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European Integration, FDI and the Internal Geography of Trade: Evidence from Western European Border Regions*

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ABSTRACT

In this paper we use a gravity model to study the trade performance of French and Spanish border regions relatively to non-border regions, over the past two decades. We find that, controlling for their size, proximity and location characteristics, border regions trade on average between 62% and 193% more with their neighbouring country than other regions, and twice as much if they are endowed with good cross border transport infrastructures. Despite European integration, however, this trade outperformance has fallen for the most peripheral regions within the EU. We show that this trend was linked in part to a shift in the propensity of foreign investors to move their affiliates from the regions near their home market to the regions bordering the EU core.

RESUM

En aquest article analitzem el rendiment comercial relatiu de les regions frontereres a França i Espanya, mitjançant un model de gravetat. Els nostres resultats mostren que, controlant per la dimensió, la proximitat i les característiques de les localitzacions, les regions frontereres comercien en mitjana entre un 62% i un 193% més que les altres regions amb els estats veïns, i més del doble si estan dotades amb bones infrastructures transfrontereres de transport. Ara bé, malgrat el procés d'integració europeu, aquest rendiment superior ha disminuït per les regions més perifèriques de la UE. Mostrem que aquesta tendència està lligada en part a un canvi en la propensió dels inversors estrangers a localitzar les seves filials des de les regions més properes al seu mercat d'origen cap a les regions properes al centre de la UE.

JEL classification: F15, F23, R12, R58

Keywords: Trade, Gravity, Border Regions, European Integration, Foreign Direct Investment

1 Introduction

The recent accession of ten Central and Eastern European (CEE) countries to the EU, as well as the Commission's recommendations to foster negotiations designed to favor the entry of Bulgaria, Romania and Turkey have renewed the academic and political interest in the effects of European economic integration. The empirical evidence has focused overwhelmingly on the trade implications for *countries* of integrating regional blocks, and these have been researched extensively. This paper is designed to extend this investigation to the context of *regions*. We assess the effects of economic integration on reallocating international trade *within countries*, and more particularly between their border and non-border regions. Border regions in an economic union are those located at the interface of two integrating country partners. As the effects of the integration process are expected to be more intense in these regions, they constitute a good empirical laboratory to assess the effects of economic integration. But the issue of whether these effects will favor or hamper border regions is still controversial.

From a theoretical point of view, the New Economic Geography (henceforth NEG) has sought to extend the usual 2-country (or 2-region) setting to frameworks in which both inter- and intra-national inequalities are assessed. In a model with two symmetric domestic regions and a foreign country, Krugman and Livas (1996) found that trade liberalization leads to the re-dispersion of increasing return to scale activities between domestic regions. However, this dispersion result is not general since it depends heavily upon the use of an urban congestion cost in the model. When a population of immobile workers is used instead (Monfort and Nicolini, 2000, Paluzie, 2001), international integration is shown to foster agglomeration in the domestic economy. In a slightly modified setting, in which one of the two domestic regions is farther away from the foreign market than the other, Crozet and Koenig-Soubeyran (2004) show that trade liberalization drives domestic firms to the region closer to the border, unless competition pressure from the foreign market is too fierce. As opening up to trade with a foreign economy increases exports (foreign demand) and imports (foreign supply), the relationship between the performance of border regions and economic integration will not be monotonic but the result of two counteracting forces: increased market access (favorable to export production) and increased import competition (negative for domestic producers that compete with foreign supply).

The core-periphery models of the Krugman type are not only known for their extreme results (with the reduction in trade costs leading to catastrophic agglomeration), but also for their analytical intractability. Hence, recent studies have tried both to attenuate centripetal forces and to provide analytical solutions to the models. For instance, Brülhart, Crozet and Koenig (2004) use a 3-region framework setting in which the manufacturing sector uses mobile human capital as the fixed cost and labor as the variable cost of production. They find that, for most parameter configurations, trade liberalization favors the concentration of human capital in the border region. However, this mechanism is not deterministic: A sufficiently strong pre-liberalization concentration of economic activity in the interior region can make this concentration globally stable, and predicts even more agglomeration in this region.

Finally, this question has been analyzed in a setting other than the Dixit-Stiglitz-Iceberg framework, by Behrens (2003) and Behrens, Gaigné, Ottaviano and Thisse (2003). Behrens (2003) develops a 2-country / 3-region model based on Ottaviano, Tabuchi and Thisse (2002) and finds that the impact of decreasing international trade costs on the regional distribution of economic activities crucially depends on the value of the country's internal transport costs. Trade liberalization in developing countries with poor internal infrastructures is likely to increase regional disparities, while developed countries with good infrastructures are likely to experience regional re-dispersion. In a similar setting, Behrens, Gaigné, Ottaviano and Thisse (2003) develop a 2-country 4-region model, whose main result is that lower international trade costs promote regional re-dispersion when inter-regional transport costs are high enough, i.e. the opposite of Behrens (2003).

As theory has not reached a consensus on whether or not border regions will benefit from integration processes, empirical analysis is even more crucial as it will help to identify the main mechanisms at work. Nonetheless, the empirical evidence that focuses on disentangling the effects of economic integration between border and non-border regions is not conclusive either. [1]

The main empirical approach consists in testing the NEG predictions of backward (demand) linkage effects: the better a region's access to large markets, the higher its factor prices, output, or a mix of the two. The price channel of this effect predicts the existence of regional wage gradients, with nominal wages decreasing with transport costs from industrial centers, and their possible reversal following changes in trade regimes. When focusing on output variables, adjustments are driven by the number of firms, and regions with good access to foreign markets end up with a higher share of employment or production in differentiated goods, as testified by the investigations of Hanson (1996a, 1996b, 1997, 2001) on the relocation of economic activity towards the U.S.-Mexico border area following the NAFTA agreement. As regards the EU, the emphasis has been mostly on assessing the impact of the enlargement to the large block of CEE countries. The interest in focusing on the recent EU enlargement is that, as the borders of CEE countries become internal to the EU, economic activities may shift towards eastern border locations, possibly at the expense of western border regions. In the same spirit as Hanson's work, several studies analyze how changes in market access are likely to affect Eastern European border regions (for instance Brakman, Garretsen and Schramm, 2002, Brülhart and Koenig, 2005 and Niebuhr, 2005). The only exception to this geographical focus is, to our knowledge, the recent work by Overman and Winters (2003, 2005) who explore whether the UK's accession to the EEC impacted the location of domestic manufacturing activities. Accession is shown to have a mitigated effect: even though it may have encouraged manufacturing activities to relocate towards the South-East, some industries also retreated north-westwards, because of increased import competition.

Therefore, studies focusing on the empirical estimation of backward linkage, both in its factor price version (wages) and in its quantity version (employment or production) indicate that regions bordering larger and richer markets do seem to benefit from economic integration with them. By contrast, the

[1] See Niebuhr and Stiller (2004) for a comprehensive survey of empirical studies on the integration effects at the borders.

results for regions bordering poorer markets are more mixed. Some of them, like the South of the US, experience positive effects while for others, particularly in Eastern Europe, the impact may be negative.

Our empirical approach is different from those used in previous studies. In addition to factor prices, employment or production, geography and distance also affect trade, as testified by the empirical success of the gravity model. This model has been used overwhelmingly to analyze issues such as the effects of currency unions or regional trading agreements on countries, but it has been applied far less at the regional scale. Coughlin and Wall (2003) is one of the few studies that assesses the differential trade regional effects of liberalization using a gravity framework. It shows that while NAFTA led to an overall increase of 15% in US exports to Mexico and Canada, its effects on states ranged considerably: Following NAFTA, 28 (36, respectively) states experienced a rise of more than 10% in exports towards Mexico (Canada, respectively), while 8 (4, respectively) states experienced the opposite counterpart fall. Hence, the diversity of results across states highlights the importance of studying the impact of integration on the intra-country geography of trade flows.

In order to shed more light on the issue, in this paper we focus on the relative trade performance of French and Spanish border regions relatively to non-border regions, as revealed by gravity estimations performed on cross-sectional time series data depicting the international trade flows of all French and Spanish regions. Our data set is unusual in that it represents both the import and export flows at a very detailed regional scale (the NUTS3 level of the Eurostat geographic classification of regions), and for a time period of a length that is rarely found in the literature (1978-2000 for France, 1988-2000 for Spain). We believe that focusing on the French and Spanish experiences of integration will yield more long-run insights than the recent enlargement to Eastern countries. Firstly, because our period of analysis encompasses several years before and after the Single European Act of 1986, the Schengen Agreement of 1990, and the Maastricht Treaty of 1992, the effects of integration will be more clearly observed than in Eastern countries that are just starting the process of joining the E.U. Secondly, both France and Spain have experienced less political and economical turmoil than most Eastern countries after the fall of the Berlin Wall.[2] And finally, the comparative analysis of the results for these two countries could give us some additional insights into the mechanisms at work in processes of this kind. As France is one of the six founder countries that signed the Treaty of Rome in 1957, the trade patterns of its border regions may already have evolved towards their long term growth path by the beginning of our period of study (1978). We therefore expect to analyze the trade reallocation effects in France of integrating Spain in the EU, rather than those of integrating France itself. By contrast, because Spain's accession to the EU was more recent (1986) we are also in the position to investigate the changes in the regional allocation of trade arising from this country's entry.

Moreover, we develop a gravity framework in which European integration is captured by the reduction of both trade and FDI barriers, and quantify the relative trade performance of regions according

[2] Even though Spain's political regime changed from a dictatorship to a democracy just before our period of analysis (after Franco's death in 1975), its economic regime did not suffer a transformation comparable to that of the Eastern European transition from communism.

to their geographical position. Our approach is innovative in that it considers foreign direct investment as one of the channels through which integration affects the allocation of international trade within countries.[3] Since regional agreements reduce impediments both to trade and to multinational activity, the enlargement process is likely to stimulate direct investment from other countries (Faini, 2004), and more particularly from integrating countries (Egger and Pfaffermayr, 2004). If multinationals are more likely to locate according to "market potentials", as recently emphasized by Head and Mayer (2004), regions bordering large central markets may become the best location for their affiliates. As a number of recent studies emphasize the tendency for multinationals to be more productive than domestic firms,[4] this could generate a net trade-creating effect for border regions, which would possibly magnify their trade surplus. However, foreign manufacturing firms could also choose to locate in central regions to avoid exposure to greater competition in border regions; if this is the case, economic integration could lead to the opposite trade reallocation.

We find that, controlling for their size, proximity and location characteristics, French border regions trade on average 62% more with the neighboring countries than other regions, and 105% more if they are endowed with good cross border transport infrastructures. However, the ongoing process of European integration coincided with a large decrease in this extra-trade over the period 1978-2000. This trend was driven by the drastic fall in the trade outperformance experienced by the most peripheral border regions within the EU. Neither the Single European Act nor the completion of the Single Market were sufficient to counterbalance the decline. By contrast, Spanish border regions do not seem to exhibit any other significant advantage than distance over the period 1988-2000. These trade differentials and evolutions can be attributed, in part, to regional FDI patterns. The French declining trend is linked to a shift in the propensity of foreign direct investors to move their affiliates from regions near their home market to those located close to the central core of the EU. Spanish border regions significantly outperform interior regions only when we exclude FDI outliers regions from the sample.

The rest of the paper proceeds as follows. Section 2 provides some stylized evidence of the suitability of the gravity framework for the study of the interaction between trade and FDI performances. Section 3 develops the model we use to measure the relative trade performance of border regions, and presents the specifications to be estimated. We separate our results in two sections. Section 4 analyzes the magnitude and evolution of the trade outperformance of French and Spanish border regions over the last two decades of European integration. Section 5 focuses on a particular aspect of European integration: The decision of multinationals to invest in the border regions of integrating countries. Therefore, we seek to measure the trade-creating impact of FDI and its contribution to the relative trade performance of regions. Section 6 concludes and suggests new lines of research.

[3]A recent work by De Sousa and Lochard (2004) puts the emphasis on the *monetary* integration channel of FDI. However, it focuses on the allocation of international trade between countries only.

[4]See among others Bernard, Eaton, Jensen and Kortum (2003), Melitz (2003), Helpman, Melitz and Yeaple (2004).

2 Trade and FDI patterns of French and Spanish regions: Stylized evidence

A complete consideration of how liberalization affects the intra-country geography of international trade requires a thorough theoretical and econometric analysis which we will seek to provide in subsequent sections. However, if border regions experience specific trends arising from the counteracting forces proposed in the introduction, we should be able to identify them with the naked eye. Section 2 therefore provides a set of stylized facts on the trade and FDI patterns of French and Spanish regions. In this section we define border regions according to a first contiguity bilateral criterion: that is, we consider border regions to be the locations that share a frontier with at least one neighboring country, either by land or by sea.[5]

2.1 Trade Specialization Patterns by Country

Let us take a first look at the relative trade performance of border and non-border regions for France and Spain.[6] In order to assess the relative specialization of regions across partner countries, we compute the following trade index. Let J denote the trade partner country of region i. We define $s_{iJ} = F_{iJ}/\sum_{i \in I} F_{iJ}$ as the share of region i in the country I's trade with country J, and $x_i = \sum_K F_{iK}/\sum_{i \in I}\sum_K F_{iK}$ as its share in the country I's international trade. The simplest way to measure how much the trade of region i is oriented towards the partner country J, and to compare this trade intensity across countries, is to compute the following Balassa Trade Specialization Index:

$$TSI_{iJ} = \frac{s_{iJ}}{x_i} \times 100. \tag{1}$$

Values above 100 mean that region i trades relatively more with country J than would be predicted by its share in international trade. Figures 1, 2, and 3 exhibit the patterns obtained for France and Spain respectively, in terms of trade oriented to their neighboring partner countries, in 2000.

The gravity pattern of trade is striking. One can see indeed that, regardless of the direction of trade (imports, exports), border regions always appear as favored partners for countries with which they share a frontier. This pattern is especially clear at the French borders with Belgium-Luxembourg and Germany, and at the Spanish border with Portugal. For instance, with a TSI of respectively 280 for exports and 355 for imports, the French NUTS3 "Ardennes", which borders Belgium, is almost three times more trade-oriented towards this country as regards exports (and almost four times as regards imports) than with the rest of the world. Hence, proximity gives the agents located on both sides of the same frontier clear incentives to trade.

[5] The reader will be able to identify French and Spanish regions locations and names on the two maps provided in Figure **??**, Appendix A. Due to data constraints, we treat Belgium and Luxembourg as a single partner country for France. Regarding the UK, we consider the French NUTS3 regions bordering the English Channel as contiguous.

[6] Appendix B presents data sources and gives more general descriptive statistics on related trade flows.

Figure 1: Trade Specialization Indexes of French regions with regard to: United Kingdom (top), Belgium-Luxembourg (middle) and Germany (bottom)

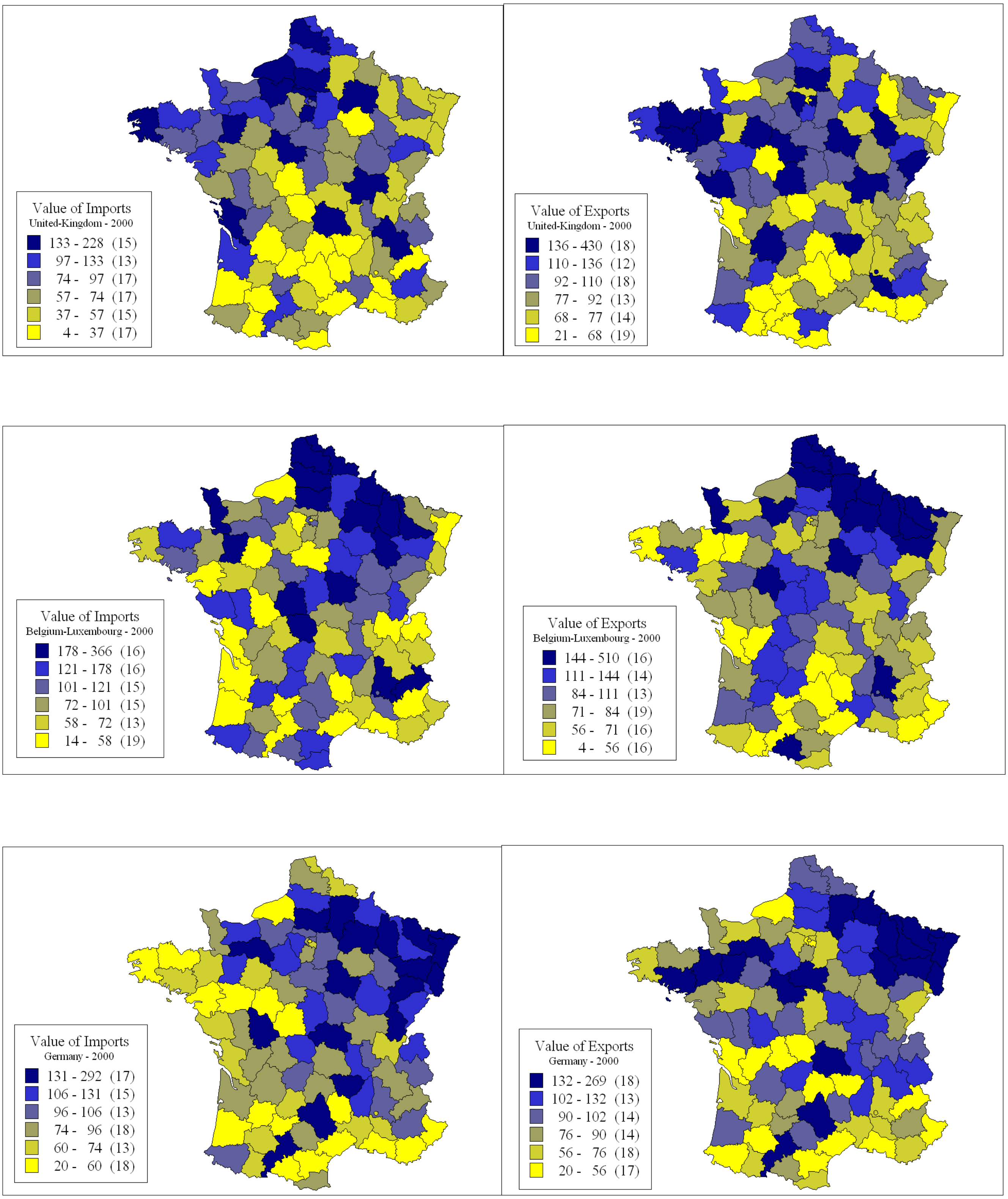
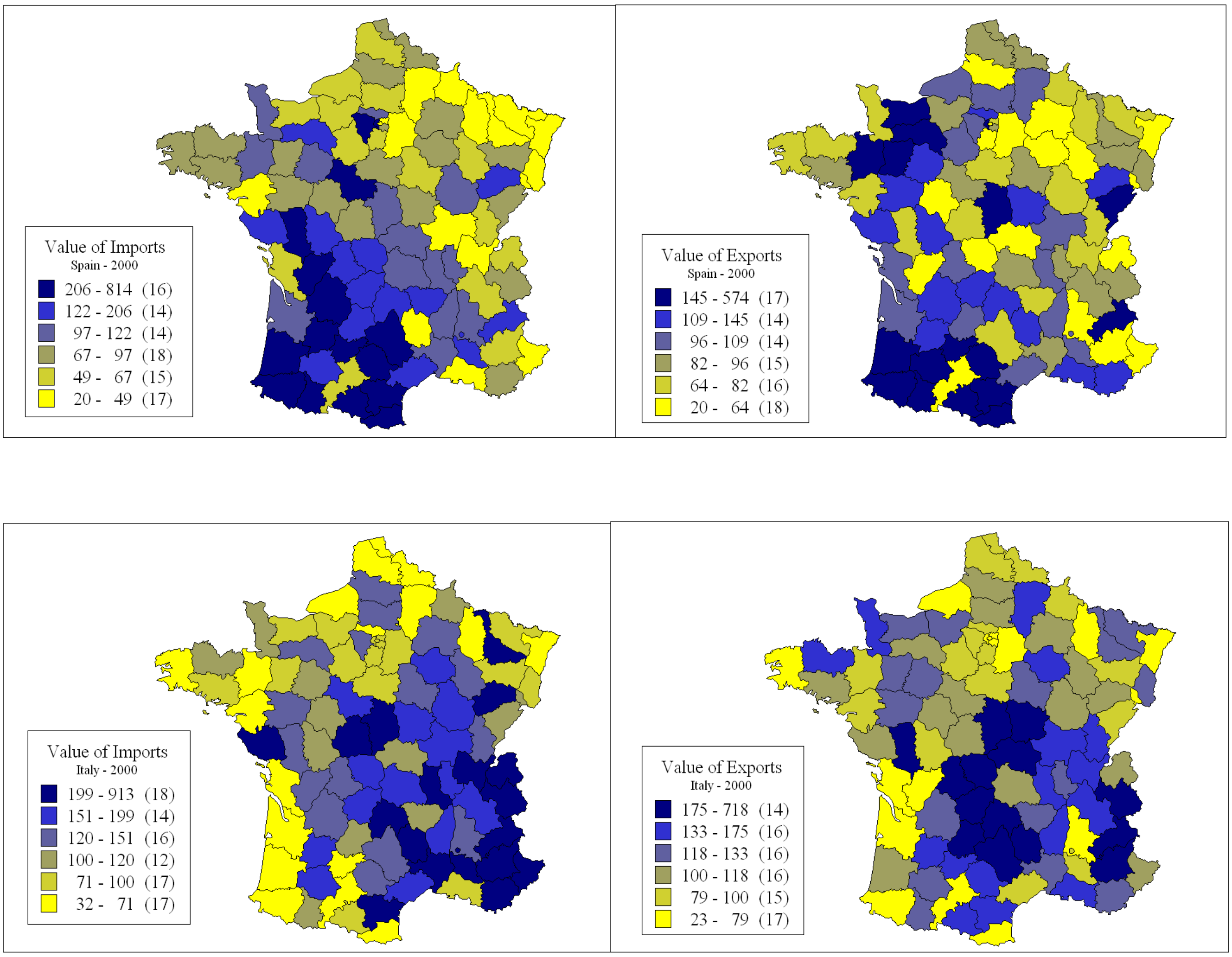


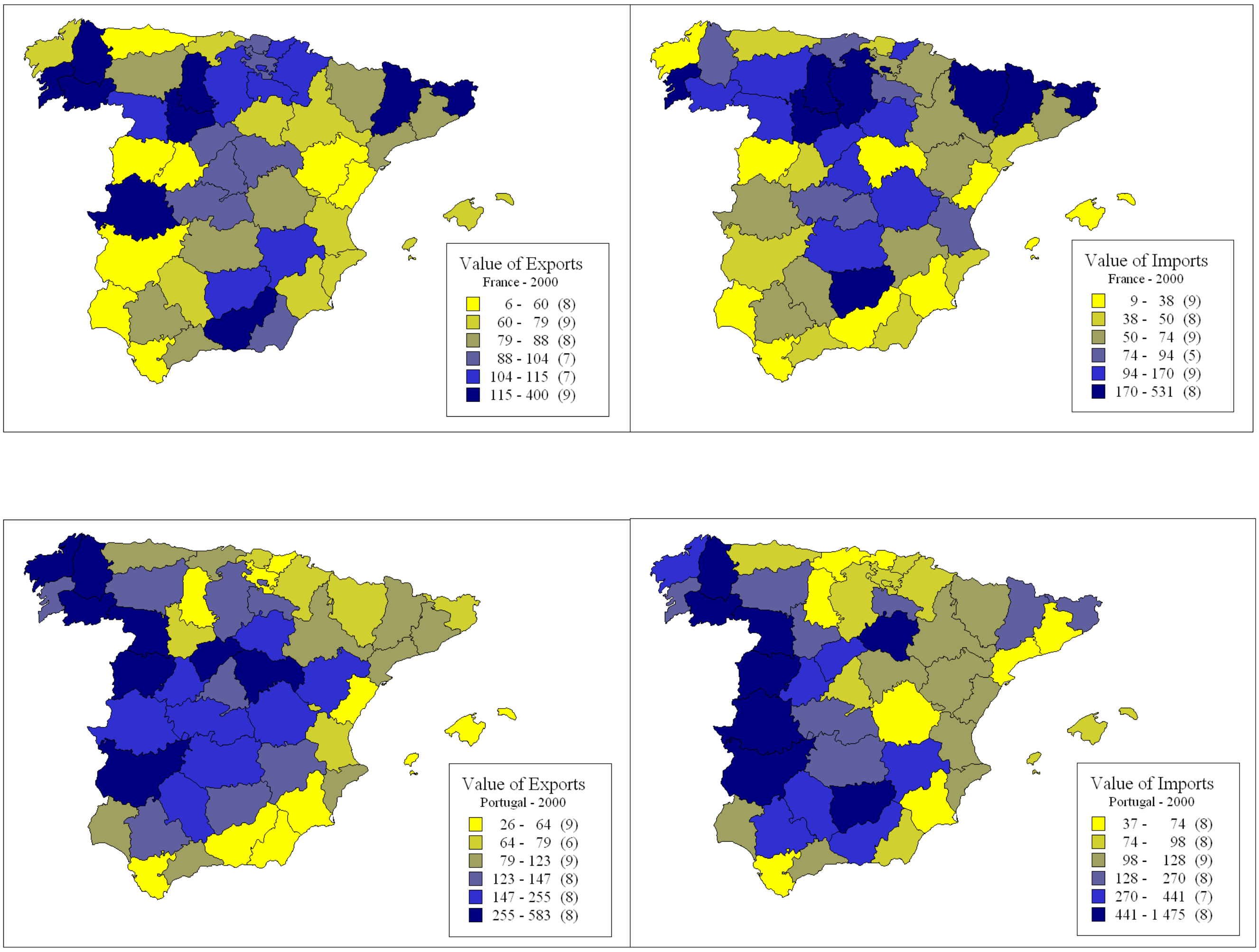
Figure 2: Trade specialization indexes of French regions with regard to: Spain (top) and Italy (bottom)



Sometimes, specific border regions have a surprisingly low TSI. For instance, in the NUTS3 of "Haute-Garonne", which hosts Toulouse and has a border with Spain, mountains in the central part of the Pyrenees represent a major geographic obstacle and make trans-border transport particularly difficult. Therefore, a strict contiguity criterion is not always sufficient to embody the real border nature of regions, as the geography of frontiers may also deeply affect trade specializations.

Furthermore, interior regions sometimes present surprisingly high levels of specialization with regard to a partner country, in spite of being located very far away. There are two main reasons for these exceptional patterns. Firstly, trans-border input-output linkages may generate specific patterns which are not necessarily of the gravity type. For instance, the French central regions of "Puy de Dôme" and "Vienne" exhibit a strong specialization of exports oriented towards Germany, probably due to the presence of the French firm Michelin, which produces equipment goods for German firms such as BMW, DaimlerChrysler and Volkswagen A.G. Secondly, vertical outsourcing, which enables

Figure 3: Trade specialization indexes of Spanish regions regarding: France (top) and Portugal (bottom)



foreign investors to benefit from advantages other than low transport costs (such as low taxes, rents or wages) may also cause extreme specialization patterns. Inward FDI from neighboring countries is likely to boost trade due to input-output linkages between the foreign parent firm in the home country and its affiliates in the host region. For instance, the southern French region "Haute-Garonne" comes out as the most specialized towards Germany (for exports) although it is located on the opposite side of the country. The reason may be that it hosts the European Aeronautic Defence and Space (EADS) consortium, of which the German firm DaimlerChrysler owns more than 30%. Similarly, the central Spanish regions of Valladolid, Palencia and the north-western region of Pontevedra in Galicia host Renault and Peugeot-Citroën factories and are also extremely specialized as regards both imports and exports with France. In order to compare the relative trade performance and orientation of regions, one has therefore to bear in mind that FDI may create trade in interior regions as well as in border ones. The next section focuses specifically on this issue.

2.2 FDI Specialization Patterns by Country

Figure 4 depicts bilateral stocks of inward regional productive FDI from the countries sharing a border with France, based on four different variables: Number of projects of plant affiliates from foreign parent firms and related jobs created, jobs maintained (zero indicates greenfield investment) and millions of euros invested.[7]

Two striking features emerge from this picture. First, regardless of their nationality, foreign firms have a clear preference for the regions located along the north-eastern frontier of France. These border regions indeed present conducive conditions for investment as they benefit from good access to both the rich markets of France, due to the high density of highway infrastructures towards the French capital,[8] and to the core of Europe, which benefits from large market potentials. As the propensity to invest increases with market potentials (Head and Mayer, 2004), the north-eastern French border represents a good trade-off between the desire to save on accessing French consumers and the costs of operating in core European markets at the same time.

Second, foreign firms also target regions on the other side of their home frontier, which may feed the trade border surpluses already discussed in section 2.1. As argued in Crozet, Mayer and Mucchielli (2004), the similarity of cultures, languages, tastes, or distribution networks is likely to distort regional FDI patterns. Gravity forces may even overlap the frontier of direct contiguous regions due to the spatial propagation of preferences. Other features such as natural geographic impediments or insufficient transport networks may also contribute to push FDI slightly beyond the border regions that are strictly contiguous to the home country. Hence, Italian firms show a larger propensity to invest in second- rather than in first-order contiguous locations, favoring the "Isère" region at the expense of "Alpes-de-Haute-Provence", for instance. The same trend is clear for British firms, who seem to target the region of "Calais", which benefits from the Euro-tunnel connection to the UK. These features stress the need to extend the definition of border regions in order to account for possible overlapping and geographic trends.

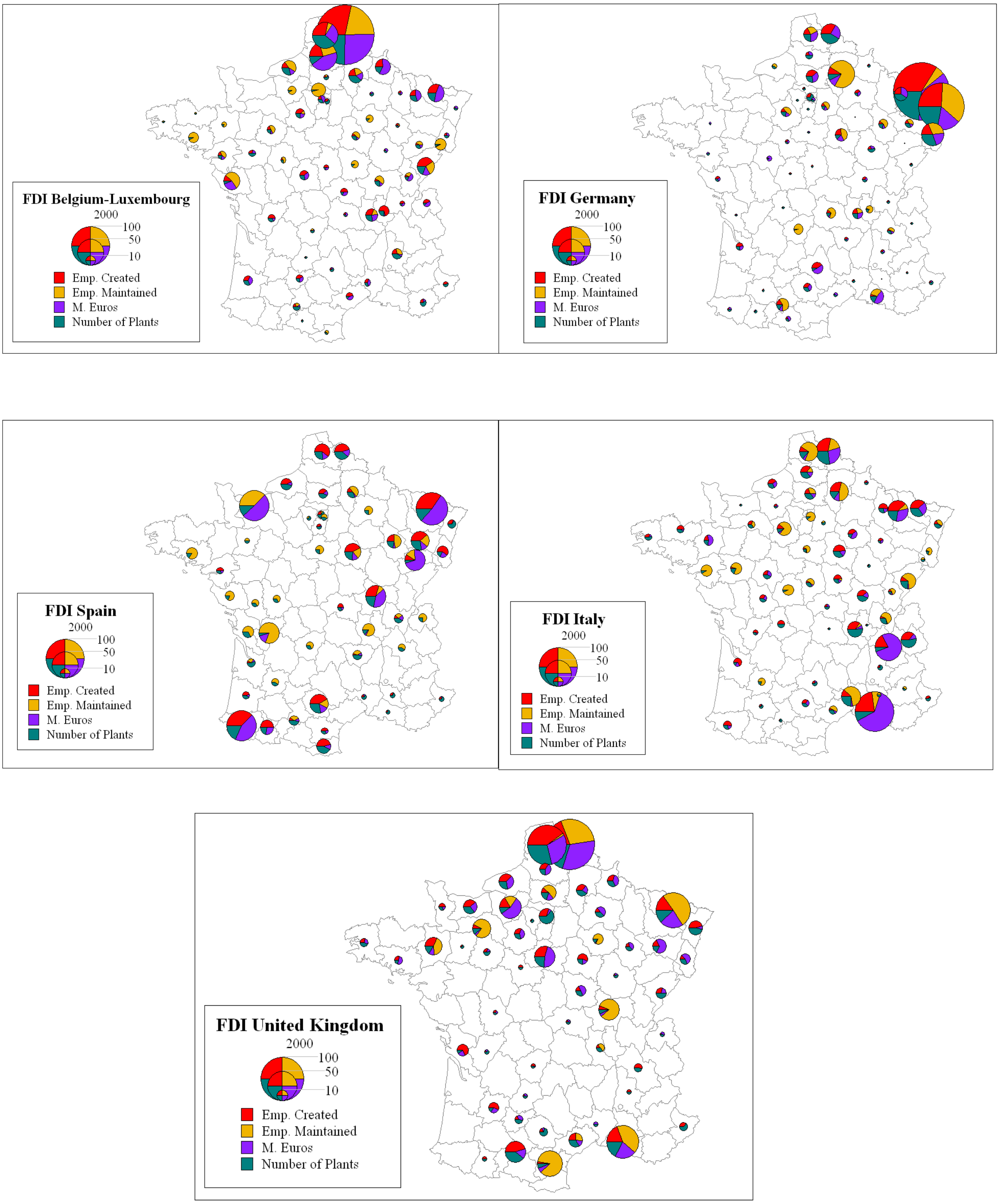
Finally, note that exceptions to these two trends, which are found in some regions, confirm some of the conjectures given in section 2.1. Despite its remoteness, the southcentral region of "Aveyron", whose exports are strongly oriented towards Germany, hosts a large share of the total German FDI.[9]

[7] We focus here on French FDI patterns only, since unfortunately no similar data are available for Spanish provinces. See Appendix B for more descriptive statistics on French data.

[8] See Combes and Lafourcade (2005) for a more detailed picture of the relative transport accessibility of French regions.

[9] As is well known, Bosch is one of the German affiliates located in this region.

Figure 4: Bilateral Regional Stocks of Inward FDI - 1993-2000 (in % of the total stock of FDI in France)



Source: Authors's computations based on data from the French Government Agency for International Investment (AFII).

3 Gravity model and trade flows specifications

The gravity model has been widely used to infer the trade-creating effects of regional or preferential trade agreements[10] or, more recently, of business networks.[11] In this paper, we also use this setting as the simplest framework to disentangle the trade effects of European integration between border and non-border regions. In addition to the lower standard trade impediments and greater accessibility to foreign markets that characterize border regions, we test for the hypothesis that they would also benefit from the over-representation of foreign affiliates from neighboring countries.

Let us look at the theoretical underpinnings of the empirical specifications of trade flows that we derive from this gravity model. The representative consumer's utility in region i depends upon the consumption of all varieties h produced in any foreign partner country J, c_{iJht}.[12] Varieties are differentiated with a constant elasticity of substitution (CES) but they do not enter symmetrically the utility function: A specific weight, a_{iJt}, is attached to all varieties imported from country J and describes the preferences of consumers located in region i as regards the varieties produced in J. Let n_{Jt} denote the number of varieties produced in country J. The corresponding utility function is:

$$U_{it} = \left(\sum_J \sum_{h=1}^{n_{Jt}} \left(a_{iJt} c_{iJht} \right)^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}, \tag{2}$$

where $\sigma > 1$ is the elasticity of substitution between the varieties produced abroad.

Let p_{iJt} denote the delivered price in region i of any variety produced in country J, τ_{iJt}, the bilateral iceberg-type *ad valorem* trade cost, and p_{Jt} the mill price in J. We have $p_{iJt} = (1 + \tau_{iJt})\, p_{Jt}$.

It is then straightforward to obtain the following demand function:

$$c_{iJt} = c_{it} P_{it}^{\sigma-1} n_{Jt} p_{Jt}^{1-\sigma} a_{iJt}^{\sigma-1} \left(1 + \tau_{iJt}\right)^{1-\sigma}, \tag{3}$$

where $c_{it} = \sum_J \sum_h c_{iJht}$ is total consumption in region i of differentiated good varieties imported from all possible foreign sources, and P_{it}, the price index in region i, $P_{it} \equiv \left(\sum_J a_{iJt}^{\sigma-1} n_{Jt} p_{iJt}^{1-\sigma} \right)^{1/(1-\sigma)}$.

Equation (3) links the trade flows imported by region i from country J to the size of the demand expressed by region i (c_{it}) and its price index (P_{it}), the size of the supply in country J (n_{Jt}) and its mill price (p_{Jt}), and bilateral effects involving preferences (a_{iJt}) and trade costs (τ_{iJt}).

We assume that two different elements enter the trade costs: Physical transport costs, T_{iJt}, and other trade costs related to the crossing of borders, B_{iJt}:

$$\left(1 + \tau_{iJt}\right)^{\sigma-1} = T_{iJt} B_{iJt}. \tag{4}$$

[10] See Greenaway and Milner (2002) for a survey of studies of this kind.

[11] See Rauch (2001) for a comprehensive survey on this particular topic.

[12] In the rest of the paper, small letters will refer to regions and capital letters to countries.

Physical transport costs are assumed to have the following symmetric structure:

$$T_{iJt} = T_{Jit} = (D_{iJt})^{\delta} \, exp\left(1 - \beta_{nT} bordn_{iJ} - \beta_{rT} bordr_{iJ} - f_i - f_J\right), \tag{5}$$

where $bordr_{iJ}$ and $bordn_{iJ}$ are dummies indicating whether region i is contiguous to country J. The subscripts n and r refer respectively to a first- and a second order contiguity criterion: n indicates that region i is a NUTS3 region which is directly contiguous to country J, whereas r means that it is part of a NUTS2 region which shares a common border with country J, without being directly contiguous to this country. Moreover, as recalled in Section 2, a definition of the contiguity of regions based on their real connections with neighboring countries (which we will present in Section 4), will help to identify the trade outperformance linked to their endowment in good cross-border transport infrastructures, in addition to their location on the other side of the political frontier. The variable D_{iJt} is the average distance between region i and the partner country J. The fixed-effects f_i and f_J are included in order to control for further time invariant characteristics, such as the presence of industrial harbors or the landlocked nature of countries.

Other trade barriers, B_{iJt}, include first tariffs t_{IJt}. We assume that this protection structure depends only upon the bilateral trade agreements signed by countries I and J, which are uniform across border and non-border regions. Advances in European integration are reflected in the progressive removal of tariffs, but also in the removal of other informal barriers to trade which can affect either border or non-border regions to different degrees, and which we denote by ntb_{iJt}. We assume:

$$B_{iJt} = (1 + t_{IJt})(1 + ntb_{iJt}) = (1 + fdi_{iJt})^{-\alpha_B}, \tag{6}$$

where fdi_{iJt} is a measure of the *inward* stock of bilateral foreign direct investment.[13] The relationship between trade barriers and inward FDI is a rather disputed issue in the literature (Neary, 2002, Faini, 2004). On the one hand, the reduction in trade barriers alleviates the costs for foreign firms of operating outside their home market. This, in turn, enhances their propensity to exploit foreign market advantages and to fragment their production, in order for instance to save on input costs. If region i benefits from a location advantage relative to other regions, multinationals are more likely to choose it as the best place for vertical outsourcing. Once located, foreign affiliates may ship back and forth intermediate or final products to parent firms, boosting both imports and exports with their home country. In the case of vertically-motivated FDI, one would expect the parameter α_B to be positive so as to reflect a trade-creating effect of FDI.

On the other hand, the location of foreign affiliates might increase competition (for goods or production factors), and deter entry of less productive domestic firms. By contrast, this could negatively affect the domestic part of the region's trade with country J. Moreover, FDI might be undertaken

[13] The direction of FDI is therefore assumed to be the same as import flows, going from J to i. A proper modeling of border barriers would require the addition to inward FDI of the effect of its outward counterpart, fdi_{Jit}, which would lead to more plausible asymmetric trade costs. However, as we do not have access to outward FDI data either for France or for Spain, we restrict the FDI channel to its inward effects on trade.

because trade barriers are so large that local markets could not be sourced in any other way: In that case, FDI could act as a substitute to regional imports from country J. Both effects would lead to the opposite negative coefficient for parameter α_B. Nonetheless, our sample is restricted to trade *inside* "Fortress" Europe, which limits the level of trade barriers borne by European foreign affiliates relative to outsiders. Moreover, as documented in Faini (2004), foreign investment aimed at "efficiency seeking" (vertical FDI) is nowadays overtaking horizontal FDI with a view to catering for consumers. Furthermore, multinationals also generate positive spillovers that benefit domestic industries, which may eventually outpace the competition deterrence effects (Barrios, Görg and Strobl, 2005). Finally, a recent strand of the literature has noted a clear tendency for the most efficient firms to select themselves into FDI (Bernard et al., 2003; Melitz, 2003; Helpman et al., 2004), which should lead to a net export surplus once the losses experienced by domestic firms are controlled for. The latter arguments all point toward a positive expected value of parameter α_B.

Consumers are assumed to have both deterministic and stochastic elements in their preferences, a_{iJt}:

$$a_{iJt}^{\sigma-1} = (1 + fdi_{iJt})^{\alpha_a} \exp[\beta_{ra} bordr_{iJ} + \beta_{na} bordn_{iJ} + \varepsilon_{iJt}], \tag{7}$$

where ε_{iJt} is the random component of preferences. Parameter α_a is expected to be positive as the presence of multinationals should be the conduit for both a better knowledge of foreign goods and a better adaptation of these goods to local tastes. The contiguity dummy $bordn_{iJ}$ represents the cultural proximity of consumers located on both sides of the same frontier, as their propensity to share the same tastes. As the propagation of preferences may overlap the frontier of direct contiguous regions, especially for small areas, we also introduce the second order contiguity dummy $bordr_{iJ}$. We expect parameters β_{ra} and β_{na} both to be positive, though β_{ra} is expected to have a lower magnitude because of distance gradients.

Equation (3) involves three groups of variables: Origin (J-specific), destination (i-specific) and "dyadic" (or bilateral iJ-specific) variables. In order to tackle the problem that non-dyadic variables c_{it}, P_{it}, n_{Jt} and p_{Jt} cannot be accurately measured, we adopt a fixed-effects approach à la Hummels (1999) and replace all destination specific and origin specific variables by two groups of time varying destination and origin fixed-effects. This is now the most widely accepted means of obtaining a theory-consistent estimable specification of equation (3).[14]

Therefore, the *gravity* log-specification of imports we estimate derives from plugging back expressions (5), (6) and (7) into (3) and from using fixed-effects in return for all non-dyadic variables:

$$\begin{aligned} \ln(c_{iJt}) &= b_1 - \delta \ln(D_{iJt}) + \alpha \ln(1 + fdi_{iJt}) \\ &\quad + \beta_r bordr_{iJ} + \beta_n bordn_{iJ} + f_{it} + f_{Jt} + f_i + f_J + f_t + \varepsilon_{iJt}, \end{aligned} \tag{8}$$

where $\beta_n = \beta_{nT} + \beta_{na}$, $\beta_r = \beta_{rT} + \beta_{ra}$, $\alpha = \alpha_a + \alpha_B$, and f_{it} and f_{Jt} are the destination-region and

[14]See also Anderson and van Wincoop (2003), Redding and Venables (2004), and Combes, Lafourcade and Mayer (2005), among others.

origin-country time-varying fixed-effects.

As only imports act as a conduit for preference effects, the export counterpart of this specification differs from the previous one only by β_{ra}, β_{na} and α_a. Therefore, we expect the difference in the β_r and β_n estimates obtained from the import and export specifications to reflect the trade outperformance arising from the proximity of cultures and tastes. However, trade direction does not allow a clear reflection of the preference effect conveyed by FDI inflows. Unless trade barriers affect imports and exports symmetrically (*i.e.* α_B is the same for imports and exports), we cannot expect the estimate of α to be larger for the former, nor can we expect the difference to represent the propagation of foreign preferences to the domestic consumers. Finally, we cannot make inferences on the structural value of the elasticity of substitution σ either.

4 The trade performance of border and non-border regions: Results

In this section, we present the results of the OLS estimation of equation (8). Trade data were provided by the Customs Departments of France and Spain.[15] The French data set includes trade export and import flows between each of the 94 continental NUTS3 regions and any country in the world over the period 1978-2000. The Spanish data set provides the same information for the 48 Spanish NUTS3 regions over the period 1988-2000. As we are primarily seeking differential *border* effects, we consider only the five neighboring countries of France (Belgium-Luxembourg, Germany, UK, Spain and Italy), and the two neighboring countries of Spain (France and Portugal).

In order to define border regions, we adopt two different strategies. First, we simply use a strict contiguity bilateral criterion, as in section 2.1. With this criterion, we consider all the locations sharing a frontier with at least one neighboring country, by land or by sea. However, due to the existence of major geographic obstacles such as the Alps, the Pyrenees and the Channel, traffic flows between France and Italy, Spain or the United Kingdom and between Spain and France tend in practice to concentrate on a few main cross border points. This obviously alters the picture we might draw from a broad definition of border regions relying on strict contiguity, and obliges us to adopt a narrower definition. In a second set of regressions, we thus replace this first "broad" border criterion with a narrower "geographic" definition of border regions as those that can be reached easily despite natural barriers, *i.e.* regions hosting good cross border transport infrastructures such as highways, major tunnels or harbors.[16] In order to avoid the bias arising from the simultaneity of trade and infrastructure endowments (since greater amounts of public funding may be available to richer regions thus enabling them to import and export), we consider only the infrastructures that were developed before the period we study. By comparing the coefficients obtained on border dummies using both the broad and geographic criteria, we can therefore estimate the share of trade outperformance that is due to cross border infrastructure endowments.

We first quantify the average trade outperformance of border regions over the whole period of

[15] Appendix B provides more details on data sources.

[16] Appendix A presents the list of border regions using both the broad and geographic criteria.

study. We next identify the changes arising from the successive episodes of European integration. We leave the study of the FDI impact on both the magnitude and time evolution of trade performances until Section 5.

4.1 The average trade outperformance of border regions

Tables 1 and 2 report OLS estimates derived from estimating equation (8) for French and Spanish trade samples respectively. The structure of both tables is similar. Columns (P), (X) and (M) report the coefficients related to Pooled imports and exports, eXports and iMports for both the broad and geographic definitions of border regions.

Table 1: Trade of French regions with all neighboring partner countries

	Dependent Variable: log of trade value					
	Border regions: Broad			Border regions: Geographic		
Model :	(P)	(X)	(M)	(P)	(X)	(M)
Intercept	14.65[a]	13.72[a]	15.58[a]	14.75[a]	13.47[a]	16.03[a]
	(0.52)	(0.64)	(0.75)	(0.45)	(0.52)	(0.67)
Distance	-0.72[a]	-0.57[a]	-0.87[a]	-0.74[a]	-0.53[a]	-0.94[a]
	(0.08)	(0.10)	(0.09)	(0.06)	(0.08)	(0.07)
Bordn	0.48[a]	0.27[b]	0.69[a]	0.72[a]	0.52[a]	0.91[a]
	(0.10)	(0.12)	(0.15)	(0.12)	(0.13)	(0.20)
Bordr	0.17[b]	0.06	0.28[a]	0.19[b]	0.11	0.26[a]
	(0.07)	(0.10)	(0.09)	(0.07)	(0.11)	(0.09)
N	21620	10810	10810	21620	10810	10810
R^2	0.881	0.906	0.923	0.883	0.907	0.925
RMSE	0.575	0.516	0.513	0.570	0.511	0.508
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Time-invariant fe	Yes	Yes	Yes	Yes	Yes	Yes
Time-varying fe	Yes	Yes	Yes	Yes	Yes	Yes

Equation: $\ln(c_{iJt}) = b_1 - \delta \ln(D_{iJt}) + \beta_r bordr_{iJ} + \beta_n bordn_{iJ} + f_{it} + f_{Jt} + f_i + f_J + f_t + \varepsilon_{iJt}$.
Robust standard errors in brackets, with [a], [b] and [c] denoting significance at the 1%, 5% and 10% levels, respectively.

The distance coefficients conform to the average magnitude displayed in Disdier and Head (2005). However, distance impediments to trade are found to be larger (in absolute values) for Spain than for France. A plausible explanation is that, whereas the French sample includes transport shipments from both maritime and land transport (due to the inclusion of trade with the United Kingdom), the Spanish sample incorporates flows transiting mainly overland (as we focus here on trade with France and Portugal only), which have been shown by Disdier and Head (2005) to yield substantially higher distance coefficients. The fact that transport networks were less developed in Spain than in France over the period of study (both for roads and railways) could be another explanation for the differences in distance impediments to trade.

Regarding the contiguity effects we are primarily interested in, a first overall conclusion to be drawn from the comparison of Tables 1 and 2 is that, controlling for their relative size, proximity and other location characteristics, border regions substantially outperform interior regions in France, while this is not the case for Spain, regardless of the definition of border regions is used.

Table 2: Trade of Spanish regions with all neighboring partner countries

	Dependent Variable: log of trade value					
	Border regions: Broad			Border regions: Geographic		
Model :	(P)	(X)	(M)	(P)	(X)	(M)
Intercept	28.94^a	29.34^a	28.54^a	29.07^a	28.94^a	29.19^a
	(2.46)	(2.34)	(2.85)	(2.31)	(1.90)	(2.75)
Distance	-0.94^a	-0.93^a	-0.96^b	-0.96^a	-0.87^a	-1.06^a
	(0.35)	(0.34)	(0.40)	(0.33)	(0.27)	(0.39)
Bordn	0.39	0.17	0.60	0.40	0.30	0.49
	(0.33)	(0.34)	(0.37)	(0.35)	(0.38)	(0.43)
Bordr	-0.14	-0.28	-0.01	-0.07	-0.25	0.11
	(0.21)	(0.21)	(0.26)	(0.22)	(0.20)	(0.26)
N	2496	1248	1248	2496	1248	1248
R^2	0.870	0.936	0.933	0.869	0.936	0.931
RMSE	0.722	0.608	0.641	0.726	0.606	0.651
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Time-invariant fe	Yes	Yes	Yes	Yes	Yes	Yes
Time-varying fe	Yes	Yes	Yes	Yes	Yes	Yes

Equation: $\ln(c_{iJt}) = b_1 - \delta \ln(D_{iJt}) + \beta_r bordr_{iJ} + \beta_n bordn_{iJ} + f_{it} + f_{Jt} + f_i + f_J + f_t + \varepsilon_{iJt}$. Robust standard errors in brackets, with ^{a}, ^{b} and ^{c} denoting significance at the 1%, 5% and 10% levels, respectively.

When significant (*i.e.* for France), the impact of contiguity is considerably larger for first-order contiguous regions than for second-order ones, regardless of the criterion used to define contiguity (broad or geographic): In France, on average, direct contiguous regions trade $[exp(0.48) - 1] \times 100 = 61.6\%$ more with their neighboring country than do interior regions, whereas the second-order contiguous regions outperformance is $[exp(0.17) - 1] \times 100 = 18.5\%$ only. The outperformance of border regions endowed with good cross border infrastructure is almost twice as high as the other border regions ($[exp(0.72) - 1] \times 100 = 105.4\%$). Trade outperformance is larger for imports than for exports, which is consistent with the model assumption that the proximity of tastes, cultures and preferences is an important determinant of trade patterns at the border.

By contrast, the results for Spain are quite puzzling. Border coefficients for direct contiguous regions are positive but not significant for both the broad and the geographic criteria, and for both export and import flows. Second-order contiguous regions do not either outperform interior regions, as the related estimates are even negative (although not significantly). This last feature is not surprising however. Consider for instance the cases of Catalonia (on the Mediterranean side of the border) and the Basque Country (on the Atlantic side of the border). In addition to Gerona and Lerida, the NUTS3 regions strictly contiguous to France, Catalonia also hosts the NUTS3 regions of Barcelona and Tarragona which, in spite of the fact that they account for around 25% of Spanish exports, are not particularly trade oriented towards France: in fact, the destination of their exports is highly diversified. Moreover, the trade specialization exhibited in Figure 3 for Spanish NUTS2 regions bordering Portugal is likely to be the result of distance proximity only, as testified by the uniformly decreasing West-East gradient.

As we can recall from Figure 3, the northern Spanish NUTS3 border regions of Guipuzkoa, Gerona and Lerida all exhibit large Trade Specialization Indexes as regards France. Although these could be the result of distance proximity only, we find rather surprising that these regions do not significantly outperform interior regions, as cross-border traffic in recent years has reached figures of 7600 and 8400 trucks per day respectively. Section 5 will further investigate this issue and shed light on these puzzling results.

4.2 The changing impact over time

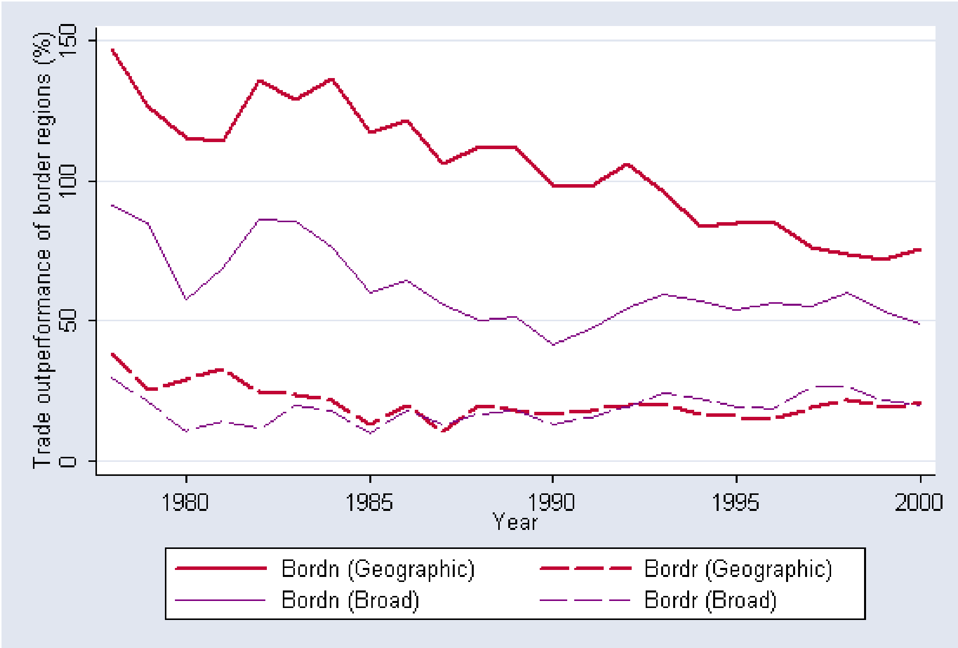
One might wonder how the trade performance of border regions has evolved over the two last decades. This dynamic perspective is even more illuminating, given that NEG models mostly build on comparative statics and do not generally account for long-term evolutions. However, the drawback of the time-series dimension is that different integration episodes might have affected French or Spanish trade at the same time. European reforms took time to be implemented and related effects might have been anticipated in advance by both countries, meaning that changes may have occurred even earlier than the year of implementation. In order to deal with this scheduling issue and to avoid a restrictive definition of European integration, we follow the relative trade performance of border regions throughout the successive integration episodes and check whether significant changes occurred around the time of formal reforms. We adopt two different approaches to studying such changes. First, we cross border and time dummies and test for significant changes in the related coefficients from year to year. And second, we check robustness by performing annual estimations on different sub-samples defined according to the countries with whom regions trade, in order to identify the geographic channels at work clearly.

Tables 6 and 7, provided in Appendix C report the results obtained for France and Spain respectively. As previously, columns P, X and M stand for Pooled exports and imports, eXports and iMports respectively. Results for France show a drastic fall in the trade outperformance of NUTS3 border regions: a significant reduction of more than 50% occurred for border regions defined according to both the broad contiguity criterion (from $[exp(0.63) - 1] \times 100 = 87.8\%$ in 1978 to $[exp(0.35) - 1] \times 100 = 41.9\%$ in 2000) and its geographic counterpart (from $[exp(0.89) - 1] \times 100 = 143.5\%$ in 1978 to $[exp(0.53) - 1] \times 100 = 69.9\%$ in 2000). However, counter forces seem to have acted against this trend around the time of two main integration events, *i.e.* just before the Single European Act of 1986 and just after the Schengen Agreement of 1990. Therefore, among the two counteracting forces emphasized in Crozet and Koenig (2004), increasing import competition would outpace the effects of larger market access on exports for French border regions.

No similar trend is observed for Spain, however. A more bell-shaped pattern of border trade differentials emerges throughout the period 1988-2000, the maximum occurring within the first years of Spain's entry into the EU. Nevertheless, time-border estimates appear to be significant only for a few years (1990, 1991 and 1992), imports and the broad border criterion, while not significant elsewhere. This could be evidence that the adhesion of Spain to the Schengen group in 1991 and the Maastricht treaty of 1992 both contributed to enhancing the trade of Spanish border regions mainly by boosting imports from neighboring countries.

To check the robustness of previous estimations, we also run year-by-year OLS estimations of specification 8. Figure 5 reports the changes in border coefficients estimated on pooled imports and exports.

Figure 5: Changes in the trade outperformance of all French Border Regions



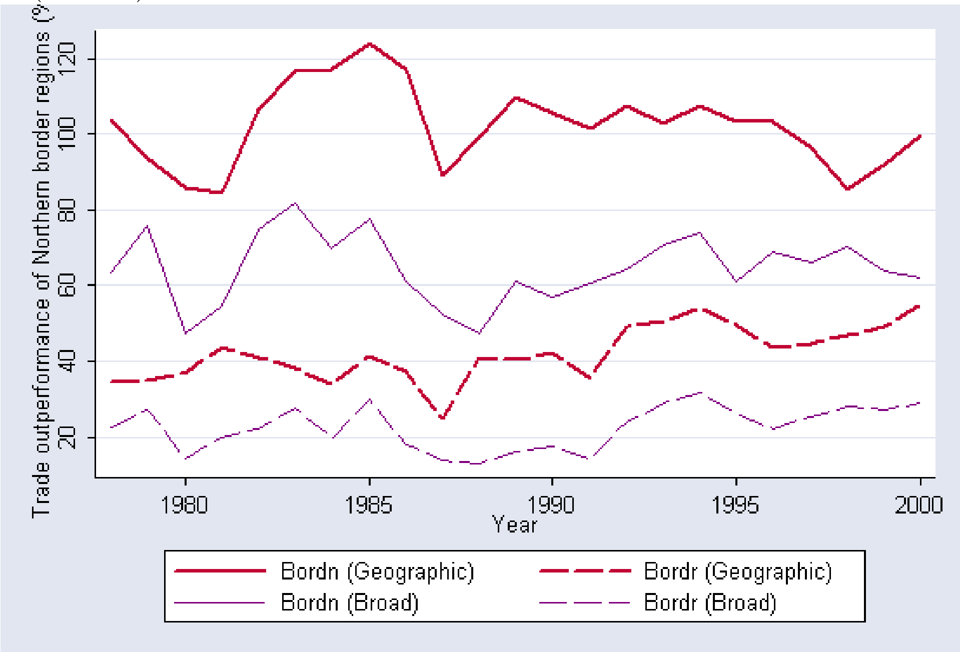
The range of estimates is very similar to the previous one, with border trade outperformance falling from 147.1% in 1978 to 75.9% in 2000 using the geographic criterion, and from 91.5% in 1978 to 48.8% in 2000 using its broad counterpart. One can see that the gap between an "average" border region and one endowed with good cross border transport infrastructure falls with the integration process (this is reflected in the convergence of the thick and thin lines in Figure 5). Indeed, during the last two decades, border regions defined according to their initially good cross border infrastructure endowments did not experience major transport improvements, while their counterparts did.[17]

Let us now disentangle the sample of pooled imports and exports according to the geographic position of border regions in Europe. As shown by Figure 6-top, the trade outperformance of the northern border regions located along the frontier of Belgium-Luxembourg, Germany and the United Kingdom has rather stagnated over the period 1978-2000 (around 100% on average), apart from a brief growth episode around the Single European Act of 1986, when it reached almost 124%. Figure 6-bottom reveals that this pattern hides a recent increase in the trade surpluses of Belgium-Luxembourg and German border regions,[18] and thus, a decline of their British counterpart.

[17] For instance, the transborder connections of the border regions of "Ariège" and "Alpes-de-Haute-Provence" extended with the opening of the Puymorens tunnel in 1994 and the Larche pass road.

[18] Notice that the apparent falls of the years 1980-1981 and 1987 correspond to non-significant estimates and therefore do not reflect a real drop in trade performances.

Figure 6: Changes in the trade outperformance of: French northern border regions (top), north-eastern border regions (bottom)



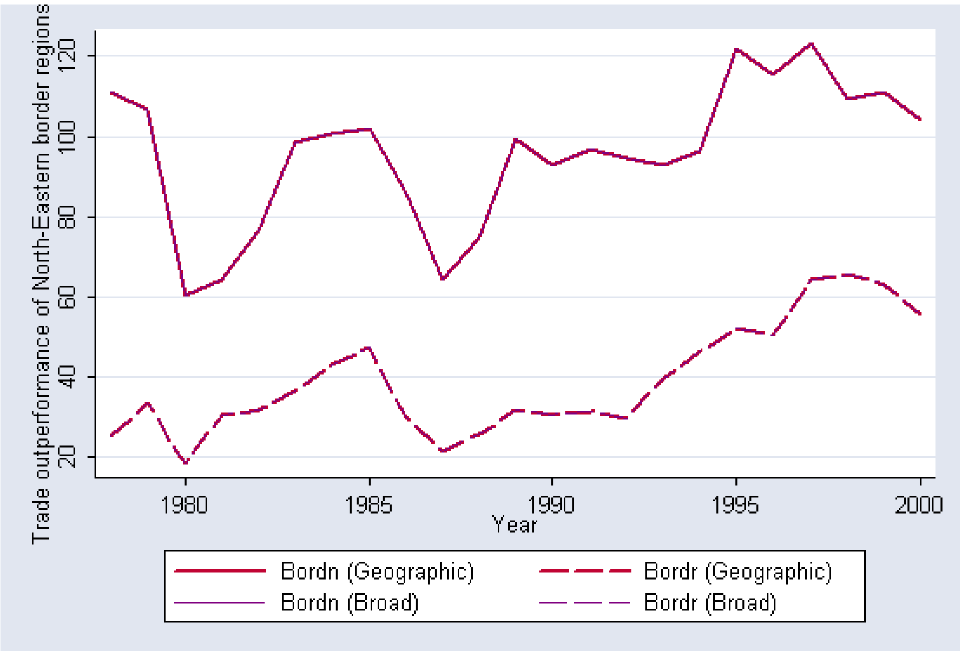
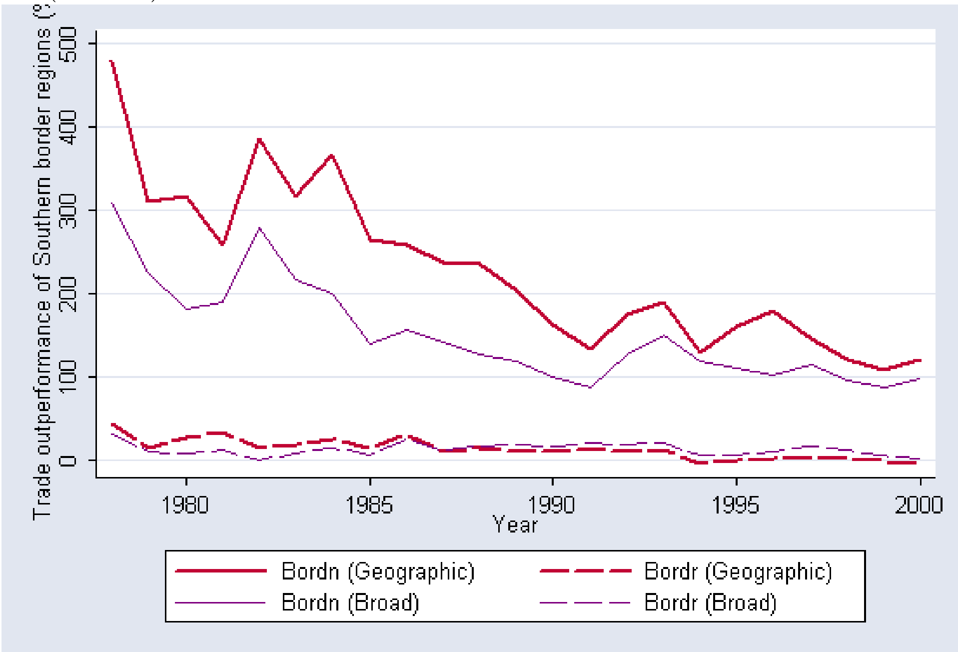
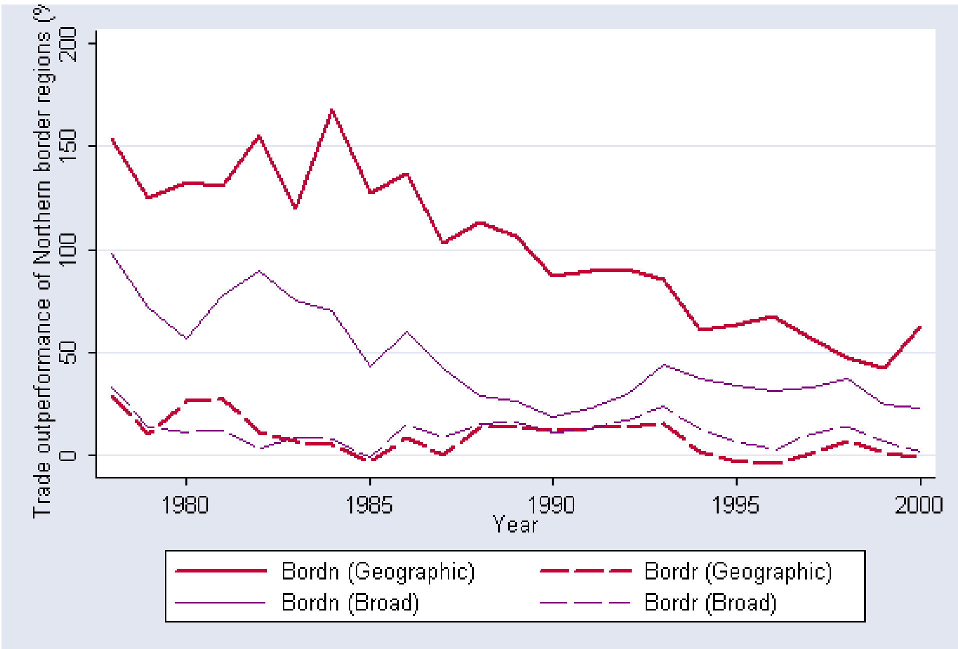


Figure 7: Changes in the trade outperformance of: French Southern Border regions (top), Peripheral Border Regions (bottom)





By contrast, as shown by Figure 7-top, the trade outperformance of southern border regions fell drastically during the period 1978-2000, from around 480% for geographic border regions (310% for broad border ones) to around 120% in 2000. This trend was interrupted by a brief episode of increasing growth before the establishment of the Single European Act and Spain's formal entry into the EU in 1986 and after the Schengen agreement of 1990. This declining trend still holds when adding the sample of regional trade with the United Kingdom, which enlarges the trade depressing prospect to all "peripheral" border regions. This huge decline could be the result of the improvement in domestic transport infrastructure connecting southern regions of France with the rest of the country, while the main cross border connections remained untouched during the last twenty years. NEG models such as Behrens *et al.* (2003) predict in this case that agglomeration in the main industrial centers will be reinforced. In the case of France, this would have led to a reorientation of trade away from southern border regions.

However, much work is still needed to investigate the clear origin of the fall in the trade differential of peripheral (and more particularly southern) border regions: What are the forces harming the growth of trade at the periphery of Western Europe? Section 5 assesses one of the potential causes of the time erosion of border trade outperformances by investigating the FDI channel.

5 The trade-creating impact of inward FDI: Results

Let us move now to the issue of measuring the trade effects of multinationals, and determine the share of the regional differences in trade differentials explained by FDI. We can only formally investigate this question for France in the period 1993-2000, as there are no French data for other years and the Spanish data do not identify the national origin of productive foreign investment at the scale of NUTS2 regions. However, the intuitions provided by regional case studies will allow us to further analyze the impact of FDI in Spain. As in section 4, we first examine the average impact of French FDI over the period 1993-2000 (section 5.1), and then study the changing patterns over time (section 5.2). We end by providing conjectures on the trade-creating effect of FDI in Spain (section 5.3).

5.1 The average impact of FDI on exports and imports

Since both trade and FDI may benefit from the removal of trade barriers, and since multinationals are likely to choose their location according to trade signals, one must deal with potential reverse causality first. In order to reduce the endogeneity bias that may arise from the simultaneity of trade and FDI, we cumulate the flows of each of the three measures of FDI available in France, over all the years preceding the time-related observation for trade. We thus obtain the one-year lagged FDI stock previously depicted in section 2.[19]

Tables 3 and 4 display the results of estimating specification (8) including the inward stock of FDI

[19] These stocks of FDI may not be relevant if foreign affiliates close their plants during the period of study for instance. However, due to standard disclosure issues, we cannot control for this bias.

from the parent country, for the two samples of respectively all neighboring countries and Belgium-Luxembourg and Germany countries only. They are structured as follows. Column (B) reports first the Benchmark results of estimating specification (8) without FDI for pooled imports and exports over the period 1993-2000. Column (P) gives the coefficients obtained after including a measure of the inward stock of FDI based on the number of projects of plant affiliates from parent firms located in neighboring countries. Columns (X) and (M) report the same estimates for respectively the sample of exports and imports only. Column (DP) disentangles the trade impact of FDI between interior regions (Variable FDI) and border regions only (Variable FDI x Bord) for pooled imports and exports.

Table 3: The average trade creating impact of FDI: Sample of all neighboring countries

	Dependent Variable: log of trade value									
	Border regions: Broad					Border regions: Geographic				
Model :	(B)	(P)	(X)	(M)	(DP)	(B)	(P)	(X)	(M)	(DP)
Intercept	15.80^a	15.56^a	15.24^a	15.88^a	15.56^a	16.12^a	15.95^a	15.44^a	16.45^a	15.94^a
	(0.56)	(0.57)	(0.61)	(0.74)	(0.57)	(0.50)	(0.51)	(0.55)	(0.63)	(0.51)
Distance	-0.68^a	-0.64^a	-0.53^a	-0.75^a	-0.64^a	-0.73^a	-0.70^a	-0.57^a	-0.84^a	-0.70^a
	(0.08)	(0.09)	(0.10)	(0.12)	(0.09)	(0.07)	(0.08)	(0.09)	(0.10)	(0.08)
Bordn	0.44^a	0.41^a	0.22^b	0.59^a	0.35^a	0.59^a	0.54^a	0.35^a	0.73^a	0.55^a
	(0.10)	(0.09)	(0.10)	(0.14)	(0.10)	(0.12)	(0.12)	(0.10)	(0.20)	(0.14)
Bordr	0.20^b	0.20^b	0.15	0.25^b	0.22^b	0.17^b	0.17^c	0.11	0.22^c	0.16
	(0.08)	(0.08)	(0.10)	(0.11)	(0.10)	(0.09)	(0.09)	(0.10)	(0.11)	(0.11)
FDI		0.12^a	0.10^a	0.14^a	0.10^a		0.10^a	0.08^b	0.11^a	0.10^a
		(0.03)	(0.04)	(0.05)	(0.04)		(0.03)	(0.04)	(0.04)	(0.04)
FDI x Bordn					0.07					-0.01
					(0.05)					(0.05)
FDI x Bordr					-0.03					0.00
					(0.06)					(0.07)
N	7520	7520	3760	3760	7520	7520	7520	3760	3760	7520
R^2	0.859	0.860	0.896	0.911	0.860	0.860	0.860	0.897	0.912	0.860
RMSE	0.555	0.553	0.458	0.503	0.553	0.553	0.552	0.456	0.501	0.552
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time-invariant fe	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time-varying fe	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Equation: $\ln(c_{iJt}) = b_1 - \delta \ln(D_{iJt}) + \alpha \ln(1 + fdi_{iJt}) + \beta_r bordr_{iJ} + \beta_n bordn_{iJ} + f_{it} + f_{Jt} + f_i + f_J + f_t + \varepsilon_{iJt}$.
Robust standard errors in brackets, with ^{a}, ^{b} and ^{c} denoting significance at the 1%, 5% and 10% levels, respectively.

As apparent from Table 3, the stock of inward FDI, measured by the total number of plant affiliates from parent firm located in a neighboring country has a positive significant impact on trade with this country, with a coefficient of 0.12.[20] This positive effect suggests that either vertical motives are more likely to prevail over horizontal strategies of FDI or positive spillovers exceed the deterrence effects of multinationals on domestic firms. The average trade-creating effect of plant affiliates is $[exp(0.12) - 1] \times 100 = 12.7\%$, the impact on imports being larger than on exports ($[exp(0.14) - 1] \times 100 = 15\%$ against $[exp(0.10) - 1] \times 100 = 10.5\%$). If one assumes that the relationship between FDI and trade barriers does not depend on the direction of trade (*i.e.* that γ_B is the same for imports as for exports), the larger coefficient found for imports can be taken as evidence of an FDI preference channel.

Furthermore, adding FDI directly affects first-order border estimates, which fall by 9% using

[20]When we measure inward FDI by the total employment of foreign affiliates and the related investment instead of the number of plant affiliates, the coefficients are 0.02 and 0.03 respectively.

Table 4: The average trade creating impact of FDI: Sample of Belgium-Luxembourg and Germany countries only

	Dependent Variable: log of trade value				
	Border regions: Broad or geographic				
Model :	(B)	(P)	(X)	(M)	(DP)
Intercept	13.01[a]	13.10[a]	14.53[a]	11.67[a]	12.90[a]
	(1.24)	(1.22)	(1.49)	(1.51)	(1.26)
Distance	-0.20	-0.21	-0.39	-0.03	-0.18
	(0.20)	(0.19)	(0.24)	(0.24)	(0.20)
Bordn	0.75[a]	0.57[a]	0.37	0.77[a]	0.41[c]
	(0.19)	(0.18)	(0.22)	(0.27)	(0.21)
Bordr	0.45[a]	0.38[a]	0.25	0.51[a]	0.31[c]
	(0.14)	(0.19)	(0.17)	(0.16)	(0.15)
FDI		0.17[a]	0.15[a]	0.20[a]	0.13[b]
		(0.04)	(0.05)	(0.06)	(0.05)
FDI x Bordn					0.12[c]
					(0.07)
FDI x Bordr					0.06
					(0.09)
N	2632	2632	1316	1316	2632
R^2	0.925	0.927	0.951	0.961	0.927
RMSE	0.460	0.455	0.442	0.424	0.454
Time dummies	Yes	Yes	Yes	Yes	Yes
Time-invariant fe	Yes	Yes	Yes	Yes	Yes
Time-varying fe	Yes	Yes	Yes	Yes	Yes

Equation: $\ln(c_{iJt}) = b_1 - \delta \ln(D_{iJt}) + \alpha \ln(1 + fdi_{iJt}) + \beta_r bordr_{iJ} + \beta_n bordn_{iJ} + f_{it} + f_{Jt} + f_i + f_J + f_t + \varepsilon_{iJt}$. Robust standard errors in brackets, with ^{a}, ^{b} and ^{c} denoting significance at the 1%, 5% and 10% levels, respectively.

the broad definition (from 0.44 to 0.41) and by 12.3% using the geographic criterion (from 0.59 to 0.54). FDI does not affect the trade performance of second-order border regions, which seem to be less privileged by the location of foreign affiliates. Adding FDI into the gravity specification also reduces distance coefficients. Therefore, trade impediments usually attributed to physical proximity are actually partly conveyed by FDI. These results stress the need to correct for bilateral omitted variables in standard gravity estimations, as was recently investigated through the regional trade-creating channel of business networks.[21]

Finally, one can see that the trade-creating impact of FDI is not significantly larger for border than for interior regions when we consider the sample of all neighboring countries. By contrast, as shown by the results provided in Table 4, the trade-creating effect of FDI is as large for northeastern border regions as for interior regions. Hence, it seems that the FDI located in interior regions would erode the trade advantage of border regions located at the periphery of Western Europe. Only the north-eastern border regions located at the border of the EU core seem to escape this negative effect.

5.2 The changing impact of FDI over time

In this subsection, we analyze time changes in both the average trade-creating effect of FDI, and its specific influence on border regions, by interacting time and border dummies with the stock of foreign

[21] Explored for instance by Combes et al. (2005), or Fukao and Okubo (2004).

affiliates.[22]

As apparent from Figure 8-top, which represents the % equivalents derived from the results presented in Table 8, Appendix C (column (DP)), the effect of inward FDI on the trade outperformance of border regions falls over time, from 35% in 1993 to 5% in 2000. Moreover, from 1997 on, this effect becomes lower than its impact on interior regions. This scissors-effect could be an illustration of the integrating impact of FDI and of the "learning process" of foreign firms already documented in Crozet *et al.* (2004). Multinationals would move gradually from the regions near their home market to more central regions, as the European integration process further advances. However, Figure 8-bottom, which is the counterpart of Figure 8-top focusing on the trade of French regions with Belgium-Luxembourg and Germany only,[23] reveals that an inverse scissor-effect benefits the border regions located along the frontier with large European market potentials, *i.e.* the north-eastern border regions. One can see that the impact of Belgian-Luxembourg and German FDI remains larger in border regions than on average over the whole period of study. Moreover, the share of the trade outperformance explained by this investment is clearly increasing, as testified by the recent rising gap between the two upper curves of Figure 8-bottom. Therefore, only the most peripheral border regions would experience a progressive shift of FDI either to more central regions or to north-eastern border regions located close to the core of EU.

5.3 Conjectures about the impact of FDI in Spain

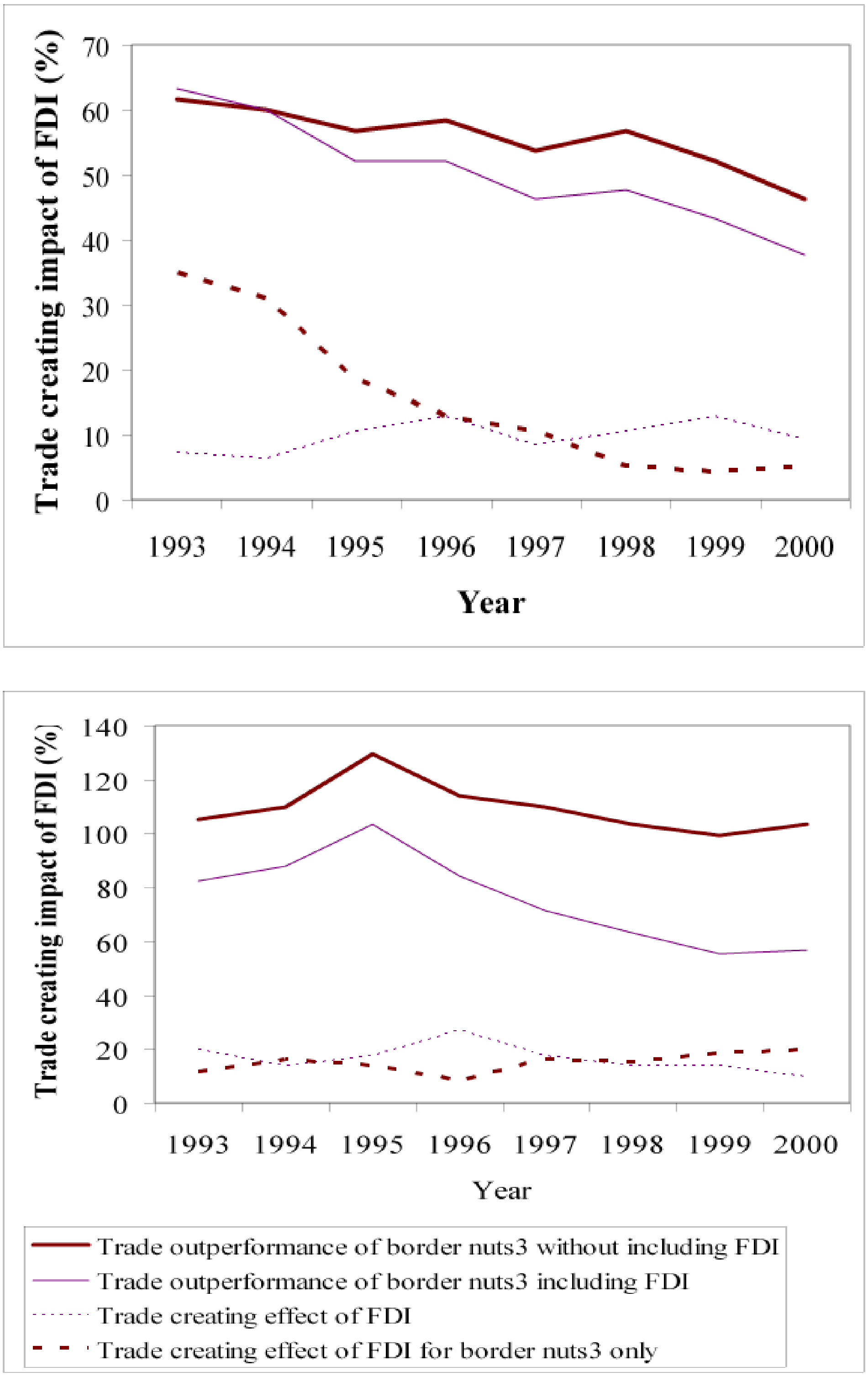
The results obtained in Sections 5.1 and 5.2 indicate that FDI inflows, in addition to being an important determinant of trade patterns, explain a significant part of the trade advantage of French border regions. Unfortunately, in the case of Spain, the lack of data does not allow us to perform a similar formal econometric analysis.

Although data on the geographical origin of productive inward FDI in Spain are not available at the regional level, crossing two different data sources might help to infer the precise information we would need to perform similar regressions as for France. Indeed, We have access to data on both *sectoral* FDI and the geographical origin of *overall* FDI, at the regional scale of Spanish NUTS2 for the same period as France, 1993-2000. A detailed look at these data will benefit our analysis in two ways. First, computing *productive* FDI as the *sum of all non service sectors*, we find that foreign investment is highly concentrated in a few regions. In 2000, the first receptor of productive FDI is Madrid (with 32% of the total productive FDI), but Catalonia and the Basque Country rank third and fifth respectively (with 21% and 4% respectively of the total productive FDI). However, based on the *overall* measure of FDI that can be identified according to country-sources, France does not account for a large part of FDI in these regions: In 2000, France accounted for 3% only of the total FDI of Catalonia (as against 6% for the EU), and for 11% of the total FDI of the Basque country (as against 30% for the EU). As documented in a recent report on the activity of multinationals in Catalonia

[22] The reader will find the details of estimations in the Tables 8 and 9 provided Appendix C.

[23] The reader will find the details of estimations in Table 9, Appendix C.

Figure 8: The trade-creating impact of FDI over time: Sample of all neighboring countries (top), of Belgium-Luxembourg and Germany only (bottom)



(Solà, Miravitlles and Rodríguez, 2003), only three French firms are ranked among the forty largest multinationals located in Catalonia, and their leader, Danone, was originally a Catalan firm, founded in 1919, which became French in 1990. All these features provide a reasonable interpretation of why Spanish second-order contiguity border regions do not account for significant trade outperformance, whereas French ones do.

Furthermore, one can use row information about the nature and location of FDI in Spain to give additional clues for interpreting the unexpected and puzzling insignificant trade outperformance of Spanish NUTS3 border regions found for Spain in Section 4.1. Such results could be strongly influenced by the trade orientation of the non border provinces hosting Renault and PSA-Peugeot-Citroën French factories. Renault's main Spanish affiliates are located in Valladolid and its neighboring province Palencia, and PSA-Peugeot Citroën's affiliates are located in Vigo (Pontevedra). The Valladolid plant, which is very productive (with an average labor productivity of 80 units per employee in 2002), now produces only the new Renault Modus, with a target output of 300,000 units per year by 2006. The PSA-center in Vigo, with a production of 496,134 vehicles in 2002, is the second largest automobile producer in Europe. Commercial relationships with France remain very strong in these three provinces: In 2000, 80% of the exports of Palencia were directed to France (60% for Valladolid, 31% for Pontevedra). Import shares are even more spectacular: In 2000, France accounted for 92% of Palencia's imports (76% for Valladolid, 57% for Pontevedra). Moreover, the volumes traded are also very large, Valladolid's exports to France amounting to as much as 90% of those of Madrid and 50% of those of Barcelona.

In order to further investigate the intuition that the provinces of Valladolid, Pontevedra and Palencia could bias the results obtained for Spain when not controlling for FDI, we perform additional regressions in which they are excluded from the sub-sample of Spanish trade with France. Although this exclusion leads to eliminating only 78 observations out of 2496, the results reported in Table 5 are drastically different from that of Table 2, and corroborate our hypothesis. Spanish border provinces now appear to trade on average three times more with neighboring countries than other regions, benefiting from a significant average trade outperformance of $[exp(0.66) - 1] \times 100 = 193.5\%$, which is even larger than the equivalent figure for France in the period 1978-2000 (see Table 1 in section 4.1). Moreover, these trade differentials are mainly driven by imports.

However, time-series estimations provide a rather different picture from the one obtained for French border regions. While clearly decreasing for imports, the pattern obtained from pooled estimations over both types of flows is rather bell-shaped, as shown by Figure 9, the largest performance being found in the early nineteen nineties following the Maastricht Treaty.

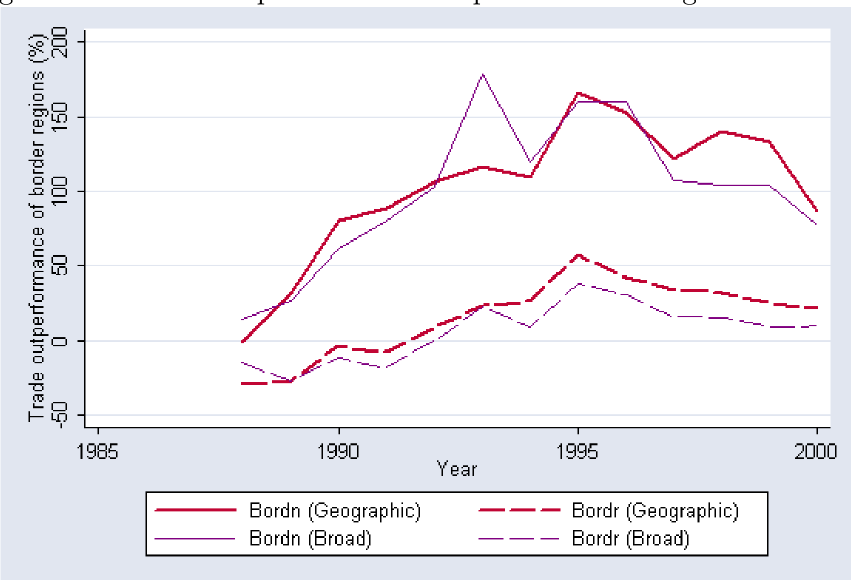
Therefore, French and Spanish trade patterns are partially reconciliated after correcting for the trade and FDI hysteresis of certain interior regions strongly trade-oriented towards France, mostly due to FDI in automobile production.

Table 5: Trade of Spanish regions with neighboring partner countries, after excluding outlier regions

	Dependent Variable: log of trade values					
	Border regions: Broad			Border regions: Geographic		
Model :	(P)	(X)	(M)	(P)	(X)	(M)
Intercept	27.56[a]	28.26[a]	26.85[a]	27.99[a]	28.12[a]	27.86[a]
	(2.34)	(2.22)	(2.65)	(2.26)	(1.80)	(2.71)
Distance	-0.75[b]	-0.77[b]	-0.72[c]	-0.81[b]	-0.75[a]	-0.87[b]
	(0.33)	(0.32)	(0.38)	(0.32)	(0.26)	(0.39)
Bordn	0.66[b]	0.36	0.96[a]	0.67[b]	0.50	0.85[b]
	(0.32)	(0.33)	(0.32)	(0.34)	(0.39)	(0.39)
Bordr	0.04	-0.13	0.21	0.12	-0.10	0.33
	(0.19)	(0.20)	(0.23)	(0.21)	(0.20)	(0.23)
N	2418	1209	1209	2418	1209	1209
R^2	0.875	0.942	0.947	0.874	0.942	0.945
RMSE	0.687	0.575	0.554	0.690	0.572	0.566
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Time-invariant fe	Yes	Yes	Yes	Yes	Yes	Yes
Time-varying fe	Yes	Yes	Yes	Yes	Yes	Yes

Equation: $\ln(c_{iJt}) = b_1 - \delta \ln(D_{iJt}) + \beta_r bordr_{iJ} + \beta_n bordn_{iJ} + f_{it} + f_{Jt} + f_i + f_J + f_t + \varepsilon_{iJt}$.
Robust standard errors in brackets, with [a], [b] and [c] denoting significance at the 1%, 5% and 10% levels, respectively.

Figure 9: Changes in the Trade outperformance of Spanish border regions after excluding outliers



6 Conclusion

In this paper we use a gravity model to explain trade flows between French or Spanish regions and their neighboring countries. We also investigate the existence of different trade performances between border and interior regions over the two last decades of European integration.

We find that border regions trade more with their neighboring country than other regions, once corrected for their size, proximity and other location characteristics. As for the impact of trade liberalization on this trade outperformance, we show that, whereas the north-eastern French border regions located close to European market potentials succeeded in triggering new extra trade, more peripheral border regions, unfortunately, did not. Although temporary gains were drawn from integration shocks such as the Single European Act, the Schengen Agreement and the Maastricht Treaty, they were not sufficient to counteract the drastic long-term decline suffered by the southern French regions bordering Spain and Italy. Our results point to two main channels for the declining trade performance of peripheral border regions. First, southern border regions did not benefit from any major developments in their cross border infrastructures but communications with the north of France (in the form of new highways and railroad infrastructure) improved notably. In this case, the NEG theory predicts deeper agglomeration in northern industrial centers and the reorientation of trade away from peripheral southern border regions.

In the paper we also tackle another controversial issue in the international trade literature: the relationship between FDI and trade. As the removal of border barriers alleviated impediments to both trade and multinational activity, the changes in FDI brought about by the location of new foreign affiliates from neighboring integrating countries are also likely to affect the internal geography of trade. But would the inward FDI stemming from deeper European integration increase trade with the home country or reduce it? What regions lose or gain from the FDI channel? We find that all French regions benefited on average from positive trade differentials arising from the location of foreign affiliates from countries neighboring France. Moreover, these trade-creating effects are large, especially with regard to imports flows. Recalling that trade and outsourcing are complements whereas horizontal FDI is clearly a substitute for imports, this would confirm that FDI from neighboring countries is more likely to be vertically motivated, outpacing on average the need to access French consumers. Once located, foreign affiliates would convey better information on foreign goods and adapt their product to consumers' preferences, in addition to importing or trading back inputs with the home country. The trade-creating impact of inward FDI would therefore be conveyed as much by a preference channel as by a standard trade barrier effect. However, we also find that the magnitude of this trade-creating impact reduces over time. Multinationals seem to re-orient their affiliates from the border regions located on the other side of their home market to either interior regions or border regions located close to market potentials, *i.e.* at the north-eastern frontier of Belgium-Luxembourg and Germany. This is the second channel that explains the decline in the trade performance of southern border regions. Moreover, as the center of gravity of Europe shifts eastwards, one would expect the effect on peripheral border regions, especially southern ones, to be even more negative in the future.

In practice, these results may inform policy action in other ways. First, as regional policies try to compensate for increasing inequalities arising from growing European integration, the losses at the southern borders and at the periphery of *Western* Europe seem to have been concealed by economists who prefer to focus on the prospects offered by the enlargement eastwards. The recent summit of the French and Spanish governments in Zaragoza (December 2004), oriented the agenda of these two countries towards the issue of coordinating the development of new transborder infrastructures. The recent opening of the tunnel of Somport, the decision to start the construction of both a new railway line and a new highway joining Sagunt-Zaragoza-Canfranc-Pau, and the beginning of the construction of the TGV tunnel at Le Perthus could, in the mid-term, benefit the trade performance of the related border regions.

Several directions deserve attention for further research. A first valuable contribution would be to extend the debate on transit shipments in addition to exchanges, as they represent around 45% of the total trade flows going across the European borders. The issue is even more crucial in our case since Spanish trade flows have recently experienced exceptional growth towards European members other than France and Portugal (+65% over the period 1993-1999, mainly oriented toward Germany). As the French-Spanish border represents the main transit axis for these flows, there may be significant changes in the way the trade performance of southern border regions reacts to the integration process. A second extension would consist in analyzing the effects of the outward stock of FDI, on top of its inward counterpart. Finally, the probable endogeneity of trade and FDI patterns certainly deserves much more work than the one-year lagged correction we performed for the moment. However, finding good instruments able to explain FDI without being correlated to trade is a complex task, which we aim to undertake in later research.

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Appendix

Appendix A: Location and definition of border regions

Figures 10 and 11 depict the French and Spanish administrative divisions and show the border regions we mention throughout the paper.

Figure 10: Spanish NUTS2 and NUTS3 regions

Figure 11: French NUTS2 and NUTS3 regions

Broad definition of border regions

The easiest way to define border regions is to consider those French and Spanish regions that are contiguous (by land or by sea) to their trade partner countries. This broad definition leads to the following list of NUTS3 border regions:

French regions bordering Belgium and Luxembourg: Nord, Aisne, Ardennes, Meuse, Meurthe et Moselle, Moselle.

French regions bordering Germany: Moselle, Bas-Rhin, Haut-Rhin.

French regions bordering the United-Kingdom (NUTS3 regions opened to the English Channel): Nord, Pas-de-Calais, Somme, Seine Maritime, Eure, Calvados, Manche, îlle-et-Vilaine, Côtes-d'Armor and Finistère.

French regions bordering Spain: Pyrénées Atlantiques, Hautes-Pyrénées, Haute-Garonne, Ariège, Pyrénées Orientales.

French regions bordering Italy: Haute-Savoie, Savoie, Hautes-Alpes, Alpes-de-Haute-Provence, Alpes Maritimes.

Spanish regions bordering France: Guipuzkoa, Navarra, Huesca, Lerida, Gerona.

Spanish regions bordering Portugal: Pontevedra, Orense, Zamora, Salamanca, Caceres, Badajoz, Huelva.

Geographical definition of border regions

We define as "geographic" border regions those that can be reached easily despite natural barriers (mountains and seas), i.e. the NUTS3 regions hosting major cross border transport infrastructures, such as highways, tunnels or industrial harbors, at the beginning of our period of study (1978 for France, 1988 for Spain). The geographic definition of border regions we adopt is thus the following:

French regions bordering Spain: Pyrénées Atlantiques (Road pass of Biriatou, highway since 1975), Pyrénées Orientales (Road pass of Le Perthus, highway since 1978).

French regions bordering Italy: Haute-Savoie (Tunnel of Mont-Blanc since 1965), Savoie (Tunnels of Frejus (road and railroad) and Mont-Cenis (railroad) since 1870s), Hautes-Alpes (Road pass of Montgenèvre since 1850), Alpes Maritimes (Road pass of Tende since 1882, highway and Tunnel of Vintimille since 1980).

French regions bordering the United Kingdom: Pas-de-Calais (Calais harbor), Nord (Dunkerque harbor), Seine-Maritime (Havre and Rouen harbors).

Spanish regions bordering France: Guipuzkoa (Highway since 1975), Girona (Highway since 1978).

Appendix B: Data

Trade of French and Spanish regions

Each year, French and Spanish decentralized customs services record the trade flows exchanged between the 94 French and the 48 Spanish continental[24] NUTS3 regions and the different countries in the world (since 1978 for France, 1988 for Spain). Regarding exports, the origins of trade flows are the regions where shipments are produced and loaded before handling to destination countries, which themselves correspond to the locations where commodities are consumed, and conversely for import flows. The measure of trade flows obtained is therefore exclusive of transit shipments (accounting therefore for more than 50% of the total exchanges between regions and countries).[25]

The French data set was made available in return for financial contractual obligations and under strict confidentiality. The Spanish data set for the period 1995-2000 is available on the web page of the Spanish Customs. Spanish data for the period 1988-1994 were kindly provided by the Customs statistics department (Dirección General de Aduanas, Agencia Tributaria).

The Spanish and French data sets include both values (euros) and volumes (tons) of trade flows and are originally available at a highly detailed industry level (176 industries for France and 99 industries for Spain) and for five transport modes (air, maritime, rivers, railroad and road).[26] However, due to a change in European legislation in 1993 ruling that the mode used to transport commodities need only be recorded when crossing European borders and not national ones, the breakdown by mode is not homogenous over the whole period of study. Therefore, we work on trade aggregated over all the

[24] We consider the Balearic Islands as continental regions for Spain.

[25] Data on French intra-national trade flows also exist. Unfortunately, their collection is not immune to transit and break-loading issues, so we cannot simply add them to customs data in order to obtain a global picture of both the intra- and international trade patterns.

[26] We neglect postal, pippers and other too specific shipments.

transport modes. Moreover, since the number of observations was low for some industries, we also aggregate trade over industries,[27] which leads us to focus on trade values (instead of volumes) due to the standard problem of the units of measure.

Distance variables

Distance between region i and country J, D_{iJt}, is computed as follows:

$$D_{iJt} = \sum_{j \in J} d_{ij} \times \frac{GDP_{jt}}{GDP_{Jt}}, \tag{9}$$

where d_{ij} is the great circle distance between regions i and j, hosted by countries I and J respectively. Hence, the distance we use is the average distance from a region i to all other regions hosted by country J, weighted by their relative economic size (measured as current GDP).

Inward FDI variables

In order to capture the trade creating effects of multinationals, we use the data collected by the French Government Agency for International Investment (AFII).[28] This agency reports yearly inward bilateral regional flows originating from 47 different countries in the world, for twenty broad categories of industries.[29] Moreover, five different measures of FDI are available: The number of projects of plants affiliated to foreign parent firms, and their related employment scale (number of jobs created, of jobs maintained and total employment) and investment (millions euro). The data sample for the period 1993-2000 amounts to around 3900 regional investments.

However, in order not to exhibit a distorted shape of regional FDI towards the capital region, which is most often chosen as the best location for foreign plants' head quarters, we keep three types of observations only: "Production/Assembly", "Retail/Logistics" and "Sales offices". Once reaggregated over all industries, our sample therefore reduces to 1823 bilateral investment regional flows.

[27] In the current version of the paper, we do not carry out a sectoral analysis, leaving industrial issues for further advanced versions of the research.

[28] See http://www.afii.fr/France/.

[29] Among which electronics, chemicals, automobile construction and food industries are the most represented.

Appendix C: Times Series regressions

Table 6: Trade of French regions with all neighboring countries, FDI excluded

	Dependent Variable: log of trade value					
	Border regions: Broad			Border regions: Geographic		
Model :	(P)	(X)	(M)	(P)	(X)	(M)
Distance	-0.72[a]	-0.57[a]	-0.87[a]	-0.74[a]	-0.53[a]	-0.94[a]
	(0.08)	(0.10)	(0.09)	(0.06)	(0.08)	(0.08)
Bordr	0.17[b]	0.06	0.28[a]	0.19[b]	0.11	0.26[a]
	(0.07)	(0.10)	(0.09)	(0.07)	(0.11)	(0.09)
Bordn - 1978	0.63[a]	0.33[b]	0.92[a]	0.89[a]	0.70[a]	1.08[a]
	(0.13)	(0.17)	(0.16)	(0.16)	(0.18)	(0.22)
Bordn - 1979	0.69[a]	0.52[a]	0.87[a]	0.92[a]	0.75[a]	1.09[a]
	(0.12)	(0.17)	(0.16)	(0.14)	(0.18)	(0.22)
Bordn - 1980	0.53[a]	0.30[c]	0.76[a]	0.78[a]	0.63[a]	0.94[a]
	(0.12)	(0.16)	(0.16)	(0.15)	(0.17)	(0.21)
Bordn - 1981	0.57[a]	0.38[b]	0.76[a]	0.77[a]	0.60[a]	0.94[a]
	(0.12)	(0.17)	(0.17)	(0.15)	(0.19)	(0.22)
Bordn - 1982	0.57[a]	0.34[b]	0.80[a]	0.80[a]	0.59[a]	1.00[a]
	(0.12)	(0.17)	(0.17)	(0.15)	(0.19)	(0.22)
Bordn - 1983	0.58[a]	0.29[c]	0.86[a]	0.80[a]	0.53[a]	1.07[a]
	(0.12)	(0.16)	(0.17)	(0.15)	(0.18)	(0.23)
Bordn - 1984	0.51[a]	0.21	0.80[a]	0.79[a]	0.53[a]	1.05[a]
	(0.12)	(0.15)	(0.18)	(0.15)	(0.15)	(0.23)
Bordn - 1985	0.48[a]	0.25[c]	0.71[a]	0.76[a]	0.52[a]	1.01[a]
	(0.12)	(0.15)	(0.18)	(0.14)	(0.16)	(0.23)
Bordn - 1986	0.48[a]	0.23	0.73[a]	0.77[a]	0.48[a]	1.05[a]
	(0.11)	(0.14)	(0.17)	(0.14)	(0.16)	(0.22)
Bordn - 1987	0.47[a]	0.21	0.74[a]	0.75[a]	0.49[a]	1.02[a]
	(0.11)	(0.14)	(0.16)	(0.13)	(0.15)	(0.21)
Bordn - 1988	0.46[a]	0.22	0.70[a]	0.77[a]	0.54[a]	1.01[a]
	(0.11)	(0.14)	(0.16)	(0.13)	(0.15)	(0.21)
Bordn - 1989	0.45[a]	0.24[c]	0.66[a]	0.76[a]	0.56[a]	0.96[a]
	(0.11)	(0.14)	(0.16)	(0.12)	(0.15)	(0.19)
Bordn - 1990	0.41[a]	0.21	0.61[a]	0.71[a]	0.52[a]	0.90[a]
	(0.11)	(0.14)	(0.15)	(0.12)	(0.16)	(0.19)
Bordn - 1991	0.45[a]	0.24[c]	0.66[a]	0.72[a]	0.53[a]	0.92[a]
	(0.10)	(0.14)	(0.15)	(0.12)	(0.15)	(0.19)
Bordn - 1992	0.43[a]	0.22	0.65[a]	0.71[a]	0.51[a]	0.91[a]
	(0.11)	(0.14)	(0.16)	(0.12)	(0.14)	(0.21)
Bordn - 1993	0.45[a]	0.25[b]	0.65[a]	0.68[a]	0.46[a]	0.89[a]
	(0.11)	(0.12)	(0.16)	(0.13)	(0.12)	(0.22)
Bordn - 1994	0.44[a]	0.23[b]	0.64[a]	0.63[a]	0.43[a]	0.82[a]
	(0.10)	(0.11)	(0.15)	(0.12)	(0.11)	(0.21)
Bordn - 1995	0.42[a]	0.24[b]	0.59[a]	0.62[a]	0.45[a]	0.79[a]
	(0.10)	(0.12)	(0.15)	(0.12)	(0.12)	(0.21)
Bordn - 1996	0.43[a]	0.27[b]	0.58[a]	0.62[a]	0.47[a]	0.78[a]
	(0.10)	(0.11)	(0.15)	(0.12)	(0.11)	(0.20)
Bordn - 1997	0.40[a]	0.25[b]	0.55[a]	0.57[a]	0.42[a]	0.72[a]
	(0.09)	(0.11)	(0.15)	(0.12)	(0.11)	(0.21)
Bordn - 1998	0.42[a]	0.26[b]	0.57[a]	0.55[a]	0.42[a]	0.67[a]
	(0.10)	(0.11)	(0.15)	(0.12)	(0.11)	(0.22)
Bordn - 1999	0.39[a]	0.21[c]	0.58[a]	0.53[a]	0.39[a]	0.68[a]
	(0.10)	(0.11)	(0.15)	(0.12)	(0.11)	(0.21)
Bordn - 2000	0.35[a]	0.25[b]	0.46[a]	0.53[a]	0.48[a]	0.58[a]
	(0.09)	(0.12)	(0.13)	(0.11)	(0.13)	(0.16)
N	21620	10810	10810	21620	10810	10810
R^2	0.870	0.936	0.933	0.869	0.936	0.932
RMSE	0.575	0.516	0.513	0.570	0.511	0.508
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Time-invariant fe	Yes	Yes	Yes	Yes	Yes	Yes
Time-varying fe	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors in brackets, with [a], [b] and [c] denoting significance at the 1%, 5% and 10% levels, respectively.

Table 7: Trade of Spanish regions with all neighboring countries, FDI excluded

	Dependent Variable: log of trade value					
	Border regions: Broad			Border regions: Geographic		
Model :	(P)	(X)	(M)	(P)	(X)	(M)
Distance	-0.94[a]	-0.93[a]	-0.95[b]	-1.11[a]	-0.86[a]	-1.37[a]
	(0.35)	(0.34)	(0.41)	(0.31)	(0.25)	(0.37)
Bordr	-0.14	-0.28	0.00	-0.20	-0.24	-0.16
	(0.21)	(0.21)	(0.26)	(0.20)	(0.18)	(0.25)
Bordn - 1988	0.31	0.13	0.49	0.21	0.36	0.05
	(0.37)	(0.42)	(0.44)	(0.39)	(0.47)	(0.53)
Bordn - 1989	0.42	0.22	0.61	0.33	0.40	0.26
	(0.35)	(0.39)	(0.43)	(0.37)	(0.43)	(0.52)
Bordn - 1990	0.45	0.18	0.71[c]	0.36	0.36	0.35
	(0.34)	(0.38)	(0.40)	(0.35)	(0.43)	(0.46)
Bordn - 1991	0.53	0.30	0.75[b]	0.40	0.47	0.33
	(0.34)	(0.36)	(0.38)	(0.35)	(0.39)	(0.45)
Bordn - 1992	0.39	0.06	0.72[c]	0.25	0.19	0.31
	(0.33)	(0.33)	(0.38)	(0.33)	(0.35)	(0.43)
Bordn - 1993	0.33	0.03	0.62	0.10	0.13	0.06
	(0.37)	(0.39)	(0.43)	(0.37)	(0.44)	(0.47)
Bordn - 1994	0.41	0.14	0.67	0.21	0.28	0.13
	(0.36)	(0.38)	(0.42)	(0.36)	(0.42)	(0.45)
Bordn - 1995	0.42	0.18	0.66[c]	0.27	0.31	0.23
	(0.34)	(0.37)	(0.39)	(0.36)	(0.42)	(0.45)
Bordn - 1996	0.41	0.23	0.59	0.26	0.36	0.16
	((0.35)	(0.36)	(0.38)	(0.36)	(0.41)	(0.45)
Bordn - 1997	0.42	0.28	0.56	0.29	0.40	0.19
	(0.35)	(0.35)	(0.39)	(0.37)	(0.40)	(0.46)
Bordn - 1998	0.32	0.22	0.43	0.24	0.38	0.11
	(0.34)	(0.34)	(0.38)	(0.36)	(0.38)	(0.45)
Bordn - 1999	0.35	0.13	0.57	0.26	0.27	0.25
	(0.34)	(0.31)	(0.38)	(0.35)	(0.33)	(0.45)
Bordn - 2000	0.30	0.11	0.49	0.17	0.20	0.14
	(0.33)	(0.30)	(0.39)	(0.35)	(0.31)	(0.46)
N	2496	1248	1248	2496	1248	1248
R^2	0.881	0.906	0.923	0.883	0.908	0.925
RMSE	0.725	0.613	0.647	0.726	0.611	0.655
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Time-invariant fe	Yes	Yes	Yes	Yes	Yes	Yes
Time-varying fe	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors in brackets, with [a], [b] and [c] denoting significance at the 1%, 5% and 10% levels, respectively.

Table 8: Trade of French regions with all neighboring countries, FDI included

	Dependent Variable: log of trade value											
	Border regions: Broad						Border regions: Geographic					
Model:	(B)	(P)	(X)	(M)	(P)	(DP)	(B)	(P)	(X)	(M)	(P)	(DP)
Distance	-0.68^a	-0.64^a	-0.53^a	-0.74^a	-0.64^a	-0.64^a	-0.73^a	-0.70^a	-0.57^a	-0.84^a	-0.70^a	-0.70^a
	(0.08)	(0.09)	(0.10)	(0.12)	(0.09)	(0.09)	(0.07)	(0.08)	(0.09)	(0.10)	(0.08)	(0.08)
Bordr	0.20^b	0.20^b	0.15	0.25^b	0.20^b	0.21^b	0.17^b	0.17^c	0.11	0.22^c	0.17^c	0.17^c
	(0.09)	(0.08)	(0.10)	(0.11)	(0.08)	(0.09)	(0.09)	(0.09)	(0.10)	(0.11)	(0.09)	(0.09)
Bordn - 1993	0.48^a	0.49^a	0.26^b	0.71^a	0.48^a	0.38^a	0.68^a	0.66^a	0.40^a	0.93^a	0.66^a	0.58^a
	(0.11)	(0.11)	(0.11)	(0.17)	(0.11)	(0.11)	(0.13)	(0.13)	(0.12)	(0.22)	(0.13)	(0.13)
Bordn - 1994	0.47^a	0.47^a	0.24^b	0.70^a	0.47^a	0.38^a	0.63^a	0.61^a	0.37^a	0.85^a	0.61^a	0.53^a
	(0.11)	(0.10)	(0.11)	(0.16)	(0.10)	(0.10)	(0.13)	(0.13)	(0.11)	(0.21)	(0.12)	(0.13)
Bordn - 1995	0.45^a	0.42^a	0.23^b	0.62^a	0.41^a	0.33^a	0.62^a	0.59^a	0.38^a	0.80^a	0.58^a	0.53^a
	(0.11)	(0.10)	(0.11)	(0.15)	(0.10)	(0.11)	(0.13)	(0.12)	(0.11)	(0.21)	(0.12)	(0.14)
Bordn - 1996	0.46^a	0.42^a	0.25^b	0.60^a	0.41^a	0.32^a	0.62^a	0.57^a	0.37^a	0.76^a	0.55^a	0.55^a
	(0.10)	(0.10)	(0.10)	(0.15)	(0.10)	(0.11)	(0.12)	(0.12)	(0.11)	(0.20)	(0.12)	(0.14)
Bordn - 1997	0.43^a	0.38^a	0.21^b	0.55^a	0.39^a	0.30^a	0.57^a	0.50^a	0.32^a	0.69^a	0.52^a	0.51^a
	(0.10)	(0.09)	(0.10)	(0.15)	(0.09)	(0.11)	(0.12)	(0.12)	(0.10)	(0.21)	(0.12)	(0.17)
Bordn - 1998	0.45^a	0.39^a	0.22^b	0.56^a	0.40^a	0.34^a	0.55^a	0.47^a	0.31^a	0.63^a	0.47^a	0.49^a
	(0.10)	(0.10)	(0.10)	(0.15)	(0.10)	(0.11)	(0.13)	(0.12)	(0.11)	(0.21)	(0.12)	(0.16)
Bordn - 1999	0.42^a	0.36^a	0.16	0.56^a	0.36^a	0.31^b	0.54^a	0.46^a	0.28^b	0.64^a	0.45^a	0.47^a
	(0.10)	(0.10)	(0.10)	(0.15)	(0.10)	(0.12)	(0.13)	(0.12)	(0.11)	(0.20)	(0.12)	(0.18)
Bordn - 2000	0.38^a	0.32^a	0.21^c	0.44^a	0.34^a	0.27^b	0.53^a	0.45^a	0.37^a	0.53^a	0.47^a	0.51^a
	(0.10)	(0.09)	(0.11)	(0.13)	(0.10)	(0.13)	(0.11)	(0.11)	(0.13)	(0.16)	(0.11)	(0.18)
FDI		0.12^a	0.10^a	0.14^a				0.10^a	0.08^b	0.12^a		
		(0.03)	(0.04)	(0.05)				(0.03)	(0.04)	(0.05)		
FDI - 1993					0.16^a	0.07					0.12^b	0.07
					(0.06)	(0.07)					(0.06)	(0.07)
FDI - 1994					0.14^b	0.06					0.10^c	0.06
					(0.06)	(0.07)					(0.06)	(0.07)
FDI - 1995					0.15^a	0.10					0.12^b	0.11^c
					(0.05)	(0.06)					(0.05)	(0.06)
FDI - 1996					0.15^a	0.12^b					0.12^a	0.12^b
					(0.04)	(0.05)					(0.04)	(0.05)
FDI - 1997					0.10^a	0.08^c					0.08^b	0.08^c
					(0.04)	(0.04)					(0.04)	(0.04)
FDI - 1998					0.11^a	0.10^b					0.10^a	0.10^b
					(0.04)	(0.04)					(0.04)	(0.04)
FDI - 1999					0.12^a	0.12^a					0.11^a	0.12^a
					(0.04)	(0.04)					(0.04)	(0.04)
FDI - 2000					0.10^a	0.09^b					0.08^b	0.08^b
					(0.03)	(0.04)					(0.03)	(0.04)
FDI x Bordn - 1993						0.30^a						0.16^c
						(0.09)						(0.08)
FDI x Bordn - 1994						0.27^a						0.15^c
						(0.09)						(0.09)
FDI x Bordn - 1995						0.17^b						0.06
						(0.08)						(0.08)
FDI x Bordn - 1996						0.12^c						0.01
						(0.07)						(0.07)
FDI x Bordn - 1997						0.10^c						0.01
						(0.05)						(0.07)
FDI x Bordn - 1998						0.05						-0.01
						(0.05)						(0.06)
FDI x Bordn - 1999						0.04						-0.02
						(0.05)						(0.06)
FDI x Bordn - 2000						0.05						-0.02
						(0.05)						(0.06)
N	7520	7520	3760	3760	7520	7520	7520	7520	3760	3760	7520	7520
R^2	0.859	0.860	0.896	0.912	0.860	0.860	0.860	0.861	0.897	0.912	0.861	0.861
RMSE	0.555	0.553	0.458	0503	0.554	0.553	0.553	0.552	0.457	0.501	0.552	0.552
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time-invariant fe	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time-varying fe	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors in brackets, with ^{a}, ^{b} and ^{c} denoting significance at the 1%, 5% and 10% levels, respectively.

Table 9: Trade of French regions with Belgium-Luxembourg and Germany only, FDI included

	Dependent Variable: log of trade value					
	Border regions: Broad or geographic					
Model:	(B)	(P)	(X)	(M)	(P)	(DP)
Distance	-0.21	-0.22	-0.41^{c}	-0.04	-0.23	-0.21
	(0.20)	(0.19)	(0.24)	(0.24)	(0.19)	(0.19)
Bordr	0.43^{a}	0.37^{b}	0.24	0.49^{a}	0.36^{b}	0.34^{b}
	(0.15)	(0.14)	(0.20)	(0.16)	(0.15)	(0.15)
Bordn - 1993	0.72^{a}	0.60^{a}	0.33	0.87^{a}	0.58^{a}	0.51^{b}
	(0.21)	(0.20)	(0.25)	(0.29)	(0.20)	(0.22)
Bordn - 1994	0.74^{a}	0.63^{a}	0.35	0.90^{a}	0.61^{a}	0.52^{a}
	(0.19)	(0.19)	(0.26)	(0.25)	(0.18)	(0.20)
Bordn - 1995	0.83^{a}	0.71^{a}	0.50^{c}	0.92^{a}	0.70^{a}	0.57^{a}
	(0.20)	(0.18)	(0.26)	(0.25)	(0.18)	(0.22)
Bordn - 1996	0.76^{a}	0.61^{a}	0.41^{c}	0.81^{a}	0.56^{a}	0.46^{b}
	(0.20)	(0.18)	(0.24)	(0.26)	(0.18)	(0.21)
Bordn - 1997	0.74^{a}	0.54^{a}	0.36	0.73^{a}	0.53^{a}	0.29
	(0.20)	(0.19)	(0.24)	(0.27)	(0.19)	(0.22)
Bordn - 1998	0.71^{a}	0.49^{b}	0.32	0.66^{b}	0.51^{b}	0.27
	(0.20)	(0.19)	(0.23)	(0.30)	(0.20)	(0.22)
Bordn - 1999	0.69^{a}	0.44^{b}	0.25	0.63^{b}	0.46^{b}	0.13
	(0.20)	(0.19)	(0.21)	(0.31)	(0.20)	(0.25)
Bordn - 2000	0.71^{a}	0.45^{b}	0.23	0.66^{b}	0.51^{a}	0.10
	(0.19)	(0.19)	(0.18)	(0.29)	(0.19)	(0.28)
FDI		0.18^{a}	0.16^{a}	0.20^{a}		
		(0.04)	(0.05)	(0.06)		
FDI - 1993					0.22^{a}	0.18^{c}
					(0.06)	(0.10)
FDI - 1994					0.20^{a}	0.13
					(0.06)	(0.09)
FDI - 1995					0.21^{a}	0.16^{c}
					(0.07)	(0.09)
FDI - 1996					0.26^{a}	0.24^{a}
					(0.06)	(0.07)
FDI - 1997					0.20^{a}	0.16^{b}
					(0.05)	(0.06)
FDI - 1998					0.16^{a}	0.13^{b}
					(0.05)	(0.06)
FDI - 1999					0.16^{a}	0.13^{b}
					(0.05)	(0.05)
FDI - 2000					0.13^{a}	0.09^{b}
					(0.04)	(0.05)
FDI x Bordn - 1993						0.11
						(0.11)
FDI x Bordn - 1994						0.15
						(0.10)
FDI x Bordn - 1995						0.13
						(0.10)
FDI x Bordn - 1996						0.08
						(0.08)
FDI x Bordn - 1997						0.15^{b}
						(0.08)
FDI x Bordn - 1998						0.14^{b}
						(0.07)
FDI x Bordn - 1999						0.17^{b}
						(0.07)
FDI x Bordn - 2000						0.18^{b}
						(0.08)
N	3008	3008	1504	1504	3008	3008
R^2	0.923	0.925	0.951	0.960	0.925	0.926
RMSE	0.464	0.458	0.439	0.429	0.459	0.459
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Time-invariant fe	Yes	Yes	Yes	Yes	Yes	Yes
Time-varying fe	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors in brackets, with ^{a}, ^{b} and ^{c} denoting significance at the 1%, 5% and 10% levels, respectively.