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The Trade Creation Effect of Immigrants: Testing the Theory on the Remarkable Case of Spain

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Non-Technical Abstract

There is abundant evidence that immigrants' networks are associated with larger trade flows between countries of origin and the country (or province) where they settle. The causality of such relation and its magnitude, however, have not been proven beyond reasonable doubt. We use the simple predictions of the model by Chaney (2008) and treat networks of migrants as a device that reduces fixed bilateral trade costs. In so doing we have strong predictions on the effect of immigrants on total exports, exports by category of goods, and on the extensive and intensive margin of trade. We test these predictions using the remarkable and uneven increase of immigration to Spanish provinces between 1993 and 2008. The richness of our data, a panel of import and export by sector between 50 Spanish provinces and 77 countries over fifteen years, allows us to control for a very large set of covariates and fixed effects and to use an instrumental variable strategy so that we can isolate the trade-creation effect of new immigrants. We are also able to qualify the effect of immigration on bilateral trade of homogeneous and differentiated goods, and its impact on the intensive and extensive margin of trade. Our findings support all the implications of the Chaney model showing that migration network indeed seems to decrease the fixed costs of trade. Finally by decomposing the effect across provinces and over time we find evidence that the elasticity of trade creation to new immigrant is larger once a critical mass has been reached.

Keywords: Immigration, International Trade, Intensive and Extensive margin, Differentiated Goods.

JEL Classification: F10, F14, R12.

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1 Introduction

Since the pioneering work of Gould (1994) and Head and Reis (1998) economists have found robust empirical evidence that, controlling for bilateral transport costs, larger bilateral migration networks between countries are associated with larger trade flows. At the same time the recent theories of international trade (Anderson and Van Wincoop 2001, Melitz 2003, Chaney 2008) that provide the theoretical underpinnings to the analysis of trade flows in the context of a gravity equation, emphasize how factors affecting the variable and fixed costs of trade between two locations would affect the volume of trade. Immigration networks , by providing channels of knowledge diffusion, and enforcement mechanisms, reduce the information, communication, transaction and contracting costs between locations (Rauch and Trindale, 2002). Hence their significant correlation with trade, uncovered by gravity-type regressions can be legitimately seen as a trade-creation effect of immigration through reduction of fixed bilateral costs. Most of the existing work, however, uses cross-sectional data analysis techniques and mostly for countries with a long immigration history (the US, Canada, UK, New Zealand and Australia). This implies that the simultaneity problem (between trade and migration) and the omitted variable problem (due to bilateral specific terms) can only be partially addressed. Moreover as immigrants communities have been established in these countries for a long period it is hard to say whether recent immigration or some long-established bilateral ties, are responsible for the bilateral trade differences observed. An ideal context to identify the trade-creating effect of new immigrants would be a country in which immigrants experienced a very rapid increase, in which they are distributed unevenly across provinces, and for which we have data detailed enough to measure immigrants by nationality and bilateral trade flows by destination across provinces in each year before and during the immigration boom. Such a context is provided by the fifty Spanish provinces during the period 1993-2008. As we illustrate below the exceptional growth of immigrants, especially in some provinces and especially from some countries, beginning in year 2002, provides the variation needed in the size of bilateral immigrant networks. Their effect on the increase in trade flows over the years, relative to the trade flows before 2002, once we control for bilateral fixed effects between province and country is a very good measure of trade-creation effect of the new immigrants. Moreover we can enhance the identification strategy to isolate the causal effect of new immigrants on trade flows, with the use of an instrument, very popular in the immigration literature. The instrument is the imputed share of immigrants across provinces, constructed by using the initial distribution of immigrants by nationality across provinces before the great immigration episodes and the total inflow into Spain by nationality. The tendency of people from the same country to settle in the same areas provides a supply-driven variation in the presence of immigrants that has been used to identify the effect of immigration on labor market outcomes (Card 2001, 2007; Ottaviano and Peri 2006) and can be used here to identify the effect on the volume of imports and exports.

An important contribution of the paper is to investigate whether the trade-creation effect of new immigrants

affects differently the extensive and intensive margins of trade, and whether the link between immigration and the trade margins is stronger for differentiated goods than for homogeneous goods as the theory of information barriers would predict. To answer these questions the data on bilateral trade flows between Spanish provinces and countries are organized in three variables, total trade value, number of transactions and average value per transaction. While the correspondence between transactions and firms is not exact, new transactions are likely to proxy for new exporting relationships, hence capturing the extensive margin of trade flows while the volume of each transaction is a proxy for the size of each existing exporting relationship, hence reflecting the intensive margin of trade. In particular we use Chaney's (2008) theory as the foundation of our empirical gravity equation. If we consider immigration networks as decreasing the fixed cost of exports (from a province to a foreign country) then Chaney's model has two implications. First the change in immigrant networks should not have any impact on the intensive margin but should increase the extensive margin of trade. More migrants would allow lower fixed costs and therefore a less productive marginal firm, and larger number of trading firms. Second the aggregate effect of immigrant networks on trade should be larger for goods with lower substitutability (differentiated) because for these goods the contribution to exports of new entrants would be larger. While the uneven effect of migrants on differentiated and homogeneous goods was first uncovered by Rauch (1999), we interpret those differences naturally within the context of the Chaney model.

Our main results are three. First, we find a very robust, significant and stable trade-creation effect of new immigrants. An increase of the immigrant community from a specific country in a province by 10% increases the exports of that province to the specific country of origin by 0.5 to 1% (elasticity of 0.05-0.1). While we analyze also the effects on imports, and those are usually also positive and significant, our theory predicts specifically effects on exports and we believe the measure of export is more precise so that we will focus on those results in most of the paper. Second, we find evidence that such a trade creation effect is in general stronger for differentiated than for homogeneous product (as Chaney's model would predict). In particular, except for trade with Africa, for which the network of immigrants creates trade in all goods categories, there is a pattern of larger trade creation for highly differentiated goods than for homogeneous goods. Third, in most cases the largest part of the trade-creation effect is due to an increase in the number of trade transactions (extensive margin) with little to no effect on the volume of each transaction (also as Chaney's model would predict). We also find that the trade creation effects has been particularly strong in provinces in which the presence of immigrants was above a certain threshold, and increased during the most recent period (2002-2008), when immigration reached a sizeable mass relative to the native population.

The rest of the paper is organized as follows. Section 2 summarizes the existing literature and emphasizes the novel contributions of this paper. Section 3 presents the data on immigration to Spanish provinces and import and export for each province. Section 4 uses the recent model of Chaney (2008) to justify the augmented-

gravity specification that we use to evaluate the trade-creating impact of foreign-born residents. Section 5 presents the benchmark empirical results, discusses several econometric issues and presents alternative econometric specification, including the instrumental variable strategy. In section 6 we discuss the decomposition of the trade-creation effects between the intensive and extensive margin, among types of goods (according to the extent of substitutability/differentiation) and across world regions. In Section 7 we explore some additional issues in the pro-trade effect of immigration: Did pro-trade effects of new immigrants change over time? Did the pro-trade effects of immigration exhibit non-linear behavior? Section 8 provides some concluding remarks.

2 Literature Review

Since the work of Gould (1994) several studies have analyzed the correlation between trade flows and stock of immigrants in the context of a gravity regression that uses bilateral relation between one country and its trade and immigration partners.[1] Recently the availability of data for sub-national units, mainly US states and Canadian provinces, on trade with (and stocks of immigrants from) other countries as well as more solid theoretical foundation for the gravity equation to analyze trade flows (Anderson and Van Wincoop 2001, Helpman et al. (forthcoming), Chaney 2008) has spurred a series of analysis that use local agglomerations of migrants and exports from the area to the countries of origin of immigrants.[2] Similarly other studies have analyzed the connections between regional migration and regional trade within countries.[3] Those studies have generally found a robust correlation between stock of immigrants and trade with an elasticity ranging between 0.01 and 0.40 with most estimates in the interval 0.1 to 0.2. We will compare our estimates systematically with those from the previous literature and discuss differences and similarities in section 5.1.2.

Going beyond the correlation between total volume of trade and stock of immigrants, Rauch and Trindale (2002) explored a specific channel through which the trade-creation effect might work. If international networks (of migrants) reduce the asymmetric information, the transaction costs and the cost of enforcing contracts between the exporting firm and the importing customers, then one would expect such a role to be more relevant in the trade of differentiated goods. The lack of internationally observable prices and the larger uncertainty on quality and conditions make the informational asymmetries a larger hurdle in the trade of these goods. If

[1] Using annual data in the eighties and nineties, Head and Ries (1998) analyze the case of Canada, Girma and Yu (2002) uses UK data, Bryant et al. (2004) examines New-Zealand data and White and Tedesse (2007) analyze Australia data. All the studies find that trade and immigration are complements. However, these studies find no evidence of an export-immigration link between the UK and Commonwealth countries, a weak link between exports and immigration between Western European countries and Australia, and no support for stronger complementary between English speaking countries and New Zealand. For Spain, Blanes (2005) and Blanes and Martin-Muntaner (2006) investigates the impact of immigration on intra-industry trade during the nineties, showing that the trade-immigration link is stronger among highly differentiated products.

[2] For instance Co et al. (2004), Herander and Saavedra (2005) and Dunlevy (2006) examine cross-sections of US state exports to foreign countries and Bandyopadhyay et al. (2008) analyze US state exports to 29 nations in 1990 and 2000. On the other hand Wagner, Head, and Ries (2002) use data on trade and immigration for Canadian provinces between 1992 and 1995. Most studies find a positive and significant elasticity of trade to the stock of immigrants.

[3] See, for instance, Combes, Lafourcade, and Mayer (2005) for France and Millimet and Osang (2007) for the US.

immigrants network help reduce the fixed trade costs related to contracting and gathering information, they should have a larger impact on the trade of differentiated, rather than homogeneous goods. Rauch and Trindale (2002) find strong evidence that migrant networks have a larger effect of trade-creation for differentiated goods.

Our paper goes beyond the existing literature in three important ways. First, by using a panel of trade data between 50 Spanish provinces and 77 foreign countries in each of 15 years (1993-2008) we can control of all province-country bilateral fixed factors (costs, geography, cultural similarity,) and identify our trade-creation effect on the within pair change in trade as consequence of changes in the stock of migrants over time. As mentioned, the fact that at the beginning of the period (1993) most provinces hosted a very small share of immigrants while at the end of the period several of them had sizeable foreign communities makes us confident that the estimated effect on trade flows is mostly driven by trade creation from new immigrants. Moreover, to reinforce our causal interpretation, we use the instrumental variable approach based on the historical immigrant enclaves. Second, as in Rauch and Trindale (2002) we are able to use trade data for different types of goods based on their elasticity of import substitution (so higher elasticity of substitution means less differentiated goods) to identify in this cleaner experiment the importance of networks in reducing information costs. Also, going a step beyond Rauch and Trindale (2002) we can further reinforce our test that networks reduce the fixed costs of trade by specifically analyzing the effect of immigrants on the extensive margin of trade (number of transactions). Since the recent empirical literature shows that relatively few firms ship internationally (Bernard et al. 2003, 2007), and that conditional on exporting internationally, firms ship to relatively few destinations (Eaton et al., 2004) it seems important to show that immigrants networks are consistent with trade-creation that is genuinely the result of decreasing fixed costs of bilateral trade. The increase in commercial transactions observed is correlated with new trade partnerships (between a firm and a customer) hence an expansion in the extensive margin of trade. Finally we analyze whether the elasticity of trade creation to new immigrants is constant or if it depends on the size the immigrant community. By splitting the sample across provinces and over time we can test whether the immigration-trade link is significantly larger in communities with larger shares of immigrants and in the period of larger presence of immigrants. This may indicate that above a certain critical mass the trade-creation effects of immigrants are larger than below it.

3 Trade and Immigration in Spain

Our dataset is obtained by merging two sources. The trade data come from ADUANAS-AEAT dataset provided by Ministerio de Economía y Hacienda. The dataset reports all the individual transactions with detailed information on the direction of trade (imports and exports), product, value (in thousands of Euros), weight, invoice currency and mode of transport, between 52 Spanish provinces (Eurostat NUTS III definition) and 190 trading partners all around the world since 1993. The data are collected as to measure the exports in the

province of original shipment of the good and to measure the imports in the province of final destination.[4] The selection of trading partners in the final sample is driven by data on immigration and contains 77 countries, which accounts for around 94 percent of total Spanish exports and imports over the period analyzed.

The Statistical Yearbook published annually by the Spanish Statistical Office (INE) provides us with exhaustive information on the number of foreign-born residents by province and country of origin. We define immigrants as residents born abroad with a foreign nationality. Even for these data we have eliminated those countries with no complete information on immigration for the entire period. Table A1 in the table Appendix, lists the countries of origin, grouped into 7 regional areas. Table A2 lists the Spanish provinces, divided into three groups according to the share of foreign-born population in total population as of year 2007 (see also Figure 3 for a map color-coding the same information on percentage of immigrants is Spanish NUTS III provinces).

Considering trade as a whole, measured as (Export+Import)/GDP, the joining of EU by Spain in 1986 started a trend of increasing openness, which accelerated during the period 1993-1999, and that clearly preceded the period of fastest growth of immigrant population that spanned the years between 2002 and 2008. Figure 1 shows the measure of trade openness (trade relative to GDP) and of immigration openness (immigrants relative to population) in each year from 1993 to 2008. One may notice that the growth of total trade possibly slowed since 2000 relative to before, while immigration growth accelerated in that period. The aggregate data, however, are affected by many determinants that may cloud the connection between new immigrants and trade. More informative is the composition of Spanish trade and immigrants across world regions.[5] For instance, an interesting example is the shift of trade (the sum of exports and imports) from Western Europe to Eastern Europe. Before year 2000 trade with Western Europe had been constant or growing. However, beginning with year 1998 the stock of immigrants from Western Europe decreased in relative importance. Figure 2, panel A, shows that immigrants from Western Europe, as a share of total foreign-born, decreased beginning from 1998 to 2008 by almost 60%. Following such trend possibly with a few years of delay, Figure 2 shows that also trade with Western Europe has become less important relative to total trade. Its share in total trade has decreased by 13% over the 1998-2008 period. Conversely, Panel B of Figure 2 shows that immigration from Eastern Europe has picked up dramatically between 1999 and 2008, increasing by 900% (ten fold). Trade with Eastern Europe has also increased in relative importance and its share relative to the total has increased by 170% over the same period. While such example is not proof of a causal relation, it shows an interesting correlation as well as a magnitude of it. For each 1% increase in the total share of immigrants to a region, the share of trade to that region seems to increase by around 0.2%. Obviously many other factors may have contributed to the joint shift of trade and migration from western to eastern Europe and the role of migration on trade is certainly not only the only explanation for the observed correlation. However, we have the detailed data to identify the

[4]The data for the period 2002-2008 is publicly available at www.aeat.es/aeat/aeat.jsp?pg=aduanas/es_ES.
[5]The share of total Spanish trade with each of seven world areas is reported in Table A3.

effect of trade (import and export) creation by new immigrants. Their contribution to enlarge the international information network and decrease the fixed bilateral trade costs from a Spanish province (where they settle) to the country of origin would have a trade-creation effect. This is what we formally analyze in the rest of the paper.

4 Empirical model

The basic equation that describes the logarithm of aggregate export X_{ij} from province i to country j for period t obtained from the model of Chaney (2008) assuming only one sector is as follows:

$$\ln(X_{ijt}) = Const + \ln(w_{it}^{-\gamma} Y_{it}) + \ln(Y_{jt}\theta_{jt}^{\gamma}) - \gamma \ln(\tau_{ij}) - \left(\frac{\gamma}{\sigma - 1} - 1\right) \ln(f_{ijt}) \tag{1}$$

The term $\ln(w_{it}^{-\gamma} Y_{it})$ captures the exporting country wages (w_{it}) and the exporting-country income Y_{it}. They capture the competitiveness and the domestic market size for the exporting country. The term $\ln(Y_{jt}\theta_{j}^{\gamma})$ captures the importing country aggregate income (market size) Y_{jt} and its remoteness relative to the rest of the world, θ_{jt}^{γ}.[6] The term τ_{ij} captures iceberg transport costs (per unit of export) and f_{ijt} captures the fixed costs for firms of province i to export in country j. This equation is derived by aggregating the exports of firms with heterogeneous productivity. Rather than discussing in detail this equation we want to focus on the relation between aggregate export and fixed export costs f_{ijt}.The presence of immigrants from country j in province i allows firms in province i to know about rules, opportunities in country j and may reduce the fixed costs of setting up business there captured by f_{ijt}. Hence we can represent this relation as follows: $ln(f_{ijt}) = \ln f(\ln(\text{Immigrants}_{ijt}))$ with $\partial \ln f / \partial \ln(\text{Immigrants}) < 0$. Two are the novelty introduced by Chaney (2008): First, the model predicts that the elasticity of total trade exports to fixed bilateral costs, $\left(\frac{\gamma}{\sigma-1} - 1\right)$ depend inversely on σ, the elasticity of substitution across goods (and on the parameter γ that captures the dispersion of productivity across exporting firms). Hence if we separate trade flows into *differentiated* and *homogeneous* goods the above equation would imply a larger coefficient on $\ln(f_{ijt})$ in the first case. Second, the model in Chaney (2008) also predicts that if we decompose the total effect of fixed costs f_{ijt} on total exports X_{ijt}, between the effect on the intensive margin of trade, i.e. on the exports ($\overline{x}_{ijt}$) of each firm that was already exporting before the change, and on the extensive margin, that is the number of exporting firms, N_{ijt}, we obtain no effect on the first and the full effect on the second margin. In his notation (pag. 1717 of Chaney 2008)

[6] Remoteness is defined as a weighted average of the bilateral distances of a source country and its trading partners with weight equal to the GDP of the trading partners.

$$-\frac{d\ln X_{ijt}}{d\ln f_{ijt}} = \underbrace{0}_{\substack{\text{Intensive margin}\\ \text{Elasticity}}} + \underbrace{\frac{\gamma}{\sigma-1}-1}_{\substack{\text{Extensive margin}\\ \text{Elasticity}}} = \frac{\gamma}{\sigma-1}-1$$

Intuitively, the reason for such decomposition is as follows. The amount sold by each exporting firm in each country j (that is optimal in monopolistic competition) depends on its own productivity and on the demand of the good in country j that in turn depends on that country income Y_j, its remoteness θ_j^{γ} and the variable trade costs τ_{ij}. However, as in any model with CES utility (and constant elasticity demand) the optimal price and quantity produced by a firm does not depend on the fixed trade costs. However, the productivity threshold for the exporting firm does depend on the fixed trade costs, hence changing those will affect only the extensive margin (number of exporting firms) and not the amount exported by each individual firm

We assume that bilateral transport costs are captured by province-country pair dummies δ_{ij} and that the term $\ln(w_{it}^{-\gamma})$ is common to all Spanish provinces, as wages are relatively homogeneous within a country and is captured by a time effect (θ_t). The term capturing the remoteness of the importing country, $\ln(\theta_{jt}^{\gamma})$ is absorbed in an importing country by time specific term ϕ_{jt}. Hence, once we allow for some measurement error, ε_{ijt} in the export flows we can re-write (1) as:

$$\ln(X_{ijt}) = Const + \phi_{jt} + \theta_t + \delta_{ij} + \ln(Y_{it}Y_{jt}) + \alpha\ln(IMM_{ijt}). \tag{2}$$

where $\alpha = -\left(\frac{\gamma}{\sigma-1}-1\right)\partial\ln f/\partial\ln(\text{Immigrants}) > 0$ captures the effect of immigrants on total exports through reducing fixed costs and is the main coefficient of interest. Notice that when we will estimate equation 2 the pure time fixed effect θ_t will be absorbed by the country-year pair effect ϕ_{jt}.

We will also use more standard gravity equations, less saturated with dummies, to check the robustness of the effect of immigrants on trade and to compare our results with the existing literature. In particular, if one assumes that variable trade costs between trading partners $\ln(\tau_{ij})$ are captured by Distance, Contiguity, EU/EFTA membership and common language (Spanish), and that remoteness does not change much over time so that we can absorb it with province of origin and country of destination fixed effects,[7] then we can estimate the following:

[7]Gross regional output and Gross Domestic Output are used to measure the variables Y_{it} and Y_{jt}, respectively. Gross domestic output is obtained from World Development Indicators (WDI 2008 on-line database) and gross regional output is reported in Regional Accounts (INE). Regional values have been scaled to match Spanish GDP in WDI.The variable. Distance between Spanish provinces and foreign countries is calculated using the great circle distance formula (expressed in kilometres) from the capital of the Spanish province and the capital of the foreign country. Contiguity is a dummy variable that takes value of 1 if a Spanish province shares a common border with France or Portugal. EU/EFTA is a dummy variable that takes value of 1 if the foreign country belongs to the EU15 or EFTA. Common language is a dummy variable that takes value of 1 if the official language of the foreign country is Spanish.

$$\ln(X_{ijt}) = \theta_t + \phi_i + \phi_j + \rho \ln(Y_{it}Y_{jt}) + \tag{3}$$
$$\delta_1 \ln(Distance_{ij}) + \delta_2 Contiguity_{ij} + \delta_3 EUEFTA_{ij} + \delta_4 Language_{ij} + \alpha \ln(IMM_{ijt}) + \varepsilon_{ijt}.$$

As mentioned above, in order to test the specific implications of the Chaney model we will also estimate equation 2 separately on highly, medium and less differentiated goods and we will separate the effect of immigrants on the extensive and on the intensive margin of exports estimating two separate equations with the same right hand side as 2 but with $\ln(N_{ijt})$ and $\ln(\overline{x}_{ijt})$ as dependent variable. The first regression, respectively, identifies the effect on the number of exporting relations (extensive margin) and the second identifies the effect on the average value of an existing export relation (intensive margin). Recall that $\ln(X_{ijt}) = \ln(N_{ijt}) + \ln(\overline{x}_{ijt})$. As measure of immigrants, IMM_{ijt}, we use the total number of foreign-born individuals residing in province i at time $t-1$ and born in country j. Similarly, to reduce simultaneity issues we use total income at time $t-1$ to measure the variable $\ln(Y_{it}Y_{jt})$.

5 Basic Estimation results

5.1 Main Trade Creation Effect of Immigrants

Table 1 shows the basic results of estimating equations 2 and 3. The preferred and most demanding specification 2 in which we account for a full set of 3850 trading partners-pair effects and 1232 country-year effects is estimated separately for export flows and import flows in specification (7) and (8). In these specifications we can genuinely consider the estimated effect as the correlation, within a trading-pair over time between the change in stock of immigrants and the subsequent (one year lagged) changes in trade flows. While the structural model described in the previous chapter produces an estimating equation relative to export from Spanish provinces, we also estimate a similar specification for Spanish imports. For imports the effect of migrant network is usually estimated to be smaller. On one hand immigrants may be less needed to reduce information costs for firms exporting to Spain, as Spain is a developed market, while the role of immigrants can be crucial to reduce information costs of exporting especially if they come from less developed countries. On the other hand it is more difficult to identify the province of actual final use of the imported goods so that the data on import may be affected by larger measurement error that would produce an attenuation bias on the coefficient. Be as it may, the most demanding specification identifies a very significant effect of immigrants on export equal to an elasticity of almost 9% and the elasticity of import to immigrants is also very significant, if somewhat smaller, and close to 5%. Doubling the number of immigrants from a country in a province would increase the exports of the

province to that country by around 6% ($2^{0.086} \approx 1.061$) and its import by 3% ($2^{0.045} \approx 1.034$). Moving to the left in Table 1 we estimate in specification (5) and (6) equation 2 without country-by-year effects, hence assuming that the "remoteness" measure of the importing country ($\ln(\theta_j^{\gamma})$ in expression 1) does not change much over time. We still allow trade-pair specific trade costs and include year effects. In specification (3) and (4) we estimate equation 3 and in specification (1) and (2) we estimate the simplest gravity equation which only includes income, year dummies and measurable trade barriers as regressors, pooling all observations together without country or province fixed effects. Interestingly, the estimates of the coefficient on $\ln(IMM_{ijt})$ are significantly smaller in the most demanding specification (7) and (8) than in the simple gravity regression (1) and (2). This implies that the actual effect of immigration on trade can be significantly overestimated by a simple pooled gravity regression (still widely used in this literature). However, the highly saturated specification 2 in (7) and (8) does not produce very different estimates of the effect of immigrants on trade when compared to the simplified regression 3 estimated in (3) and(4) that omits country- by-year effects and trading partners-pair effects. Accounting only for country, province and time fixed effects as well as for income and the usual distance, contiguity and colonial ties effects, correct most of the bias in the estimates of the effect of $\ln(IMM_{ijt})$.

In order to use all observations on bilateral trade flows, we have added one euro to all the observations on import and export used in Table 1. One question is how sensitive are the results to the exclusion of zero-trade observations. While there is information in the fact that some province-country pairs have no trade flows, and we think that information should not be discarded, it is common practice to estimate gravity equations using only non-zero observations (Bandyopadhyay et al, 2008). To this purpose Table A4 in the appendix shows the difference between the estimates of the coefficient on $\ln(IMM_{ijt})$ in different specifications, when including or not the zero-observations. Specification (1) in Table A4 shows the case when we estimate our basic specification (equivalent to (7)-(8) in Table 1), specification (2) shows the results with Pooled OLS (as in (1)-(2) of Table 1) and specification (3) shows the case including country, province and year dummies (as in (3)-(4) of Table 1). The last specification (4) uses a Tobit estimator censored at 0 to estimate the coefficients. The results shown in Table A4 imply that the estimated effect with or without the inclusion of zero observations are very close. For instance, in the basic specification the effect of immigration on imports is estimated to be 0.086 when including the zero-export cells, and 0.068 when excluding them. Accounting for the standard errors (0.013) these two estimates are not significantly different. Even the Tobit specification, truncated at 0 implies that the elasticity estimated with this method is still in the vicinity of 0.10.

To sum up, immigrant flows do have a positive and significant correlation with both exports and imports, even when we rely only on the within cell variation, after controlling for all country-by-year and trading partners-pair effects. Relative to a simple gravity equation estimated with pooled OLS the estimated effect is significantly smaller but relative to a panel regression that controls for province, country and year effects, we obtain almost

the same estimates. A 1% rise in the stock of immigrants increases the value of exports by around 0.1% while the impact on imports may be smaller at 0.05%. These results are robust to different specifications, inclusions of dummies and sample selection.

5.1.1 Robustness Checks: Instrumental Variables Estimation and Lagged Trade Flows

While our approach, based on a panel regression with a large set of dummies, is already much more demanding relative to the one usually implemented in the literature (based on cross-section analysis and fewer dummies) we care to genuinely identify the causal effect from the stock of immigrants to created trade. Besides including trading partner effects and country by year effect that should absorb any unobserved variation due to shocks in the country of origin or to the specific bilateral relation and besides lagging the explanatory variable (immigrants) one year, we implement an instrumental variable approach. While never applied to the trade and migration literature this approach is common in the literature that analyzes the wage and employment impact of immigrants (e.g. Card 2001, Ottaviano and Peri 2006, Card 2009). In particular, in order to instrument the changes in immigrants from a particular nationality in a particular province we use the imputed net inflow of immigrants from that nationality. Using the distribution of immigrants by nationality, across provinces in 1993, that is well before the extraordinary expansion of immigration flows, we attribute to each group in each province the national net growth of population from that nationality.[8] If immigrants tend to settle, at least initially, where other persons of the same nationality are already settled, then this constructed inflow of immigrants will be correlated to the actual one. On the other hand, as it is based on the initial distribution of immigrants across provinces as of 1993, the constructed flows are not affected at all by any province-specific demand factor and demand shock during the period of large immigration (2002-2008). The constructed instrument is used, in estimating specification 2 in column (1) and (2) of Table 2. The first stage of the instrument (not reported) is very strong. In our preferred specification including province-country pair dummies and country-year dummies in the first stage we obtained $\beta^{IV} = 0.261$ with an standard error of 0.007. In the second stage (Column 1 and 2 of table 2), the estimated effect of immigrants on export is about 0.05 and for import it is almost 0.045. Let us emphasize how this specification is by far the most demanding run so far in this literature, expressly focussing on the causal effect of (new) immigrants on trade. An exogenous change in the stock of immigrants by 1% would produce an increase in trade from the province to the country of origin of those immigrants by 0.05%. While the effect is not too large it is very precisely estimated and very likely to be genuinely causal. In specification (3) and (4) of Table 2 we go back to an OLS panel estimate but we include among the controls the lagged value of trade flows. Due to autocorrelation of bilateral trade flows such specification would identify the effect on new immigrants only on the change in trade flows from one year to the other. The effects on export are

[8] For some countries of origin of the immigrants the initial year is 1996 or 1997. See Table A1 for the list of countries.

estimated to be still significant with an elasticity close to 0.05 while the effect on import, while still significant, are smaller.

All in all Table 1 and 2 provide very robust and consistent evidence that a causal effect from immigrants to trade flows exists for Spanish provinces and its elasticity is estimated to be between 0.05 and 0.10. Such effect is stronger for exported goods, which are the focus of our analysis as we can exactly identify the location of production of exported goods but not as precisely the location of use of imported goods, and we have a specific theoretical prediction from the Chaney (2008) model. In the rest of the paper we will report the effects of immigrants on exports. We also show in specifications (1) and (2) of Table 1 that simply pooling observations and estimating a basic gravity equation (as done in large part of the literature) may overestimate the effect of immigration on trade finding an elasticity as large as 0.2. Before proceeding to test the other predictions of the theoretical model it is useful to compare our estimated effect with those found for other countries in the recent literature.

5.1.2 Discussion and comparison with previous estimates

As trade and migration data have become more widely available and as gravity equations have become popular in the trade literature several estimates of the effect of immigration on trade have been produced. Several estimates look at immigration and bilateral trade of the US and several other countries, but estimates for other European countries (France, UK) are also available. Table 3 compares our estimates of the elasticity of export to immigration with several estimates from other recent studies. We have chosen the most influential and significant ones, but several other estimates are available applying, with small variations, similar methods to other countries. First of all let us notice that most studies, and certainly the seminal ones (such as Rauch and Trindade 2001 and Head and Reis 1998) use national trade data, and one cross-sectional approach. In fact all the studies we review in Table 3, except for Bandyopadhyay et al (2008), use cross-sectional data, and all but Bandyopadhyay et al (2008), Dunlevy (2006) and Briant et al (2009) use national trade data rather than province-level trade. Notice, first of all, that some of the cross-sectional regressions (Dunlevy 2006 and Rauch and Trindale 2002) find much larger elasticities than ours (between 0.2 and 0.4). Our Table 1 shows that the simple cross-sectional gravity regression (specification 1 and 2) can in fact produce larger estimates, due to omitted variables and endogeneity. However, most of the estimates reviewed in the literature are closer to our estimated range (around 0.10). In fact Bandyopadhyay et al (2008) that is the only study using sub-national units (states) in a panel (as we do) finds a coefficient of immigrants on export of 0.14 and Briant et al (2009) that is the only study using sub-national units in a European country (France) and instrumenting for immigration flows (as we do) finds a coefficient of immigrants on exports between 0.07 and 0.10, very close to our range. Finally, also the other two studies included in the review, Girma and Yu (2002) for the UK and Dunlevy and

Hutchinson (1999) for the US using historical data (1870-1910), find effects not far from 0.10 (0.16 the first and 0.08 the second). Let us emphasize again that no study, except ours, uses a panel of sub-national units with several foreign countries and also accounts for endogeneity of immigrants with an instrumental variable strategy. Moreover none of the other countries included in the analysis (except possibly for the US 1870-1910) experienced in the period of analysis a surge of immigrants as large as the Spanish one in the period 2002-2008. Hence the data, sample and methods of our analysis should allow us to better identify the genuine causal effect of immigrants on export laying to rest some lingering doubts that the correlation may not be causal. The fact that the estimated effects are in the range of those found in several reasonable recent studies strengthens our confidence in the estimated coefficients. Besides estimating this aggregate effect, however, the more interesting part of our contribution is to test specific predictions of the Chaney (2008) model, relative to the effect of immigrants on the intensive and extensive margin and to the effect on different types of goods. We analyze these effects in the next sections.

6 Effects on the Intensive and the Extensive Margin of Trade

In order to test a key implication of the Chaney (2008) model we decompose the effect of immigration on exports[9] by running a regression as specification 2 but alternatively using as dependent variable $\ln N_{ijt}$, the number of export transactions between province j and country i , and $\ln \overline{x}_{ijt}$,the average value in Euros of each transaction between province j and country i. Each export transaction is invoiced by an exporting firm to one foreign firm. Hence an increase in the number of export transactions to one country may reflect more exporting firms, new trading relations or higher frequency in trading relations between trading partners. The first two elements are clearly part of the extensive margin while the last one is part of the intensive margin. Hence, while the correspondence between new exporting relations and exporting transactions is not perfect certainly the correlation is large enough to consider one proxy for the other. Hence we consider the part of trade due to changes in $\ln N_{ijt}$ as the effect on the extensive margin of trade and the part due to changes in $\ln \overline{x}_{ijt}$ as the effect on the intensive margin of trade.

Table 4 shows the effects of immigrants on total Exports (column 1 and 4) and its decomposition on the Extensive (column 2 and 4) and Intensive (Column 3 and 6) margins. In column 1-3 we estimate the model using the OLS estimator and, thus, the sum of the estimated coefficients on the intensive and extensive margin of trade is equal to the estimated coefficient on total value of trade (Bernard et al, 2007). In column 4-6 we use 2SLS method to estimate the coefficients with imputed immigrants as instrument. Let us first comment the result of the upper portion of the table (Panel A) that considers (as Tables 1 and 2) the estimates using all traded goods. Two results emerge very clearly. First, as predicted by the Chaney (2008) model, assuming

[9]The equivalent estimates for imports are available upon request.

that migration networks decrease fixed bilateral trade costs, they only affect the extensive margin. By reducing the cost of doing business in the country of origin of immigrants the community of expatriates in a Spanish province increases the number of transactions from that province to the country. Both in the case of the OLS and of the 2SLS estimates 80-90% of the total effect is explained by the effect on the extensive margin. Also, both in the OLS and 2SLS estimates, the effects are estimated very precisely so that we can reject any effect on the intensive margin that is larger than 0.03. The effect estimated with 2SLS is only marginally smaller than the effect estimated with OLS.

The lower panels of Table 4 separate the estimates between non-differentiated, moderately differentiated and highly differentiated goods (see more on this in the next section). While we will comment in the following sections on the differences in the estimates between categories of goods, in this section we notice that in each category of goods, for each method of estimation, the largest effect of immigration on trade takes place through the extensive margin. The effect on the extensive margin is always significant and quantitatively larger than the effect on the extensive margin that is significant only in one out of six cases. Hence, independently of the type of traded goods, immigrants networks seem to operate by extending the number of new trade relations with the country of origin of immigrants. This is interesting as the welfare gains from trade are positively related to the different varieties of goods traded (as larger variety increases utility) and therefore immigration seems to affect trade on the margin that is more relevant to welfare.[10]

6.1 Effects on trade of Homogeneous and Differentiated Goods

Table 4 analyzes also another aspect of the effect of immigrants on trade. By separating goods according to their degree of differentiation we also test another implication of the Chaney (2008) paper, that a decrease in fixed trade costs should affect more the export of more differentiated goods. Trade flows in our dataset are originally available at a very disaggregated product level (8 digit Combined Nomenclature classification). We match this classification with the one proposed by Broda and Weinstein (2006) to characterize the degree of differentiability of products. More specifically, they have calculated the import demand elasticities for 2715 goods of the 5-digit SITC (rev. 3) system for the period 1990 and 2001. Summary statistics for the trade in each category of goods, and for the average number of transactions and value per transaction in representative years are reported in Table A.5 of the Appendix. Goods with low (high) elasticities of substitution correspond to goods that are more (less) differentiated.[11] We first use the correspondence table between 8-digit Combined Nomenclature (CN8) and the 5-digit SITC provided by the European Statistical office (EUROSTAT). We then

[10] Foreign countries will benefit from more varieties from Spanish exporters and Spanish citizens will benefit from more imported varieties.

[11] Broda and Weinstein (2006) examine how well their estimates correspond to the classification proposed by Rauch (1999) to characterise the degree of product differentiability of products: commodities, reference priced goods and differentiated goods. They observe that the median elasticities of substitution are higher for commodities than for differentiated and reference priced goods.

group the products into three broad categories according to their elasticity of substitution: goods with an elasticity that is below 2 are classified as highly differentiated products; goods with an elasticity between 2 and 3.5 are classified as moderately differentiated products and goods with an elasticity above 3.5 are classified as less differentiated products. Panel B through D of Table 4 show the elasticity of trade to immigration (decomposed between extensive and intensive margin) for those three types of goods. The prediction of Chaney (2008) is that the effect should become stronger moving from less differentiated to more differentiated goods. Our point estimates support only in part this implication. The 2SLS estimates reflect the magnitudes predicted by Chaney (2008), with an elasticity of immigration equal to 0.109 on highly differentiated exports, to 0.09 on medium differentiated and to 0.085 on less differentiated. The differences, however are not too large. On the other hand the OLS estimates show that while the effect of immigration is larger for moderately than for less differentiated exports, the elasticity for highly differentiated is not the highest, but it is as large as the one for less differentiated. Taken together these result are not a strong confirmation of Chaney's implications. A more accurate analysis however, reveals that these effect, especially those obtained with OLS method, can be explained when we allow the effect of immigrants on trade to be different, depending on their region of origin.

6.2 Effects on trade by region of origin of immigrants

When analyzing the effects of immigrants on trade, it is important to take into account some institutional and cultural characteristics that may affect the importance of the immigration effect. For instance, Dunlevy (2006) shows that immigration effect on US exports is less important when Spanish and English is the language of the origin country. Dunlevy (2006) and Briant et al. (2009) have noticed that the largest trade-creation effect of immigrants in the US and France, respectively, tend to be towards those countries whose institutions are less developed and whose cultural and development distance is larger. For instance, in trading with African countries where there exist very severe problems of institutional inefficiency, lack of enforcement and differences in habits and cultural norms the presence of immigrant networks can help much to increase mutual interactions and to decrease costs even in trading something as simple as an homogeneous good. On the other hand in trading with developed European countries the presence of a network of immigrants should mostly affect the transmission of more sophisticated type of information, likely to be more relevant in the trade of complex and differentiated goods. More recently, Bandyopadhyay et al (2008) investigates the individual immigration effect of 29 foreign countries on US exports and find that it is important only for a subset of 6 foreign countries.

The interactions between countries of immigration (and trade) and type of goods may generate the unclear or weak pattern shown in Table 4, for the effect of immigrants on exports of different categories of goods. In Table 5, therefore, we address this issue by allowing the effect of immigration on exports, estimated as usual using

specification (2) separately across regions of immigration (and trade) and across goods.[12] Table 5 shows the effect of immigration on total export, separating the extensive and the intensive margin of trade, and differentiating across categories of goods (specification 1 to 3 is for highly differentiated, 4 to 6 is for moderately differentiated and 7 to 9 for less differentiated) and across seven regions of the world (by row).[13] This table reveals a pattern that for the most relevant regions is very consistent with the Chaney (2008) theory and provides an explanation for why the aggregate regressions did not reveal such a pattern. For trade between Spanish provinces and European countries (Western and Eastern Europe that together account for more than 70% of Spanish exports) the pattern of the coefficients is exactly as predicted by the theory in Chaney (2008). Considering total exports (as well as the part channeled through the extensive margin) the effects of immigrants is largest on export of highly differentiated goods, intermediate on the export of moderately differentiated and smallest on the export of less differentiated goods. The impact of immigration on exports to the OECD and Asian Countries (that together cover another 10% of total Spanish exports) is also moderately consistent with Chaney: the impact of immigrants is greater on exports of moderately and highly differentiated products than for less differentiated products, however moderately (rather than highly) differentiated seem to have the strongest benefits. The exceptions are Africa and Latin America. The reason, however, can be simply understood. For Latin America none of the estimated coefficients is statistically significant, suggesting that Spanish provincial exports do not benefit from ethnic networks of these immigrants. The importance of historical links between Spain and its former colonies as well as the fact that they share the same language and culture could explain the lack of importance of ethnic networks: Latin America has always been an export market with low costs for Spanish exporters. To the contrary for Africa, the region with the largest cultural differences with Spain and the least developed institutions, the networks of immigrants are crucial (the point estimates of the effects are the largest) not only for trade of differentiated products but for all types of trades and this is why we observe a positive and similar effect of immigrants on trade of all types of goods. In every other region, except Africa, the total export effect for highly and moderately differentiated goods is larger than for less differentiated goods. Also, combining the estimates in Table 5, there are eleven significantly positive estimates of the effects of immigrants on export of highly differentiated goods, nine significant effect on export of goods with moderate differentiation and only four significant effects for the less differentiated goods.

So the decomposition of immigrants and trade by region is very important in identifying the correct effects of immigration, showing that for some poor potential trade partners the main effect is to spur export in general, while with more developed potential trade partners immigrants facilitate the diffusion of sophisticated information that reduces trading costs mostly for differentiated goods. The estimated magnitudes from Table

[12] In Table 5 we only report the OLS estimates as for several regions (e.g Europe or OECD) the immigration instrument is quite weak and we obtain very large standard errors and also some negative results that are hard to interpret and probably reflect mostly noise.

[13] We also calculated the effect of immigration on imports. Those effects exhibit much less of a pattern and are available upon request.

5 also suggest that the rise in immigration from Eastern Europe and the decline of immigration from western Europe to Spain (shown in Figure 2) can explain about half of the increase and decrease of trade with those two regions (respectively). Immigration, therefore was not only a causal determinant of exports from Spain but also a very significant one from the quantitative point of view.

7 Differences between Periods and Provinces

Another aspect that is interesting to explore is whether there are some nonlinearity in the relation between size of the immigrant network and fixed trade costs. Equation 2 assumes that there is a simple linear relation between the fixed trade costs $\ln(f_{ijt})$ and the size of the immigrant's network $\ln(IMM_{ijt})$. However, it is likely that in order to exert its cost-reducing effect the community of immigrants need to be large enough to generate less than occasional interactions between the province of residence of immigrants and their country of origin. It is likely that very small communities may be more isolated, while large communities of immigrants may look for interactions, and official ties with the countries of origin. Also the probability of creating official networks and formal ties is increased with a larger group of migrants. Empirically such issue could be addressed by looking at the trade-creation effect of immigrants in earlier years (when the immigrant communities were very small in Spain) as well as across provinces, comparing those with small communities and those with a large presence of foreign-born.[14] Table 6 explores these aspects. In the upper part of the Table we estimate the export elasticity to immigrants splitting the sample between years before and after 2002, as the largest inflows began around the years 2001-2002. The lower part of the table also differentiates between the elasticity in provinces with low (<4%), medium (between 4 and 10%) and high (above 10%) share of immigrants in the population in the last year of the sample. Again we focus on the effects of immigration on exports as we are more confident about the theory and the data behind those specifications.[15] The results of Table 6 are consistent with the idea of a minimal threshold for the immigration network to operate and they also support a convex relation between immigrant density and its effect on trade. In particular, notice that the effect of immigrants on total exports and on the number of export transactions was significantly larger for the period after 2002 (elasticity of total effect of 0.12) than before (elasticity of total effect of 0.068). This implies that while small early groups of immigrants helped establish trade relation it was only with the large boom of the 2000's that the impact on trade became really large and significant. Similarly the trade-creating effect of immigrants in provinces with a very small presence of immigrants (less than 4% of the population) is quite small and insignificant, while communities where immigrants count for 10% or more of the population show an increase of export by 0.1%

[14]Table 7 shows the estimates using OLS method. The 2SLS estimates, not reported and available upon request, are quite consistent with those, showing a pattern of increase coefficient in the second sub-period and significantly positive coefficient only for provinces with immigrants above 4% of the population.

[15]The estimates of the effects on imports were also calculated and are available upon request.

(before 2002) or even by 0.2% (after 2002) for each increase by 1% in the stock of immigrants. The occurrence of this "convexity" in the relation between immigrants and export both in the cross-section of provinces and in the time-series make us think that this is a feature of the relation between immigrants and fixed bilateral trade-costs. Some previous studies (such as Herander and Saveedra 2002) have also found that the effect of the "diaspora" (i.e. migrants) on trade and technological diffusion requires a minimal size of the network in order to produce a measurable effect on costs and volume of trade. Our results seem in line with those estimates.

8 Conclusions

This paper uses the rapid and large increase of immigrants from several countries into Spanish provinces that took place in the years between 1993 and 2008, especially after 2002, to estimate the causal effect of new immigrants on trade, specifically exports, differentiating between types of goods and decomposing the intensive and extensive margin. Assuming that immigration networks are a channel that reduces the information-related fixed costs of trade between a Spanish province and a country that is a potential trading partner, we test some of the implications of the Chaney (2008) model, framed in a generalized and theory-based gravity regression. First, that model predicts that once we control for country by year and bilateral country-province effects immigration networks should be positively correlated with bilateral trade. Second, it predicts that the correlation is causal from migration to trade. Third it predicts that all the trade-creation effect of immigrants (if it corresponds to a decrease in fixed trade costs) shows in the extensive margin of trade and not in the intensive margin. Fourth and final, it predicts that the trade-creation effect will be larger in the trade of goods with higher degree of differentiation than on those with low degree of differentiation. Our data are rich enough that we can test all these prediction. Using a panel of bilateral trade flows for 50 Spanish provinces and 77 countries and corresponding data for immigrant stocks by Spanish province and foreign country of origin we show a very strong and robust elasticity of export to immigrants close 0.10. Second, instrumenting immigration flows with flows constructed using the distribution of immigrants in 1993, we also find a very significant, elasticity closer to 0.05. Third the decomposition of the export-creating effect of immigrants between increased number of export transactions and average value of export in each transaction shows that the whole effect is due to an increase in the number of transactions. Finally the analysis of trade-creation effects across categories of goods, once we allow different effects for different regions, shows that in most of the cases and particularly in the relation with developed countries (Europe), the network of immigrants affects mostly the trade of differentiated goods. As predicted by Chaney (2008) the trade-creation effect is inversely related to the elasticity of substitution between varieties of the good. On the other hand in the trade with the least developed countries (Africa) the effects of immigrants applies rather uniformly to the export of any good, suggesting that in the trading relation with those countries the most important effect is that of decreasing the very high fixed costs of trade that are

independent of the nature of traded goods. As the surge of immigrants came to a halt and even reversed in 2009, as a consequence of the economic and financial crisis in Spain and in most of the rich world, it is possible that some of these trade-creation effects will be reversed: as immigrants go back to their countries this also would contribute to reduce the volume of trade between Spain and the rest of the world. In a proper account of costs and benefits of immigration this trade-creating effect is certainly to be accounted for.

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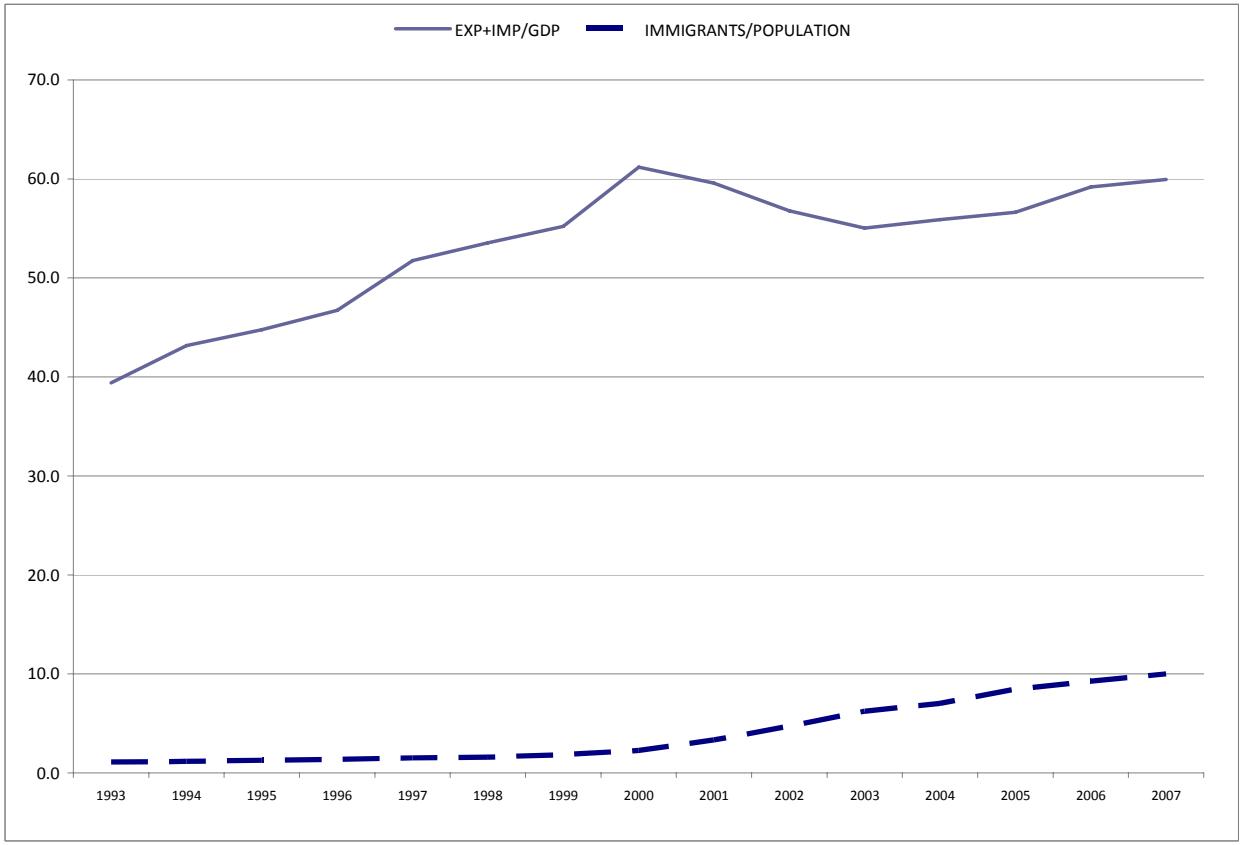
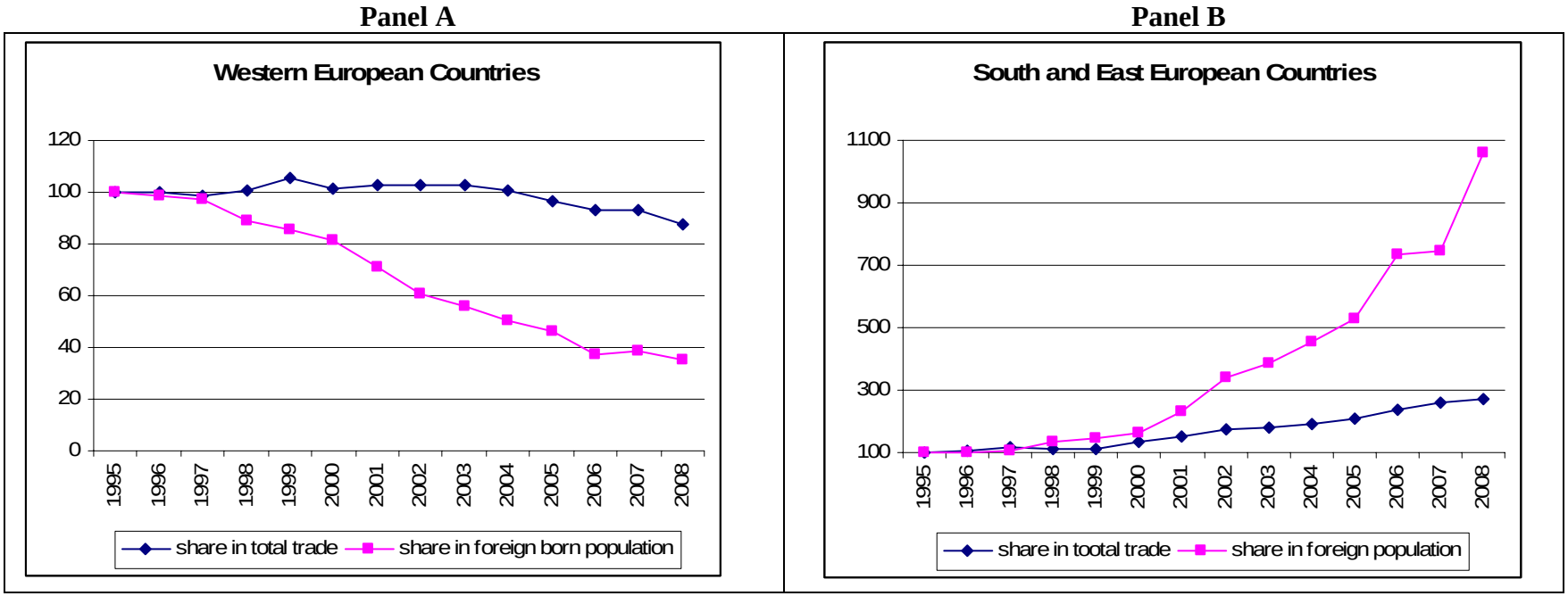
Figures and Tables

Figure 1:
Trade openness and immigration rate, Spain 1993-2007



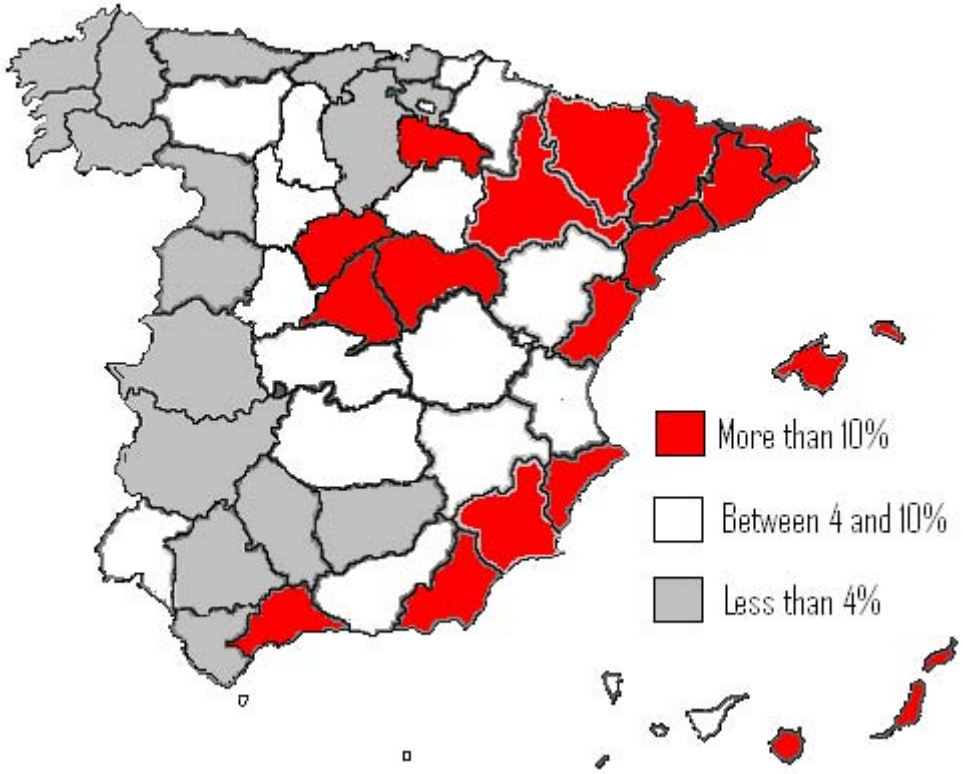
Note: The solid line represents Exports and Imports as share of Spanish GDP, the dashed line is the stock of immigrants relative to the total population. Source: Own elaboration using Regional Accounts and Annual Statistical Book (INE).

Figure 2:
Trade and immigration with Western Europe and South/Eastern Europe (1995=100)



Note: Total trade is the sum of imports and exports. Immigration is lagged one period. Each of the two measures is reported as share of total (trade volume or immigration) and is standardized so that the level in 1995 is equal to 100.

Figure 3:
Foreign-born population by Province
(Percentage of foreign-born population in total population in 2007)



Note: The figures on the foreign-born population are obtained using data from the Statistical Yearbooks published annually by the Spanish Statistical Office.

Table 1:

Trade-Creation Effect of Immigrants, Basic Specifications

50 Spanish provinces, 77 Countries, 1994-2008

	Pooled OLS		Origin & destination fixed effects		Trading partner pair fixed effects		Basic: Pair FE plus country-year dummies	
	(1) exports	(2) imports	(3) exports	(4) imports	(5) exports	(6) imports	(7) exports	(8) imports
ln (Y_iY_j)	**0.917***	**1.135***	**0.788***	**-0.218***	**1.180***	**1.243***	**0.340***	0.191
	(0.017)	(0.017)	(0.083)	(0.108)	(0.009)	(0.011)	(0.123)	(0.164)
ln distance	**-1.056***	**-0.527***	**-0.320***	**-0.673***				
	(0.061)	(0.064)	(0.115)	(0.201)				
Contiguity	**1.411***	**1.381***	**0.842***	**1.348***				
	(0.228)	(0.227)	(0.318)	(0.290)				
EU/EFTA	**0.847***	**1.249***	**3.171***	**5.678***				
	(0.103)	(0.112)	(0.210)	(0.426)				
Language/colonial ties	**0.757***	**-0.243***	**-1.620***	**4.913***				
	(0.098)	(0.096)	(0.392)	(0.722)				
ln IMM	**0.249***	**0.345***	**0.114***	**0.089***	**0.233***	**0.235***	**0.086***	**0.045***
	(0.018)	(0.017)	(0.016)	(0.018)	(0.008)	(0.009)	(0.011)	(0.013)
Year dummies	yes	yes	yes	yes	yes	yes		
Country and province dummies			yes	yes				
Trading pair dummies					yes	yes	yes	yes
Country-year dummies							yes	yes
Adjusted R^2	0.60	0.67	0.78	0.76	0.82	0.82	0.86	0.85
Observations	54350	54350	54350	54350	54350	54350	54350	54350

Note: The dependent variable in each regression is the logarithm of the total value of trade in Euros (import or export) plus one between province i and country j. The explanatory variables are lagged one period. Specification (3) and (4) include 77 country dummies and 50 province dummies, specifications (5) and (6) include 3850 trading-pair dummies and specifications (7) and (8) include 3850 trading-pair dummies and 1232 country-year dummies. *=significant at 5%.

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Table 2
Trade-Creation Effect of Immigrants: IV estimation and controlling for lagged trade

	2SLS (instrumented IMM)		Including lagged dependent variable	
	(1)	(2)	(3)	(4)
	exports	imports	exports	imports
ln $(Y_i Y_j)$	**0.421***	0.206	**0.176***	-0.036
	(0.133)	(0.183)	(0.100)	(0.138)
ln $(Trade)_{t-1}$			**0.513***	**0.526***
			(0.007)	(0.006)
ln IMM	**0.048***	**0.044***	**0.044***	**0.017***
	(0.015)	(0.021)	(0.009)	(0.008)
Trading pair dummies	Yes	yes	yes	yes
Country-year dummies	Yes	yes	yes	yes
Adjusted R^2	0.87	0.86	0.89	0.90
Observations	54350	54350	54350	54350

Note: The dependent variable in each specification is equal to the logarithm of the total value of trade in Euroes (import or export) plus one between province i and country j. The Instrument used in specification (1) and (2) for the variable ln(IMM) is the imputed presence of immigrants of a certain nationality in the province. This is obtained by allocating the total immigration to Spain by nationality of origin, for each year, proportionally to the initial size of each nationality in the province. The standard errors are heteroskedasticity-robust and clustered by province-country pair. *=significant at 5%,.

Table 3
Comparison with other estimates from the literature of the elasticity of Exports to Immigrants

Authors	**Estimated elasticity of Export to migrants**	**Sample**	**Specification-Method**
Our Estimates	0.05-0.11	Panel: 50 Spanish provinces, 77 countries, 1993-2008	Panel, OLS and 2SLS with country-time and trading partner pairs FE
Bandyopadhyay, Coughlin and Wall. (2008)	0.14	Panel: 50 US states, 29 Countries, 1990, 2000	Panel, OLS with country-time and trading partner pairs FE
Briant, Combes and M. Lafourcade (2009)	0.07-0.10	93 French Departments, 1999-2001	Pooled cross section, 2SLS with country and Department FE
Dunlevy (2006)	0.24-0.47	50 US states, 87 Countries, 1990-1992	Pooled cross-section, OLS with country and state FE
Dunlevy and Hutchinson (1999)	0.08	US, with 17 countries, 1870-1910	Pooled cross-section, simple gravity specification
Head and Ries (1998)	0.10	Canada and 136 trading partners, 1980-1992	Pooled Cross section, simple gravity specification
Girma and Yu (2002)	0.16	UK and 48 trading partners	Pooled Cross section, simple gravity specification
Rauch and Trindade (2002)	0.22-0.47	Ethnic Chinese in 120 countries	Pooled Cross section, simple gravity specification

Table 4:
Decomposition of the effects of Immigrants;
The Intensive and Extensive margin of Export; Homogeneous and Differentiated Goods

	Exports					
	OLS estimates			IV estimates		
	Total Value	**Extensive Margin**	**Intensive Margin**	**Total value**	**Extensive Margin**	**Intensive Margin**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Exports					
	Panel A: All Goods					
Ln (IMM)	0.086*	0.081*	0.009	0.078*	0.063*	0.015
	(0.011)	(0.005)	(0.008)	(0.015)	(0.007)	(0.011)
	Panel B: Highly differentiated products (elasticity of substitution less than 2)					
Ln (IMM)	0.076*	0.067*	0.009	0.109*	0.086*	0.023
	(0.011)	(0.005)	(0.008)	(0.016)	(0.007)	(0.012)
	Panel C Medium differentiated products (elasticity of substitution between 2 and 3.5)					
Ln (IMM)	0.123*	0.082*	0.041*	0.090*	0.063*	0.027
	(0.012)	(0.005)	(0.008)	(0.018)	(0.008)	(0.013)
	Panel D: Low differentiated products (elasticity of substitution above 3.5)					
Ln (IMM)	0.087*	0.075*	0.012	0.085*	0.069*	0.016
	(0.012)	(0.005)	(0.009)	(0.018)	(0.008)	(0.013)

Note: Each cell report the estimates of the coefficient on the variable $\ln(Immi_{ijt})$ from equation (2) in the text. All regressions include 3850 trading-pair dummies and 1232 country-year dummies. Specification (1) and (4) use as dependent variable the total value of export from the Spanish province to the country, specification (2) and (5) use as dependent variable the number of transactions between province j and country i –that we call the extensive margin- and specification (3) and (6) use as dependent variable the average value per transaction between province j and country I –that we call the intensive margin. Standard errors are heteroskedasticity-robust and clustered by trading-pair. *= significant at 5% level.

Table 5:
Effect of Immigration on Exports by Region of Origin of Immigrants

	Highly Differentiated			**Moderately Differentiated**			**Less Differentiated**		
	Total	Extensive	Intensive	Total	Extensive	Intensive	Total	Extensive	Intensive
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
EU/EFTA	**0.071***	**0.044***	**0.027***	0.053	**0.043***	0.010	0.001	**0.048***	-0.046
	(0.032)	(0.015)	(0.014)	(0.035)	(0.015)	(0.030)	(0.038)	(0.017)	(0.028)
East Europe	**0.102***	**0.053***	**0.049***	0.028	0.022	0.006	-0.049	-0.015	-0.034
	(0.032)	(0.015)	(0.022)	(0.033)	(0.015)	(0.022)	(0.032)	(0.015)	(0.023)
Africa	**0.172***	**0.115***	**0.057***	**0.161***	**0.077***	**0.084***	**0.194***	**0.129***	**0.065***
	(0.022)	(0.011)	(0.015)	(0.033)	(0.013)	(0.024)	(0.027)	(0.014)	(0.020)
Latin America	-0.013	0.012	-0.025	0.012	0.016	-0.003	-0.017	0.002	-0.019
	(0.026)	(0.011)	(0.019)	(0.025)	(0.011)	(0.018)	(0.030)	(0.011)	(0.022)
Asia	0.029	**0.038***	-0.009	-0.027	0.003	-0.030	-0.064	0.004	-0.068
	(0.047)	(0.018)	(0.034)	(0.048)	(0.018)	(0.036)	(0.054)	(0.018)	(0.041)
Rest OECD	0.010	**0.037***	-0.026	**0.092***	**0.045***	0.048	0.043	**0.048***	-0.005
	(0.041)	(0.018)	(0.030)	(0.049)	(0.019)	(0.037)	(0.053)	(0.021)	(0.039)
Middle East	0.049	0.010	0.039	**0.226***	**0.082***	**0.144***	-0.047	-0.018	-0.030
	(0.071)	(0.027)	(0.054)	(0.073)	(0.027)	(0.056)	(0.071)	(0.028)	(0.051)

Note: Each cell reports the elasticity of export to immigrants estimated using specification (2) with total exports or number of transaction or value per transaction as dependent variable. All regressions include trading-pair dummies and country-year dummies. The sample is restricted, for each row, to countries in the region only. Specifications (1)-(3) include only trade in highly differentiated goods; (4)-(6) include trade in moderately differentiated goods and (7)-(9) include only less differentiated goods. The Method of estimation is OLS, with Standard errors are heteroskedasticity robust and clustered by trading-pair. *= significant at 5% level.

Table 6
Effects of immigrants on Exports:
Separating periods and initial province-density of immigrants

	Exports		
	Total value	Extensive	Intensive
	(1)	(2)	(3)
	Before and after 2002		
period 1994-2001	**0.068***	**0.064***	0.004
	(0.017)	(0.007)	(0.012)
period 2002-2008	**0.125***	**0.104***	**0.021***
	(0.017)	(0.008)	(0.010)
Provinces grouped by percentage of immigrants in the total population in 2007			
	period 1994-2001		
<4%	0.025	**0.050***	-0.025
	(0.030)	(0.012)	(0.028)
[4-10%]	0.042	**0.044***	-0.002
	(0.032)	(0.014)	(0.026)
>10%	**0.099***	**0.080***	0.019
	(0.029)	(0.014)	(0.027)
	period 2002-2008		
<4%	-0.026	**0.039***	**-0.065***
	(0.034)	(0.025)	(0.034)
[4-10%]	**0.062***	**0.052***	0.010
	(0.034)	(0.025)	(0.031)
>10%	**0.210***	**0.155***	**0.054***
	(0.028)	(0.019)	(0.027)

Note: Each cell reports the elasticity of export to immigrants estimated using specification (2) with total exports (column 1), number of transaction (column 2) or value per transaction (column 3) as dependent variable. All regressions include trading-pair dummies and country-year dummies. The sample is split by years in the upper part of the Table and two regressions are run separately for each period. In the lower part the sample is split by year and province according to the density of immigrants in 2007. Method of estimation is OLS. Standard errors are heteroskedasticity robust and clustered by trading-pair. *= significant at 5% level.

Table Appendix

Table A1
Countries included in the study (77 countries in 7 regional groups)

Western Europe	South-East Europe	Africa	Latin America	Asia	Rest of OECD	Middle East
Austria	Bosnia*	Angola*	Argentina	Bangladesh	Australia	Egypt*
Belgium	Bulgaria	Algeria	Bolivia	China	Canada	Iran*
Denmark	Croatia *	Cape Verde	Brazil	Pakistan	Japan	Israel*
Finland	Czech*	Gambia	Chile	India	Korea	Jordan
France	Hungary	Ghana**	Colombia	Philippines	Mexico	Lebanon*
Germany	Poland	Guinea**	Costa Rica	Thailand*	N. Zealand	Syria
Greece	Serbia*	Guinea-B*	Dom. Rep.		Turkey*	
Ireland	Romania	Guinea Eq.	Ecuador		USA	
Italy	Russia*	Mali **	El Salvador			
Netherlands	Ukraine*	Morocco	Guatemala			
Norway		Mauritania	Honduras			
Portugal		Nigeria	Nicaragua			
Sweden		Senegal	Panama			
Switzerland		Sierra Leone**	Peru			
UK		Tunisia*	Paraguay			
			Uruguay			
			Venezuela			
N=15	N=10	N=15	N=17	N=6	N=8	N=6

Note: We included only those countries for which we could reconstruct a consistent and uninterrupted series of observations on the stock of immigrants in each Spanish province between 1993 and 2007. * Series starts in 1996 and ** series starts in 1997.

Table A2
Spanish Provinces divided between high, intermediate and low presence of immigrants in 2007

High Immigration Provinces IMMIGRANTS/POPULATION >10%	Intermediate Immigration Provinces IMMIGRANTS/POPULATION Between 4% and 10%	Low Immigration Provinces IMMIGRANTS/POPULATION <4%
Alicante	Álava	Badajoz
Almería	Albacete	Cáceres
Balears	Ávila	Cádiz
Barcelona	Burgos	Córdoba
Castellón	Ciudad	Coruña
Girona	Cuenca	Guipúzcoa
Guadalajara	Granada	Jaén
Huesca	Huelva	Lugo
Lleida	León	Ourense
Rioja	Navarra	Asturias
Madrid	Tenerife	Palencia
Málaga	Soria	Pontevedra
Murcia	Teruel	Salamanca
Las Palmas	Toledo	Cantabria
Segovia	Valencia	Sevilla
Tarragona	Valladolid	Vizcaya
Zaragoza		Zamora

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Table A3
Shares of exports, imports and Immigrants by Regions of the World.

	Share of exports (%)			Share of imports (%)			Share of immigrants (%)		
	1993	**2002**	**2008**	**1993**	**2002**	**2008**	**1993**	**2002**	**2008**
Western Europe	74.10	73.05	67.47	67.77	65.80	53.13	49.24	29.99	17.45
Eastern and Southern Europe	1.71	3.65	5.92	2.46	3.88	5.92	1.81	6.13	22.89
Africa	2.70	2.72	4.29	3.00	4.21	6.46	16.77	27.02	20.85
Latin America	4.01	2.67	2.78	3.02	2.86	3.71	17.07	23.16	29.08
Asia	1.68	1.16	1.97	3.16	4.66	8.84	5.54	6.94	5.27
Rest OECD	8.27	9.32	9.67	12.56	10.26	10.05	6.04	2.94	1.31
Middle East	1.49	1.31	1.35	1.40	1.03	2.00	1.02	0.44	0.19
Rest of the World	6.05	6.12	6.55	6.64	7.30	9.89	2.50	3.38	2.97
World	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Note: See Table A1 for list of countries included in each geographic area.

Table A4
Robustness Checks: Dealing with 0-trade observations.

	Basic Specification log (y+1)	Pooled OLS log (y+1)	Origin & destination fixed effects log (y+1)	Tobit log (y+1)	Number of observations
	(1)	(2)	(3)	(4)	(5)
Exports>=0	**0.086***	**0.249***	**0.114***	**0.118***	54350
	(0.009)	(0.020)	(0.015)	(0.007)	
Exports >0	**0.068***	**0.203***	**0.086***	**0.086***	48196
	(0.013)	(0.016)	(0.014)	(0.006)	
Imports>=0	**0.045***	**0.345***	**0.089***	**0.064***	54350
	(0.011)	(0.020)	(0.020)	(0.010)	
Imports >0	**0.041***	**0.331***	**0.047***	**0.048***	42296
	(0.010)	(0.017)	(0.019)	(0.008)	

Note: The dependent variable is the logarithm of trade flows (imports or exports) plus one. The first row indicates whether we include all observations in the estimation or only those strictly positive. Standard error are heteroskedasticity robust and clustered by trading-pair. *= significant at 5% level.

Table A5
Description of exports and imports by year, type of product and extensive/intensive margin

	All products	Highly differentiated products	Moderately differentiated products	Less differentiated products		All products	Highly differentiated products	Moderately differentiated products	Less differentiated products
	Exports					**Imports**			
Year	Total value by province-country pair (Thousands Euros)				Year	Total value by province- country pair (Thousands Euros)			
1994	17055	3839	6569	5642	1994	21793	5140	7325	7560
1998	21813	5121	8285	6988	1998	27836	6730	9144	9779
2003	30539	6764	11999	9683	2003	39543	9651	12631	13296
2008	40556	8314	14414	14578	2008	71144	13686	17081	32774
	Number of transactions by province-country pair					Number of transactions by province-country pair			
1994	260	88	83	66	1994	387	133	119	100
1998	308	101	101	79	1998	408	139	127	105
2003	451	145	153	113	2003	601	207	190	148
2008	532	166	177	132	2008	773	258	238	185
	Average value per transaction by province-country pair (thousands Euros)					Average value per transaction by province-country pair (thousands Euros)			
1994	66	44	79	86	1994	56	39	61	76
1998	71	50	82	89	1998	68	48	72	93
2003	68	47	78	85	2003	66	47	66	90
2008	76	50	81	110	2008	92	53	72	177

Note: Authors´ calculations using trade data for 50 provinces and 77 countries. Exports and imports flows include zeros. Products are classified into three broad categories: High differentiated products (elasticity of substitution below 2), medium differentiated products (elasticity of substitution between 2 and 3.5) and low differentiated products (elasticity of substitution above 3.5).