU Trade: Application of the Hausman-Taylor Estimation in Panels with Heterogenous Time-Specific Common Factors*", Unpublished Manuscript, University of Edingburgh.

WTO (2000), "*Mapping of Regional Trade Agreements*", World Trade Organization WT/REG/W/41, October 2000.

**Appendix A: Hausman-Taylor Estimates without Common Language Dummy**

| Variable | $\ln X_{ijt}$ (HT1) | $\ln X_{ijt}$ (HT2) | $\ln M_{ijt}$ (HT1) | $\ln M_{ijt}$ (HT2) |
|---|---|---|---|---|
| C | -137.522*** | -132.754*** | -158.925*** | -156.255*** |
| | (6.821) | (6.874) | (8.900) | (8.945) |
| $Y_{it}$ | 0.267*** | 0.179*** | 0.538*** | 0.509*** |
| | (0.035) | (0.037) | (0.046) | (0.048) |
| $Y_{jt}$ | 0.917*** | 0.933*** | 0.913*** | 0.901*** |
| | (0.021) | (0.023) | (0.028) | (0.030) |
| $D_{ij}$ | -0.000*** | -0.001*** | -0.001*** | -0.001*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| $\overline{D}_i$ | -0.000*** | -0.000*** | -0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| $A_{ij}$ | 0.170 | -0.209 | -0.959 | -0.736 |
| | (0.971) | (1.199) | (1.347) | (1.572) |
| $P_{ijt}$ | -0.042 | -0.148 | 0.559*** | 0.502*** |
| | (0.085) | (0.095) | (0.115) | (0.124) |
| $Y_{USt}$ | 4.121*** | 4.070*** | 4.201*** | 4.155*** |
| | (0.232) | (0.232) | (0.302) | (0.302) |
| $ER_{it}$ | -0.000 | -0.000 | 0.000** | 0.000** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| $EUMexFTA_t$ | 0.114 | 0.108 | 0.310** | 0.311** |
| | (0.103) | (0.103) | (0.134) | (0.134) |
| $ExtraBloc_t$ | -0.076** | -0.069** | 0.017 | 0.023 |
| | (0.034) | (0.034) | (0.044) | (0.044) |
| $FTAs_t$ | 0.806*** | 0.794*** | 0.680*** | 0.670*** |
| | (0.060) | (0.060) | (0.078) | (0.078) |
| $Triangular_t$ | -0.820*** | -0.802*** | -0.584** | -0.567** |
| | (0.181) | (0.189) | (0.234) | (0.234) |
| *Trend* | -0.224*** | -0.216*** | -0.266*** | -0.262*** |
| | (0.014) | (0.014) | (0.018) | (0.018) |

*** Significant at 99% confidence level; ** significant at 95% confidence level; * significant at 90% confidence level.