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European Integration, FDI and the Geography of French Trade

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ABSTRACT

We use an augmented gravity model to investigate whether the 1978-2000 process of European integration has changed the geography of trade within France, with a particular focus on border regions. We find that, once controlled for bilateral distance, origin- and destination-specific characteristics, French border regions trade on average 73% more with neighboring countries than predicted by the gravity norm. They perform even better if they have good transport connections with these countries. However, French border regions at the periphery of Europe experienced a downward trend over the period, that is partly due to the decrease in the propensity of Spanish and Italian foreign affiliates to trade with their home country.

Keywords: Gravity, Border Regions, Foreign Direct Investment, Transportation Infrastructure.

JEL classification: F15, F23, R12, R58.

1. Introduction

The recent wave of European enlargement eastward has been accompanied by an increasing fear of outsourcing to new entrants. This raises the question as to how European integration is likely to affect the geography of economic activities. Whereas empirical evidence focuses overwhelmingly on post-integration reallocation effects between old and new member countries, this paper sets out to extend the assessment to regions within countries. It focuses in particular on whether the border regions located on the frontier with acceding countries have expanded or suffered due to their transition from a peripheral position in France to a central location in the common market. Our approach is also innovative in that it considers foreign direct investment and the cross-border transport infrastructure as possible channels for regional differentials. Indeed, economic integration prompts multinational firms to invest in the new regional bloc by improving market accessibility and lifting barriers to trade and multinational business. Since foreign affiliates are more likely to choose their locations based on market potential (HEAD and MAYER, 2004), the border regions located at the core of rich Europe might benefit from a higher percentage of foreign firms and, if FDI and trade are complementary activities, from growth in trade with the parent country. In terms of policy outlook, the question of whether border regions are particularly attractive to certain economic activities is eminently significant to the European Commission's adoption of multiple entrepreneurship, trade and transport cross-border programmes under the new 2007-2013 cohesion policy. To facilitate cross-border cooperation, the EU has recently created a new legal entity, the European Grouping for Territorial Cooperation (EGTC), which groups together the authorities of different Member States without the need for prior international agreements.

The issue of whether economic integration might favor or hinder border regions is controversial. In theoretical terms, the New Economic Geography (hereafter NEG) has sought to extend the usual two-country (or two-region) setting to frameworks in which both inter- and intra-national inequalities are assessed. In a model comprising a foreign country and a home country, each composed of two equidistant domestic regions (the core and the periphery), KRUGMAN and LIVAS (1996) show that trade liberalization between countries favors the regional dispersion of increasing return-to-scale activities between each country's core and periphery. Hence, the peripheral region could benefit from increased urban congestion within the core. Yet this result is not robust: when the dispersion force is modeled through immobile workers, instead of urban congestion, catastrophic agglomeration may occur (MONFORT and NICOLINI, 2000; PALUZIE, 2001). 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 competitive 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 impact of trade liberalization is the result of two counteracting forces: increased market access (favorable to export production) and increased import competition (negative for domestic producers that compete with the foreign supply).

Nonetheless, core-periphery models of the Krugman type are not only known for the extreme finding that a reduction in trade costs yields catastrophic agglomeration, but also for their analytical intractability. Recent studies have therefore tried to attenuate the centripetal forces and provide analytical solutions to the models. For instance, BRÜLHART *et al.* (2004) build a three-region setting in which the manufacturing sector uses mobile human capital as the fixed cost and immobile workers 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 stable overall, predicting even more agglomeration in this region. BEHRENS *et al.* (2007) develop a two-country, four-region model in which low inter-country trade costs are shown to promote regional dispersion when inter-regional trade costs are high enough. BEHRENS *et al.* (2006) use the same model to investigate the role of “gateway” regions, through which goods are shipped to the international market. If a country is endowed with a gateway region, this region benefits from agglomeration when the country is well integrated. If not, the landlocked region benefits. So theory has not reached a consensus as to whether or not border regions might benefit from integration processes. This makes empirical analysis even more crucial to identify the main mechanisms at work.

The main empirical approach consists in testing the NEG predictions of backward (demand) linkage effects:[1] the better a region’s access to large markets, the higher its factor prices, output, or a combination of the two. So regional wage gradients, initially decreasing monotonously from center to periphery, might possibly reverse due to changes in trade regimes and market potential. Changes in output variables are driven by the number of firms, and regions with good access to foreign markets end up with a higher share of business. Regarding North America, HANSON (1996a, 1996b, 1997, 2001) is among the empirical pioneers assessing whether the NAFTA process triggered changes in wages or employment within participating countries. While he provides strong evidence of job relocation by both sides of the US-Mexico border following NAFTA, he does not unequivocally support the wage gradients reversal prediction. EU prospects concern mostly the recent enlargement eastward and the fear that, as the borders of EEC countries become internal to the EU, economic activities could shift towards

Eastern border locations, eventually at the expense of Western border regions. For instance, BRÜLHART and KOENIG-SOUBEYRAN (2006) compare the wage gradients of five accession countries (Czech Republic, Hungary, Poland, Slovenia and Slovakia) to those of incumbent EU countries for the 1996-2000 period. They find that concentration in the capital regions is significantly stronger in the former and that nominal wages are higher in the border regions of the incumbent EU countries. Hence they conjecture that market forces would most likely favor Eastern border regions. Based on simulated changes in the market accessibility of EU27 regions, NIEBUHR (2005) also supports the inference that border regions could experience above-average integration benefits due to their favorable access to foreign markets. A noticeable exception to the eastward focus is the recent work by OVERMAN and WINTERS (2003, 2005), who examine whether the UK's accession to the EEC in 1973 affected the location of domestic manufacturing activities within the UK. Accession is shown to have a mitigated effect: even though manufacturing activities may have relocated south-eastwards, several industries also retreated north-westwards because of increased import competition. Therefore, the empirical estimation of backward linkages, both in the factor price version (wages) and the quantity version (employment or production), suggests that regions bordering the largest and richest markets do seem to benefit from economic integration with them. By contrast, the results for regions bordering poorer markets are more mixed. Some of them, like the south of the US, experience positive effects while the impact can be negative for others, particularly in Eastern Europe.

Our empirical approach is different in that, first, we focus on the western part of Europe and, second, we concentrate on trade rather than wage and employment issues. Post-integration changes in trade performances depending on where regions are located within countries have rarely been investigated. There are two notable exceptions to this. First, COUGHLIN and WALL (2003) distill the trade impact of NAFTA on the US states. Their conclusion is that, following

NAFTA, 28 (36 respectively) US states experienced a rise of more than 10% in their exports towards Mexico (Canada respectively), while 8 (4 respectively) were negatively affected. However, the core-periphery nature of winners and losers is not assessed. In contrast, EGGER and PFAFFERMAYR (2002) analyze the trade impact of the 1960-1998 process of EU integration, with a special focus on trade within and between the core and periphery countries. They find that, while both core-periphery and intra-periphery trade benefited more from EU integration than intra-core trade, this positive effect diminished over the course of the enlargement. The southern enlargement even exerted a negative effect on the intra-core volume of trade.

In line with EGGER and PFAFFERMAYR (2002), we assess the trade differentials sparked by European integration, but we focus on the case of French regions. We develop an augmented gravity model in which European integration is materialized through the reduction of FDI barriers. We then quantify the trade performance of border regions as their deviation from the value of trade predicted by this gravity norm. We find evidence that, other things being equal, French regions located at the border of a country trade on average 73% more with this partner than interior regions, and even more (129%) if they have good cross-border transport connections with the neighboring country. However, the process of European integration coincided with a sharp decrease in this trade outperformance over the 1978-2000 period. This downward trend was driven by the huge reduction in the deviations posted by the most peripheral French border regions within the EU. Neither the Single European Act nor the completion of the Single Market were sufficient to counterbalance the decline. We find that these trade differentials can partly be attributed to FDI regional patterns, and more precisely to the decreasing scope of foreign investors for trading with the home country. However, this trend is less pronounced for the Belgian-Luxembourg and German firms located near the EU core.

The remainder of the paper proceeds as follows. Section 2 provides some stylized evidence on the suitability of the gravity framework for the study of the interplay between trade performances and FDI. Section 3 describes the augmented gravity model, as well as the data and methodological issues. Section 4 provides two sets of results for France. The first set relates to the 1978-2000 long-run change in trade performances between border and interior regions, whereas the second set analyzes more specifically the role of inward FDI in sparking these trade differentials over the 1993-2000 period. Section 5 concludes.

2. Trade and FDI patterns of French regions: stylized evidence

A detailed assessment of whether integration is likely to affect the internal geography of trade calls for a thorough theoretical and econometric analysis, which we will seek to provide in subsequent sections. However, if border regions do indeed post specific trends due to the counteracting forces described in the introduction, we should be able to pick up them with the naked eye. Section 2 therefore provides a set of stylized facts on the trade and FDI patterns of French regions.

2.1. Trade specialization patterns by country

It is instructive to take a brief look at the relative trade performances of regions inside France to see that proximity is a clear catalyst for trade.[2] We compute the following trade index to assess the relative specialization of regions across partner countries. 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 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 country I's international trade. The simplest way to measure how much the trade of region i is oriented towards partner country J is to compute the following Balassa Trade Specialization Index:

$$TSI_{iJ} = \frac{s_{iJ}}{x_i} \times 100. \qquad (1)$$

Values above 100 mean that region i trades relatively more with country J than would be predicted by its share in international trade.[3]

As shown by Figure 1, the gravity pattern of trade is striking: in 2000, regardless of the direction of trade, border regions largely outperform in trade with adjacent countries. This pattern is especially clear for trade with Spain and Germany. For instance, the "Pyrénées Orientales" region, which borders Spain, is almost six times more export-oriented towards this country than towards the rest of the world. Sometimes, however, certain border regions have a surprisingly low TSI. This is the case of "Haute-Garonne", which comprises the city of Toulouse, on the border with Spain. It is worth noting that the Pyrenees mountains are very steep at this part of the border, making cross-border transport particularly difficult. Therefore, a strict contiguity criterion may not be sufficient to account for the true border nature of regions due to the geography of the physical frontiers.

Furthermore, a number of interior regions trade surprisingly more with a partner country than their adjacent regions in spite of sometimes being located very far away. One first plausible explanation is that cross-border input-output linkages could generate specific patterns not necessarily of the gravity type. For instance, the French region of "Vienne" is strongly export-oriented towards Germany probably because it hosts the French firm Michelin, which produces equipment goods for German firms such as BMW, Daimler-Chrysler and Volkswagen A.G. A second explanation is that vertical outsourcing, which enables foreign investors to reap the benefits of lower transport costs, but also lower taxes, rents and wages, might also cause extreme specialization patterns. Foreign direct investment from neighboring countries is likely to boost trade due to input-output linkages between the parent firm in the home country and its affiliates in the host region. For instance, the southern region of “Haute-Garonne” is the largest exporter to Germany even though it is on the opposite side of the country. The rationale is that it hosts the European Aeronautic Defence and Space (EADS) consortium, in which the German firm Daimler-Chrysler owns more than 30%. Hence, to compare the trade performance of regions, we have to bear in mind that FDI might drive up the trade of interior as well as border regions. We turn to this issue in Section 2.2.

INSERT FIGURE 1

2.2. FDI specialization patterns by country

Figure 2 presents the inward stocks of Foreign Direct Investment based on four different variables: number of investments, related jobs created or maintained, and millions of euros invested.[4] 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 present conducive conditions for investment as they benefit from good access to the richest internal French regions due to the high density of highway infrastructures towards the French capital,[5] and also to the core of Europe. As the propensity to invest increases with market potential (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 rich European markets at the same time.

Secondly, foreign firms also target the regions located on the other side of their home frontier, which can cultivate their trade expansion. As argued in CROZET *et al.* (2004), the similarity in cultures on both sides of a single frontier is likely to distort FDI patterns to the benefit of the regions near the home country. Gravity forces may even extend beyond such regions due to the spatial propagation of preferences. Other features such as natural geographic impediments may also increase the propensity of foreign firms to target some of the border regions at the expense of others or to locate slightly further away from the border. Hence, Italian firms favor the “Isère” region at the expense of the mountainous “Alpes-de-Haute-Provence”, whereas Spanish firms clearly prefer to locate in the “Pyrénées Atlantiques” and “Pyrénées Orientales”, where a smoother relief allows for pass roads. The same trend is salient for British firms, which prefer to locate in the « Pas-de-Calais» region where the Eurotunnel connects to the UK.

INSERT FIGURE 2

These features point up the heterogeneity of border regions and the need to qualify their border nature based on the frontier geography or the presence of transport gateways. Lastly, it is worth noting that exceptions to these two trends found in some regions confirm some of the conjectures in section 2.1. For instance, despite its relative remoteness, the central region of “Aveyron”, which has exports strongly oriented towards Germany, host a large share of total German FDI.[6]

3. Trade specifications, data and econometric issues

Section 3 presents the theoretical mechanisms underpinning the interplay between economic integration, multinational activity and trade (Section 3.1.), and provides some clues about the data and estimation issues (Section 3.2.).

3.1. The augmented gravity model

The representative utility in region i depends on the consumption of the n_{Jt} varieties produced in each foreign partner country J, c_{iJt}.[7] Varieties are differentiated with a Constant Elasticity of Substitution. Given that goods are heterogeneous across countries, we use the ARMINGTON (1969) assumption that consumers might prefer the varieties produced in some countries at the expense of others: parameter a_{iJt} captures the preference bias of consumers in region i with respect to the varieties produced in J. The utility function in region i is:

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

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 *ad valorem* trade cost, and p_{Jt} the mill price in J. We have $p_{iJt} = \left(1 + \tau_{iJt}\right) p_{Jt}$.

Obtaining the following expression for imports originating from J is straightforward:

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

where $c_{it} = \sum_J \sum_{n_{Jt}} c_{iJt}$ is total demand in region i for varieties originating from all foreign sources, and P_{it}, the price index in region i, $P_{it} \equiv \left(\sum_J a_{iJt}^{\sigma-1} n_{Jt} p_{iJt}^{1-\sigma}\right)^{\frac{1}{1-\sigma}}$.

We assume that trade costs are composed of two different elements: transport costs, T_{iJ}, and other cross-border costs, B_{iJt}:

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

Transport costs have the following symmetric structure:

$$T_{iJ} = T_{Ji} = (dist_{iJ})^{\delta} exp\left(1-\beta_1^T bord_{1iJ} - \beta_2^T bord_{2iJ}\right), \tag{5}$$

where $bord_{1iJ}$ and $bord_{2iJ}$ are contiguity dummies capturing the border nature of regions. $bord_{1iJ} = 1$ indicates that the NUTS3 region i shares a frontier with country J (first-order contiguity criterion), while $bord_{2iJ} = 1$ means that, in the absence of strict contiguity, the NUTS3 region i belongs to a NUTS2 region that shares a frontier with country J (second-order contiguity criterion). Moreover, if, in the absence of transport gateways, trade cannot transit through the border of region i to accede market J (due, for instance, to mountains), the previous two dummies are set to 0, which means that region i is treated as interior and not border. Therefore, we capture the true border nature of regions by taking into account their endowments in cross-border infrastructures in addition to their location on the political frontier. As adjacency and cross-border transport connections ease the cost of shipping goods over the border, parameters β_1^T and β_2^T are both expected to be positive. Finally, in a more standard manner, transport costs increase with the distance covered to ship goods between region i and country J, $dist_{iJ}$.

The other cross-border costs, B_{iJt}, include firstly tariffs t_{IJt}.[8] The structure of protection depends only on 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 by the gradual removal of tariffs, but also by the reduction in informal barriers to trade, denoted ntb_{iJt}, which might affect border and non-border regions differently. We assume:

$$B_{iJt} = (1+t_{IJt})(1+ntb_{iJt}) = (1+fdi_{iJt})^{-\alpha^B}, \qquad (6)$$

where fdi_{iJt} is a measure of the *inward* stock of bilateral foreign direct investment.[9]

The relationship between trade barriers and FDI is somewhat disputed in theory (NEARY, 2002; FAINI, 2004). Consequently, there is no clear assertion regarding the question as to whether multinational activity and trade should be complements or substitutes.[10] On the one hand, the reduction in trade barriers reduces the costs to foreign firms of operating outside their home market, which should give multinationals a greater incentive to fragment production. If region i has lower input costs relative to other regions, it should be targeted for vertical outsourcing. If foreign affiliates trade back and forth with parent firms in the home country, there should be a positive causal link between FDI and both the imports and exports of the recipient region. Moreover, a number of recent models explain the propensity of more productive firms to self-select into multinational activity.[11] This could generate an additional trade-expanding effect for the recipient regions. A huge body of empirical literature supports the evidence that multinational activity and trade are complementary activities (LIPSEY and WEISS, 1981, 1984; PFAFFERMAYR, 1996; CLAUSING, 2000; HEAD AND RIES, 2001). However, on the other hand, the standard multinational corporation theory predicts a proximity-concentration trade-off leading firms to outsource production when trade barriers are large and when economies of scale at plant level outstrip economies of scale at industry level (BRAINARD, 1997). Therefore, horizontally-motivated overseas production could substitute for exports to the home country. In addition, if foreign affiliates deter the entry of local producers (in both goods and production factors), multinational activities could also depress the domestic share of the region’s trade. Hence, we expect α^B to be either positive or negative, depending on whether the complementarity-expanding effects offset the substitution-depressing effects.

Preferences involve deterministic as well as stochastic elements:

$$a_{iJt}^{\sigma-1} = (1+fdi_{iJt})^{\alpha^a}\exp[\beta_1^a bord_{1iJ} + \beta_2^a bord_{2iJ} + \varepsilon_{iJt}], \qquad (7)$$

where ε_{iJt} is the random component. FDI affects the Armington preferences because multinational corporations may be conducive to a better knowledge of foreign goods in recipient regions and a better adaptation of these goods to local tastes. Henceforth, parameter α^a is expected to be positive. The border dummy $bord_{1iJ}$ captures the existence of potentially close ties between consumers located on both sides of the same frontier. As the propagation of preferences could extend beyond the frontier of strictly contiguous regions, especially if those are small areas, we also introduce $bord_{2iJ}$. If consumers living in border regions have a larger propensity to share the tastes of the neighboring country than other regions, we expect parameters β_1^a and β_2^a to both be positive, though β_2^a should be of lower magnitude than β_2^a due to distance decay.

Taking the logs and plugging back expressions (4), (5), (6) and (7) into equation (3), we obtain the following log specification for the imports of region i:

$$\begin{aligned}\ln c_{iJt} &= 1 + \ln c_{it} + (\sigma-1)\ln P_{it} + \ln n_{Jt} + (1-\sigma)\ln p_{Jt} - \delta\ln dist_{iJ} + \alpha\ln(1+fdi_{iJt}) \\ &\quad + \beta_1 bord_{1iJ} + \beta_2 bord_{2iJ} + \varepsilon_{iJt},\end{aligned} \qquad (8)$$

where $\alpha = \alpha^a + \alpha^B$, $\beta_1 = \beta_1^T + \beta_1^a$, $\beta_2 = \beta_2^T + \beta_2^a$.

Note that the home bias in preferences acts through imports only. Consumers prefer to buy the goods produced in neighboring countries, either because they have better information on their quality (they are produced very close to their place of residence, consumers commute frequently across the border etc.), or because they find these goods more suited to their tastes (due to cultural proximity). Therefore, the export specification differs slightly from equation (8) and we have:

$$\begin{aligned}\ln c_{Jit} = 1 + \ln c_{Jt} + (\sigma - 1)\ln P_{Jt} + \ln n_{it} + (1-\sigma)\ln p_{it} - \delta \ln dist_{iJ} + \alpha^{B} \ln(1 + fdi_{iJt}) \\ + \beta_1^T bord_{1iJ} + \beta_2^T bord_{2iJ} + \varepsilon_{iJt}.\end{aligned} \tag{9}$$

Henceforth, we expect the trade outperformance in border regions to be greater for imports than for exports (for which we have $\alpha^a = \beta_1^a = \beta_2^a = 0$). In our empirical analysis, we proceed with separate regressions to test this conjecture.

3.2. Trade specifications and econometric issues

Equation (8) comprises three groups of variables: origin-specific (J-specific), destination-specific (i-specific) and “dyadic” (or bilateral iJ-specific). 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 two-way fixed-effect approach and replace all destination-specific and origin-specific variables with two groups of fixed effects.[12] The import specification we estimate is the following:

$$\ln c_{iJt} = \theta + f_{it} + f_{Jt} - \delta \ln dist_{iJ} + \alpha \ln(1 + fdi_{iJt}) + \beta_1 bord_{1iJ} + \beta_2 bord_{2iJ} + f_t + \varepsilon_{iJt}, \tag{10}$$

where f_t is a fixed effect capturing the unobserved time-dependent factors affecting flows identically across regions and countries, and where f_{it} and f_{Jt} are respectively destination- and origin-specific dummies interacted with time fixed effects.

Independently of trade direction, the FDI explanatory variable is potentially endogenous in equation (10). There are two main sources of endogeneity: unobserved heterogeneity and simultaneity bias. The first shows up if common determinants of trade and FDI are omitted from the regression. And indeed, preferences and trade barriers might not be the only channels conveying the influence of FDI on trade. For example, the literature on multinational corporations emphasizes that ownership advantages or specific assets, such as technology and patents, are driving forces for the internationalization of firms. More generally, any subsidy designed to increase the propensity of firms to locate in a particular region could simultaneously increase FDI (by attracting investments into the subsidized region), and trade (by attracting new, and potentially more productive, domestic firms into the subsidized region). In addition to this unobserved heterogeneity, foreign investors are more likely to locate in the most attractive regions and hence, FDI might depend on the trade activity itself.

To cope with the issue of endogeneity, we use the instrumental variables method and estimate the model by means of 2SLS. Hence, we are looking to find at least one variable that is partially correlated with FDI (but not with trade), once all the other right-hand side exogenous variables of equation (10) have been netted out. So the IV candidate must be dyadic (i.e. iJ-specific), otherwise it would be strictly collinear with either the origin or the destination fixed-effects.[13] We choose the following instrument:

$$MP_{iJt} = \sum_{k(\neq i)\in I} \frac{emp_{kJt}}{gtc_{ki}^{93}}, \tag{11}$$

where emp_{kJt} is the number of jobs created or maintained by J-investors located in region k, and gtc_{ki}^{93} is the generalized road transport cost incurred to ship manufacturing goods from region i to region k in 1993.[14] Therefore, MP_{iJt} is a French market potential variable capturing the propensity of foreign firms to locate in the vicinity of the largest affiliates from the same home country. This has proved to be highly correlated with FDI location in previous empirical studies (for instance CROZET *et al.*, 2004). To avoid any additional bias arising from potentially endogenous transport infrastructure (since more public funds could be spent on the main FDI recipient regions), we compute market potential based on the value of transport costs at the beginning of the sample period, i.e. 1993.

The first-stage regression consists here in estimating the following FDI specification:

$$\ln\left(1+fdi_{iJt}\right)=\rho+f_{it}+f_{Jt}-\gamma\ln dist_{iJ}+\phi ln\left(1+MP_{iJt}\right)+\varphi_1 bord_{1iJ}+\varphi_2 bord_{2iJ}+f_t+\xi_{iJt}. \qquad (12)$$

The IV estimator for α is derived from the following second-stage regression:

$$\ln c_{iJt}=\theta+f_{it}+f_{Jt}-\delta\ln dist_{iJ}+\alpha\left[\ln(1+\hat{fdi}_{iJt})\right]+\beta_1 bord_{1iJ}+\beta_2 bord_{2iJ}+f_t+\varepsilon_{iJt}. \qquad (13)$$

The IV estimator is consistent under the hypothesis that the market potential and FDI variables are *effectively* partially correlated. Save additional exclusion restrictions, the model is just-identified and, therefore, condition $\phi \neq 0$ must hold.

3.3. Definition of border regions

As noted in Section 2, defining border regions properly calls for caution. A number of French border regions, despite sharing a frontier with a neighboring country, do not necessarily benefit from a direct access to this country, mostly because of physical geography (sea, mountains, etc.). Therefore, we run two sets of regressions that build on two different definitions of border regions. Firstly, we adopt a broad definition based on a simple bilateral contiguity criterion.[15] We consider that all the regions sharing a frontier, land or sea, with at least one neighboring country are border regions.[16] Secondly, we restrict the definition of border regions to the subset of contiguous regions that are well connected to a neighboring country, i.e. regions with good cross-border transport infrastructures (major highways, tunnels or harbors).[17] Using the two sets of estimates, we can compare the trade performances of both types of border regions and quantify the contribution of transport corridors to these performances, a prominent issue for policy-makers.

4. The trade performance of border and non-border regions

In this section, we present two sets of estimations. In the first set, presented in Section 4.1., we analyze the trade performance of border regions relative to interior regions with respect to five neighboring partner countries (Belgium-Luxembourg, Germany, the UK, Spain and Italy), over the entire 1978-2000 period. Although this approach disregards the causal relationship between multinational activity and trade, it does allow for the sample to be broken down into different sub-periods. Hence, we can analyze the changes in trade performance throughout the successive integration episodes. By way of contrast, Section 4.2. provides further estimates that are structurally consistent with our FDI model. However, due to data constraints, the relationship between trade performance and FDI can only be investigated for the 1993-2000 period.

4.1. Baseline regressions: 1978-2000

Table 1 reports on the OLS estimates derived from estimating equation (10), minus FDI in the right-hand side explanatory variables. Columns P, X and M report the coefficients estimated for pooled flows, exports and imports respectively.

INSERT TABLE 1

A first overall conclusion to be drawn from Table 1 is that, other things being equal, in particular bilateral distance, border regions trade substantially more with the country with which they share a frontier than do interior regions. This higher trade performance is considerably larger for first-order than for second-order border regions (i.e. $bord_1 > bord_2$): the former trade on average 73% more ($[exp(0.55)-1]\times 100$) than interior regions, whereas the trade deviation is just 26% ($[exp(0.23)-1]\times 100$) for the latter. As expected, border regions with good cross-border transport connections perform even better, with an average over-performance of 129% ($[exp(0.83)-1]\times 100$).

Trade deviations with respect to the gravity norm are on the whole larger for imports than for exports, which means that $\beta_1^a > 0$ and $\beta_2^a > 0$ in equation (8). This is consistent with the model's assumption that consumer preferences are biased in favor of goods imported from the country located on the other side of their frontier, due, for instance, to cultural proximity.

Over and above simple averages, the question might be asked as to how relative trade performances have evolved over the last two decades of EU integration. A dynamic perspective is even more illuminating, given that NEG models generally build on comparative statics and do not usually take in long-term trends. The drawback of time-series analysis here is that different integration episodes might have affected French trade at the same time. Indeed, although EU reforms become effective on a formal date, their impact is largely anticipated, and changes are likely to occur even before implementation. Therefore, we cannot reasonably capture the integration-induced changes using a standard difference-in-difference approach. To overcome this European integration timetable issue, we choose to track trade performances over the 1978-

2000 period and to check whether significant changes occurred around the time of the main integration episodes, namely the Single European Act (1986), the Schengen Agreement (1990), the Maastricht Treaty (1992) and EU enlargement to Greece (1981), Spain and Portugal (1986), and Austria, Finland and Sweden (1996).

More precisely, we adopt two different approaches. First, we keep on working with trade flows pooled over the years 1978-2000. We interact border dummies with a linear time trend, denoted t, so as to test for any significant change in the trade performance pattern over the observation period. Second, we provide further results drawn from yearly regressions involving different trade sub-samples, so as to test whether the border regions located near the EU core exhibit specific trends compared with the border regions located at the periphery of western Europe.

Table 2 reports on the results of the first set of estimations. The coefficient of the border time trend interacted variable is significantly negative for the first-order border regions. Whereas the regions bordering a country traded almost twice as much with this country than the interior regions before 1978 ($[exp(0.64)-1]\times 100=90\%$), their higher performance falls 1% on average from year to year afterwards. The same downward trend is seen for the transport corridors, with a particularly remarkable pattern found for imports: before 1978, the border regions traded around 230% more goods with nearby countries than predicted by the gravity norm ($[exp(1.19)-1]\times 100=229\%$), but the downward trend is also more marked (2% compared with 1%). By way of contrast, there is no such systematic downward pattern for second-order border regions, which means that higher trade performances have gradually shifted from strictly contiguous regions to their close neighbors.

INSERT TABLE 2

We now turn to a second set of estimations to gain further insight into whether this shift can be attributed to the success of European integration rather than French market integration. We then proceed with year-by-year regressions on pooled imports and exports for different sub-samples of partner countries.

Figure 3-a reports the time changes in the average trade performances of border regions, computed as $\left([exp(\beta_i)-1]\times 100\right)_{i=1,2}$, where $\left(\beta_i\right)_{i=1,2}$ is the coefficient related to the year of estimation.[18] The range of estimates is very similar to that obtained previously. In addition, we see that the gap between well- and poorly-connected border regions narrows throughout the integration process (as reflected by converging thick and thin lines). The reason might be that the "gateway" regions posted no major infrastructure improvements over the 1978-2000 period, while their counterparts did.[19]

INSERT FIGURE 3

We then divide the trade sample into four groups of trade partner countries. The first includes Belgium-Luxembourg and Germany and focuses on the trends posted on the border of EU core. The second group adds in the UK to extend the focus to the entire northern EU border. The third group includes Spain and Italy to spotlight the trends posted by southern border regions. The last group adds the UK to the third to see the trends at the western EU periphery.

As depicted in Figure 3-b, aside from a brief growth episode around the Single European Act of 1986, the northern French border regions rather stagnated over the 1978-2000 period. This stable pattern conceals a recent increase in the higher performances posted by the regions bordering the EU core (see Figure 3-c) and thus a corresponding downturn in the regions bordering the UK. By contrast, the trade outperformance of the southern border regions fell sharply over the same period, from 320% (494% for transport corridors) in 1978 to 103% (123% for transport corridors) in 2000 (see Figure 3-d). As this trend still holds true, once the regions bordering the UK are considered (see Figure 3-e), the outlook of a downturn can be enlarged to all the border regions located at the western periphery of Europe. However, slowdowns seem to have occurred namely around the time of the main integration episodes, i.e. just before the Single European Act of 1986, when Spain entered the EU, and just after the Schengen agreement.

Why does the trade outperformance of French border regions decrease at the western and southern periphery of Europe, while it increases around the EU core? In Section 4.2., we investigate the role of multinationals in shaping such differentials.

4.2. The interplay between trade performances and FDI: 1993-2000

This section aims at assessing the share of trade differentials explained by multinational location strategies over the 1993-2000 period, for which FDI stocks are available for the French regions. As in Subsection 4.1., we first examine the average impact of FDI on trade performances for the entire period. Then we interact the explanatory variables with a time trend to analyze changes over time. Tables 3 and 4 display the results of this first set of estimations. As a benchmark, column B in Table 3 reports on the OLS estimates for equation (10), without FDI, drawn from the 1993-2000 sample of pooled exports and imports. Column P provides the 2SLS estimates for structural equation (13), whereas column P1 (respectively P2) interacts FDI with the first-order (respectively second-order) border region dummy in order to separate out its impact for border and interior regions. Likewise, column P3 interacts FDI with a core border region dummy (defined independently of the partner country),[20] so as to assess whether trade differentials exist due to the presence of foreign investors either from the neighboring country or from the other countries in the sample. Table 4 presents similar results for the sample of exports (columns X, X1, X2 and X3) and imports (columns M, M1, M2 and M3) respectively.

INSERT TABLE 3

INSERT TABLE 4

There is a strong positive relationship between inward multinational activity and trade, which means that FDI is a complement to rather than a substitute for trade in our European context. A 10% increase in the FDI stock implies a 5.3% increase in trade with the parent country (see Table 3). However, the net complementarity is significantly larger for exports (8%) than for imports (2.6%), which casts doubt on the model’s assumption that part of the consumer preference bias transits through FDI (see Table 4). As the α estimates are not significantly different from 0 in most import specifications, this could be evidence that border regions are mostly platforms for exports to neighboring countries.[21]

More importantly, we see that augmenting the gravity specification with FDI greatly reduces the coefficient of the $bord_1$ variable. For border regions defined with a strict contiguity criterion, the deviation from the gravity norm falls from 64.9% $([exp(0.50)-1]\times 100)$ to 31% $([exp(0.27)-1]\times 100)$, whereas transport corridors post a similar fall in their lead position, from 89.6% $([exp(0.64)-1]\times 100)$ to 36.3% $([exp(0.31)-1]\times 100)$. When FDI is accounted for in the regression, transport corridors no longer outperform in exports. Therefore, nearly half of the higher trade performance of border regions is due to the presence of foreign investors from the nearby country.[22]

However, the elasticity of trade with respect to FDI is significantly larger for interior regions (0.61) than for border regions (0.31 or 0.20 depending on the underlying definition). Because interior regions are, on the whole, less attractive than border regions, the marginal gains of attracting new investments is more pronounced. Nonetheless, bear in mind that the regions sharing a frontier with another country host an average of some 14 times more investments from this country than interior regions. Whereas the trade-expanding effect of each additional affiliate is greater for interior than for border regions, this is compatible with FDI having a trade-creating impact larger on the latter than on the former. When we break down the analysis into a further two groups of border regions, we find that FDI is more trade-creating at the border of the EU core than anywhere else: the estimated elasticity is significantly positive and high, at about 0.6.

Lastly, the distance coefficient also decreases when FDI is included in the gravity specification, which means that distance conveys the effects of variables that are negatively correlated with FDI. Therefore, spatial proximity matters for trade, but in quite a complex manner that transcends the impact of shipment costs or « physical» geography alone.

Table 5 provides further insight into the dynamics observed for the 1993-2000 period. As before, the main explanatory variables are interacted with a time trend. Column (B) reports on the results of estimating equation (10) for the 1993-2000 sub-sample of pooled flows without including FDI in the specification (same as column B in Table 3). Columns P, P1 and P2 show the 2SLS coefficients drawn from estimating equation (13) on pooled exports and imports, for different border-FDI interactions.[23]

INSERT TABLE 5

The significantly negative coefficient associated with the interacted FDI time-trend variable, at -0.13, provides robust evidence that the trade-creating effect of FDI diminishes over time. So there is a clear increasing gravitation of foreign firms towards the French market. It might well be that the affiliates either sell more to French consumers and firms, or buy more from French suppliers. In any case, affiliates trade less with the country of origin over time, which suggests that horizontal motives come to prevail over vertical motives. The erosion of the trade-expanding impact of foreign investment is less dramatic for border regions than for the others. Overall, the FDI border time-trend coefficient is at -0.08, as against -0.15 for the interior. Yet, somewhat surprisingly, foreign investors located in “gateway” regions do not convey any specific trade advantage. A plausible explanation would be that the French border regions located at the periphery of Europe did not benefit from any major cross-border transport developments from 1993 to 2000, whereas their communications with the north of France (in the form of new highways and railroad infrastructures) improved considerably. Hence, the trade orientation of these regions shifted from neighboring countries (Spain and Italy) to the French northern market, which became more accessible over time.

5. Conclusion

In this paper, we use an augmented gravity model to explain the geography of trade within France over the 1978-2000 period. Firstly, we compare the trade performances of 94 regions based on their geographic position in relation to a bloc of five countries neighboring France, during their ongoing process of European integration. We find that the regions sharing a frontier with another country trade on average as much as 73% more with this partner than other regions, once we have controlled for own region-specific and country-specific characteristics and bilateral distance. As European integration progressed, the French border regions located near the EU core generated new trade surpluses, whereas those located at the western periphery of Europe did not. Even though temporary gains were derived from integration shocks such as the Single European Act, the Schengen Agreement and the Maastricht Treaty, they were not sufficient to counteract the sharp long-term decline suffered by the southern French regions bordering Spain and Italy.

Secondly, we assess how much of these trade differentials can be explained by the location strategy of foreign investors from the five countries studied. The spatial distribution of inward FDI across French regions, like its post-integration trends, partially explain these differentials. We find that inward FDI is on average trade-expanding, independently of both the country source and the geographic position of the regions. Bearing in mind that trade and outsourcing are complements whereas horizontal FDI is clearly a substitute for trade, this can be taken as evidence that FDI from French bordering countries is mostly vertically motivated. The induced additional trade is larger for border regions than for their interior counterparts. However, the marginal effect of FDI is stronger for interior than for border regions, excepting those located around the EU core (*e.g.* at the north-eastern frontier of Belgium-Luxembourg and Germany), which benefit from a higher percentage of investments from all country sources. Over time, the trade-creating effect of inward FDI decreases. This may indicate an increasing gravitation of foreign firms towards the French market and hence, a downward prevalence of vertical motives, and this trend is even more pronounced for the Spanish and Italian investors.

However, inward FDI is not the only explanation for regional differentials in trade. Even once we have controlled for the over-representation of foreign investments in border regions, those still outperform interior regions. Although it is largely beyond the scope of this paper to properly investigate the determinants of remaining differentials, simple conjectures can provide useful insights. A plausible explanation would be that a dyadic variable distinct from inward FDI, also potentially sensitive to proximity, might be specifically trade-expanding for border regions. Although an obvious prime candidate is outward FDI, the most plausible candidate is cross-border migrations. As shown by some empirical studies, such as WAGNER *et al.* (2002), COMBES *et al.* (2005) and BRIANT *et al.* (2009), the preferences of immigrants might be biased towards the home country, and their presence in a recipient region might convey better information on the trade partner country. If border regions benefit from a higher percentage of immigrants from nearby countries, due to labor/capital complementarity (as suggested for instance by BUCH *et al.*, 2006 for German FDI), or because of cultural, language and spatial proximity, which allows them to become assimilated more easily while keeping active ties with their family, this could generate higher growth in trade with the home country. However, time-series data on regional immigration stocks by country source are lacking and this conjecture cannot be associated properly with European integration.

In practice, the results presented in our paper may provide some pointers for the new cross-border cohesion policy action for 2007-2013. Although European regional policies are designed to offset possible post-integration inequalities, the losses suffered at the periphery of *western* Europe seem to have been concealed by academic research to the benefit of eastward enlargement prospects. Policy initiatives such as the summit of the French and Spanish governments in Zaragoza (December 2004), which steered both countries' agendas towards new cross-border infrastructure developments, would have warranted more support in that respect.

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Appendix A: Data sources

Trade

Each year since 1978, decentralized French customs agencies have recorded the trade flows between the 94 French NUTS3 regions and some 200 countries worldwide. The origins of trade flows are the regions where shipments are produced and loaded before being dispatched to destination countries, which themselves correspond to the locations where commodities are consumed. Transit shipments being unaccounted for, we only observe around 50% of total trade between regions and countries.[24]

The data set includes trade values in euros and is originally available at a highly detailed industry level (176 industries) and for five transport modes (air, sea, rivers, railroad and road).[25] 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 homogeneous throughout the entire period of study. Therefore, we work on trade aggregated over all transport modes. Moreover, since the number of observations was low for some industries, we also aggregate trade across industries.

Inward FDI

The data on inward FDI comes from the Agence française pour les investissements internationaux (AFII), the French Agency for international investments. It is drawn from a comprehensive search by web-crawlers of public announcements of new investments from a variety of sources (such as press releases, newspapers or LexisNexis).[26] This agency reports on annual inward bilateral investments from different countries worldwide, for twenty broad categories of industries.[27] Moreover, three different measures of FDI are available for each investment: the number of jobs created or maintained and the investment value (in millions of euros). The data sample for the 1993-2000 period contains 3900 investments from 47 countries worldwide.

To prevent any distortive pattern arising from the huge proportion of headquarters in the Paris region, we use three types of investments only: Production/Assembly, Retail/Logistics and Sales offices. Once aggregated over industries, our sample is reduced down to 1,823 bilateral observations. Lastly, investments are cumulated from the first observation year (1993) up to the year observed in order to obtain the regional FDI stocks.[28]

Distance

To compute bilateral distances between region i and country J, we use the latitude and longitude of their capitals' centroid (provided by the software Mapinfo). We then apply the geodesic (i.e. the shortest route between two points on the Earth's surface) distance formula.

Appendix B: Location and definition of border regions

INSERT FIGURE 4

B.1. First-order border regions: contiguity criterion ($bord_1$ "All")

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

French NUTS3 bordering Belgium-Luxembourg: Nord, Aisne, Ardennes, Meuse, Meurthe et Moselle, and Moselle.

French NUTS3 bordering Germany: Moselle, Bas-Rhin, and Haut-Rhin.

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

French NUTS3 bordering Spain: Pyrénées Atlantiques, Hautes-Pyrénées, Haute-Garonne, Ariège, and Pyrénées Orientales.

French NUTS3 bordering Italy: Haute-Savoie, Savoie, Hautes-Alpes, Alpes-de-Haute-Provence, and Alpes Maritimes.

B.2. First-order border regions: gateway criterion ($bord_1$ “Transport corridors only”)

We define as transport corridors those border regions that can be reached easily despite natural barriers (mountains and seas), i.e. the NUTS3 regions with major cross-border transport infrastructures, such as highways, tunnels and industrial harbors, at the beginning of our period of study (1978). This definition gives rise to the following list of NUTS3 border regions:

> French NUTS3 bordering Spain: Pyrénées Atlantiques (the Biriatou pass-road, highway since 1975), Pyrénées Orientales (Le Perthus pass-road, highway since 1978).
>
> French NUTS3 bordering Italy: Haute-Savoie (Mont-Blanc Tunnel since 1965), Savoie (Tunnels of Frejus (road and railroad) and Mont-Cenis (railroad since 1870s), Hautes-Alpes (Montgenèvre pass-road since 1850), Alpes Maritimes (Tende pass-road since 1882, Vintimille highway and tunnel of since 1980).
>
> French NUTS3 bordering United Kingdom: Pas-de-Calais (Calais harbor), Nord (Dunkirk harbor), Seine-Maritime (Le Havre and Rouen harbors).

B.3. Regions bordering the EU core (core dummy)

All NUTS3 bordering Belgium-Luxembourg and Germany: Nord, Aisne, Ardennes, Meuse, Meurthe-et-Moselle, Moselle, Bas-Rhin, and Haut-Rhin.

Table 1: Trade performance in French border regions

	Dependent Variable: log of trade value					
Border regions:	All			Transport corridors only		
Model:	P	X	M	P	X	M
$\ln(dist)$	-0.59^{a}	-0.48^{a}	-0.70^{a}	-0.61^{a}	-0.44^{a}	-0.78^{a}
	(0.02)	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)
$bord_1$	0.55^{a}	0.32^{a}	0.78^{a}	0.83^{a}	0.61^{a}	1.04^{a}
	(0.03)	(0.04)	(0.05)	(0.04)	(0.04)	(0.05)
$bord_2$	0.23^{a}	0.09^{b}	0.36^{a}	0.27^{a}	0.17^{a}	0.37^{a}
	(0.03)	(0.04)	(0.03)	(0.02)	(0.04)	(0.03)
N	21,620	10,810	10,810	21,620	10,810	10,810
R^2	0.842	0.864	0.882	0.844	0.867	0.885

Notes: (i) Specification estimated: $\ln(c_{iJt}) = \theta + f_{it} + f_{Jt} + f_t - \delta \ln(dist_{iJ}) + \beta_1 bord_{1iJ} + \beta_2 bord_{2iJ} + \varepsilon_{iJt}$. (ii) Heteroskedasticity-robust standard errors in brackets, with ^{a} and ^{b} denoting significance at the 1% and 5% levels, respectively. (iii) Fixed-effects are not reported.

Table 2: Time changes in the trade performances of French border regions

	Dependent Variable: log of trade value					
Border regions:	All			Transport corridors only		
Model:	P	X	M	P	X	M
$\ln(dist)$	-0.62^{a}	-0.46^{a}	-0.79^{a}	-0.64^{a}	-0.45^{a}	-0.84^{a}
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
$bord_1$	0.64^{a}	0.40^{a}	0.88^{a}	0.94^{a}	0.70^{a}	1.19^{a}
	(0.05)	(0.06)	(0.07)	(0.06)	(0.07)	(0.10)
$bord_1 \times t$	-0.01^{a}	-0.01	-0.01^{a}	-0.01^{a}	-0.01^{b}	-0.02^{a}
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
$bord_2$	0.14a	0.04	0.25^{a}	0.30^{a}	0.14^{b}	0.46^{a}
	(0.03)	(0.04)	(0.03)	(0.04)	(0.06)	(0.05)
$bord_2 \times t$	0.01^{a}	0.01^{a}	0.01^{a}	0.00^{c}	0.00	-0.01^{a}
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
N	21,620	10,810	10,810	21,620	10,810	10,810
R^2	0.879	0.904	0.921	0.881	0.906	0.923

Notes: (i) Specification estimated:

$$\ln(c_{iJt}) = \theta + f_{it} + f_{Jt} + f_t - \delta \ln(dist_{iJ}) + \beta_1 bord_{1iJ} + \gamma_1 bord_{1iJ} \times t + \beta_2 bord_{2iJ} + \gamma_2 bord_{2iJ} \times t + \varepsilon_{iJt}.$$

(ii) Heteroskedasticity-robust standard errors in brackets, with ^{a}, ^{b} and ^{c} denoting significance at the 1%, 5% and 10% levels, respectively. (iii) Fixed-effects are not reported.

Table 3: The average trade-expanding impact of FDI on pooled flows

	Dependent Variable: log of trade value									
Border regions:	All					Transport corridors only				
Model:	B	P	P1	P2	P3	B	P	P1	P2	P3
$\ln(dist)$	-0.57^{a}	-0.45^{a}	-0.45^{a}	-0.44^{a}	-0.50^{a}	-0.65^{a}	-0.53^{a}	-0.51a	-0.53^{a}	-0.57^{a}
	(0.03)	(0.05)	(0.05)	(0.06)	(0.07)	(0.03)	(0.05)	(0.05)	(0.07)	(0.08)
$bord_1$	0.50^{a}	0.27^{a}	0.56^{a}	0.22^{c}	0.27^{a}	0.64^{a}	0.31^{b}	0.85^{a}	0.32^{c}	0.31^{b}
	(0.04)	(0.09)	(0.07)	(0.12)	(0.09)	(0.05)	(0.13)	(0.12)	(0.19)	(0.13)
$bord_2$	0.26^{a}	0.23^{a}	0.21^{a}	0.29^{a}	0.23^{a}	0.22^{a}	0.17^{a}	0.16^{a}	0.16b	0.18^{a}
	(0.03)	(0.04)	(0.04)	(0.06)	(0.04)	(0.03)	(0.04)	(0.04)	(0.07)	(0.04)
$\ln(1+fdi)$		0.53^{a}					0.51^{a}			
		(0.17)					(0.19)			
$\ln(1+fdi)\times bord_1$			0.31^{a}					0.20		
			(0.11)					(0.13)		
$\ln(1+fdi)\times(1-bord_1)$			0.61^{a}					0.61^{a}		
			(0.20)					(0.21)		
$\ln(1+fdi)\times bord_2$				0.51^{a}					0.51^{a}	
				(0.17)					(0.17)	
$\ln(1+fdi)\times(1-bord_2)$				0.63^{a}					0.50^{c}	
				(0.23)					(0.27)	
$\ln(1+fdi)\times core$					0.60^{a}					0.57^{a}
					(0.14)					(0.16)
$\ln(1+fdi)\times(1-core)$					0.30					0.27
					(0.31)					(0.33)
N	7520	7520	7520	7520	7520	7520	7520	7520	7520	7520
R^2	0.857	0.845	0.841	0.838	0.852	0.858	0.846	0.841	0.846	0.853
Hausman (*Prob>F*)		0.0115	0.0002	0.0071	0.0000		0.0195	0.0004	0.0012	0.0000

Notes: (i) Specification estimated: $\ln(c_{iJt}) = \theta + f_{it} + f_{Jt} + f_t - \delta\ln(dist_{iJ}) + \alpha\ln(1+fdi_{iJt}) + \beta_1 bord_{1iJ} + \beta_2 bord_{2iJ} + \varepsilon_{iJt}$.
(ii) Heteroskedasticity-robust standard errors in brackets, with ^{a}, ^{b} and ^{c} denoting significance at the 1%, 5% and 10% levels, respectively. (iii) Fixed-effects are not reported. (iv) "Hausman" provides the p-value of the Fisher test for significance of $\hat{\xi}_{iJt}$ drawn from equation (12). A p-value < 0.05 means that the null of the FDI exogeneity is rejected at the 5% significance level.

Table 4: The average trade-expanding impact of FDI on exports and imports

	Dependent Variable: log of trade value															
Border regions:	All								Transport corridors only							
Model:	X	M	X1	M1	X2	M2	X3	M3	X	M	X1	M1	X2	M2	X3	M3
$\ln(dist)$	-0.28^{a}	-0.62^{a}	-0.28^{a}	-0.62^{a}	-0.25^{b}	-0.62^{a}	-0.28^{b}	-0.71^{a}	-0.30^{a}	-0.75^{a}	-0.29^{a}	-0.73^{a}	-0.28^{a}	-0.78^{a}	-0.29^{a}	-0.86^{a}
	(0.08)	(0.06)	(0.08)	(0.06)	(0.10)	(0.07)	(0.11)	(0.09)	(0.08)	(0.06)	(0.09)	(0.07)	(0.11)	(0.08)	(0.13)	(0.11)
$bord_1$	-0.04	0.58^{a}	0.27^{a}	0.84^{a}	-0.13	0.57^{a}	-0.04	0.58^{a}	-0.12	0.75^{a}	0.37^{a}	1.33^{a}	-0.21	0.85^{a}	-0.12	0.74^{a}
	(0.13)	(0.11)	(0.08)	(0.13)	(0.18)	(0.15)	(0.13)	(0.12)	(0.20)	(0.17)	(0.11)	(0.25)	(0.31)	(0.25)	(0.20)	(0.19)
$bord_2$	0.15^{a}	0.30^{a}	0.14^{a}	0.29^{a}	0.26^{a}	0.31^{a}	0.15^{a}	0.31^{a}	0.07	0.27^{a}	0.06	0.26^{a}	0.14	0.18^{b}	0.06	0.29^{a}
	(0.05)	(0.05)	(0.05)	(0.05)	(0.08)	(0.07)	(0.05)	(0.05)	(0.06)	(0.05)	(0.06)	(0.05)	(0.10)	(0.09)	(0.07)	(0.06)
$ln(1+fdi)$	0.80^{a}	0.26							0.88^{a}	0.14						
	(0.27)	(0.21)							(0.30)	(0.22)						
$ln(1+fdi)\times bord_1$			0.57^{a}	0.06							0.60^{a}	-0.19				
			(0.16)	(0.15)							(0.19)	(0.19)				
$ln(1+fdi)\times(1-bord_1)$			0.88^{a}	0.33							0.97^{a}	0.24				
			(0.30)	(0.24)							(0.34)	(0.26)				
$ln(1+fdi)\times bord_2$					0.76^{a}	0.25							0.86^{a}	0.16		
					(0.28)	(0.20)							(0.30)	(0.21)		
$ln(1+fdi)\times(1-bord_2)$					0.98^{a}	0.29							1.00^{b}	0.00		
					(0.37)	(0.27)							(0.46)	(0.33)		
$ln(1+fdi)\times core$							0.79^{a}	0.41^{b}							0.87^{a}	0.26
							(0.21)	(0.18)							(0.26)	(0.21)
$ln(1+fdi)\times(1-core)$							0.81^{c}	-0.22							0.94^{c}	-0.41
							(0.48)	(0.40)							(0.55)	(0.45)
N	3760	3760	3760	3760	3760	3760	3760	3760	3760	3760	3760	3760	3760	3760	3760	3760
R^2	0.844	0.909	0.837	0.907	0.818	0.909	0.842	0.901	0.830	0.911	0.823	0.908	0.812	0.909	0.822	0.891
Hausman ($Prob > F$)	0.0002	0.6140	0.0007	0.0057	0.0005	0.3218	0.0000	0.0000	0.0001	0.9949	0.0004	0.0053	0.0000	0.1427	0.0000	0.0000

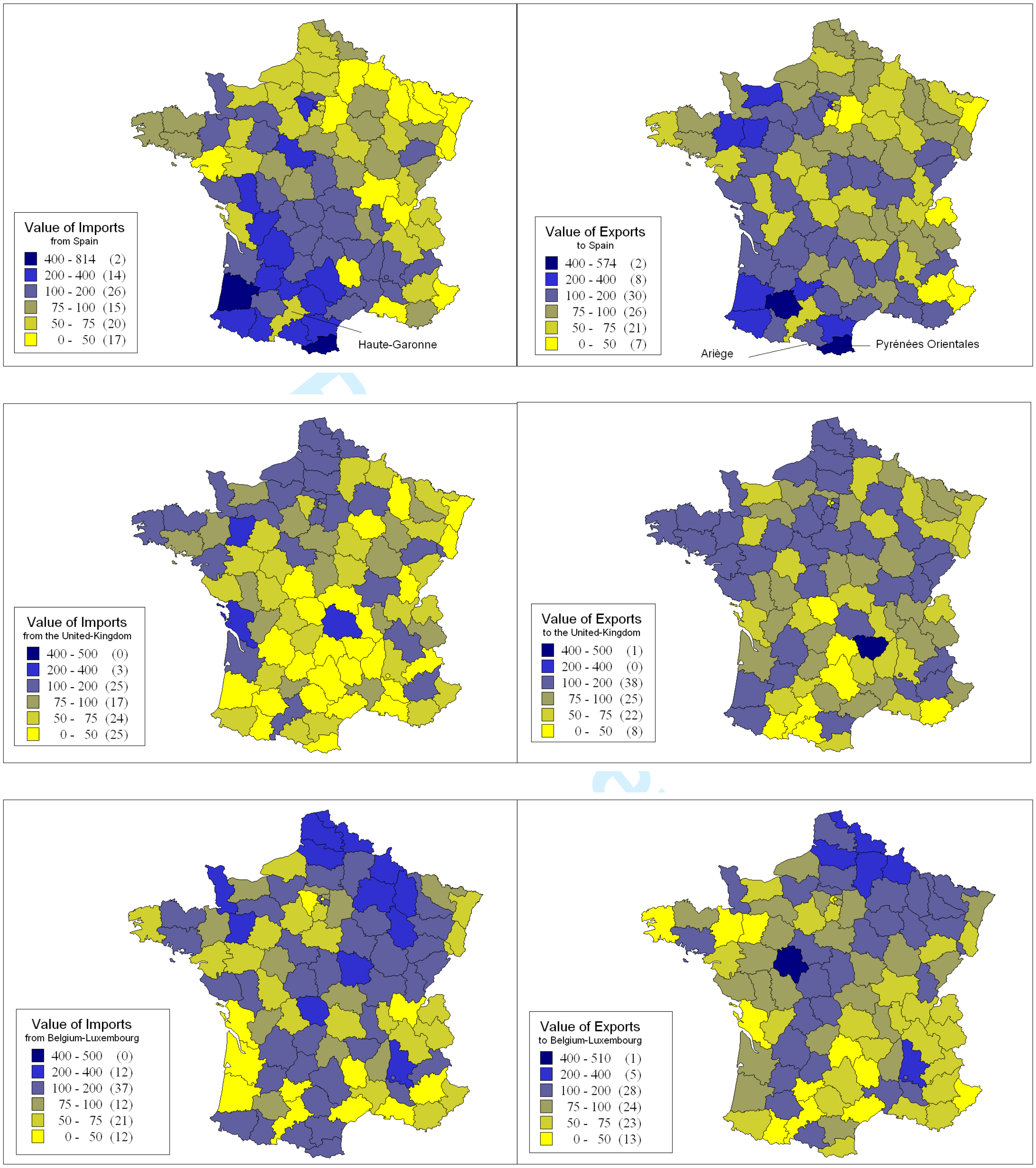
Notes: (i) Heteroskedasticity-robust standard errors in brackets, with ^{a}, ^{b} and ^{c} denoting significance at the 1%, 5% and 10% levels, respectively. (ii) Fixed-effects are not reported. (iii) “Hausman” provides the p-value of the Fisher test for significance of $\hat{\hat{\xi}}_{iJt}$ drawn from equation (12). A p-value < 0.05 means that the null of the FDI exogeneity is rejected at the 5% significance level.

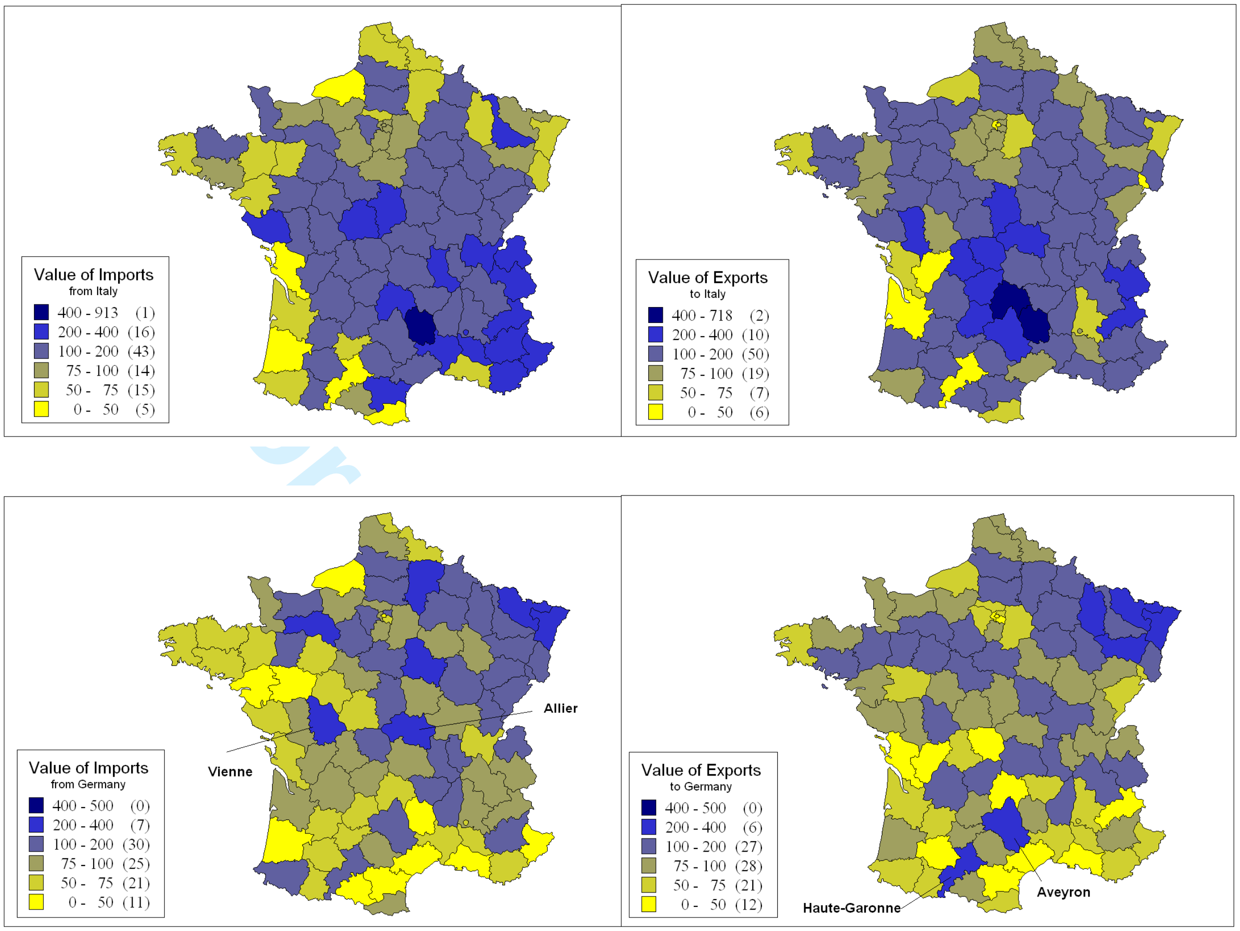
Table 5: Time changes in the trade-expanding impact of FDI (pooled flows)

	Dependent Variable: log of trade value							
Border regions:	All				Transport corridors only			
Model:	B	P	P1	P2	B	P	P1	P2
$\ln(dist)$	-0.57^{a}	-0.45^{a}	-0.46^{a}	-0.51^{a}	-0.73^{a}	- 0.53^{a}	-0.54^{a}	-0.60^{a}
	(0.03)	(0.05)	(0.05)	(0.08)	(0.02)	(0.05)	(0.05)	(0.08)
$bord_1$	0.50^{a}	0.30^{a}	0.53^{a}	0.32^{a}	0.56^{a}	0.35^{a}	0.90^{a}	0.37^{a}
	(0.04)	(0.09)	(0.09)	(0.09)	(0.05)	(0.13)	(0.18)	(0.13)
$bord_2$	0.26^{a}	0.24^{a}	0.24^{a}	0.25^{a}	0.22^{a}	0.18^{a}	0.18^{a}	0.20^{a}
	(0.03)	(0.04)	(0.04)	(0.04)	(0.06)	(0.04)	(0.04)	(0.04)
$\ln(1+fdi)$		1.15^{a}				1.08^{a}		
		(0.34)				(0.34)		
$\ln(1+fdi)\times t$		-0.13^{a}				-0.12^{a}		
		(0.04)				(0.04)		
$\ln(1+fdi)\times bord_1$			0.67^{a}				0.31	
			(0.19)				(0.23)	
$\ln(1+fdi)\times bord_1\times t$			-0.08^{a}				-0.05^{c}	
			(0.03)				(0.03)	
$\ln(1+fdi)\times(1-bord_1)$			1.26^{a}				1.15^{a}	
			(0.38)				(0.36)	
$\ln(1+fdi)\times(1-bord_1)\times t$			-0.15^{a}				-0.13^{a}	
			(0.06)				(0.05)	
$\ln(1+fdi)\times core$				1.11^{a}				1.01^{a}
				(0.29)				(0.31)
$\ln(1+fdi)\times core\times t$				-0.11^{a}				-0.10^{a}
				(0.04)				(0.04)
$\ln(1+fdi)\times(1-core)$				0.93^{b}				0.81^{c}
				(0.45)				(0.45)
$\ln(1+fdi)\times(1-core)\times t$				-0.15^{a}				-0.14^{a}
				(0.05)				(0.05)
N	7520	7520	7520	7520	7520	7520	7520	7520
R^2	0.857	0.843	0.843	0.847	0.857	0.845	0.845	0.849

Notes: (i) Heteroskedasticity-robust standard errors in brackets, with ^{a}, ^{b} and ^{c} denoting significance at the 1%, 5% and 10% levels, respectively. (ii) Fixed-effects are not reported.

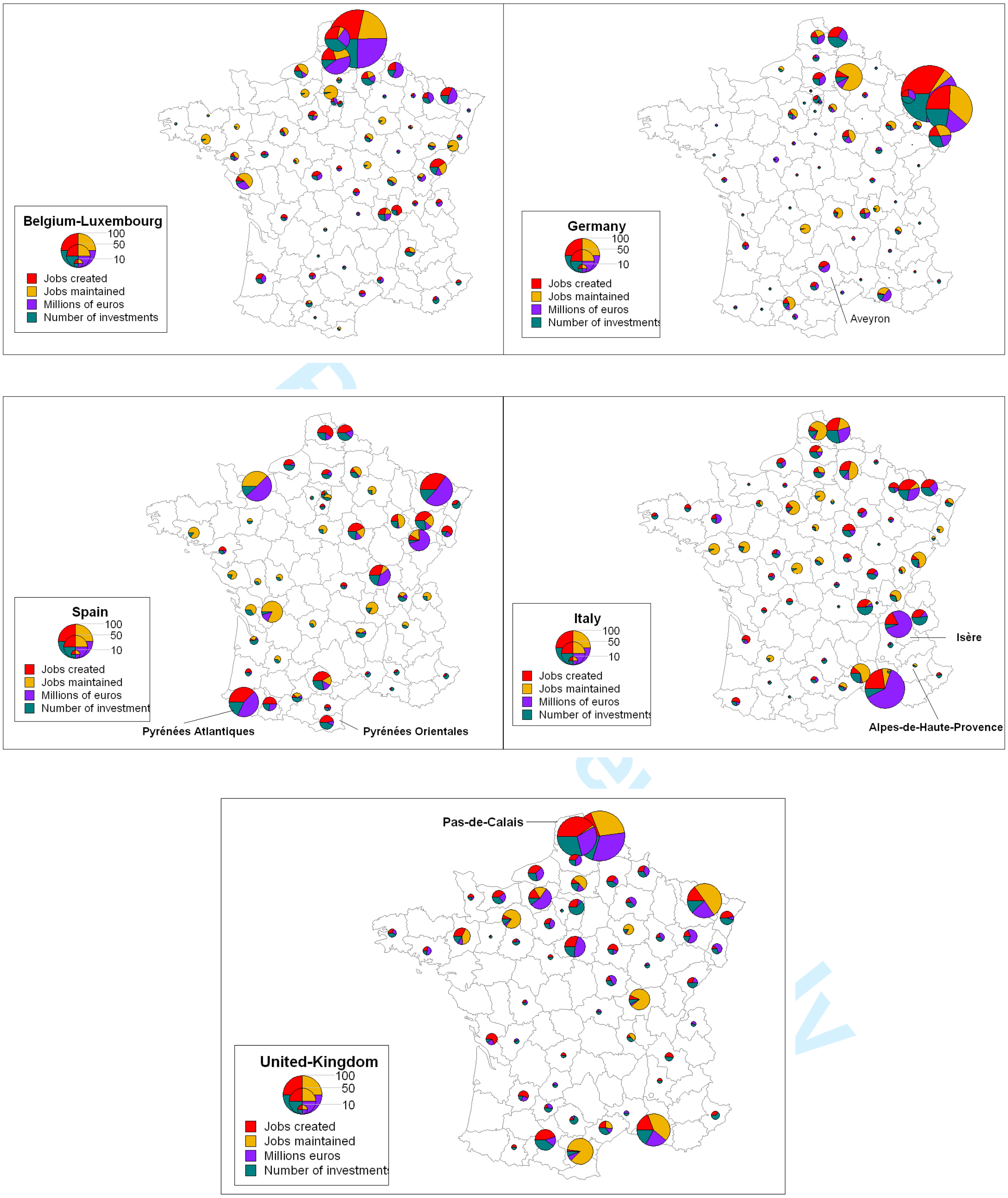
Figure 1: Trade specialization of French regions in 2000





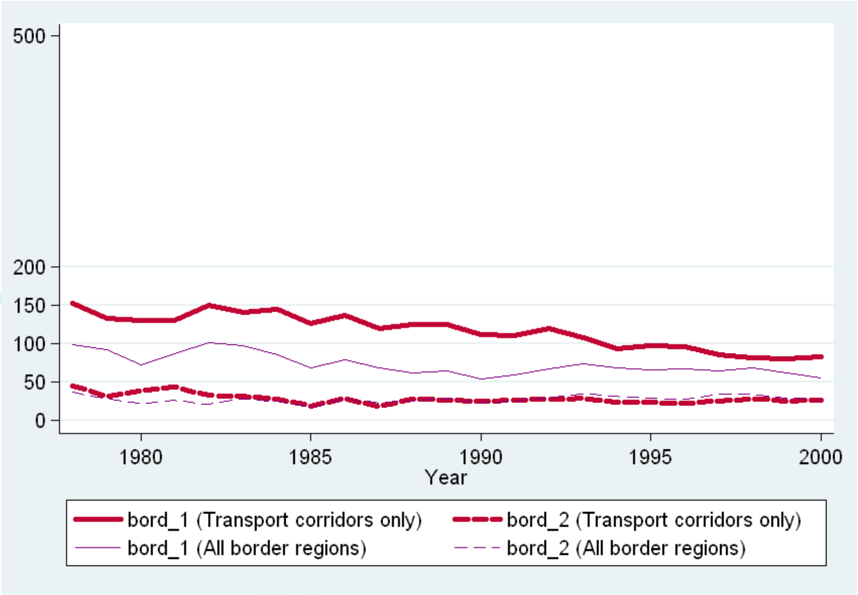
Source: French Ministry of Ecology, Energy, Sustainable Development and Sea (SITRAM database). See Appendix A for further details.

Figure 2: Regional stocks of FDI by country source in 2000 (in % of total FDI from the country)

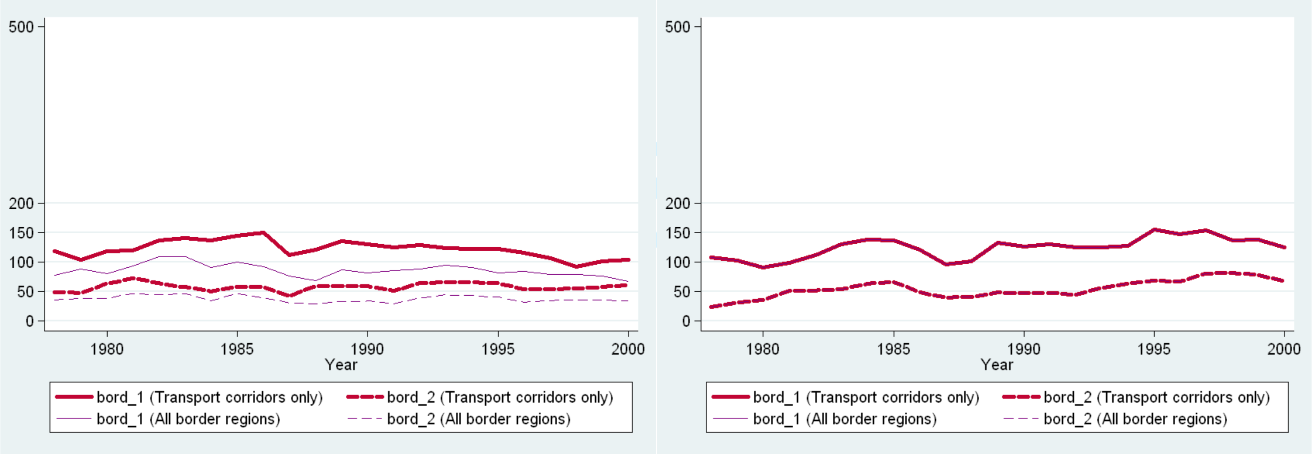


Source: Agence Française pour les Investissements Internationaux (FDI stocks computed for productive activities only and cumulated over 1993-2000). See Appendix A for further details.

Figure 3: Trade outperformance of French border regions (deviations from the gravity norm) by group of partner countries

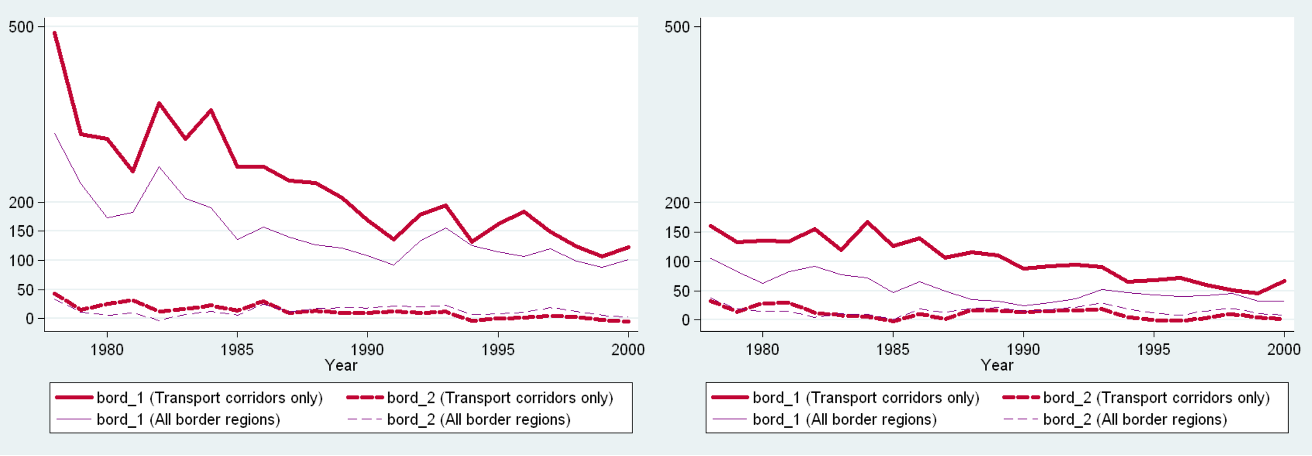


3-a Average



3-b Northern border of EU

3-c Border of EU core



3-d Southern border of EU

3-e Border of EU periphery

Figure 4: French NUTS2 and NUTS3 regions

Notes

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[1] See NIEBUHR and STILLER (2004) for a comprehensive survey.

[2] As we are looking at trade differentials depending on whether regions border a country or not, we examine only the six EU countries neighboring France: Belgium, Luxembourg, Germany, the United Kingdom, Spain and Italy. Due to data constraints, we treat Belgium and Luxembourg as a single partner country to French regions. Appendix A presents the data sources.

[3] A word of caution is called for here. Under the Hillman condition, the index values are interpretable with respect to the 100 cut-off only.

[4] Appendix A presents the data sources.

[5] See COMBES and LAFOURCADE (2005) for a more detailed picture of the relative transport accessibility of French regions.

[6] As is well known, the German firm Bosch has a production site located in Rodez (Aveyron).

[7] In the rest of the paper, small letters will refer to regions and capital letters to countries. The subscript t indicates that the variable is time-variant.

[8] This term is zero in our empirical analysis because free trade agreements removed all existing tariffs between France and its neighboring EU trade partners prior to 1978.

[9] The direction of FDI is therefore assumed to be the same as imports. A proper modeling of border barriers would require the addition of the outward stock, fdi_{Jit}, which would give rise to more plausible asymmetric trade costs.

[10] FORTE (2004) presents an exhaustive survey of both the theoretical and empirical literature on this issue.

[11] See, among others, BERNARD *et al.* (2003), MELITZ (2003), and HELPMAN *et al.* (2004).

[12] Empirically, including fixed-effects is the most widely accepted means of obtaining theory-consistent estimates for gravity equations. See, for instance, BERGSTRAND (1985), HUMMELS (1999), and ANDERSON and VAN WINCOOP (2003).

[13] In standard empirical analysis (discrete choice or gravity models), FDI specifications include a set of variables relating to the recipient region (local taxes, wages, GDP, etc.) and to the home country. We cannot use such variables as instruments here, because they are already captured by either f_{it} or f_{Jt}.

[14] COMBES and LAFOURCADE (2005) provide a full description of this variable.

[15] See Appendix B for detailed listing and mapping.

[16] With respect to the UK, we consider all regions bordering the English Channel.

[17] See Appendix B for detailed listing and mapping. To avoid any bias due to possibly simultaneous trade and infrastructure endowments, we consider only the transport infrastructures built before the period under study.

[18] Estimation tables are available on request. Unless mentioned, the β_i coefficients are significantly different from zero at the 5% level at least.

[19] For instance, transport connections were improved between Spain and the French border regions of “Ariège” and between Italy and the French border region of “Alpes-de-Haute-Provence”, with the opening of the Puymorens tunnel and the Larche pass-road in 1994.

[20] So *core* is a dummy taking the value 1 whenever trade observed relates to a region located at the Belgium-Luxembourg or the German border (regardless of whether trade concerns these countries or not). See Appendix B for a list of these regions.

[21] In most of the estimations, we cannot reject the null of exogeneity of FDI at the 5% significance level, which means that 2SLS are consistent estimators. Incidentally, in all the first-stage regressions, market potential exerts a large and significant positive impact on FDI, which gives us confidence in the validity of this instrument.

[22] By contrast, multinational activities only slightly affect the coefficient for second-order border

regions.

[23] A separate analysis of exports and imports can be found in LAFOURCADE and PALUZIE (2008).

[24] Data also exist on French intra-national trade flows. Unfortunately, their collection is not free from transit and intermediate loading issues, so we cannot simply add them to customs data to obtain an overall picture of both the intra- and inter-national trade patterns.

[25] We disregard postal, pipelines and other specific shipments.

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

[27] Top of the list of which are electronics, chemicals, automobile construction and food industries.

[28] These incorrectly approximate “true FDI” stocks, especially in the case where parent firms close their affiliates in the meantime. However, due to standard disclosure issues, we cannot control for this bias.