SPATIAL EFFECTS OF REGIONAL INTEGRATION. WHAT HAPPENS TO NATIONAL LANDSCAPES?[*]

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Abstract

This paper studies the impact of preferential trade liberalisation on the economic geography of a member country, by applying a simple NEG model in which heterogeneity between locations plays a major role in shaping industrial location. The theoretical exercise shows that heterogeneity between locations inside a country plays a major role in shaping industrial location. Regional integration tends to foster agglomeration inside the country, to deepen initial imbalances, and to favour domestic locations with access advantage to the bloc's market. These theoretical predictions seem to be supported by some illustrative evidence found for Argentina between 1993 and 2001. Indeed, MERCOSUR process would have fostered spatial concentration in the most developed Argentinean location, while more remote or initially less-developed regions may have been damaged.

- **JEL Classifications:** F12, F15, R12
- **Key Words:** Economic Integration, Economic Geography, Industrial Location, Regional Inequalities, MERCOSUR, Argentina

1. INTRODUCTION

Regional integration agreements (RIAs), as it is well-known, tend to affect location of economic activities and the spatial distribution of factors of production, demand, and thus the level of welfare both within and outside the integrated bloc. Policy-makers and those agents whose interests are directly affected by the agreement may be very much concerned about how the bloc's economic landscape is going to change. They should be interested in understanding how economic activities can potentially relocate within the bloc; whether some more (less) developed regions or border (remote) zones may attract (deter) capital inflows and labour immigration; and consequently how their well-being could be modified.

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However, to uncover how those impacts may occur seems to be quite a puzzling task, since there are not unanimous or general answers, neither from theory nor from the empirical arena. Although location theories have received renewed attention during the last fifteen years –and within them, New Economic Geography (NEG) models have boomed– non comprehensive framework can give yet a complete explanation for those RI's spatial effects[1]. On the other hand, applied work has not been conclusive in finding definite evidence in that respect –mainly due to methodological difficulties– thus slowing down empirics-to-theory feedback[2].

Despite that, the empirical papers that aim to address the relevance of trade-induced agglomeration –i.e., one of NEG's most renowned predictions– show that RIAs may deepen initial production (and income) imbalances across countries (and regions), and that the precise dimension and direction of those spatial effects seem to rely on each region's relative geographic position inside the bloc (Brakman et al., 2005; Brülhart et al., 2004; Niebuhr, 2004; and Traistaru et al., 2002). So, even there is not an agreed test for RI's spatial effects, several authors have found persuasive evidence of their significance and have revealed their main characteristics.

To be clearer about the importance that RIA's spatial impacts may have for any member country and its inner regions, we can consider the case of Argentina within MERCOSUR[3]. As a result of MERCOSUR's enactment, it seems that some industry relocation would have taken place within the bloc and that it may have been unequal across Argentinean regions. While more industrialised or developed locations may have attracted firms due to market access and spillovers effects; other ones might have suffered due to comparative disadvantages and relative remoteness from (or closeness to) the partners[4].

Furthermore, prospective enlargements of MERCOSUR –even the recent one comprising Venezuela– or the completion of deeper trade agreements with the EU or NAFTA open new queries about those spatial effects. How could MERCOSUR's industry structure be modified as a result of those processes? How might factor owners react to these changes? How may certain regions be affected in terms of industry location and welfare? These are the type of questions that policy-makers and involved agents may be willing to answer; and indeed are the type of issues our paper aims to address.

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[1] Complete reviews of NEG theoretical outcomes can be found in Ottaviano and Thisse (2004) and Neary (2001).

[2] For an extensive survey of NEG's empirics see for instance Head and Mayer (2004).

[3] MERCOSUR, or the Common Market of the South, was established by Argentina, Brazil, Paraguay and Uruguay in 1991. Starting in 1996, several Latin American countries have been incorporated to the agreement as associated members –specifically: Chile in 1996, Bolivia in 1997, Peru in 2003, and Ecuador, Colombia and Venezuela in 2004 (MERCOSUR Secretariat, 2005).

[4] This kind of 'predictions' are indeed in line with the results Terra and Vaillant (1997) obtain from their simulation exercise for MERCOSUR, and with those obtained by some empirical studies carried out for Brazil –namely, Sá Porto (2000), Haadad, et al. (2002), Canuto and Sá Porto (2002) and Volpe Martincus (2004).

Specifically, from the perspective of NEG this paper proposes a theoretical discussion about the impacts of RI on industrial location, both within the bloc and particularly inside a member country. The objective of the paper is to present a very simple but illustrative framework that can deal with *different 'pre-integration' scenarios*, thus allowing us to get a broad picture of the spatial effects that *any RIA* can originate in terms of both location and welfare. In addition, and intending to give at least preliminary answers for the Argentinean case, the paper presents some empirical clues about the effects that MERCOSUR –together with the Argentinean unilateral trade liberalisation of the nineties– would have induced in the industrial landscape of the country.

Within the theoretical literature, the link between trade liberalisation and industrial location inside countries has already been studied by different authors from the NEG perspective[5]. In particular, those papers study within a *particular* geographical scenario how industrial location across two domestic regions may be modified when a country *unilaterally* opens to trade. Our challenge then is to introduce some appealing extensions to those models, which both take account of *different* geographical scenarios and address the distinctive effects of *preferential* or *discriminatory* trade liberalisation.

Following Henderson (1996, p.33)'s suggestion that the final spatial outcome of any policy is 'situation-specific' –or in other words, that it may crucially depend on the 'pre-integration' distribution of agents and factors– we depart from previous studies that deal with a *restricting* landscape. In particular, we build a model where different 'pre-integration' geographical scenarios are allowed; feature which makes the model more suitable for studying many 'special cases' that could come out.

On the other hand, we also depart from previous works since we extend the number of regions and redesign the manner in which they are interconnected through trade. Specifically, we model a world economy with three countries or larger regions: two preferential partners that may differ in terms of size and the Rest of the World (RoW)[6]. In addition, one member country is assumed to comprise two domestic locations that can differ in terms of both market size and access to the preferential partner[7].

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[5] The referred studies are: Krugman and Livas Elizondo (1996), Krugman (1996), Fujita et al. (1999, Ch.18), Monfort and Nicolini (2000), Alonso-Villar (2001), Paluzie (2001), Crozet and Koening-Soubeyran (2002), Behrens et al. (2003), Moncarz (2004) and Brülhart et al. (2004). More recently, models studying trade effects on industry structure or location have introduced firm heterogeneity as a very fruitful extension–see, for instance, Helpman, Melitz and Yeaple (2003), Bernard et al. (2003), Falvey et al. (2004), Yeaple (2005), Ottaviano and Melitz (2005), and Baldwin and Okubo (2005 and 2006) within the NEG tradition.

[6] The incorporation of a third country for studying preferential trade liberalisation is the approach introduced by Puga and Venables (1997) and also followed by Baldwin et al. (2003, Ch.14) and Melitz and Ottaviano (2005), among others.

[7] In order to make the exposition clearer, we will talk about *countries* and *domestic locations*; however, the reader must bear in mind that a member country can be thought instead as any *region* within the bloc, and that domestic locations can be regarded as *locations inside that region*.

With respect to the latter, the paper concentrates in analysing two particular scenarios, namely: the Non-Border Effect (NBE) setting, where all domestic firms regardless of their location have equal access to the preferential partner; and the Border Effect (BE) scenario, where instead one domestic location –and so firms located there– has better access to the partner. So, with this extension we aim to contribute to the study of integration effects in border regions[8].

Those two main departures from previous models are, nonetheless, not costless. We adopt an extended version of a very tractable NEG model due to Martin and Rogers (1995), which due to its simplicity permits us to more easily handle the particular issues we aim to address[9]. However, this particular framework –i.e., a 4x2x2 'Footloose Capital' setting[10]– leaves us with a world where demand and thus income distribution remains unaltered, even though firms do change location endogenously. So, we loose one of NEG key mechanisms, i.e. circular causality, that is at the heart of the catastrophic-agglomeration phenomena and core-periphery outcomes.

Finally, an additional contribution of this paper is to give some clues about how Argentinean experience may (or may not) resemble our model's predictions. Although our empirics consist in a modest first attempt to analyse the Argentinean scarce regional data from the perspective of a RI NEG model, the aim is to depart as less as possible from the spirit of the New Empirics of Agglomeration and Trade (Head and Mayer, 2003). Thus, though neither testing nor estimating NEG postulates, the goal is to be the first attempt in contrasting the theoretical predictions derived from a RI-NEG model with some trade and production data available for Argentinean regions.

The remainder of the paper is organised as follows. Next section sets up the formal model and illustrates how dispersion and agglomeration forces can support a long-run equilibrium in our world. Section 3 shows, through numerical simulations, how RI can modify the geographical landscape of a member country. More specifically, this section provides a set of examples for specific arbitrary asymmetries among regions, which are therefore indicative of general conclusions about the relocation process provoked by RI.

Our results suggest that preferential liberalisation tends to foster industrial concentration within member countries; and that it generally favours locations with better market-access, unless competition from abroad is too high. In terms of welfare effects, member countries and the bloc as a whole tend to be better off after the agreement. Section 4 shows some evidence about which could be interpreted as spatial effects of MERCOSUR

[8] For a survey of theoretical and empirical literature on the spatial effects of RI in border regions see for instance Niebuhr and Stiller (2002).

[9] More precisely, our framework is based on posterior versions of Martin and Rogers' model, which were put forth by Baldwin et al. (2003, Chs.3 and 14) and Ottaviano and Thisse (2004).

[10] This setting allows for: uneven levels of exchange 'freeness' across regions, size asymmetries, and market-access heterogeneity between domestic locations.

within the Argentinean landscape. Finally, section 5 presents concluding remarks and draws some lines for future research.

2. THE MODEL

2.A. ASSUMPTIONS

• Four regions $r,s=\{A1,A2,B,C\}$. More specifically, there are three countries: a domestic country divided into two locations (*A1* and *A2*), and two foreign countries *B* and *C* –the prospective preferential partner and RoW, respectively– represented by a single location each.

• Two productive sectors: the 'traditional' sector (or agriculture) *Z*, and the 'modern' sector (or manufacturing) *X*.

• Two production factors: 'physical' capital *H* and labour *L*.

<u>*Regions:*</u>

• Regions are symmetric in terms of tastes and technology. With respect to endowments, the model allows to analyse different cases as it is explained later on.

• Regions (i.e. *r* and *s*) are distinguished from each other in terms of exchange costs, t_{rs}. While 'domestic' exchange of manufactured goods –i.e. between *A1* and *A2*– has a cost related with transport infrastructure and distance, $d_{rs} \in [\varepsilon,\infty[$; 'external' exchange is costly due to both transport and trade costs –namely, tariff and non-tariff barriers $\tau_{rs} \in [0,\infty[\ \forall r,s \neq A1,A2$[11].

• Regions are assumed to be either: equidistant among them or *partially* heterogeneous. In the first case or 'No Border Effect' scenario, transport costs are assumed to be the same between any two regions, i.e.:

$$d_{rs} = d \qquad \forall r \neq s$$

The other scenario, called 'Border Effect' case, implies instead that one domestic location, let assume *A1* has better access to *B* than the other, *A2*:

$$d_{A2B} = d_{A2A1} + d_{A1B} = 2d\,,$$

while all other regions remain as before (i.e. equidistant). Thus, shipments from *A2* arrive in *B* after passing through location *A1*[12].

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[11] Unlike previous literature, the model does not make any additional distinction between countries and domestic locations in terms of factor mobility. More specifically, while those studies assume free labour ('embodied' factor) mobility within each country but complete labour immobility across countries; our model rules out any labour mobility, and additionally assumes free mobility of capital-services ('disembodied' factor). As a consequence, our setting features neither circular causality nor endogenous catastrophic agglomeration.

[12] Since parameter *d* may be viewed as a policy instrument, the model could be extended to allow for a richer analysis. For instance, different transport costs (*d* and d^*) might be introduced for shipments inside the domestic

Sectors:

• The 'traditional' sector is kept as simple as possible. It is assumed that: it produces a homogeneous good under constant returns to scale (CRS) and perfect competition; it uses one unit *L* per unit of output; and its output is inter-regionally exchanged without cost.

• The 'modern' sector produces a continuous of horizontally differentiated varieties under IRS and monopolistic competition with free entry –the number (mass) of varieties is *N*, being n_r the sub-set produced in region *r*. Interregional exchange of its output is costly, as it was already explained; and regional markets are segmented.

Production of $x(i)$ units of variety *i* requires a fixed amount *F* of capital-services and a variable amount $mx(i)$ of labour. Then, the total cost of firm producing variety *i* in region *r* is given by:

$$TC_r(i) = \pi_r F + w_r m x_r(i) \quad \forall r$$

where w_r is nominal wage, and π_r is both rental rate of capital in region *r* and firm's operating profit under free entry.

Market structure in the 'modern' sector:

• Monopolistic competition takes Dixit and Stiglitz's (1977) form. The representative consumer in each region has preferences given by a two-tier utility function: the upper tier determines consumer's division of expenditure between the homogeneous good and all differentiated industrial varieties; and the lower tier dictates his/her preferences over those varieties. More specifically, the utility function of representative consumer living in region *r* is given by:

$$U_r = \frac{Q_r^{\mu} Z_r^{1-\mu}}{\mu^{\mu}(1-\mu)^{(1-\mu)}} \quad \forall r, \qquad (1)$$

where $Q_r = \left[\int_0^N q_r(i)^{\frac{\sigma-1}{\sigma}} di\right]^{\frac{\sigma}{\sigma-1}}$ is consumption of good *X*; $q_r(i)$ is consumption of variety $i \in [0,N]$; and Z_r is consumption of the 'traditional' good. With respect to parameters, $\mu \in]0,1[$ is the weight of good *X* in utility, and $\sigma \in]1,\infty]$ is the elasticity of substitution between any two industrial varieties.

• Transaction costs are modelled as iceberg costs à la Samuelson. That is, for one unit of differentiated good produced in region *r* to reach region *s*, $t_{rs} \in [1+\varepsilon,\infty[$ units must be shipped, where:

$$t_{rs} = 1 + d_{rs} + \tau_{rs} \quad \forall r \neq s$$

Thus, t_{rs}-1 units of the good 'melt' in transit.

Production factors:

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country and those across countries, intending to distinguish between national and international transport infrastructure or technology.

• World economy is endowed with *H* capitalists and *L* workers, each supplying one unit of their corresponding factor inelastically. And endowments are distributed among regions as follows:

$$H_{r\in O}=\theta H \quad , \quad H_{A1}=\rho(1-2\theta)H \quad \text{and} \quad H_{A2}=(1-\rho)(1-2\theta)H$$
$$L_{r\in O}=\theta L \quad , \quad L_{A1}=\rho(1-2\theta)L \quad \text{and} \quad L_{A2}=(1-\rho)(1-2\theta)L$$

where $O=\{B,C\}$ is the set of '*O*ustide' or foreign countries, which are assumed to be equally endowed. $\theta\in]0,1/2[$ is the share of world capital (labour) that resides in each foreign country, and $\rho\in]0,1[$ is the share of domestic capitalists (workers) who live in *A1*. Therefore, relative endowments are the same across regions; thus there is no place for comparative advantage à la Heckscher-Ohlin[13].

• Labour is inter-regionally immobile and capital-services are perfectly mobile, but capitalists stay put; in other words, they reside and expend money in their region of origin though they can offer their factor services in any region.

• Both labour and capital are fully employed:

$$L_r=\int_{i\in n_r} mx_r(i)di+L_r^Z \quad \forall r \qquad (\textit{regional} \text{ full employment of labour})$$
$$H=NF \qquad (\textit{global} \text{ full usage of capital - services})$$

where L_r^Z is the number of workers in the 'traditional' sector.

• Inter-regional distribution of capital-services is endogenously determined in the long-run. λ_r is the fraction of *H* employed in region *r*, and $\sum_r \lambda_r=1$.

Since $\pi_r(\Gamma)$ is the rental rate of capital-services in region *r* when their spatial distribution is $\Gamma=\{\lambda_{A1},\lambda_{A2},\lambda_B,\lambda_C\}$, a spatial equilibrium arises at $\lambda_r\in]0,1[\ \forall r$ (i.e. is interior) when:

$$\Delta\pi(\Gamma)\equiv\pi_r(\Gamma)-\pi_s(\Gamma)=0 \quad \forall s\neq r$$

because perfect capital mobility equalises equilibrium rewards to capitalists.

A long-run spatial equilibrium could also arise at $\lambda_r=0$ for some $r\neq s$ when $\Delta\pi(\Gamma)\leq 0$[14]. However, from now on we assume that parameters allow for $\lambda_{r\in O}>0$ and $\min\{\lambda_{A1},\lambda_{A2}\}>0$; thus their values ensure that some firms are in fact operating in every region.

2.B. SHORT-RUN EQUILIBRIUM

2.B.a. 'Traditional' Sector

In each region, 'traditional' sector maximises its profits:

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[13] A more general framework, which allows for asymmetric-sized foreign countries, international and intra-national H-O comparative advantage, etc. could assume: 1) $H^W=H^*+H$ and $L^W=L^*+L$, where superscript *W* denotes world endowments and * denotes foreign ones; 2) $\theta_H H^*$ and $\theta_L L^*$ are *B*'s capital and labour endowments, respectively, and $(1-\theta_H)H^*$ and $(1-\theta_L)L^*$ are *C*'s resources; 3) for domestic locations: $\rho_H H$ and $\rho_L L$ are *A1*'s endowments, while $(1-\rho_H)H$ and $(1-\rho_L)L$ are location *A2*'s ones.

[14] For values of t_{rs} or Γ that would imply a share λ_r, for some *r*, either below zero or above unity, it is assumed that either all industry is clustered in the remaining regions or, conversely, it is agglomerated inside those regions.

$$Max_{Z_r \geq 0} Z_r p^Z - Z_r w_r$$

The homogeneous good, which price is the same everywhere due to its zero trade costs, is chosen as a numeraire. Therefore, under CRS and perfect competition, the first order conditions imply that $p^{Z^*} = 1 = w_r$. Furthermore, as long as some homogeneous good is produced in every region there is inter-regional wage equalisation[15]:

$$w_r = w_s = 1 \quad \forall r, s$$

2.B.b. Consumers

The representative consumer in each region maximises its two-tier utility function. First, she/he decides the amounts of both homogeneous and differentiated goods that he/she will optimally consume.

$$Max_{Q_r, Z_r \geq 0} U_r = \frac{Q_r^{\mu} Z_r^{1-\mu}}{\mu^{\mu}(1-\mu)^{(1-\mu)}}$$
$$s.t. \quad Y_r = Z_r + P_r Q_r$$

where Y_r is income (expenditure) in region r[16].

Optimal quantities are: $Z_r^* = (1-\mu)Y_r$ and $P_r Q_r^* = \mu Y_r$, where P_r is the CES price index in region r. Explicitly:

$$P_r = \left[\int_{i \in n_r} p_{rr}(i)^{1-\sigma} di + \sum\nolimits_{s \neq r} \int_{i \in n_s} p_{sr(i)}{}^{1-\sigma} di \right]^{\frac{1}{1-\sigma}} \qquad (2)$$

being $p_{sr}(i)$ the price of variety i produced in region s and consumed in region r.

After that first step, the representative consumer determines her/his demands for each variety of industrial good by solving the following problem:

$$Max_{q_{sr}(i), q_{rr}(i) \geq 0} Q_r = \left[\int_{i \in n_r} q_{rr}(i)^{\frac{\sigma-1}{\sigma}} di + \sum\nolimits_{s \neq r} \int_{i \in n_s} q_{sr}(i)^{\frac{\sigma-1}{\sigma}} di \right]^{\frac{\sigma}{\sigma-1}}$$
$$s.t. \quad \int_{i \in n_r} p_{rr}(i) q_{rr}(i) di + \sum\nolimits_{s \neq r} \int_{i \in n_s} p_{sr}(i) q_{sr}(i) di = \mu Y_r$$

where $q_{sr}(i)$ is consumption of variety i, produced in region s, by a consumer who resides in region r.

The optimal direct demands are:

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[15] The homogeneous good is produced in every region when any three regions (or less) together have not enough labour to satisfy world demand for this good. The exact condition is that total world spending on Z, $(1-\mu)Y$, is greater than the maximum value of Z's production attainable by any three regions together. After operating, the condition can be written as: $\mu < 1 + \left(\frac{\mu}{\sigma} - 1\right)(\max\{[2\theta + \rho(1-2\theta)], [2\theta + (1-\rho)(1-2\theta)], (1-\theta)\}L)$. This condition, which is assumed to hold from now on, applies when the differentiated good has a small weight in utility, and product variety is so highly valued by consumers (i.e. σ is small) that a large amount of labour is employed in the 'modern' sector.

[16] By assuming the equivalence between income and expenditure the model rules out investment and, in turn, growth; thus it precludes *real* dynamics.

$$q_{sr}^{*}(i) = \frac{p_{sr}(i)^{-\sigma}}{P_r^{1-\sigma}} \mu Y_r \qquad (3)$$

Finally, the indirect utility function in region *r* can be written as[17]:

$$V_r = \frac{Y_r}{P_r^{\mu}} \qquad (4)$$

2.B.c. 'Modern' Sector

A typical firm located in region *r* and producing variety *i* maximises its profits, which are given by:

$$\Pi_r(i) = p_{rr}(i)q_{rr}(i) + \sum_{s \neq r} p_{rs}(i)q_{rs}(i) - m\left[q_{rr}(i) + \sum_{s \neq r} t_{rs}q_{rs}(i)\right] - \pi_r F$$

The resulting optimal prices for that firm are:

$$\begin{aligned} p_{rr}^{*}(i) &= m\frac{\sigma}{\sigma - 1} \qquad \text{for sales in region } r, \text{ and} \\ p_{rs}^{*}(i) &= m t_{rs}\frac{\sigma}{\sigma - 1} \qquad \text{for sales in region } s. \end{aligned} \qquad (5)$$

Introducing these prices into CES price index formula (2), we get:

$$P_r = \frac{m\sigma}{\sigma - 1}\left(n_r + \sum_{s \neq r} t_{sr}^{1-\sigma} n_s\right)^{\frac{1}{1-\sigma}} \qquad (6)$$

We also define $\phi_{sr} \equiv t_{sr}^{1-\sigma} \in]0,1[$ as a measure of 'freeness' of exchange, which approximates the value of one as τ_{sr} approximates to zero. Then, price index (6) can be re-written as follows:

$$P_r = \frac{m\sigma}{\sigma - 1}\left(n_r + \sum_{s \neq r} \phi_{sr} n_s\right)^{\frac{1}{1-\sigma}} \qquad (7)$$

2.B.d. Market Clearing in the 'Modern' Sector

Market clearing conditions say that total production by a typical firm in region *r* must equal, in equilibrium, world consumption of the variety produced by that firm, plus real exchange costs paid to ship goods from *r* to other regions:

$$x_r(i) = q_{rr}(i) + \sum_{s \neq r} \phi_{rs}^{\frac{1}{1-\sigma}} q_{rs}(i) \qquad (8)$$

Replacing optimal direct demands (3) into (8), and using equations (5), (7) and 'freeness' parameters, we find that market clearing conditions imply:

$$x_r^{*}(i) = \frac{\sigma - 1}{m\sigma}\left[\frac{\mu Y_r}{n_r + \sum_{s \neq r} \phi_{sr} n_s} + \sum_{s \neq r} \frac{\phi_{rs} \mu Y_s}{n_s + \sum_{r \neq s} \phi_{rs} n_r}\right] \qquad (9)$$

2.B.e. Free Entry in the 'Modern' Sector

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[17] To find this short expression, we first plug the optimal direct demands for homogeneous and modern goods (3) into utility function (1), getting:

$$V_r = \left\{ \int_{i \in n_r} \left[\frac{p_{rr}(i)^{-\sigma}}{P_r^{1-\sigma}} \mu Y_r\right]^{\frac{\sigma-1}{\sigma}} di + \sum_{s \neq r} \int_{i \in n_s} \left[\frac{p_{sr}(i)^{-\sigma}}{P_r^{1-\sigma}} \mu Y_r\right]^{\frac{\sigma-1}{\sigma}} di \right\}^{\mu\left(\frac{\sigma}{\sigma-1}\right)} [(1-\mu)Y_r]^{1-\mu}$$

Due to the 'free entry' assumption, a firm's scale of production is such that pure profits $\Pi_r(i)$ are zero. In other words, the fixed cost paid in terms of capital is determined by a bidding process for H, which ends when no firm can earn a positive profit at equilibrium market prices[18].

By market clearing condition (8), the free-entry assumption, and given that $p^*_{rs}(i) = \phi_{rs}^{\frac{1}{1-\sigma}} p^*_{rr}(i)$, operating profits for every firm are:

$$\pi^*_r = \frac{m x_r(i)}{F(\sigma - 1)}$$

Replacing $x_r(i)$ by its equilibrium value (9), we find a final expression for the equilibrium reward to capital in region r, namely:

$$\pi^*_r = \frac{\mu}{\sigma F}\left[\frac{Y_r}{n_r + \sum_{s \neq r} \phi_{sr} n_s} + \sum_{s \neq r} \frac{\phi_{rs} Y_s}{n_s + \sum_{r \neq s} \phi_{rs} n_r}\right] \qquad (10)$$

2.C. LONG-RUN SPATIAL EQUILIBRIUM

The model presented is a 4x2x2 'Footloose Capital' setting, which allows for: uneven levels of exchange 'freeness' across regions, size asymmetries and market-access heterogeneity between domestic locations[19]. In order to shape the model for addressing our research questions, the following simplifying assumptions are taken to hold from now on:

$$\phi_{rs} = \phi_{sr} \qquad \forall s \neq r \qquad (11)$$

and

$$\phi_{rC} = \phi_{Cr} = \phi_{GE} \equiv (1 + d + \tau_{GE})^{1-\sigma} \qquad \forall r \neq C \qquad (12)$$

where *GE* is a mnemonic for '*G*lobal *E*xternal'.

The first equality expresses that exchange costs are equal independently of their direction. The second line implies that preferential partners will maintain a common (also 'pre-RI') trade policy with country *C*, which additionally coincides with RoW's external policy[20].

Expression (10) together with (11) and (12) and the fact that λ_r is given by $n_r F/H$, allows us to write down the following system of equations.

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[18] For simplicity, we choose F=1; thus the fixed cost equals equilibrium rental rate.

[19] 'Footloose Capital' is the name given by Baldwin et al. (2003, Ch.3) to their 2x2x2 version of Martin and Rogers' (1995) model.

[20] Somewhat as in footnote 11, since τ_{GE} may be viewed as a policy instrument; an extension of this model could allow for divergent external policies between the bloc and RoW (τ_{GE} and τ^*_{GE}) and even between member countries.

$$\begin{aligned}
\pi^*_{A1} &= \frac{\mu}{\sigma H}\left[\frac{Y_{A1}}{DA1} + \frac{\phi_A Y_{A2}}{DA2} + \frac{\phi_{A1B} Y_B}{DB} + \frac{\phi_{GE} Y_C}{DC}\right] \\
\pi^*_{A2} &= \frac{\mu}{\sigma H}\left[\frac{\phi_A Y_{A1}}{DA1} + \frac{Y_{A2}}{DA2} + \frac{\phi_{A2B} Y_B}{DB} + \frac{\phi_{GE} Y_C}{DC}\right] \\
\pi^*_{B} &= \frac{\mu}{\sigma H}\left[\frac{\phi_{BA1} Y_{A1}}{DA1} + \frac{\phi_{BA2} Y_{A2}}{DA2} + \frac{Y_B}{DB} + \frac{\phi_{GE} Y_C}{DC}\right] \\
\pi^*_{C} &= \frac{\mu}{\sigma H}\left[\frac{\phi_{GE} Y_{A1}}{DA1} + \frac{\phi_{GE} Y_{A2}}{DA2} + \frac{\phi_{GE} Y_B}{DB} + \frac{Y_C}{DC}\right]
\end{aligned} \qquad (13)$$

where $\phi_A = \phi_{A1A2} = \phi_{A2A1} \equiv (1+d)^{1-\sigma}$, $DA1 \equiv \lambda_{A1} + \phi_A \lambda_{A2} + \phi_{BA1}\lambda_B + \phi_{GE}\lambda_C$, $DA2 \equiv \phi_A \lambda_{A1} + \lambda_{A2} + \phi_{BA2}\lambda_B + \phi_{GE}\lambda_C$, $DB \equiv \phi_{A1B}\lambda_{A1} + \phi_{A2B}\lambda_{A2} + \lambda_B + \phi_{GE}\lambda_C$, and $DC \equiv \phi_{GE}(\lambda_{A1} + \lambda_{A2} + \lambda_B) + \lambda_C$ [21].

For $\lambda_r \in]0,1[\ \forall r$, the equilibrium distribution of firms solves: $\pi^*_{A1} = \pi^*_{A2} = \pi^*_B = \pi^*_C = \pi^\circ$. This equalisation of rental rates across regions implies that:

$$\begin{aligned}
Y_{A1} &= \rho(1-2\theta)(\pi^\circ H + L) \\
Y_{A2} &= (1-\rho)(1-2\theta)(\pi^\circ H + L) \\
Y_B &= Y_C = \theta(\pi^\circ H + L)
\end{aligned}$$

and being $Y^\circ \equiv \pi^\circ H + L$ world equilibrium income.

Plugging these expressions into system (13), we can re-write it as follows:

$$\begin{aligned}
\Omega^*_{A1} &= (1-2\theta)\left[\frac{\rho}{DA1} + \frac{\phi_A(1-\rho)}{DA2}\right] + \theta\left[\frac{\phi_{A1B}}{DB} + \frac{\phi_{GE}}{DC}\right] \\
\Omega^*_{A2} &= (1-2\theta)\left[\frac{\phi_A \rho}{DA1} + \frac{(1-\rho)}{DA2}\right] + \theta\left[\frac{\phi_{A2B}}{DB} + \frac{\phi_{GE}}{DC}\right] \\
\Omega^*_{B} &= (1-2\theta)\left[\frac{\phi_{BA1}\rho}{DA1} + \frac{\phi_{BA2}(1-\rho)}{DA2}\right] + \theta\left[\frac{1}{DB} + \frac{\phi_{GE}}{DC}\right] \\
\Omega^*_{C} &= (1-2\theta)\phi_{GE}\left[\frac{\rho}{DA1} + \frac{(1-\rho)}{DA2}\right] + \theta\left[\frac{\phi_{GE}}{DB} + \frac{1}{DC}\right]
\end{aligned} \qquad (14)$$

where $\Omega^*_r \equiv \dfrac{\pi^*_r \sigma H}{\mu(\pi^* H + L)} \quad \forall r$ (15)

Therefore, the solution of this system characterises the interior equilibrium or spatial division of industry that equates rental rates across all regions. In particular, a set of functions of both 'freeness' and the full distribution of expenditure portrays the *always stable* equilibrium location pattern –namely, $\Gamma^\circ = \{\lambda^\circ_{A1}, \lambda^\circ_{A2}, \lambda^\circ_B, \lambda^\circ_C\}$ [22]. Thus, industry spatial distribution is a synthesis of the interaction between ensuing 'accessibility' and 'attraction' forces[23].

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[21] Being the fifth equation: $\lambda_r = 1 - \sum_{s \neq r} \lambda_s$ for any $r \neq s$.

[22] Within this model, since capital ownership is fixed and labour is immobile, when capital-services relocate and reduce the incentive for further relocation, no other agglomeration force is set into motion. So, there are no destabilising forces operating.

[23] It is worth to mention that we keep the distinction between π^*_r, π°, and an additional variable π^*–though they are equalised in the long-run equilibrium– in order to gain some insights from the analysis of the 'ad-hoc' adjustment process that *should* take place from any 'short-run equilibrium' to the final or long-run 'spatial equilibrium'.

At this point, our main task should be to analyse how distribution of firms among regions may change when RI took place. However, before doing this it seems convenient to present some intuition behind the system's dynamics within the two main scenarios we analyse. Therefore, the following two sub-sections study how capital-services tend to move across regions both in the 'No Border Effect' (NBE) scenario, where all domestic firms regardless of their location have equal access to the preferential partner; and within the 'Border Effect' (BE) setting that is characterised by domestic locations heterogeneous in terms of that accessibility.

2.C.a. 'No Border Effect' Scenario

Within the 'NBE' scenario, the following additional assumption holds:

$$\phi_{A1B} = \phi_{A2B} \equiv \phi_{AB} \equiv \phi_{FTA} \qquad \text{since} \quad \tau_{AB} \equiv \tau_{FTA}$$

In other words, exchange costs are the same from/to any domestic location to/from preferential partner *B*. In addition, given that $\phi_{AB} = \phi_{BA}$ by (11), intra-bloc trade liberalisation is assumed to be symmetric[24].

Although equilibrium industry shares Γ° conform a set of somewhat unwieldy functions of 'freeness' (i.e. ϕ's) and 'expenditure' (i.e. θ and ρ), we can briefly examine the behaviour of some key expressions in order to get intuition for how the model works. Focus is therefore put on rental rates differentials across regions, which are the engine of firms' spatial relocation.

Particularly, firms decide whether to move from region *r* to region *s* by evaluating their operating profit differential. From expression (15) we know that:

$$\pi_s^* - \pi_r^* = \frac{\mu\left(\pi^* H + L\right)}{\sigma H}\left(\Omega_s^* - \Omega_r^*\right)$$

Since the initial ratio is positive, one has that: $\text{sgn}\left(\pi_s^* - \pi_r^*\right) = \text{sgn}\left(\Omega_s^* - \Omega_r^*\right)$. Plugging expressions for Ω_s^* and Ω_r^*, one obtains an equation that shows how capital-services move from *r* to *s*. For the special case of domestic firms one finds that:

$$\text{sgn}\left(\pi_{A1}^* - \pi_{A2}^*\right) = \frac{(1-2\theta)(1-\phi_A)}{\Psi}\text{sgn}\left[\rho DA2' - (1-\rho)DA1'\right] \qquad (16)$$

where Ψ, *DA1'* and *DA2'* are positive functions of 'freeness' and industry shares (i.e. ϕ's and λ's)[25].

Although there is no real dynamics in the model, for analytical purposes the 'short-run' is understood as a situation in which capital-services hired in each region are given and immobile. During the 'adjustment' period, it is assumed that capitalists (everywhere) earn the world average reward π^* although regional rental rates π_r^* can differ. Specifically, it is assumed that a share θ of capital-services hired in each region belongs to capital owners residing in *C*; another share θ belongs to those living in *B*; a share $\rho(1\text{-}2\theta)$ corresponds to assets of capitalists in *A1*; and the remaining assets belong to capitalists from *A2*.

[24] With this new assumption, system (14) is modified. The new system (A1) is written down in the Appendix.

[25] Explicitly: $\Psi \equiv \phi_A\left(\lambda_{A1}^2 + \lambda_{A2}^2\right) + \left(1+\phi_A^2\right)\lambda_{A1}\lambda_{A2} + (1+\phi_A)(\lambda_{A1}+\lambda_{A2})(\phi_{FTA}\lambda_B + \phi_{GE}\lambda_C) + \phi_{FTA}^2\lambda_B^2 + \phi_{GE}^2\lambda_C^2 + 2\phi_{FTA}\phi_{GE}\lambda_C\lambda_B$, $DA1' \equiv \lambda_{A1} + \phi_A\lambda_{A2} + \phi_{FTA}\lambda_B + \phi_{GE}\lambda_C$ and $DA2' \equiv \phi_A\lambda_{A1} + \lambda_{A2} + \phi_{FTA}\lambda_B + \phi_{GE}\lambda_C$.

Thus, when domestic and international shipments are not perfectly free, i.e. ϕ's<1, pressure for firms to move across domestic locations is driven by the interaction of opposing forces: market-access and market-crowding effects. That is, producing in the largest domestic market –*A1* when ρ>1/2– gives profit-advantage to local firms and promote domestic agglomeration in *A1*[26]. On the other hand, the market-crowding effect operates; i.e. a larger number of firms in *A1* tend to reduce that profit-advantage, thus pushing firms towards *A2*[27].

In the case of capital flows from/to country *B* to/from any domestic location, for instance *A1*, they tend to respond to the following forces[28]:

$$\operatorname{sgn}\left(\pi^{*}_{A1}-\pi^{*}_{B}\right)=\operatorname{sgn}\left\{\frac{(1-2\theta)}{\Psi}\left[\rho(1-\phi_{FTA})DA2'+(1-\rho)(\phi_{A}-\phi_{FTA})DA1'\right]-\theta\frac{(1-\phi_{FTA})}{DB'}\right\} \qquad (17)$$

where *DB'* is a positive function of ϕ's and λ's[29].

Hence, a larger local market gives incentives for firms to stay put in their own region; while a bigger *A2*'s market is more advantageous for national firms rather than for firms in *B* due to 'accessibility' differences (ϕ_A>ϕ_{FTA}). On the other hand, dispersion forces –which act through the interaction of industry shares and 'freeness'– tend to foster capital relocation towards less crowded markets.

2.C.b. 'Border Effect' Scenario

Now we analyse the case in which locations *A1* and *A2* are assumed to be heterogeneous in terms of access to *B*. This implies that:

$$\begin{aligned}&\phi_{FTA1}\neq\phi_{FTA2} && \text{where}\\ &\phi_{FTA1}=\phi_{A1B}=\phi_{BA1}\equiv\left(1+d+\tau_{FTA}\right)^{1-\sigma} && \text{and}\\ &\phi_{FTA2}=\phi_{A2B}=\phi_{BA2}\equiv\left(1+2d+\tau_{FTA}\right)^{1-\sigma}\end{aligned}$$

while the rest of assumptions remain as before. For the new system of equations –written down in the Appendix, (A3)– the equilibrium distribution of industry can be expressed as another set of functions of 'freeness' and 'expenditure'.

As in the previous sub-section, we proceed to get some insights from the analysis of the system's dynamics. In the case of domestic locations, the sign of capital reward differential is given by that of the right hand side in this following expression:

$$\operatorname{sgn}\left(\pi^{*}_{A1}-\pi^{*}_{A2}\right)=\operatorname{sgn}\left\{\frac{(1-2\theta)(1-\phi_{A})}{\Phi}\left[\rho DA2''-(1-\rho)DA1''\right]+\theta\frac{\left(\phi_{FTA1}-\phi_{FTA2}\right)}{DB''}\right\} \qquad (18)$$

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[26] It is worth noting that within this setting, it is not possible to definitely derive the well-known 'home-market effect' (HME) featured by most of NEG models. As it has been accurately shown by Behrens et al. (2004), in a *multi-country* setting the interplay between 'freeness' (i.e. ϕ's) and 'expenditure' puts 'accessibility' and 'attraction' effects –rather than the unambiguous HME– at the heart of industry relocation.

[27] To be more illustrative, starting from a symmetric domestic equilibrium (λ_{A1}=λ_{A2}) an exogenous movement of firms from *A2* to *A1* tends to generate a market-crowding disadvantage for firms in *A1*. Since Ψ's denominator remains unchanged, operating profits of *A1*'s firms tend to diminish due to fiercer local competition.

[28] In the Appendix we present expression (A2) that shows how industry relocation between *C* and *A1* is driven.

[29] Explicitly, $DB'\equiv\phi_{FTA}\left(\lambda_{A1}+\lambda_{A2}\right)+\lambda_{B}+\phi_{GE}\lambda_{C}$.

where Φ, *DA1''*, *DA2''* and *DB''* are positive functions of ϕ's and λ's[30].

The first term between curly brackets is very similar to the whole expression obtained for the 'NBE' case. In other words, it reveals the interaction between two opposing forces governing firms' incentives to relocate: market-access and market-crowding effects. As a subtle difference from that case, supposing $\phi_{FTA1}>\phi_{FTA}=\phi_{FTA2}$ –i.e. DA1''>DA1' while DA2''=DA2'– one can notice that firms in *A1* suffer higher competition from firms located in *B* than before; and thus incentives to relocate from *A2* to *A1* are lower.

However, the presence of a border effect introduces one more noticeable difference. A new term, the last one appears in the reward differential; it is again a combination of opposing forces. Domestic firms are attracted towards the border location in order to gain better access to *B* –the larger this market, the stronger this force. On the other hand, firms are pushed towards location *A2*, where competition from *B*'s firms is softer –i.e. higher λ_B, thus higher DB'' and lower ratio, implies lower positive impact of the border effect (ϕ_{FTA1}-$\phi_{FTA2}>0$) on the rental rate differential[31].

With respect to international capital movements, relocation from the preferential partner to *A1* is driven by:

$$\operatorname{sgn}\left(\pi^*_{A1}-\pi^*_B\right)=\operatorname{sgn}\left\{\frac{(1-2\theta)}{\Phi}\left[\rho(1-\phi_{FTA1})DA2''+(1-\rho)(\phi_A-\phi_{FTA2})DA1''\right]-\theta\frac{(1-\phi_{FTA1})}{DB''}\right\} \qquad (19)$$

Thus, incentives for foreign firms to enter market *A1* are similar to those of the 'NBE' case; however, there is one interesting difference which deserves some attention. When a gate effect is introduced, the impact of *A2*'s market-size on capital flows from *B* to *A1* changes. Specifically, 'accessibility' advantage of *A1*'s firms in market *A2* does remain even after all trade barriers have been removed –ϕ_A is always larger than ϕ_{FTA2}. Consequently even after complete intra-bloc liberalisation, the border effect continues stimulating industry dispersion from *B* towards *A1*.

Apart from that, the border effect also changes the incentives for capital flows to move from *B* towards each particular domestic location. The negative impact of *B*'s market-size on those capital outflows –represented by the last term between curly brackets– is always lower for the border location. That is, capitalists in *B* have stronger incentives to move towards *A1* rather than towards *A2* due to 'accessibility'[32].

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[30] Where $\Phi\equiv\phi_A\left(\lambda_{A1}^2+\lambda_{A2}^2\right)+\left(1+\phi_A^2\right)\lambda_{A1}\lambda_{A2}+\left(\lambda_{A1}+\phi_A\lambda_{A2}+\phi_{FTA1}\lambda_B+\phi_{GE}\lambda_C\right)\left(\phi_{FTA2}\lambda_B+\phi_{GE}\lambda_C\right)+\left(\phi_A\lambda_{A1}+\lambda_{A2}\right)\phi_{GE}\lambda_C+\left(\lambda_{A1}+\phi_A\lambda_{A2}\right)\phi_{FTA1}\lambda_B$ $DA1''\equiv\lambda_{A1}+\phi_A\lambda_{A2}+\phi_{FTA1}\lambda_B+\phi_{GE}\lambda_C$, $DA2''\equiv\phi_A\lambda_{A1}+\lambda_{A2}+\phi_{FTA2}\lambda_B+\phi_{GE}\lambda_C$ and $DB''\equiv\phi_{FTA1}\lambda_{A1}+\phi_{FTA2}\lambda_{A2}+\lambda_B+\phi_{GE}\lambda_C$.

[31] These effects seem to be directly associated with the 'pull' and 'push' effects discussed by Crozet and Koening-Soubeyran (2002) within a 'Core-Periphery' model.

[32] In the case of capital relocation from C to each domestic location, the border effect also introduces a distinction. That is, flows from *C* to *A1* tend to be more abundant than those towards *A2* solely because of *A1*'s relative access advantage towards *B*.

3. REGIONAL INTEGRATION

Within this section, we aim to obtain some insights about how symmetric trade liberalisation between *B* and the domestic country can modify national economic landscape. Due to our model's characteristics, such as unevenness of exchange costs, size-asymmetries and market-access heterogeneity, the analysis has to rely on numerical simulations.

Simulations were run for a marginal and continuous reduction of τ_{FTA} from infinity –or complete intra-bloc autarky– to zero within each of our two benchmark scenarios, i.e. 'NBE' and 'BE'[33]. In addition, and aiming to find specific predictions for diverse hypothetical cases, different 'factor-endowment' settings (i.e. values of θ and ρ) were considered.

In the case of ρ, levels used were: 0,6, 0,5 and 0,4; so we simulated both a symmetric domestic landscape and an asymmetric one, where border location could be either the largest (ρ=0,6) or the smallest (ρ=0,4) one. With respect to θ, three different cases were considered. When foreign countries were assumed to be larger than domestic country, θ could take values between 1/2 and 1/3[34]. When complete symmetry among countries was assumed, this parameter was set equal to 1/3. Finally, when all *regions* were supposed to be symmetric, θ was set equal to 1/4, and ρ equal to 0,5; thus implying a domestic country larger than *B* and *C*.

3.A. INDUSTRIAL RELOCATION IN THE 'NO BORDER EFFECT' CASE

In the present case, results –which are summarised by the following figures– show that for every 'factor-endowment' scenario considered there is a 'production shifting' effect from RoW to the bloc as a whole[35]. That is, *C*'s industry share always diminishes when preferential trade liberalisation takes place, and thus the bloc is benefited.

Additionally, it is also found that country *B* always receives new entrants; *B*'s relative market size and its freer access to (and from) domestic country may explain this result. In fact, as figures reveal spatial impacts on *B* diminish as its market size decrease and, simultaneously, competition from firms in *A1* and *A2* becomes fiercer.

Figure 1: 'NBE' case. Location effects when domestic locations are asymmetric (ρ=0,6)[36]

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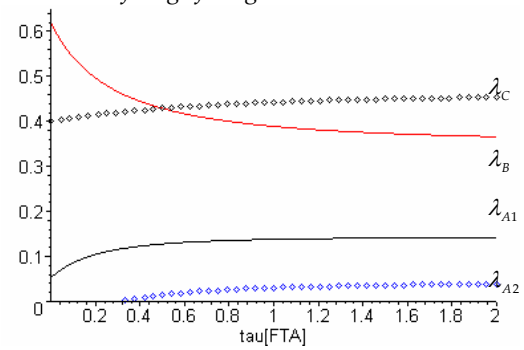
[33] Simulations were run using Maple 8. With respect to robustness, a modest analysis was carried out in order to get insights of how the results were modified when some key parameters, such as *d*, ρ, θ and τ_{GE} were altered. The results were the expected ones, and they can be requested for to the author.

[34] In fact, θ was set equal to 3/8. In the case of the other parameters, the following values were applied: σ=4, τ_{GE}=0,5 and *d*=0,5; which are around average values used by similar studies.

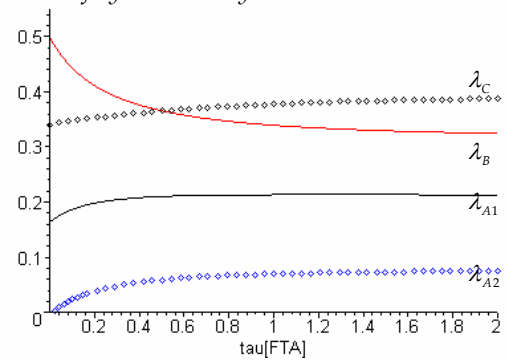
[35] The name 'production shifting' given for that effect is due to Baldwin and Venables (1995). Since in this model industrial delocation is synonymous of international capital flows, preferential trade liberalisation implies also what Baldwin, et al. (1996) call 'investment diversion'.

[36] When domestic locations are equally sized (ρ=0,5), both locations suffer exactly the same delocation process. In the case of *B* and *C*, spatial impacts are the same as in the asymmetric case (ρ=0,6).

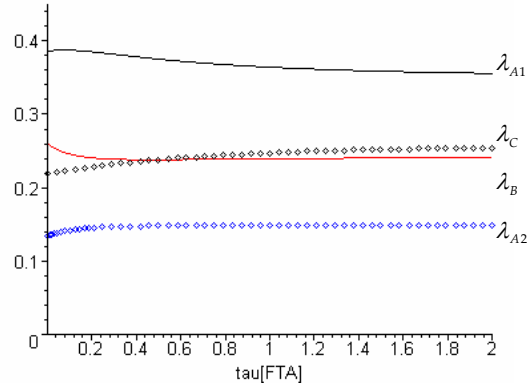
Case of large foreign countries (θ=3/8)



Case of symmetrically sized countries (θ=1/3)



Case of a big domestic country (θ=1/4)



Domestic inequalities or, in other words size-asymmetries between *A1* and *A2* do not have any impact on foreign countries' industry shares. More clearly, the spatial effects that RI have on those markets is unaffected by domestic internal geography; and this is because capital owners in *B* and *C* do not find any advantage in hiring their services inside any *particular* domestic location –since the model does not display cumulative agglomeration.

Considering now domestic landscape, we find that in general terms there is a displacement of national firms towards the partner. Indeed, the only case in which delocation does not happen, and instead the country receives new entrants is when it is the largest country in the world (*θ*=1/4). In this case, the country is benefited since its relative market size is large enough to overcome its 'disadvantage' in terms of internal transport costs; that is, during the process of trade liberalisation, capitalists from *B* and *C* may have incentives to hire their capital-services inside that large market[37].

Inside domestic country, relative distribution of industry between *A1* and *A2* remains unchanged with RI when both locations are totally homogeneous. On the contrary, when domestic locations are asymmetric, preferential trade liberalisation tends to worsen pre-existent internal disparities. The largest location is either less damaged in terms of firms' outflow or the only location that receives new entrants.

[37] However, no relocation from *B* to the domestic country would have happened with a big-bang liberalisation.

Interestingly, for the domestic country as a whole, internal inequalities can only improve the overall effects of RI on its geography. Indeed, when the country is larger than or as big as foreign countries, inner asymmetries are globally innocuous; on the other hand, when the country is small enough, to have a relatively more developed location helps. The explanation for this is that the largest domestic location may retain some firms which will then 'survive' RI.

3.B. INDUSTRIAL RELOCATION IN THE 'BORDER EFFECT' CASE

Results for the 'BE' scenario reveal that 'production shifting' effect from RoW towards integrating countries is again present in every 'factor-endowment' setting considered –see table 1. Besides, country *B* is generally benefited by firms' relocation, though it suffers some delocation when domestic country is the biggest in the world and its border location is relatively large.

Moreover, comparing with the 'NBE' case one can conclude that the presence of a gate effect tends to diminish *B*'s gains in terms of industrial location, and to softly reduce the negative impact of RI on *C*'s industrial landscape. Hence, as it was referred to in section 3, our model predicts that the border effect leaves *B*'s firms in a less profitable position and relatively benefits RoW's firms.

Table 1: 'BE' case. Location effects outside the domestic country

Relative changes

Countries' relative size (θ)	$\Delta\lambda_B/\lambda_{B0}$			$\Delta\lambda_C/\lambda_{C0}$
	when ρ=0,4	**when ρ=0,5**	**when ρ=0,6**	
Big foreigners (3/8)	38%	38%	34%	-11%
Symmetric (1/3)	31%	25%	19%	-10%
Big domestic (1/4)	0%	-8%	-21%	-11%

Note: $\Delta\lambda_C$ does not vary with ρ, unless θ=3/8 and ρ=0,4 –thus λ_{A1} becomes negative. In this last case, the simple average of $\Delta\lambda_C$ values is reported.

As in the previous case, domestic size asymmetries do not affect investing decisions taken by capital owners who live in *C*. However, they do modify the way in which firms tend to move from and towards country *B*. Indeed, the larger the border location, the smaller *B*'s industry share after trade liberalisation.

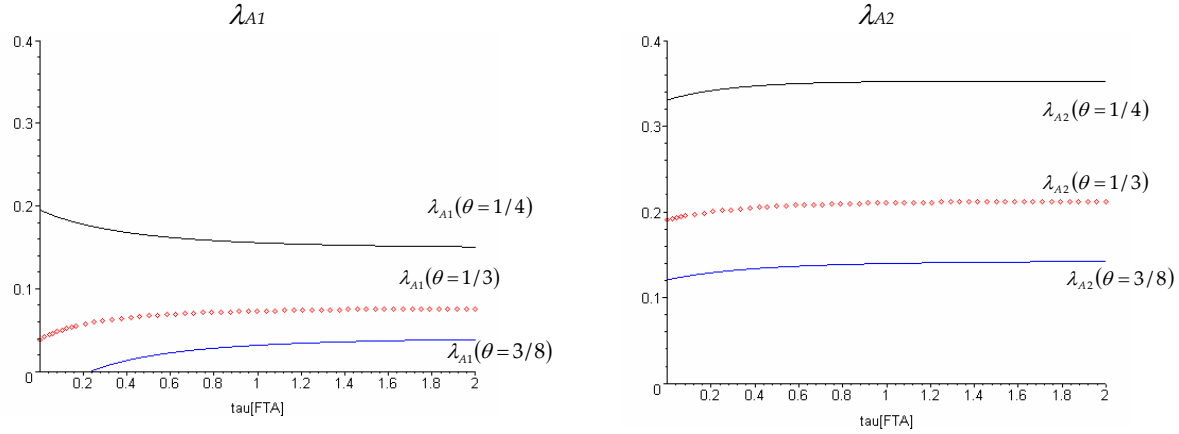
With respect to the domestic country, in general terms there is a displacement of firms towards the partner's market –see figures below. Additionally, and likewise the 'NBE' case, internal size-asymmetries tend to improve global spatial effects of RI, unless domestic competition faced by the border region is too high.

Further comparisons with that previous scenario show us that the border effect plays a favourable role in reducing RI's negative impacts for the domestic country as a whole. The gate effect can be viewed as an additional force that pushes firms inside the country;

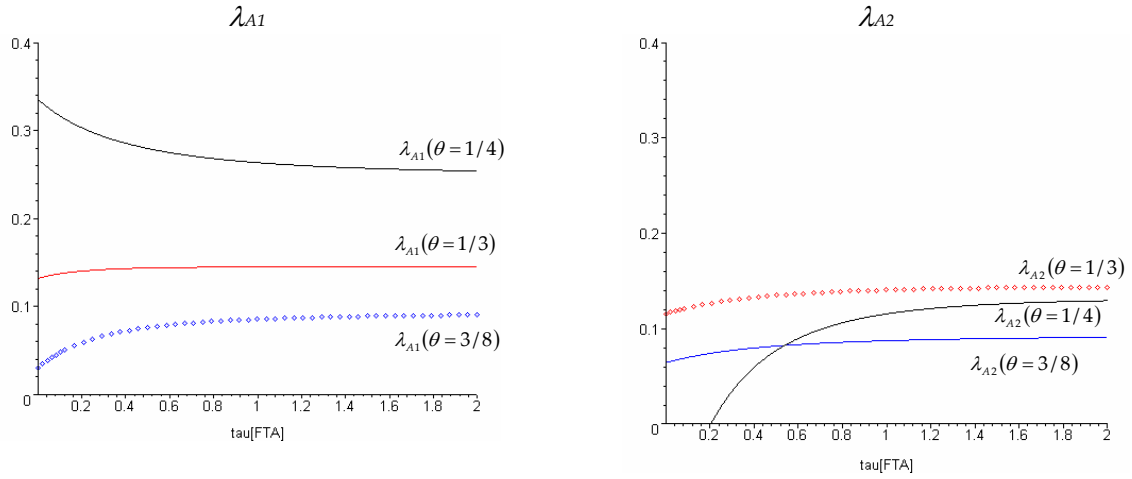
therefore differently from the 'NBE' case, even with a big-bang liberalisation some capital-services would still migrate from *B*.

Figure 2: 'BE' case. Location effects inside the domestic country

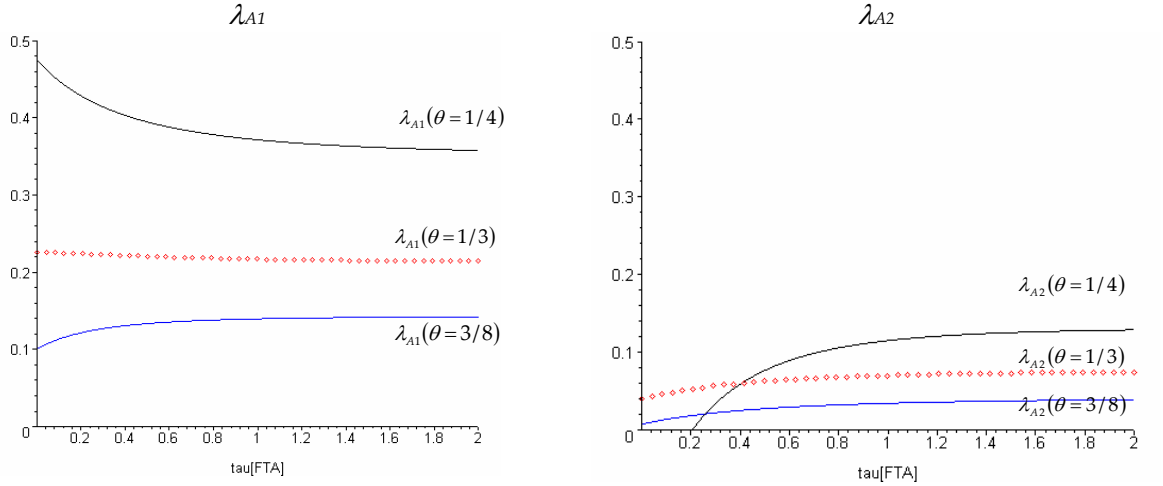
Case of a big remote location (ρ=0,4)



Case of symmetrically sized locations (ρ=0,5)



Case of a large border location (ρ=0,6)



Inside domestic country and in the case of symmetrically-sized locations, RI tends to propitiate the emergence of an uneven economic landscape. To be the border region is an advantage when the country is large enough because of its better external 'accessibility'. However, on the other hand, *A1* may be the most seriously damaged location when foreign regions are very large and competition from abroad is too high.

When domestic locations are heterogeneous in terms of expenditure, inequalities tend to be deepened after RI. Size asymmetries are likely to diminish only when the country is the biggest and its remote location is the richest or most developed one. Within every other scenario, the border location becomes the most relatively favoured one.

To sum up, the collection of examples provided by this section are suggestive of the following main conclusions:

- RoW is harmed by industrial relocation when there is a process of preferential trade liberalisation.
- The bloc and its largest member are benefited by capital inflows.
- Within a country inside the bloc, RI tends to foster spatial concentration, either creating an uneven national landscape or deepening pre-existent imbalances.
- Finally, the location with better access to preferential partners tends to be generally favoured by industry agglomeration.

The results found by this paper are close to those reported by previous research. Indeed, 'inside-outside' effects and intra-bloc spatial impacts of preferential trade liberalisation –i.e. our two first conclusions– have already been put forth by Baldwin et al. (2003, Ch.14) within a similar framework, and by Puga and Venables (1997) using a 'Core-Periphery' setting.

With respect to the impact of trade liberalisation policies on the internal geography of a country, our findings appear to coincide with those obtained by Alonso-Villar (2001), Monfort and Nicolini (2000), Paluzie (2001), Crozet and Koening-Soubeyran (2002) and Brülhart et al. (2004). What can be concluded in light of our contribution is that trade liberalisation, either *unilateral* or *preferential*, is likely to foster agglomeration inside the country which opens to trade, and that this may indeed occur within *different* geographical scenarios[38].

[38] It is worth mentioning that some other studies –i.e. Krugman and Livas Elizondo (1996), Krugman (1996), Fujita et al. (1999, Ch.18), Behrens et al. (2003) and Moncarz (2004)– conclude instead that trade liberalisation tend to foster *dispersion* of economic activity within the country. The contradiction between these two groups of studies is due to different assumptions each makes on how dispersion forces are affected by trade costs reductions –see Behrens et al. (2003) and Crozet and Koening-Soubeyran (2002) for a detailed discussion about this issue.

Moreover, our results seem to support Crozet and Koening-Soubeyran's findings in relation with the spatial impacts of trade liberalisation in the presence of a gate effect. This feature introduces two opposing forces in the model: a 'pull' pressure towards border locations and a 'push' force inside remote ones, which balance is shaped by the strength of both 'external' market-access and market-crowding effects. Our model shows; in addition, that this outcome is also dependent on size imbalances inside the country.

3.C. WELFARE EFFECTS OF REGIONAL INTEGRATION

We now proceed to analyse some welfare implications of preferential trade liberalisation[39]. To do this, and for the case of region *r*, we first differentiate indirect utility function (4) with respect to τ_{FTA}, which yields[40]:

$$\frac{\partial V_r}{\partial \tau_{FTA}} = \Theta_r \left[\sum_{s \neq r} \frac{\partial \phi_{sr}}{\partial \tau_{FTA}} \lambda_s + \left(\frac{\partial \lambda_r}{\partial \tau_{FTA}} + \sum_{s \neq r} \phi_{sr} \frac{\partial \lambda_s}{\partial \tau_{FTA}} \right) \right] \qquad (20)$$

where Θ_r is a positive function of λ's and ϕ's[41].

Since regional nominal incomes remain constant across spatial equilibria, welfare in region *r* increases with trade liberalisation if and only if 'location effects' imply a reduction in consumer prices –i.e. an increase in real income[42]. The first summation inside brackets shows the *direct* effect of preferential trade liberalisation on local prices, while the expression between parentheses accounts for *indirect* price effects, which operate through industry relocation.

To be more illustrative, in the case of domestic location *A1* we have[43]:

$$\frac{\partial V_{A1}}{\partial \tau_{FTA}} = \Theta_{A1} \left\{ \frac{\partial \phi_{FTA1}}{\partial \tau_{FTA}} \lambda_B + \left[(1-\phi_{GE}) \frac{\partial \lambda_{A1}}{\partial \tau_{FTA}} + (\phi_A - \phi_{GE}) \frac{\partial \lambda_{A2}}{\partial \tau_{FTA}} + (\phi_{FTA1} - \phi_{GE}) \frac{\partial \lambda_B}{\partial \tau_{FTA}} \right] \right\}$$

The first term inside curly brackets shows the 'welfare-improving' effect that a fall in prices of goods imported from *B* provokes. The second expression (between brackets) reveals that production shifting has three indirect effects that depend on exchange-costs differentials across regions. Specifically, if firms located inside the bloc have higher accessibility to *A1*'s

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[39] For simplicity, in doing this we neglect the proceeds that governments obtain through tariffs on imports.

[40] In doing this, we have used expression (7) and the fact that $\lambda_r = \frac{n_r F}{H}$. Additionally, since *Z* is the numeraire we have chosen units such that: *H*=1, *Y*=1 and *m*=$\frac{\sigma - 1}{\sigma}$, thus *L*=$\frac{\sigma - \mu}{\sigma}$.

[41] Specifically: $\Theta_r \equiv \Xi_r \frac{\mu}{\sigma - 1} \left(\lambda_r + \sum_{s \neq r} \phi_{sr} \lambda_s \right)^{\frac{\mu - \sigma + 1}{\sigma - 1}}$, where Ξ_r is the share of region *r*'s expenditure in world income; that is: $\Xi_{A1} \equiv \rho(1-2\theta)$, $\Xi_{A2} \equiv (1-\rho)(1-2\theta)$, $\Xi_B \equiv \theta$ and $\Xi_C \equiv \theta$.

[42] The name 'location effects' is used as in Baldwin et al. (2003, Ch.12).

[43] Welfare impacts in *A2* are very similar to those of *A1*'s residents. In the Appendix, we present the derivatives of V_B and V_C –(A4) and (A5), respectively.

market than firms located in RoW, relocation towards (beyond) the bloc may benefit (harm) consumers in region *A1*.

In order to determine what the welfare effects of RI are within our multiple scenarios, we proceed to run numerical simulations, which results are summarised by figures in the Appendix. As one could expect from results in section 4, while RoW's welfare level diminishes within every scenario due to industry delocation; *B*'s consumers are always better off since capital inflows are the most probable ones, and because industry relocation towards domestic country becomes less welfare-reducing for *B*'s residents as intra-bloc liberalisation takes place.

In the case of domestic locations, *A1* always gain in terms of well-being, and *A2* is very unlikely damaged. In fact, *A2*'s welfare only decreases when the domestic country is very large, there is gate effect and *A2* is relatively unindustrialised. Furthermore, just in this peculiar scenario, both domestic country and the bloc as a whole tend to suffer a reduction in welfare levels after intra-bloc trade barriers fall below certain critical value[44,45].

To sum up, while RoW is 'the loser' in this story, for member countries and the bloc as a whole preferential trade liberalisation tends to be a welfare-improving policy. Moreover, even though domestic delocation may take place and regional inequalities tend to be deepened; domestic welfare may increase, and every location is very likely better off in terms of real income –results which are again in line with those of previous studies.

4. SOME EVIDENCE ON MERCOSUR'S SPATIAL EFFECTS WITHIN ARGENTINA

As it was mentioned, the idea of this last section is to give some rough but illustrative evidence about which could have been the spatial effects of MERCOSUR within the Argentinean economic landscape. Therefore, we first introduce some features about this Latin-American process of regional integration, and later on we analyse some data and facts which may help us to find some hints about how RI's spatial effects may have taken place in Argentina.

4.A. A BRIEF STORY OF MERCOSUR

[44] Total welfare for each of those territories was defined as the simple sum of the indirect utility levels of their component regions.

[45] This result, which is not general but very specific, can be taken as a counterexample to the result found by Baldwin et al. (2003, Ch.14) –namely, that in the 'FC' model the degree of delocation within the bloc is small enough to ensure that all member countries are better off after any level of preferential liberalisation. We conjecture that the presence of a border effect in our model reinforces agglomeration making delocation stronger than in the 'standard FC'; as a consequence welfare in the more disadvantaged region can decrease.

MERCOSUR was officially launched on March 26, 1991 when the four original members –that is, Argentina, Brazil, Paraguay and Uruguay– signed the Treaty of Asuncion creating a common market by December 31, 1994. More precisely, on that date a custom union would be completed by means of both a gradual, automatic and linear reduction of tariffs and non-tariff barriers and the implementation of the Common External Tariff (CET). Afterwards, the integrating process would evolve towards a common market, characterised by: 1) free movement of goods, services and factors; 2) common trade policy; 3) coordinated macroeconomic and sectoral policies; and 4) harmonised legislation.

Today, MERCOSUR's trade policy can be described as a combination of some features which are common to all members –i.e., intra-bloc free trade, 85 percent of external tariffs lines, and some preferences to third countries– and several issues which remain within each member's national jurisdiction. This second subset includes those policy aspects –such as antidumping and countervailing measures, non tariff instruments, export policies, and other preferences to third parties– which have hitherto not been harmonised but would be soon.

Prior to MERCOSUR's enactment, there was already some, though limited in its extent, preferential trade among the four countries. Since early eighties, these countries –together with other Latin-American nations– had exchanged tariff preferences as well as exceptions from non-tariff barriers within the LAIA (Latin American Integration Association) framework[46]. In addition to that, from 1986 Argentina and Brazil had been implementing what can be regarded as the basis of the MERCOSUR agreement. Within the Economic Integration and Cooperation Program, both countries agreed on lists of negotiated products that were to receive preferential treatment, and designed industry cooperation programs (Estevadeordal et al., 2000).

On the other hand, MERCOSUR's preferential liberalisation also overlapped with unilateral trade opening reforms initiated in mid eighties or early nineties by its member countries. At different speeds and beginning in different years, Argentina, Brazil, Paraguay and Uruguay unilaterally reduced tariff levels and eliminated quantitative restrictions, thus opening up their economies. These led to significantly lower import tariffs, reduced dispersion of rates and the scrapping of most non-tariff barriers for imports from third countries (Estevadeordal et al., 2000).

As one can easily grasp, to disentangle MERCOSUR's effects from the overall effects of trade liberalisation, both preferential and unilateral, seems to be no such a straightforward task[47]. Despite this difficulty, several authors –such as Terra and Vaillant (1997), Calfat and Flôres (2001), Bouzas (2003) and Heyman (2004), among others– coincide with highlighting

[46] Even before, between 1960 and 1980 within LAFTA (Latin American Free Trade Association), Latin American countries were exchanging trade preferences among them. This was indeed the predecessor of LAIA.

[47] For a detailed analysis of the evolution of tariff barriers in MERCOSUR's member countries during the nineties see, for instance, Estevadeordal et al. (2000) and Sanguinetti et al. (2004a).

MERCOSUR's great influence on investment and location decisions inside the members. They argue that there are several noticeable features which must be taken as evidence of MERCOSUR's geographical impacts, and they conclude that those impacts will be greater as the integrating process moves forwards and progresses in common policies –i.e., infrastructure, industry, energy, and fiscal policies– are made

What is more significant, these studies claim that MERCOSUR's geography seems to be a very relevant issue when defining opportunities and constraints that different regions –border locations, big economic centres (São Paulo, Rio de Janeiro and Buenos Aires), and more remote regions– may face in terms of trade, growth and development within the medium and long run.

4.B. ARGENTINEAN EXPERIENCE WITHIN MERCOSUR

As those studies suggest, Argentina may have experienced some relevant and non-innocuous changes in industry location due to MERCOSUR's enactment and the static and dynamic economic effects it has induced. We want to find out whether MERCOSUR could have triggered dissimilar spatial impacts across Argentinean locations that differ in terms of access to MERCOSUR's partners, and how some initial regional imbalances could have been deepened or lessened as a result of this preferential trade agreement (PTA).

When accomplishing and designing our empirical exercise, one limitation is that in the case of MERCOSUR there are neither 'statistics *of* the bloc' nor adequate statistical data at national levels –being Argentina not the exception[48]. Indeed, official statistics of MERCOSUR's members are very likely scarce, and sometimes wide-lagged, discontinuous and sporadic; thus they are not easily comparable across regions, periods and sectors.

Therefore, the following empirics should be taken as a first attempt to analyse Argentinean scarce regional data from the perspective of the spatial effects our NEG model predicts for MERCOSUR –better to say, 'for a *standard* PTA'. In this enterprise the aim is to depart as less as possible from the spirit of the New Empirics of Agglomeration and Trade and its more recent approaches[49]. Thus, though neither testing nor estimating NEG postulates, the goal is to contrast theoretical predictions derived from our RI model with some trade and production data available for Argentinean regions.

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[48] 'Adequate statistical data' refers to the basic data needed to undertake valuable empirical assessments of NEG models –as one can get from studies carried out for the EU or NAFTA– namely: trade costs, distances, gross product or value added, wages, price indices, among others, disaggregated at both regional and sectoral levels.

[49] These more recent approaches –namely, Brülhart et al. (2004), Niebuhr (2004), and Barkman et al. (2005)– tend to depart from first-generation empirical assessments of NEG theories. While the latter regress specialisation or concentration indexes on openness, industry and country characteristics, and interaction terms –see for instance Kim (1995), Ellison and Glaeser (1997), Amiti (1999), Midelfart-Knarvik et al. (2000), Midelfart-Knarvik, Overman and Venables (2000), Brülhart (2001), and for Latin-American countries, Volpe Martincus (2004), Sanguinetti, et al. (2004a and 2004b), and Sanguinetti and Volpe (2005)– new empirical implementations tend to take a closer look at NEG predictions trying to test them, and thus to ratify (or falsify) the models.

4.B.a. Data and methodology

Since the most directly observable results one gets from the theoretical model are related with changes in the distribution of industries across regions that occur as preferential trade liberalisation takes place –i.e., λ_rs' movements as ϕ_{FTA} increases (or τ_{FTA} decreases)[50]– our main purpose should be to analyse how the distribution of manufacturing activities across Argentinean regions has evolved with MERCOSUR. Thus, in order to accomplish this empirical task, records of those two key variables, λs and τ_{FTA}, are required.

To begin with, what have MERCOSUR really meant in terms of τ_{FTA} reduction? As it has been briefly mentioned, intra-bloc trade liberalisation is complete and the implementation of the CET is almost finished. And, though MERCOSUR's formation has coincided with MFN trade liberalisations and other preferential trade schemes endorsed by its members, the net effect of altogether trade reforms has implied an inexorable advanced of internal trade preferences over MFN (or extra-bloc) tariffs (Estevadeordal et al., 2000)[51].

Therefore, it can be postulated that from 1991 on there has been an unrelenting increase of preferential margins among MERCOSUR's members. Since we have not access to a complete tariff database, the applied assessment is performed relying on this statement; thus, it is assumed that both, τ_{GE}'s 'modelled' rigidity and a continuous and smooth intra-bloc trade liberalisation have taken place. Consequently, departing as less as possible from facts, the analysis focuses in how Argentinean λ_rs have moved during MERCOSUR's years[52].

We work with annually Gross Geographic Product (GGP) 1990-2001 database provided by the Unidad de Información Provincial Integrada (Unity of Integrated Provincial Information, ProvInfo[53]). A proxy that closely resembles this λ_r theoretically-defined share of world capital endowment, H, employed in region r –which also represents the share of world firms (or varieties) located in region r– seems to be the ratio between Gross Regional Manufacturing Product and Gross National Manufacturing Product. That is, for location *A1*, λ_{A1} is approximated through $z_{A1} \equiv P_{A1}Q_{A1}/P_AQ_A$, which measures absolute manufacturing concentration[54].

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[50] This evidence on λ_rs might also tell us about welfare gains arriving to each region, through *direct* price-effects.

[51] Related with this issue it is worth to remember that though the focus of this research is on MERCOSUR-scented impacts, some location effects observed in Argentina's economic geography may actually be result of an eccentric cocktail of plurilateral trade costs reductions. As an indication of that, one can refer to the few empirical studies carried out for studying regional impacts within MERCOSUR –i.e., Sanguinetti et al. (2004a and 2004b) for MERCOSUR; Volpe Martincus (2004), Canuto and Sá Porto (2002), Haddad et al. (2002), and Sá Porto (2000) for Brazil; and recently Sanguinetti and Volpe Martincus (2005) for Argentina– which chiefly measure regional effects of altogether those trade policies measures.

[52] In fact, this is the way in which various descriptive studies carried out for MERCOSUR proceed –such as, Estevadeordal et al. (2000), Calfat and Flôres (2001) and Bouzas (2003). Differently, other studies try to account for trade liberalisation by introducing openness measures or distance indexes as explanatory variables in their regressions.

[53] This Unity pertains to the Secretariat of Provinces, Ministry of Interior Affairs of Argentina.

[54] Perhaps, in order to more closely address the model one should work with manufacturing data disaggregated at sectoral level. However, there are neither raw annual manufacturing statistics for Argentinean regions or

In fact, this ratio –i.e., *A1*'s share in Argentinean manufacturing product– is a proxy of relative capital-services' employment ($\lambda_{A1}/\lambda_A = n_{A1}/n_A$), given that technology and thus factors' productivity is the same all around the world. Any increase in this ratio represents an improvement of *A1*'s industrialisation compared with the national average; on the contrary, any decline in the ratio describes a worsening of *A1*'s situation with respect to *A*'s one[55].

Alternatively, a relative or normalised concentration index for manufacturing product can be used. For location *A1*, for instance, it is defined as:

$$\tilde{z}_{A1} \equiv \frac{P_{A1}Q_{A1}/P_AQ_A}{Y_{A1}/Y_A}$$, where $Y_r = Z_r + P_rQ_r$ is product (or income) in region *r*.

This index may be regarded as better proxy of λ_r than the former since it corrects for some relative regional characteristics (or first nature). Dividing z_{A1} by the relative GGP, some location factors different from the ones explicitly modelled seem to be controlled for.

In addition to the above empirical analysis, we also study the behaviour of Argentinean regional exports, using a database constructed by INDEC for period 1993-2001, where exports are classified in terms of: tariff line, country of destination, type of good, and province of origin. This second enquiry tries to verify, by analysing some trade indicators, whether preferential liberalisation, and its 'resultant' relocation process, may have changed manufacturing trade flows –and, in particular, intra-MERCOSUR exports.

NEG models assume that industry relocation inside any region leads to augmented exports towards trade partners; and that, instead, industry relocation outside any region implies a reduction of its manufacturing exports. Therefore, one may expect relocation of industries within Argentina, due to MERCOSUR's influence, to have generated changes in regional export patterns. In addition, intra-bloc exports on the one hand, and extra-bloc ones on the other might have been affected differently, as a result of increased preferential margins among MERCOSUR's members.

In order to be coherent with the configuration of our model and for expositional clarity, the empirical analysis is presented for an Argentina divided into two large locations[56]: *A1*, which comprises two known territories that are close to MERCOSUR's members, i.e. the

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provinces, nor good substitutes for the period analysed. The more complete data is obtained from National Economic Censuses, but the more recent ones were conducted in 1984 and 1993. A new census is now been processed by the INDEC (National Institute of Statistics and Censuses of Argentina), so more complete studies could be done soon.

[55] Any of these two events may imply either net capital inflows or net capital outflows. Namely, an increase of λ_{A1}/λ_A may be a result of either $\Delta\lambda_{A1}>\Delta\lambda_A$ or $\nabla\lambda_{A1}<\nabla\lambda_A$; while a reduction of λ_{A1}/λ_A may be a result of either $\Delta\lambda_{A1}<\Delta\lambda_A$ or $\nabla\lambda_{A1}>\nabla\lambda_A$.

[56] Though we choose to present regional results, the analysis was also carried out for every Argentinean province. These results are available from the authors upon request.

Pampean region and the Northeast; and *A2* which is a remote location formed by three territories, namely the Northwest, Cuyo and Patagonia[57].

Indeed, when dividing Argentina into two broad locations the intention is to address as much as possible the structure of our model. This NEG setting distinguishes across domestic regions aiming to introduce both, size asymmetries and differences in terms of access to members' markets. Therefore, the division we propose for Argentina tries to follow that idea. Location *A1* is situated next to Uruguay, Paraguay and Brazil; it comprises the northern and central-east part of the country and before MERCOSUR it was the responsible of 82,37 percent of the national manufacturing product (in 1990) and the place of residence of near 77,35 percent of Argentinean population (INDEC, 1991)[58].

It is proper to note that none of these broad Argentinean locations exhibits in reality a homogeneous interior landscape –which is one of our model's assumptions. For instance, within *A1* the Pampean region alone explained, in 1990, over 95 percent of *A1*'s manufacturing activity; however it shares a shorter border with MERCOSUR's partners in comparison with that sheared by the Northeast. Inside *A2*, the most developed region is Cuyo –accounting for around 49 percent of regional manufacturing product– which is situated in the middle-west of the country, exactly on the opposite side to MERCOSUR. Therefore, albeit the empirical analysis tries to follow the NEG model, it is indeed enhanced in order to study whether spatial impacts might have been not uniform inside each broad location[59].

4.B.b. Results: MERCOSUR's spatial effects within Argentina

Our theoretical analysis of previous sections suggests that from the point of view of Argentina –in a Border Effect scenario, where θ equals 3/8 so the domestic country is assumed as relatively small (or even if θ equals 1/3)– MERCOSUR may have not been a pro-industrialisation opening strategy. The picture seems not very favourable for Argentina since firms would have moved towards Brazil due to market access incentives, and a more uneven economic landscape would have resulted.

In the case that *A1* had taken advantage of its enhanced access towards the bloc and/or its pre-integration superior level of industrialisation, capital outflow may have been

[57] Region *A1* includes the following provinces: Misiones, Corrientes, Entre Ríos, Chaco, Formosa (Northeast), Santa Fé, Buenos Aires, Córdoba, La Pampa, the city of Buenos Aires (Pampean region). *A2* comprises: Salta, Jujuy, Santiago del Estero, Tucumán, La Rioja, Catamarca (Northwest), San Luis, Mendoza, San Juan (Cuyo), Neuquén, Río Negro, Chubut, Santa Cruz and Tierra del Fuego (Patagonia). See the map in the Appendix.

[58] It is worth mentioning that results are sensible about the definition of those two broad locations. We conducted several analyses and decided to present the results for which seems to be both the 'average case' and the most similar to the theoretical definition. The other results are available from the authors upon request.

[59] In addition, the empirical analysis could be enhanced by taking into account that closeness of other MERCOSUR's associated members –in principal, Chile and Bolivia– may have also play a role in re-shaping Argentinean industry landscape. We leave this for future research.

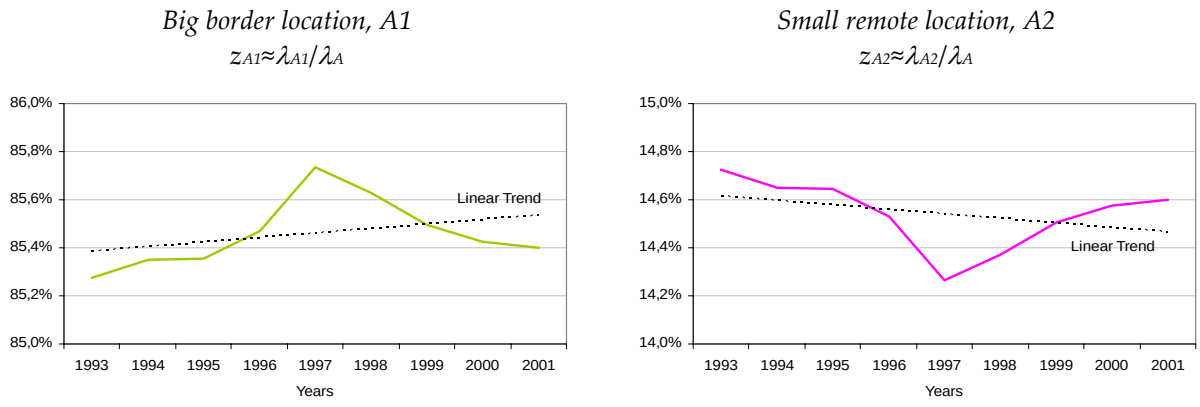
lessened, and this border location benefited. On the other hand, the less developed or more remote location, *A2*, would have been damaged due to MERCOSUR's location effects.

Apart from that, in an ad-hoc manner –that is, applying our theoretical predictions to deal with spatial effects inside the Argentinean heterogeneous locations– one could expect that more industrialised provinces inside *A2* might have retained or even attracted some firms. Whereas, provinces geographically closer to preferential partners but relatively under-developed –i.e. the Northeast– might have suffered due to fiercer competition coming from big preferential partners.

All these are the type of conclusions one can derive from our theoretical exercise for a country like Argentina which launched a PTA with Brazil (a fairly big country), Paraguay and Uruguay. Let see now whether those results are supported or not by Argentinean data. Beginning with the analysis, Figure 3 shows the evolution z_{A1} and z_{A2} have displayed, and suggests that regional disparities seem to have increased since 1993.

Moving from the origin of each diagram to the right, it can be observed that some relative industry relocation may have happened inside *A1* since its participation in total manufacturing product has increased; accordingly, location *A2* might have suffered some capital outflow. These movements experienced by z_{A1} and z_{A2} are nevertheless slight. For instance, between 1993 and 2001, the former indicator grew only 0,15 percent, and z_{A2} decreased 0,84 percent, at an average annual growth rate of 0,02 percent and -0,10 percent, respectively.

Figure 3: The Argentinean 'BE' case. Spatial effects in its locations
Absolute concentration measure



Source: Author's calculation based on ProvInfo database.

Inside those locations, the effect was not homogeneous. Whilst the most developed region in *A1* moved a bit above those aggregate rates, the less developed one (the Northeast) was importantly damaged –registering a growth rate of -4,11 percent between 1993 and

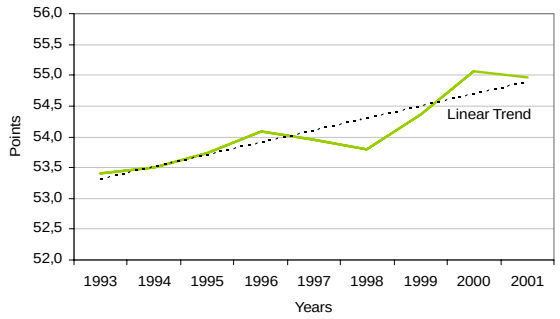
2001[60]. Somewhat similar occurs in *A2*, where industry seems to have expanded in the Northwest and Patagonia, and relocated out of Cuyo.

Figure 4 seems to corroborate the previous pattern. One finds that again *A1* may have tended to attract manufacturing firms, while *A2* may have expulsed producers. Indeed, using this relative measure of concentration, changes in location seem to be greater: $\tilde{z}_{A1}$ grew 2,93 percent during the eight years considered, whereas $\tilde{z}_{A2}$ diminished 3,36 percent –0,36 percent and -0,42 percent annually, respectively. This indicates that both *A1*'s 'manufacturing bias' (with respect to national average) and *A2*'s 'non-manufacturing bias' grew together with MERCOSUR.

Figure 4: The Argentinean 'BE' case. Location effects inside its locations
Relative concentration measure

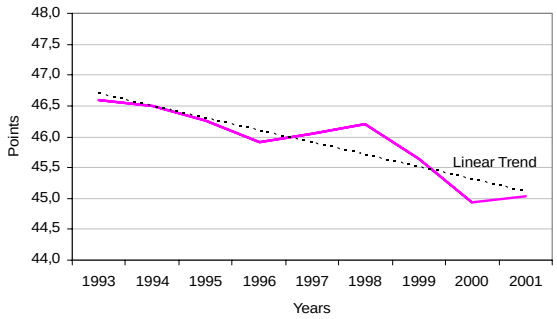
Big border location, A1

$$\tilde{z}_{A1} \approx \frac{\lambda_{A1}/\lambda_A}{Y_{A1}/Y_A}$$



Small remote location, A2

$$\tilde{z}_{A2} \approx \frac{\lambda_{A2}/\lambda_A}{Y_{A2}/Y_A}$$



Source: Author's calculation based on ProvInfo database.
Note: Normalised values are reported, $\tilde{z}_{A1} + \tilde{z}_{A2} = 100$.

With this relative indicator, we can also get an image of disparities inside each location. Within *A1*, the Northeast and the Pampean region show very similar behaviours –growing their indices less than 1 percent in the whole period, and between 0,12 and 0,04 percent annually– so relative industry inequalities may have almost not increased inside this location. In *A2*, on the contrary, Cuyo is the less damaged sub-region –registering a growth rate of -0,23 percent between 1993 and 2001– whilst the Northwest and even more Patagonia –with rates of -2,12 percent and -8,73, respectively– seem to have suffered comparatively more due to industry outflow.

Coming back towards our model's predictions for the case of a large border location (ρ=0,6) –see Figure 2, in Section 3.B– one finds that z and $\tilde{z}$'s behaviours are to some extent in line with the theoretical estimates for a medium sized or small domestic country

[60] The participation of each sub-region, and so its growth rates are calculated with respect to national manufacturing product.

(1/3>θ>3/8). Whilst less developed and remote location is relatively damaged, *A1* is benefited in terms of industry relocation[61].

Complementing the above analysis, we intend to asses whether the process of industry relocation, which seems to have occurred within Argentina, may have been export-promoting by studying manufacturing exports' evolution. Table 2 shows that the participation of *A1*'s manufacturing external sales in manufacturing Argentinean exports has diminished from 1993 to 2001.

Table 2: Manufacturing exports of Argentinean locations
Period 1993-2001

Region	Regional share in national manuf. exports		Specialisation in manuf. exports		Manufacturing export coefficient	
	1993	2001	1993	2001	1993	2001
Argentina	100%	100%	68,06%	62,55%	13,11%	26,20%
A1	88,20%	85,76%	75,33%	74,20%	13,56%	26,31%
A2	11,80%	14,24%	39,54%	32,14%	10,51%	25,55%

Source: Author's calculation based on INDEC[62] and ProvInfo databases.
Note: Manufacturing export coefficient is calculated as percentage of regional manufacturing product.

From table 2 one can also get that, in each region, whilst the ratio of manufacturing exports to total external sales have decreased, the manufacturing export coefficient have increased, being these movements relatively more important for the remote location[63]. Therefore, though manufacturing specialisation have decreased –both in terms of production and external sales– the three regions may have augmented their external manufacturing exposure.

Therefore, total export data does not allow us to conclude that MERCOSUR had stimulated external sales from *A1* –i.e., the location supposed to have received capital inflows– and reduced (or stimulated less) exports from *A2*, the remote and less-industrialised district. The little evidence seems to diverge from our expectations; however, due to its unsteadiness no definite inferences should be derived from this analysis[64].

If we specifically consider intra-MERCOSUR (rather than total) manufacturing exports, one finds that the participation of each location in national intra-bloc sales is indeed fairly in line with production data –see two first columns in table 3 and take into account, for

[61] Anyhow, it is worth mentioning that we are just extrapolating simulations' results to the empirical arena, when an appropriated procedure should be to check whether parameters' values are close or not to Argentinean and MERCOSUR's reality. This is left for future empirical research.
[62] Note that values presented for Argentina are not the same as those INDEC publishes in its web-site. The difference comes from exports that we have not considered in the total because they are either of undetermined origin, non-declared or originated abroad.
[63] This occurs at the same time as the ratio of manufacturing product to total product has diminished.
[64] Perhaps the instability of the indicators is in fact implying that some short-run phenomena have been taking place rather than long-run re-location processes.

instance, that z_{A1} was 85,28 percent in 1993 and 85,40 in 2001. Again nevertheless, the quasi-imperceptible evolution of these shares has been not steady.

Table 3: Manufacturing intra-MERCOSUR exports of Argentinean locations
Period 1993-2001

Region	Share in national manuf. exports towards MERCOSUR		Specialisation in manuf. exports towards MERCOSUR		Intra-MERCOSUR export coefficient	
	1993	2001	1993	2001	1993	2001
Argentina	100%	100%	25,71%	31,79%	3,37%	8,33%
A1	87,44%	87,99%	25,50%	32,60%	3,46%	8,58%
A2	12,56%	12,01%	27,40%	26,80%	2,88%	6,85%

Source: Author's calculation based on INDEC and ProvInfo databases.
Note: Intra-MERCOSUR export coefficient is calculated as percentage of the regional manufacturing product.

The importance of manufacturing sales towards MERCOSUR with respect to total manufacturing exports in each region has evolved differently between 1993 and 2001 –look at two second columns in table 3. While MERCOSUR has grown as destination of those exports in the case of both, the country and *A1*; it has diminished for *A2*. This indicates that MERCOSUR has become a comparatively principal destination of *A1*'s manufacturing exports and a less essential market for *A2*'s products.

Finally, the evolution of intra-MERCOSUR export coefficient –which measures manufacturing exports towards MERCOSUR as a share in manufacturing product– shows that every region is more linked to MERCOSUR as the process of RI made progresses. *A1* is always above the national average, whilst *A2* is below it.

To sum up, this empirical approximation towards corroborating MERCOSUR's spatial impacts within the Argentinean economic landscape is enlightening though not conclusive. There is some evidence about changes in the location of manufacturing product across the country, which seems to be in line with our theoretical predictions. Thus, within Argentina RI would have tended to foster spatial concentration, deepening pre-existent regional imbalances –i.e., *A1* seems to have been favoured by industry agglomeration.

On the other hand, export data is providing no such a crystal clear picture of the situation –perhaps even contradicting that presumption. Anyhow, MERCOSUR has grown as destination of Argentinean manufactures. If one compares, for these goods, the evolution of total export coefficient with the one displayed by intra-bloc export coefficient finds that relative importance of MERCOSUR has steadily augmented. So PTL, and probably its 'resultant' relocation process, may have stimulated intra-bloc trade flows.

6. CONCLUDING REMARKS

This paper builds on a very tractable RI-NEG model in order to acknowledge for spatial impacts of preferential trade liberalisation on the internal geography of a member

country. Inspired by Henderson's (1996, p.33) suggestion, focus has been put in analysing those spatial effects within different geographical scenarios.

Our theoretical exercise has shown that RI tends to foster agglomeration inside the country, and to deepen initial imbalances. Furthermore, the model predicts that a domestic location with some access advantage to the bloc is generally favoured, while a remote one may be very likely damaged. Nonetheless, our examples also show that RIAs tend to be welfare-enhancing for each member country and any of their inner regions.

Our empirical assessment carried out for Argentina, as a MERCOSUR's member, has presented some rough but illustrative evidence about some spatial impacts that may have taken place within the country during the process of RI[65]. These location effects, which seem to have occurred in the manufacturing sector, would resemble the theoretical predictions derived from our NEG model.

Overall, our findings are indeed an incentive for future theoretical and empirical work. Within the theoretical arena, the goal is to move from this simple setting to one that can give deeper insights into the real picture of MERCOSUR and other PTA. The main idea is to build a model that introduce some 'realistic' features –such as comparative advantage differences and fiscal policy heterogeneities across regions, vertical linkages among firms, capital relocation costs[66], etc.– thus nesting NEG with some traditional determinants of location[67].

On the other hand, future empirical research aims to, more precisely, evaluate MERCOSUR's spatial impacts both across and within members. The intention is to move on methodologically –though working with data limitations– trying to estimate parameters' values in order to run simulations and, thus, contrast the theoretically predicted spatial distribution of manufacturing activity with that which really takes place.

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[65] Related with this result, Sanguinetti and Volpe Martincus (2005) –who analyse how manufacturing location patterns have changed across Argentinean provinces and industries between 1985 and 1994– find that that trade policy seem to matter for the geography of industries. In particular, they conclude that trade liberalisation seems to be associated with location of activities away from Buenos Aires city and its surroundings.

[66] Baldwin and Robert-Nicoud (2000) study that last extension, and conclude that asymmetric liberalisation can be designed to avoid delocation during preferential trade liberalisation.

[67] In addition, we aim to generalise our setting –following in principal Behrens, et al. (2004)– and thus to circumvent relying on numerical simulations.

APPENDIX

A.1. THE SPATIAL EQUILIBRIUM

A.1.a. 'No Border Effect' scenario

The system of equations can now be re-written as follows:

$$\begin{aligned}
\Omega^{*}_{A1} &= (1-2\theta)\left[\frac{\rho}{DA1'}+\frac{\phi_A(1-\rho)}{DA2'}\right]+\theta\left[\frac{\phi_{FTA}}{DB'}+\frac{\phi_{GE}}{DC'}\right]\\
\Omega^{*}_{A2} &= (1-2\theta)\left[\frac{\phi_A\rho}{DA1'}+\frac{(1-\rho)}{DA2'}\right]+\theta\left[\frac{\phi_{FTA}}{DB'}+\frac{\phi_{GE}}{DC'}\right]\\
\Omega^{*}_{B} &= (1-2\theta)\phi_{FTA}\left[\frac{\rho}{DA1'}+\frac{(1-\rho)}{DA2'}\right]+\theta\left[\frac{1}{DB'}+\frac{\phi_{GE}}{DC'}\right]\\
\Omega^{*}_{C} &= (1-2\theta)\phi_{GE}\left[\frac{\rho}{DA1'}+\frac{(1-\rho)}{DA2'}\right]+\theta\left[\frac{\phi_{GE}}{DB'}+\frac{1}{DC'}\right]
\end{aligned} \qquad \text{(A1)}$$

and denominators are re-defined: $DA1' \equiv \lambda_{A1}+\phi_A\lambda_{A2}+\phi_{FTA}\lambda_B+\phi_{GE}\lambda_C$, $DA2' \equiv \phi_A\lambda_{A1}+\lambda_{A2}+\phi_{FTA}\lambda_B+\phi_{GE}\lambda_C$, $DB' \equiv \phi_{FTA}(\lambda_{A1}+\lambda_{A2})+\lambda_B+\phi_{GE}\lambda_C$ and $DC' \equiv \phi_{GE}(\lambda_{A1}+\lambda_{A2}+\lambda_B)+\lambda_C$.

The following expression shows the direction that capital flows may take between location *A1* and RoW.

$$\operatorname{sgn}\left(\pi^{*}_{A1}-\pi^{*}_{C}\right)=\operatorname{sgn}\left\{\frac{(1-2\theta)}{\Psi}\left[\rho(1-\phi_{GE})DA2'+(1-\rho)(\phi_A-\phi_{GE})DA1'\right]+\frac{\theta}{DB'DC'}\left[(\phi_{FTA}-\phi_{GE})DC'-(1-\phi_{GE})DB'\right]\right\} \qquad \text{(A2)}$$

A.1.b. 'Border Effect' scenario

The system of equations is now:

$$\begin{aligned}
\Omega^{*}_{A1} &= (1-2\theta)\left[\frac{\rho}{DA1''}+\frac{\phi_A(1-\rho)}{DA2''}\right]+\theta\left[\frac{\phi_{FTA1}}{DB''}+\frac{\phi_{GE}}{DC''}\right]\\
\Omega^{*}_{A2} &= (1-2\theta)\left[\frac{\phi_A\rho}{DA1''}+\frac{(1-\rho)}{DA2''}\right]+\theta\left[\frac{\phi_{FTA2}}{DB''}+\frac{\phi_{GE}}{DC''}\right]\\
\Omega^{*}_{B} &= (1-2\theta)\left[\frac{\phi_{FTA1}\rho}{DA1''}+\frac{\phi_{FTA2}(1-\rho)}{DA2''}\right]+\theta\left[\frac{1}{DB''}+\frac{\phi_{GE}}{DC''}\right]\\
\Omega^{*}_{C} &= (1-2\theta)\phi_{GE}\left[\frac{\rho}{DA1''}+\frac{(1-\rho)}{DA2''}\right]+\theta\left[\frac{\phi_{GE}}{DB''}+\frac{1}{DC''}\right]
\end{aligned} \qquad \text{(A3)}$$

and denominators are: $DA1'' \equiv \lambda_{A1}+\phi_A\lambda_{A2}+\phi_{FTA1}\lambda_B+\phi_{GE}\lambda_C$, $DA2'' \equiv \phi_A\lambda_{A1}+\lambda_{A2}+\phi_{FTA2}\lambda_B+\phi_{GE}\lambda_C$, $DB'' \equiv \phi_{FTA1}\lambda_{A1}+\phi_{FTA2}\lambda_{A2}+\lambda_B+\phi_{GE}\lambda_C$ and $DC'' \equiv \phi_{GE}(\lambda_{A1}+\lambda_{A2}+\lambda_B)+\lambda_C$.

A.2. WELFARE EFFECTS OF RI

Expressions below show how welfare of consumers in *B* and *C*, respectively, changes with preferential trade liberalisation.

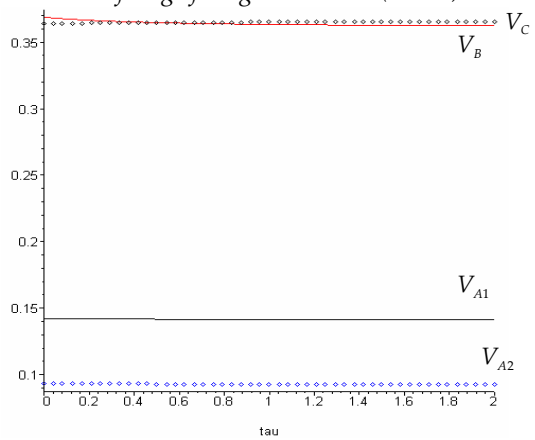
$$\frac{\partial V_B}{\partial \tau_{FTA}}=\Theta_B\left\{\left[\frac{\partial \phi_{FTA1}}{\partial \tau_{FTA}}\lambda_{A1}+\frac{\partial \phi_{FTA2}}{\partial \tau_{FTA}}\lambda_{A2}\right]+\left[(1-\phi_{GE})\frac{\partial \lambda_B}{\partial \tau_{FTA}}+(1-\phi_{FTA1})\frac{\partial \lambda_{A1}}{\partial \tau_{FTA}}+(1-\phi_{FTA1})\frac{\partial \lambda_{A2}}{\partial \tau_{FTA}}\right]\right\} \qquad \text{(A4)}$$

$$\frac{\partial V_C}{\partial \tau_{FTA}} = \Theta_C \left(1 - \phi_{GE}\right) \frac{\partial \lambda_C}{\partial \tau_{FTA}} \qquad \text{(A5)}$$

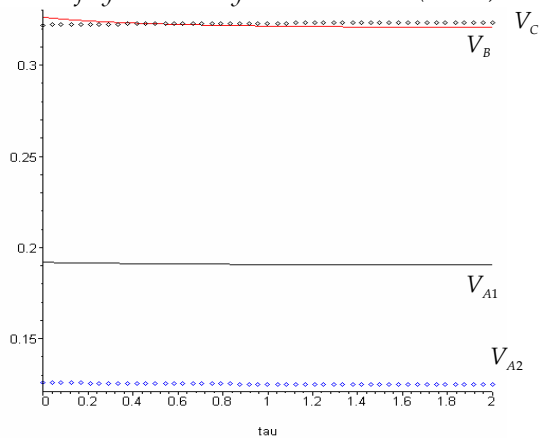
The following figures summarise how welfare levels in each region are modified as RI takes place when there is no gate effect, but domestic locations are asymmetric in terms of size.

Figure A.1: 'NBE' case. Welfare implications

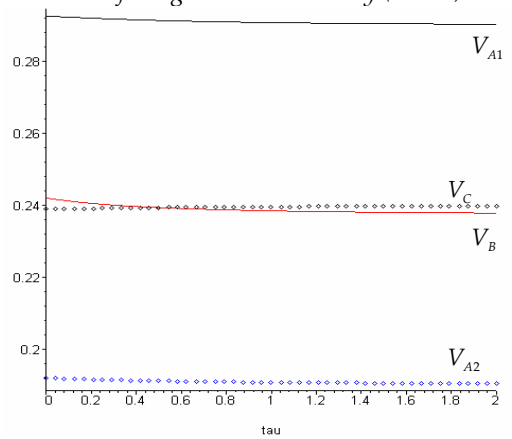
Case of large foreign countries (θ=3/8)



Case of symmetrically sized countries (θ=1/3)



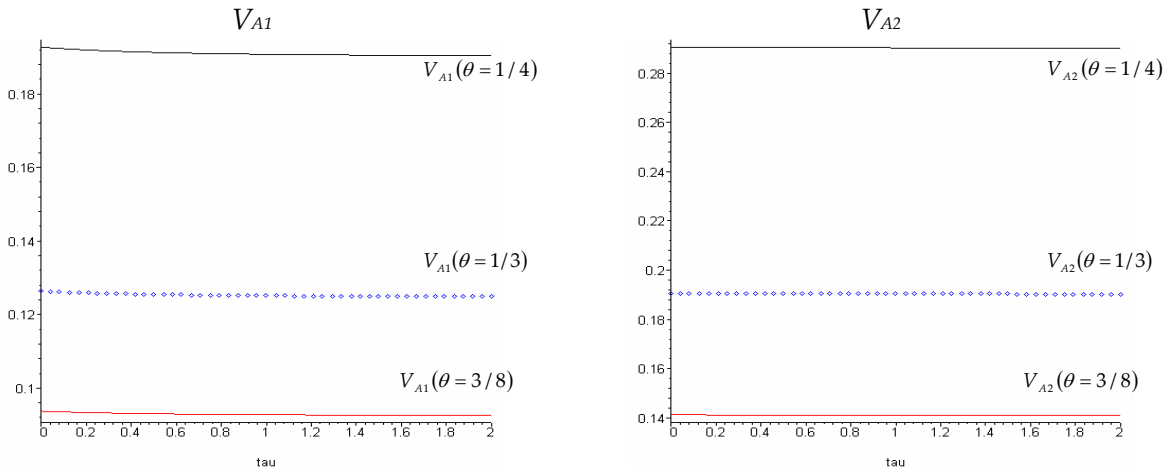
Case of a big domestic country (θ=1/4)



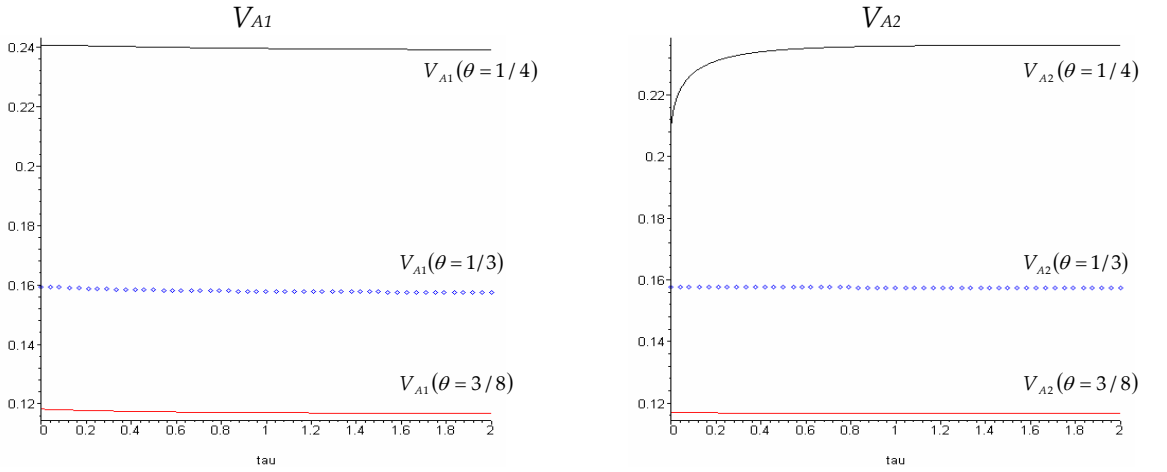
Finally, figure A.2 shows welfare impacts of RI on each domestic location, for different scenarios, when there is a border effect.

Figure A.2: 'BE' case. Welfare implications

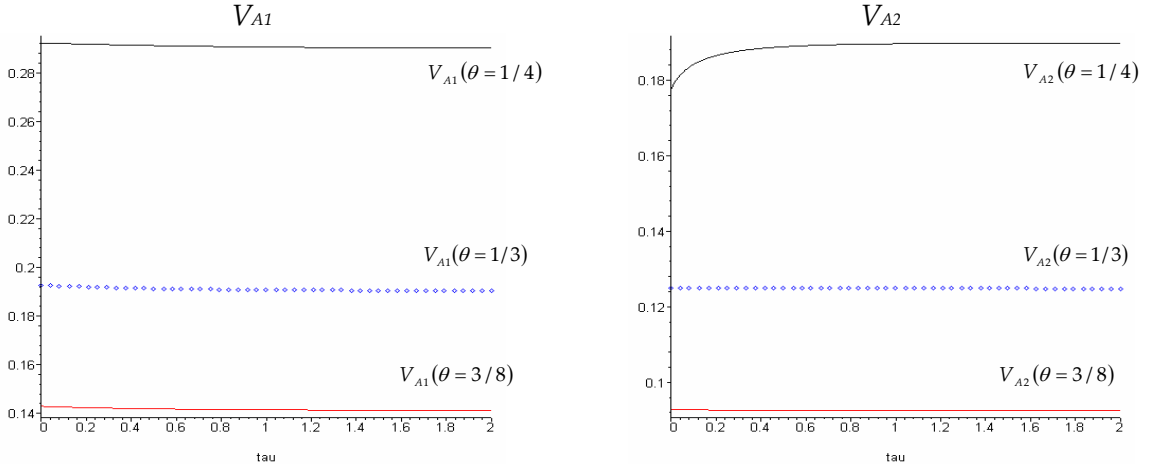
Case of a big remote location (ρ=0,4)



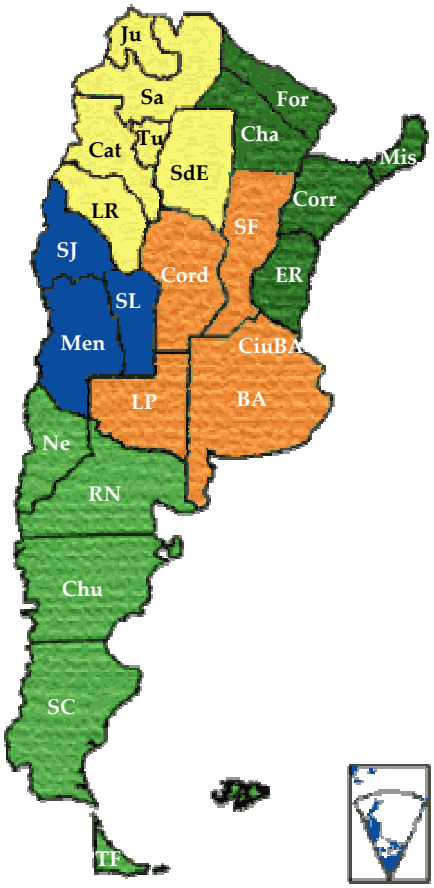
Case of symmetrically sized locations (ρ=0,5)



Case of a large border location (ρ=0,6)



A.3. ARGENTINEAN REGIONS AND PROVINCES



Regions	Provinces
Northwest	Jujuy (Ju), Salta (Sa), La Rioja (LR), Tucumán (Tu), Catamarca (Cat) and Santiago del Estero (SdE)
Northeast	Formosa (Fo), Chaco (Cha), Misiones (Mis), Corrientes (Corr) and Entre Ríos (ER)
Cuyo	San Juan (SJ), San Luis (SL) and Mendoza (Men)
Pampean	Córdoba (Cord), Santa Fé (SF), Buenos Aires (BA) and La Pampa (LP)
Patagonia	Neuquén (Ne), Río Negro (RN), Chubut (Chu), Santa Cruz (SC) and Tierra del Fuego (TF)

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