

MARKET SIZE AND GEOGRAPHICAL ADVANTAGE

Sylvia D. Gottschalk (YE)¹

Abstract: This paper examines the geographical distribution of firms within integrating countries, when regions differ in market sizes and in location with respect to a foreign manufacturing core. We found that geographical proximity of a poor region to the core allows the latter's manufacturing industry to expand when trade costs are very low. However, at intermediate trade costs, regional market size is a stronger determinant of the location of industries. Firms are less likely to locate in small regions close to larger cores than in large peripheral regions. Proximity may expose local industries to increased competition from imports and lead firms to leave the region. Regional policies which finance infrastructure in a small region and increases its accessibility can thus be detrimental to local industries without a strong local consumer market. The distribution of welfare gains from trade varies according to consumers' geographical location. Consumers located in a poor region but close to a manufacturing core may experience higher welfare gains than consumers located in the peripheral region.

Keywords: Trade integration, industrial location, regional policies.

JEL classification: F12, F15, R12

1 Introduction

Regional policies in the European Union have mostly been used to finance new infrastructure in ailing regions. Resources for regional policies represented up to 0.45% of the EU GDP in 1999 and up to 3% of GDP for some countries of the Cohesion Group (Greece, Ireland, Portugal and Spain). However, recent studies of the impact of EU's policies on regional inequality and

¹National Institute of Economic and Social Research, 2 Dean Trench Street, Smith Square, London SW1P 3HE. e-mail:sgottschalk@niesr.ac.uk. This paper draws on a chapter of my PhD dissertation. I am indebted to Alasdair Smith, M. Gasiorek and A. Venables for valuable discussions and comments. I am responsible for any remaining errors.

economic development suggest that regional policies may not be delivering. Martin (2000) and Hurst, Thisse, and Vanhoudt (2000), for instance, have concluded that new infrastructure linking lagging regions and manufacturing cores have ambiguous effects on lagging regions' industries. On the one hand, they may benefit from better access to new consumer markets and firms may relocate from the core to the ailing region. On the other hand, they may be exposed to increased competition from imports and local firms may then relocate away from the region to the manufacturing core. Abruzzo in Italy is an example of a relatively less developed region where investment in infrastructure has successfully increased the number of locally-owned plants. In Galicia, Spain, similar investments have not succeeded in changing the local economy.

Empirical studies of the regional impacts of recent European integration-1980s onwards- also indicate the existence of a trade-off between regional equity and a country's aggregate growth. Analysing three countries of the Cohesion group Quah (1996) finds that Spain and Portugal have achieved the highest rates of growth and also experienced a sharp increase in regional inequality. Greece, on the contrary, has had low rates of growth and no rise in regional disparities. DeLa Fuente and X.Vives (1995) suggest that during the 1980s and 1990s per capita income differentials have been narrowing between countries but widening between regions within individual countries. They find that around half the income inequality existing between the regions of the EU is accounted for by domestic inequality between regions of individual EU members.

Few papers in the 'new economic geography' literature tackle these issues. Krugman (1993) proposes a three-region model with asymmetric transport costs between regions and shows that the region or the country with better access to other locations agglomerates manufacturing production. In a two-country model where the level of demand for manufactures is positively related with the quality of domestic infrastructure, Martin and Rogers (1995) show that domestic infrastructure differentials strongly influence the location of manufacturing firms, when international trade costs are lowered. In addition, the lower international trade costs, the more sensitive firms are to the quality of domestic infrastructure. Krugman and R.Livas-Elizondo (1996) analyse how restrictions on trade create huge cities and how trade liberalisation leads to the decentralisation of manufacturing production. Their work was motivated by the 80s Mexican trade liberalisation, which followed decades of import substitution policies characterised by high trade costs. Finally, Puga and Venables (1997) analyse how preferential trade agreements

and hub-and-spoke agreements create manufacturing agglomerations in the countries having better access to other countries' markets.

Like most papers of the 'new economic geography' literature, Martin and Rogers (1995) and Krugman and R.Livas-Elizondo (1996), and Puga and Venables (1997) overlook location in space as a characteristic that differentiates regions. For instance, in Krugman and R.Livas-Elizondo (1996) both regions of Home country are at the same distance from the foreign country. However, the specificity of the US-Mexican example is that Mexican regions differ in terms of their location with respect to the US market, although they can be considered identical in terms of factor endowments, technologies. Trade liberalisation allied with congestion costs/land rents may account for the relocation of Mexican firms from Mexico City. The proximity of the border region to US markets accounts for the concentration of manufacturing production in that region. This fact is not captured by Krugman and R.Livas-Elizondo (1996)'s model, in which any peripheral region could attract defecting firms. In Martin and Rogers (1995) and Puga and Venables (1997) countries are assumed to be points in space, i.e., without distinct domestic regions.

In this paper, we examine the regional distribution of firms and of welfare gains within integrating countries, when regions differ in market sizes and in location with respect to a foreign manufacturing core. We are particularly interested in analysing whether (i) the geographical proximity of the central region to the core allows its manufacturing industry to expand and (ii) whether the distribution of welfare gains from trade varies according to consumers' geographical location. Consumers located in a poor region but close to a manufacturing core may experience higher welfare gains than consumers located in the peripheral region. We add a spatial dimension to the Helpman and Krugman (1985) model by assuming a distance function between countries and regions. The relative location of countries and regions is thus exogenous. This allows us to distinguish between the effects of geographical proximity and market size effects on the location of manufacturing industry. Our results are thus clearer than Krugman and R.Livas-Elizondo (1996)'s results which can be obtained by varying either trade costs or distance. Home country has two regions, a 'periphery' and a 'central' region. The periphery (central region) is located at the longest (shortest) distance from Foreign country. It is important to emphasize that in this paper, 'periphery' is defined exclusively in geographical terms, following the tradition of location theory.

Our main results suggest that regional market size along with geographical location crucially affect the location of industries. A peripheral region with a small number of firms and a limited consumer market is more likely to become deindustrialised than a large peripheral region. Improved market access can be followed by increased competition from goods produced in manufacturing cores, where real wages are also higher. As a result, investments in infrastructure can simply facilitate the migration of firms and factors from the lagging region to the core. However, regions located very close to large manufacturing cores are more likely to be the major winners of economic integration, irrespective of their size. Proximity to a large consumer market may allow the manufacturing industry of the small region to exploit economies of scale. Consumers in these peripheral locations also experience lower gains from trade. The distance from the periphery to the core translates into higher transactions costs on manufactures and consequently, into lower quantities available and higher prices.

Following this Introduction, Section 2 presents the simulations that will be carried out and autarky equilibrium. Hub effects and market size are analysed in Section 3 and welfare issues in Section 4. Section 5 concludes.

2 The model

Two countries lie along a line. Foreign country is at location 0. Home country comprises two regions. Region 1 is at the centre of the line -location 1- and region 2 is at the right end, location 2. Each location is separated by the Euclidean distance $\delta(c_i, c_j) = |c_j - c_i|$. Transaction costs are defined as $T_{ij} = \tau * \delta(c_i, c_j)$, $i \neq j=0,1,2$ where τ represents trade costs and c_i , is the position of location i along the line. Transaction costs are symmetric, with $T_{ij} = T_{ji}$. The transaction cost function reflects the value of trade barriers as a function of the distance between locations.

In order to simplify the analysis, we assume that $\delta(c_i, c_j) = |j - i|$, $i \neq j=0,1,2$ ² As trade is liberalised, region 1, at the central location, has thus equal access to Foreign country and to region 2 ($T_{10} = \tau = T_{12}$). Foreign country and region 2 have better access to region 1 than to each other ($T_{02} = 2\tau$), and at free trade transaction costs between Foreign country and central region are twice as much as transaction costs between the central region and region 2. The particular position of region 1 gives it a geographical advantage. We may also say, following Krugman (1993), that region 1 is a 'transport hub'.

²When $i=j$, $\delta(c_i, c_j)=0$, but T_{ij} is set to 1.

It is worth mentioning that Puga and Venables (1997) and Krugman (1993) use asymmetric trade costs to approximate different spatial locations. Puga and Venables (1997) analyse (i) preferential trade agreements giving two countries better access to each other's market, while restricting access from third countries, and (ii) hub-and-spoke agreements, in which one country ('hub') has better access to other countries ('spoke') than these have to each other. The main drawback of asymmetric trade costs as a proxy for spatial location is that reductions of trade costs affect the relative position of regions. The 'distance' between two regions that are closer to each other in autarky may increase if one joins a trade bloc, although relative geographical position of these regions should remain unaffected by economic integration.

Product differentiation is modelled following Dixit and Stiglitz (1977). In each country the representative consumer's preferences are given by a homothetic utility function. Its indirect utility function takes the form

$$V_i(w_i, w_j) = Y_i(w_i)Q_i(w_i, w_j, \tau)^{-\gamma}b \quad (1)$$

for region $i=0,1,2$. Y_i is the regional income and Q_i a price index. $\gamma \in [0, 1]$ is the weight of manufactures in the representative consumer's utility. b is a positive constant. The price index is a CES-type aggregator with elasticity of substitution $\sigma_i > 1$. This specification follows Dixit and Stiglitz (1977). Here we assume that all varieties have the same elasticity of substitution and that there is a continuum of potential varieties.

$$Q_i(\cdot)^{1-\sigma_i} = \sum_{j=1}^2 \int_{v_j \in \Omega_j} (p_{ij}(v_j, w_j) * \tau)^{(1-\sigma_i)} dv_j \quad (2)$$

for $i=0,1,2$. $p_{ij}(\cdot) = \tau(\cdot) * p_i(\cdot)$ is the price of a variety of manufacture produced in region i and consumed in region j . $p_i(\cdot)$ is the producer price ex-factory. $p_{ii}=p_i$, i.e., there are no transaction costs on manufactures consumed in the region of production. Finally, $\mu(\Omega_j)=n_j$, i.e., the measure of the set of varieties is the number of firms in region j .

The demand for manufactures is obtained by Roy's Identity

$$x_i^d(w_i, w_j, \tau) = (p_j(w_j)\tau)^{-\sigma_i} e_i(w_i)Q_i(\cdot)^{\sigma_i-1} \quad (3)$$

where $e_i = \gamma Y_i$ is the total expenditure in manufactures.

In each region CRS goods are produced according to a Cobb-Douglas production function combining capital (K) and labour (L). The proportion of labour in the production of CRS is $\epsilon \in (0.5, 1)$, as CRS goods is capital-intensive.

$$c(w_i, r_i(w_i)) = w_i^{1-\epsilon} r_i(w_i)^\epsilon d = 1 \quad (4)$$

Profit maximization in this perfectly competitive sector yields the equalisation of marginal cost to price. For convenience, the price of CRS goods is set to 1. r_i and w_i are the rewards to capital and labour respectively. Finally, d is a positive constant.

The production of manufactures is subject to increasing returns to scale and monopolistic competition. Manufacturing is capital-intensive. The first property may be translated in the cost function of a firm producing a single variety of manufacture as follows:

$$TC_i(w_i, w_j, \tau) = F_i(w_i)(f + mx_i(.)) \quad (5)$$

where $F_i(.) = r_i(w_i(\tau))^\eta w_i(\tau)^{1-\eta} g$. f and $m \in (0, 1)$ are the fixed and marginal costs respectively. $\eta \in [0, 0.5]$ as manufactures are labour intensive. g is a positive constant. This cost function is non-homothetic as is generally the case in firms characterised by internal economies of scale. The production of manufactures in any region is given by

$$x_i(w_i, w_j, \tau) = p_i(.)^{-\sigma_i} \sum_{j=1}^R e_j(.) Q_j(.)^{\sigma_i-1} (\tau)^{-\sigma_i} \quad (6)$$

for $i, j=1, 2$. $e_j = \gamma Y_j$ is region j 's expenditure in manufactures.

The short-run profit function for each firm is

$$\pi_i(.) = \frac{p_i(w_i)}{\sigma_i} (x_i(.) - x) \quad (7)$$

where the short-run production level is expression (6) above and the long-run production level is

$$x = \frac{f(\sigma_i - 1)}{m} \quad (8)$$

The long-run production level results from the assumption of free entry and exit of firms, which in turn leads to zero profit. Profit maximization in an imperfect competition sector implies mark-up pricing. The producer price is given by:

$$p_i(w_i) = \frac{\sigma_i m}{\sigma_i - 1} g d^{-\eta/\epsilon} w_i(\tau)^{\frac{\epsilon-\eta}{\epsilon}} \quad (9)$$

All firms in a given region charge (9) independently of the variety they produce. However, in open economies without factor mobility it is not necessarily the case that the international equilibrium price is unique as will be seen in section 3 below.

The demand for factors of production are obtained from Shephard's Lemma:

$$L_i^d = \frac{X_0(1 - \epsilon)}{w_i} + \frac{n_i(\cdot)F_i(\cdot)(1 - \eta)}{w_i}(f + mx_i(\cdot)) \quad (10)$$

$$K_i^d = \frac{X_0(\epsilon)}{r_i(\cdot)} + \frac{n_i(\cdot)F_i(\cdot)(\eta)}{r_i(\cdot)}(f + mx_i(\cdot)) \quad (11)$$

L_i^s and K_i^s are the region's total supply of labour and capital respectively, and must equal demands (10) and (11) in equilibrium. Factors are perfectly mobile between sectors and regions but not between countries. This implies that differences in real rewards to factors are eliminated by migration. The equality of real wages in Home country is given by

$$w_i/Q_i^\gamma = w_j/Q_j^\gamma \quad (12)$$

for $i \neq j = 1, 2$. As there is no international factor mobility, real reward to factors in Foreign country (region 0) and Home country (regions 1 and 2) will not be equalised in equilibrium. n_i is the measure of the set of varieties

produced and will be considered as the number of firms. From these factor market clearing conditions, an expression for n_i , can be derived,

$$n_i(w_i(\tau)) = \frac{\epsilon)L_i w_i(\tau)^{\eta/\epsilon} - d^{-1/\epsilon}(1 - \epsilon)K_i w_i^{\frac{\eta-1}{\epsilon}}}{(\epsilon - \eta)f\sigma_i d^{-\eta/\epsilon}} \quad (13)$$

Finally, each region's income is the sum of the rewards of each factor of production and the total profits:

$$Y_i(w_i) = w_i L_i + r_i(w_i) K_i + n_i(w_i) \pi_i(\cdot) \quad (14)$$

As will be explicated in the following section, long-run equilibrium is characterised zero profit, so that total profits in the national income are actually inexistant.

Substituting (2), (6), (9), (12) and (13) in (7) yields a non-linear system of 3 equations to be solved for w_i , $i=0,1,2$ at distinct values of τ , $i \neq j=0,1,2$ under the assumption of zero profit ³

$$\begin{aligned} \pi_i = 0 &\Rightarrow \\ (w_i^{\frac{\epsilon-\eta}{\epsilon}})^{-\sigma_i} d^{\eta/\epsilon} g^{-1} \left[\frac{e_i}{q_i^{1-\sigma_i}} + \frac{e_j \tau^{1-\sigma_i}}{q_j^{1-\sigma_i}} \right] - f\sigma_i &= 0 \end{aligned} \quad (15)$$

The solution of this system will be considered an equilibrium if aggregate profits in each country are zero.

$$n_i \pi_i = 0 \text{ with } n_i \geq 0 \text{ and } \pi_i = 0 \text{ or } n_i = 0 \text{ and } \pi_i \leq 0 \quad (A1)$$

³(2) can be rewritten as $(\frac{\sigma_i m_i}{\sigma_i - 1} d^{-\eta/\epsilon} g)^{1-\sigma_i} q_i^{1-\sigma_i}$. Cancelling identical terms in (9) results in expression (14). e_i results from the substitution of the reward to land, $r_i(w_i)$, in the expenditure function. The reward to land is obtained by solving (4) for $r_i(\cdot)$.

This condition ensures that a region's profits are exhausted by free entry and exit. It also rules out the possibility of the number of firm being negative while each firm's profits are zero. Equilibrium wages and number of firms must be found numerically.

We examine the geographical distribution of firms and of welfare gains between the regions of Home country. We first assume that Foreign country and Home country have identical sizes as a benchmark. Regions in Home country also have identical sizes. Market size was shown to be an important parameter in industry size. So, in a second simulation we consider that Foreign country is larger than Home country, whilst the regions of Home country have identical sizes. Finally, Foreign country is assumed to be larger than Home country, and Home country's peripheral region is larger than its central region.

We have also simulated the case of the central region being larger than the periphery, with Foreign country being the largest location in the world. The results are quite predictable and thus will not be presented in this paper. In effect, the new economic geography literature has shown that large markets agglomerate manufacturing production, while Krugman (1993) and Fujita, Krugman, and Venables (1999) showed that a 'transport hub' attracts IRS firms. In this simulation, the central region shares the world production of manufactures with Foreign country at free trade. The periphery becomes totally specialised in the production of CRS goods.

These simulations replicate a broad range of economic integration cases. For instance, the European Union comprises countries that can be considered similar in terms of relative factor endowments, but not in terms of market size. Analogously, some regional trade blocs in developing countries, e.g., Mercosur, integrate large economies and very small countries, with similar comparative advantage.

3 'Hub effects' and market size

In all figures the relative number of firms and the market share of each region is graphed against trade costs, which are being reduced from 50% ($\tau=2$) to 0% ($\tau=1$). Market shares are defined as the ratio of the number of firms in region i and the total number of firms in the three regions. In Figure 1 and

2 the number of firms in the central region and in the periphery are divided by the number of firms in Foreign country (n_i/n_0). In Figure 1 the plots of the number of firms in Foreign country and of the number of firms in the periphery coincide at all τ .

3.1 'Hub effects'

This section shows that trade liberalisation creates an industrial agglomeration in the central region of Home country. This region offers better access to consumer markets in Foreign country than the periphery. In addition, Foreign country becomes a net importer of manufactures, due to its geographical disadvantage.

Figure 1 illustrate the first simulation of the model. All regions have identical sizes. At all levels of trade costs, manufactures produced in the central region are available in Foreign country (region 2)⁴ at lower consumer prices than varieties produced in the periphery of Home country (Foreign country). With diminishing trade barriers demand for manufactures as well as manufacturing output then increase in Home country. New firms set up but most of them will be located in the country's central region. The opposite occurs in the periphery (Foreign country). The number of firms declines as trade costs are liberalised, since the periphery's restricted market access implies that total demand for its manufactures is lower than demand for manufactures produced in the central region. Other things equal, fewer firms can then break even in the periphery (Foreign country).

Although countries have identical underlying characteristics, at free trade industrial production is agglomerated in the central region of Home country. This contrasts with the main result of the economic geography literature, where manufacturing production is evenly split at free trade. 'Hub effects' account for this outcome. The central region is a 'transport hub', a location where transport costs are intrinsically lower than in any other location. As a consequence, other things equal, its export market is larger than the export market of that of the periphery (Foreign country) at all but prohibitive trade costs, as Figure 1b illustrates. At 50 % trade costs, each country's market share equals 1/3 of world production of manufactures. Each country's market shares diverge slowly from this point on and at intermediate levels of trade costs, the central region's share is marginally larger than Foreign country's

⁴Due to the symmetrical location of Foreign country and region 2 with respect to the central region, the behaviour of all relevant variables are identical in both locations.

Figure 1: Hub effect - Identical countries

Fig.a: Relative number of firms in Home country

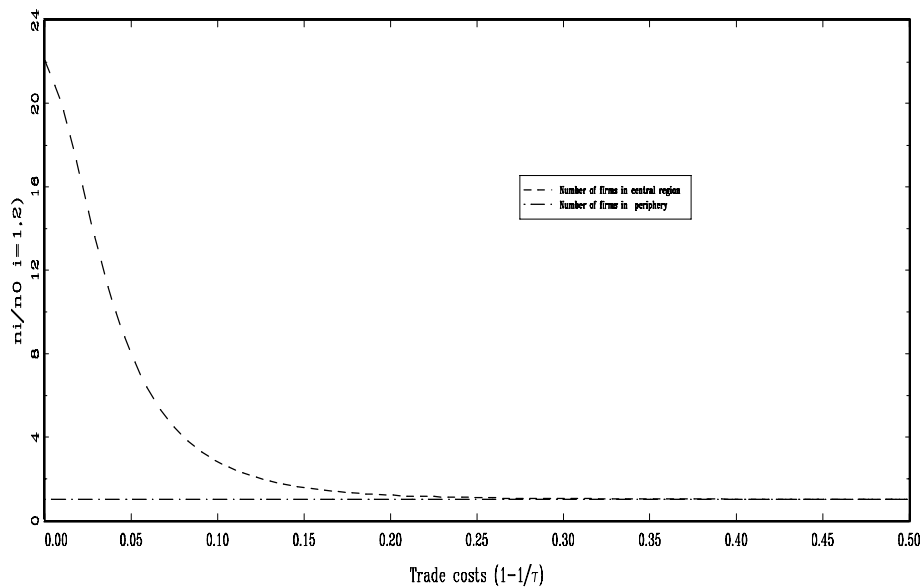
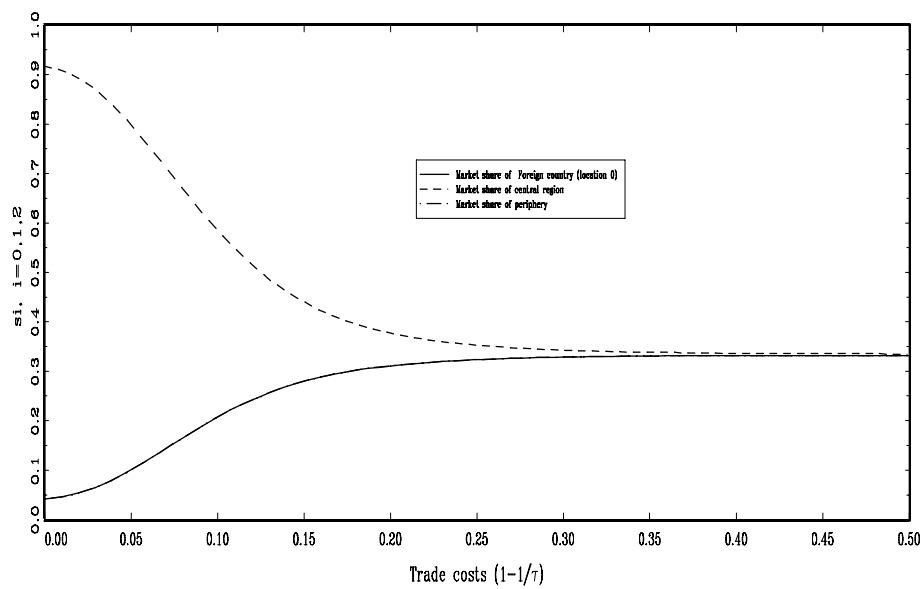


Fig.b: Market shares



share. The increase in manufacturing output in the central region of Home country implies higher demand for labour which in its turn yields higher nominal wages. On the contrary, as less firms produce in Foreign country and in the periphery of Home country demand for labour -and hence nominal wages- are lower. In addition, since more varieties are being produced in the central region, its price index is lower and real wages are higher. Labour then migrate from the periphery to the central region. Capital migrate to the periphery. This intensifies the agglomeration of firms in the central region.

The lower nominal wages in the periphery of Home country, combined with lower transport costs do not offset the market access advantage of the central region. Although location may become less relevant to firms at lower trade costs, the geographical disadvantage of the periphery of Home country makes it a less attractive location for firms than the central region. This explains the dissimilarity of the behaviour of the number of firms in the periphery to the non-monotonic behaviour of the number of firms in small regions in most papers of the new economic geography literature⁵. Whilst in these models the wage differential between countries at lower trade costs makes manufacturing production in the small regions more profitable, here, the wage differential cannot compensate for the geographical disadvantage of the periphery. Even at free trade, transport costs between Foreign country and the periphery are twice as much as transport costs between the central region and its trade partners. The central region's market share of world manufacture at free trade is $s_2 = 92\%$ while Foreign country and the periphery share the remaining 8%. Our results are also analogous to those of the literature on hub-and-spoke agreements and preferential trade agreements, e.g., Puga and Venables (1997) and Krugman (1993).

3.2 Foreign country larger

Figure 2 shows the behaviour of the number of firms and market shares when countries differ in size. Foreign country has a larger domestic market than the central region and the periphery, which are identical. It has been shown in the new economic geography literature that at positive trade costs a small domestic market can have a negative impact on the number of manufacturing firms. We show in this section that geographical proximity can offset adverse market size effects. The industry of a small region located near a large consumer market may expand in detriment to the industry of a similar-sized but

⁵Puga (1999) for instance.

peripheral region.

The central region's industry presents the non-monotonic behaviour of the small country in the new economic geography literature. At intermediate trade costs, its industry shrinks and wages consequently decline following the reduction in demand for labour (Figure 2a). At 18% trade costs the market share of the central region has been reduced to 11% of world production, against 15% in autarky. Its relative number of firms, (n_1/n_0) , declines from 21% at 50% trade costs to 15% at 18% trade costs. Trade liberalisation implies a shift in demand from domestic to foreign varieties which is symmetrical in Foreign country and the central region 1. However, it has asymmetrical impacts on their manufacturing industries due to their market size differences. Given symmetrical trade costs ($T_{01}=T_{10}$) a reduction of trade costs is followed by an equal increase in imports (expression 3) in both locations. Although imported quantities are identical in both countries, total demand for the larger country's manufactures is greater than total demand for the small country's varieties, due to the former's larger domestic demand. At intermediate trade costs, more firms become unprofitable in the smaller country. Foreign country's market share thus remains constant at 74% of world production, while region 2's share declines. (Figure 2b).

In contrast, the manufacturing industry of the peripheral region (region 2) is largely unaffected by partial trade liberalisation. Above 18% trade costs its market share remains close to autarky levels, $s_2=15\%$, and since it has a small consumer market, it is a net importer of manufactures. n_2/n_0 varies between 15% for trade costs above 18% and 0% for trade costs below 4% (Figure 2a). On the one hand, the greater distance between Foreign country and region 2 shields the periphery's manufacturing sector from Foreign country's varieties at higher trade costs. On the other hand, region 2's manufacturing industry faces less competition from the central region's shrinking industry at intermediate trade costs. At intermediate τ , more firms can then break even in the periphery than in the central region 1. Nominal wages in the peripheral region are thus higher than nominal wages in the central region. At low trade costs (below 15% in Figure 2) the central region becomes a privileged location for manufacturing production in Home country, due to its lower nominal wages allied to its geographical proximity to Foreign country's larger market. Firms migrate from the periphery to the central region, which becomes the manufacturing core of Home country. The periphery becomes completely specialised in the production of CRS goods at trade costs below 4%.

Figure 2: Hub effect - Distinct sizes

Fig.a: Relative number of firms in Home country

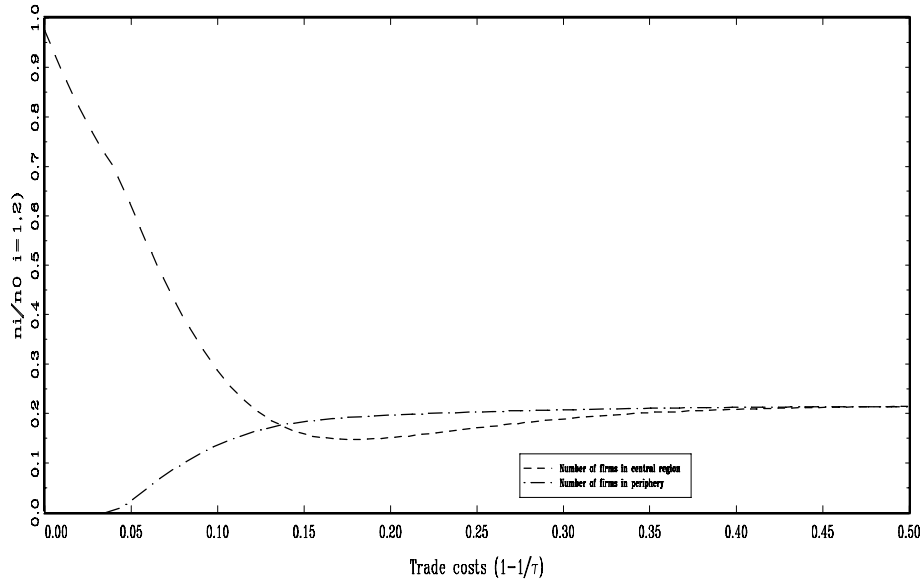
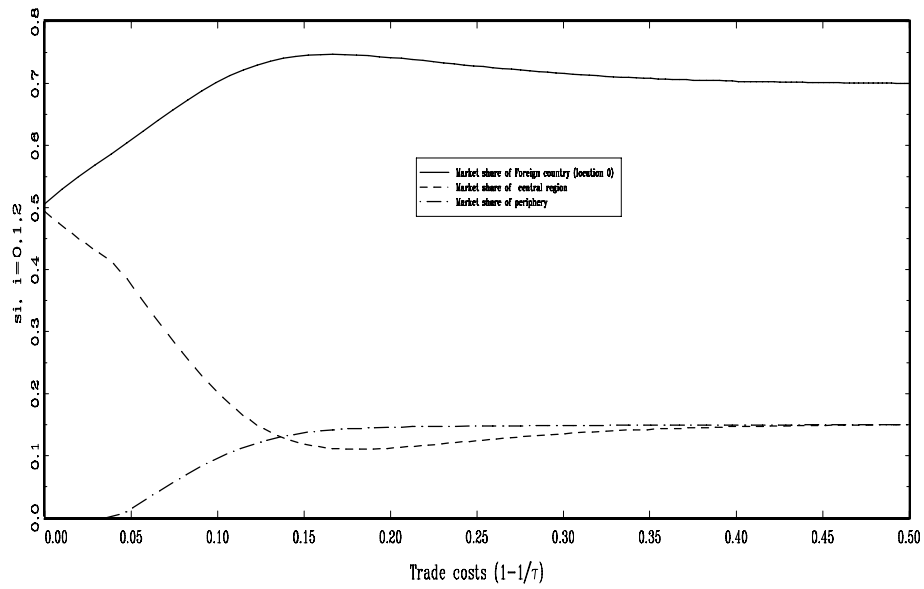


Fig.b: Market shares



Finally, Foreign country's manufacturing production declines slightly from autarky levels at trade costs below 15%. At 5% the number of firms has been reduced to 97% of the autarky level. Figure 2b shows that, at lower levels of trade costs, the central country's industry expands partly at the expense of Foreign country, which has the same geographical disadvantage of region 2. The 'hub effects' identified in the previous simulation also apply here, but the location with the largest market, Foreign country, remains the largest producer of manufactures irrespective of trade costs, whereas in the previous case its manufacturing production declined sharply at intermediate trade costs. Its market share varies between 78% of world production at 50% trade costs and 51% at free trade against 33% and 5% in the previous case. Comparing both cases suggests that a large domestic market can compensate for poor market access.

Although this simulation assumes that the three locations have identical factor proportions, which is hardly the case of NAFTA, it captures more closely the Mexican border region phenomenon exposed by Hanson (1997). Here, region 1 and region 2 stand in the relative positions of the Mexican border region and the region of Mexico City, respectively. Both are small consumer markets, opening up to trade with a large country. We found, as Hanson (1997), that wages in region 1 ('border region') increase with trade liberalisation, as opposed to the falling wages in the periphery ('Mexico City'). Industrial production also increases (decreases) in the region 1 (region 2).

The results of these simulations seem somehow pessimistic for regions with naturally poor access to consumer markets. Clearly, investments in transportation infrastructure can improve the attractiveness of peripheral regions to manufacturing firms. However, market access will always be limited by geographical distance. This section indicated that a large domestic market may compensate poor market access. The next simulations show that large peripheral regions may in effect agglomerate manufacturing production in detriment to central regions.

3.3 Periphery larger

We assume that the periphery of Home country is larger than its central region, at prohibitive trade costs. As trade costs are reduced between the two regions and Foreign country, the size of Home country's regions may change due to factor mobility. As above Foreign country has a larger market than Home country. The results of these simulations are quite interesting in that they clearly suggest that market size is a stronger determinant of the location

Figure 3: Periphery larger

Fig.a: Relative number of firms in Home country

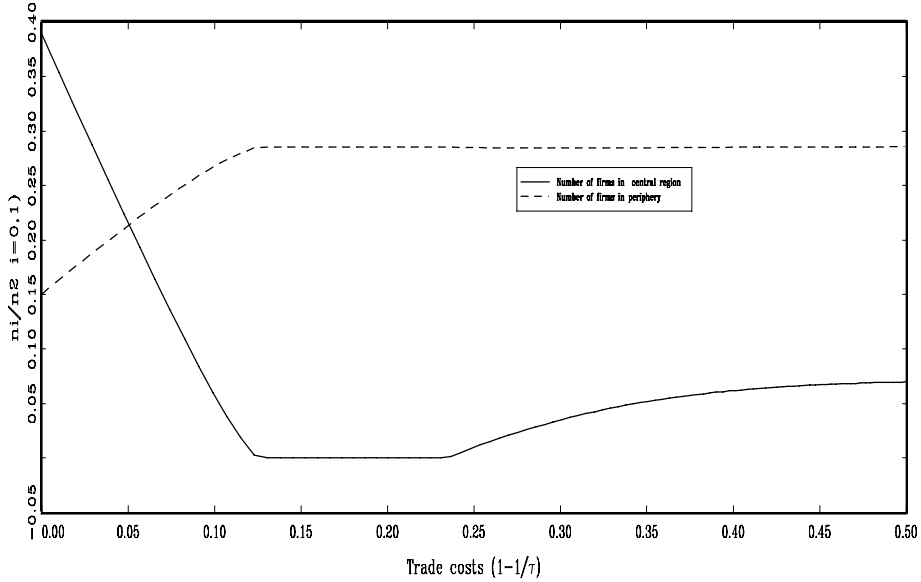
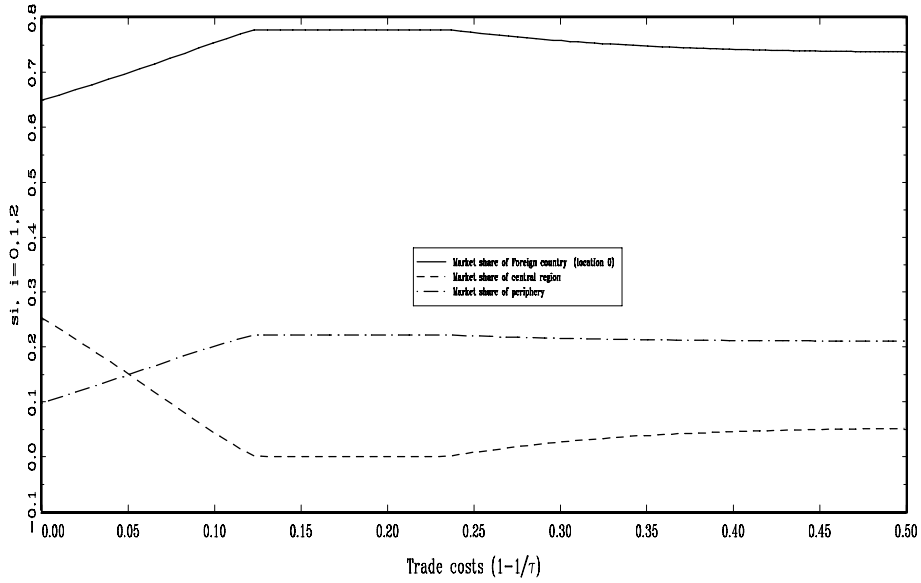


Fig.b: Market shares



of firms than market access.

In Figure 3a the number of firms in the central region relative to the number of firms in Foreign country decreases with reductions of trade costs until the region is completely specialised in the production of CRS goods. Competition from Foreign imports and the limited local market contribute to the deindustrialisation of the region. On the contrary, the periphery of Home country is shielded from competition of foreign goods by its remote location. In addition, firms located in the periphery can rely on a large local consumer market to exploit economies of scale. Figure 3a shows that the number of firms in the periphery remains constant until trade costs are reduced to 12%. The number of firms in the central region reaches zero at 24% trade costs down to 12% trade costs.

Interestingly, firms do not migrate from the central region to the periphery. This is very much unlike the agglomeration process described in the new economic geography literature, where large markets attract firms from smaller regions. Here, migrating from the central region to the periphery reduces a firm's potential market by half due to the location of region 2. In terms of market shares (Figure 3b), Foreign country-the largest market- remains a net exporter of manufactures at any level of trade cost. The central region's share varies from 5% to 0% at 12% trade costs. The periphery has naturally a larger share than the central region, 20% for trade costs varying from 50% to 12%. From 12% trade costs down to free trade, however, the lower nominal wages of the central region and its location with respect to the largest market will attract firms from the periphery. At free trade the central region agglomerates Home country's manufacturing production and becomes the larger region. Its share of manufacturing production reaches 25% at free trade against the periphery's 10%.

4 Welfare

In this section we show that the gains from trade in smaller regions are higher than the gains of larger regions. However, peripheral regions of any size gain less than regions located near large consumer markets.

The relationship between market size and gains from trade appears in Ricardo's theory of comparative advantage. After two countries have specialised in the goods they can produce more efficiently, the international equilibrium price of exported goods must lie within the range comprising each country's autarky prices. If one country is substantially bigger than the other-e.g. in

terms of its absolute endowments of factors- then its demand for its trade partner's exported good may be such that the international equilibrium price is closer to its own autarky price. In the limit, the world price may be equal to the big country's autarky price. Since lower prices are the source of all gains from trade in the Ricardian theory, the bigger country may not gain at all from opening up to trade.

Welfare gains follow a similar pattern. Given that welfare gains derive from lower consumer prices and/or higher number of varieties, large countries and those with comparative advantage in manufacturing are less likely to gain from trade than small countries or countries with adverse comparative advantage. In autarky, more varieties are available in larger countries, whereas comparative advantage in manufacturing implies lower producer prices. Opening up to trade thus has marginal impacts on consumer welfare in these countries, but it increases social welfare in small countries and countries with adverse comparative advantage. In these countries fewer varieties are produced due to the smaller market, at higher producer prices, due to adverse comparative advantage.

Figure 4 illustrates the point. Social welfare in Foreign country rises by less than 2% when it is the larger market. In the small central region and in the peripheral region the gains from trade amount to 15% and 6%, respectively (Figure 4b). When the periphery has a large domestic market its gains from trade are reduced to 1%, against 6% when it is a small region.

In all cases, the gains from trade in peripheral locations are much lower than the gains of central locations. The distance from the periphery to the core translates into higher transactions costs on manufactures and consequently, into lower quantities available and higher prices. Figure 4a presents the results of the simulations when countries are identical except for their locations on the line. Clearly, at any level of trade costs, the welfare of consumers in the central region is higher than the welfare of consumers in the periphery and in Foreign country. The total gains from trade reach 8% in the central region, against 5% in Foreign country and in the periphery. Figures 4b and 4c show analogous results. Although the central region and region 2 are identical small regions, the peripherality of region 2 translates into smaller gains from trade with Foreign country. Given to its central location, region 1 has access to larger quantities of manufactures than Foreign country and region 2. Trade costs from Foreign country (region 2) to region 1 equal τ , whereas trade costs from Foreign country to region 2 equal 2τ . This implies lower price index of manufactures in the central region, and hence higher social

welfare. In addition, since manufacturing production in the central region expands at lower levels of trade costs, the number of transaction cost-free varieties increases in that region, contributing to higher levels of welfare.

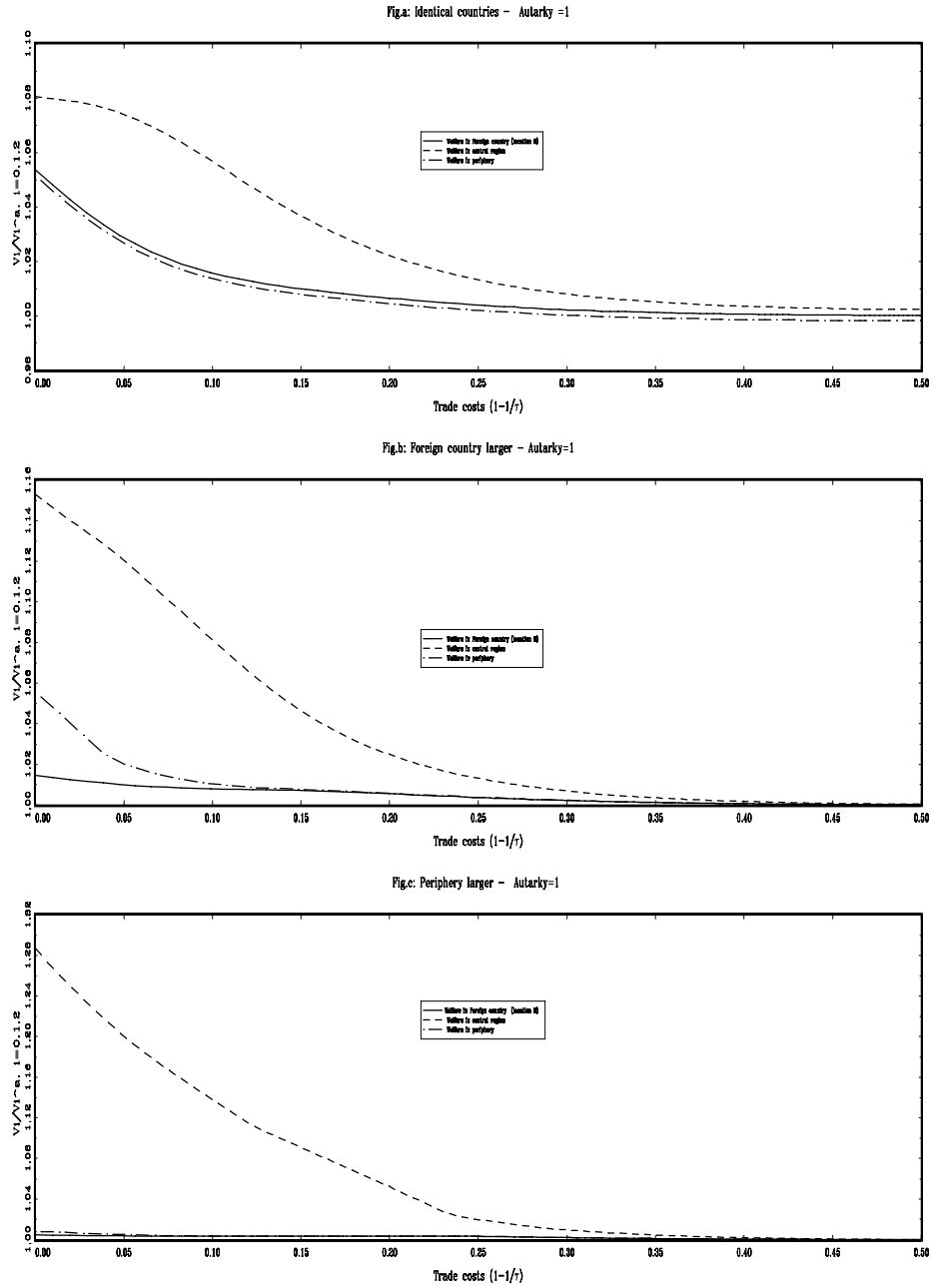
5 Conclusion

Several recent papers have documented the ambiguous results of the European Union's regional policies, in particular, the EU's heavy investments in infrastructure in lagging regions. This policy seem to have accelerated the deindustrialisation of some regions, while reinvigorating the economy of other regions. We have seen in this paper how geography and market size can account for these contradictory results.

First, regions located very close to large manufacturing cores are more likely to be the major winners of economic integration. Proximity to a large consumer market may allow the manufacturing industry of the small region to exploit economies of scale. At lower level of trade costs, the industry of regions located near manufacturing cores expands in detriment to the industry located further away from the core. Consumers in these peripheral locations also experience lower gains from trade. The distance from the periphery to the core translates into higher transactions costs on manufactures and consequently, into lower quantities available and higher prices. So, other things equal, improving a region's market access can boost local industries. However, improved market access can be followed by increased competition from goods produced in manufacturing cores, where real wages are also higher. As a result, investments in infrastructure can simply facilitate the migration of firms and factors from the lagging region. The industry of the periphery, on the other hand, is shielded by the region's remoteness.

We found that local market size is a crucial element to consider when assessing the impact of infrastructure on peripheral regions. A region with a small number of firms and a limited consumer market is more likely to become deindustrialised than a large peripheral region. When exposed to competition from goods produced in the manufacturing core, the latter's larger consumer market and the improved access to the core can help the expansion of local manufacturing firms.

Figure 4: Welfare



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