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The impact of globalization on FDIs : an empirical assessment for Central and Eastern European Countries

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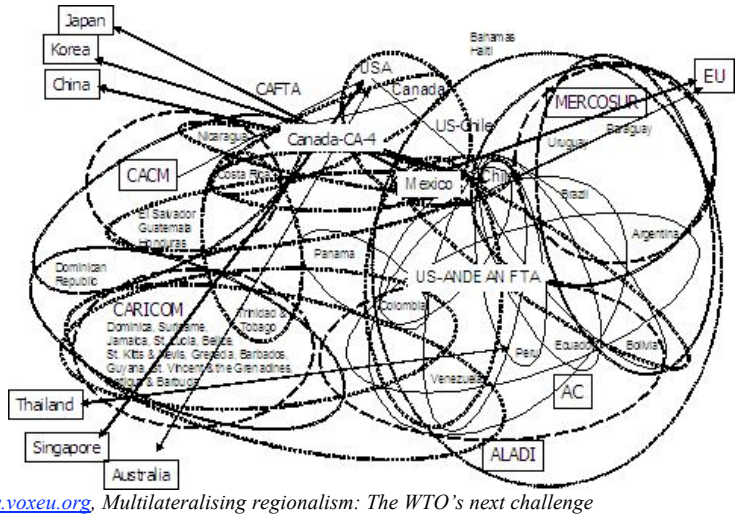
This article analyzes the impact of economic integration under multilateral and preferential arrangements on relocation and welfare. Economic integration is measured by the reduction of interregional trade costs and by the reduction of communication costs between the headquarters and the production units of multinationals firms. We find that generally for high communication costs, industry relocates to the rich region and for low communication costs, to the developing regions, while the reduction of communication costs triggers industry relocation to the region reducing them. The numerical simulations are confirmed by an empirical analysis of the CEECs. Location determinants in these countries are low labour and communication costs. We also checked competition effects between recipient countries in terms of relative labour and communication costs and a significant impact only in terms of communication costs.

Key-words: preferential liberalization, multinational firms, communication costs
JEL classification: F15, F23, R11, R15

1 Introduction

The world trade map has considerably changed in the last decades, with the rise of multilateralism and regionalism. In 2007, the four biggest FTAs (EU, NAFTA, Mercosur and ASEAN) alone count for about two thirds (59.6%) of world export trade (UNCTAD database, 2007) and only one member of WTO seems to stay away from any FTA arrangement, namely Mongolia (UNESCAP, 2004). Furthermore, one year before WTO was born, there were only 13 FTAs in the world; today there are over a hundred (Figure 1), with countries signing FTAs in many different parts of the world and turning world trade into what Jagdish Bhagwati calls the "spaghetti bowl". The overall importance of bilateral agreements, including hub-and-spoke type, is non-negligible: there are over 230 agreements all over the world. Still, regarding trade liberalization, there is an ongoing debate over the effects of multilateralism versus regionalism.



Source: www.voxeu.org, Multilateralising regionalism: The WTO's next challenge

Figure 1. 'Spaghetti bowl' RTAs in the Western Hemisphere

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Multilateral liberalization, like bilateral liberalization, is known to have important effects on production factors allocation, the location of activities and welfare. In this paper, we shall focus on the last two. We analyze the impact of FTAs and hub-and-spoke arrangements on the distribution of activity and welfare, in a three-region new economic geography (NEG) framework.

Regarding multilateral liberalization, Forslid (2004) discusses industrial location as well as regional policy in a three asymmetric region framework. He finds that, as usual in the NEG literature, economic integration leads to the deindustrialization of the periphery. In this context, the industrialization of the peripheral regions can be fostered by locating government agencies in some regional centres rather than in the absolute periphery, by improving infrastructure between the peripheral regions rather than between the periphery and the core or by subsidies, which are effective for low as well as for high levels of economic integration. A multi-region version of the footloose capital model is analyzed by Baldwin et al. (2003) and also a version of Krugman's (1991) core-periphery model is analyzed by Fujita, Krugman and Venables (1999) in a three-region framework. Baldwin et al. (2003) show how multilateral liberalization in a multi-region framework favours industry relocation to the largest region leading to a core-periphery pattern. Fujita, Krugman and Venables (1999) find that for high trade costs, industry is equally divided between the three regions, while for low trade costs, a core-periphery pattern emerges, depending on the initial conditions in each region. For the intermediary trade costs case, both core-periphery and equal distribution between the three regions are stable equilibria.

Then, the NEG literature shows that on a global scale, multilateral liberalization is preferable to a bilateral one. Arguments have been based on trade diversion and comparative advantage. Through bilateral liberalization, national agents are encouraged to develop trade with particular trade partners regardless of the competitiveness of alternative potential partners: countries may see their terms of trade deteriorate. In the case of a FTA, there is trade diversion and increasing welfare inside the area, while in the hub-and-spokes[1] case, there is trade diversion towards the hub, together with increasing welfare inside the hub and decreasing welfare in the spokes (Baldwin et al., 2003).

Puga and Venables (1997) discuss industrial location and preferential trading arrangements (FTAs and hub-and-spoke), based on a vertical linkages model[2] with three regions. They find that at first, the members of the FTA benefit identically from integration, while industry size and welfare fall outside the liberalizing regions. But then, as integration proceeds, some members of the FTA gain industry at the expense of others. As for hub-and-spoke arrangements, they trigger relocation of industry to the hub, with disparities appearing between the spokes as liberalization proceeds. From a political economy point of view, Krishna (1998) and Levy (1997) show that FTAs triggering industry agglomeration to the member regions enjoy more political support, rendering multilateral liberalization unfeasible, even though it may be more beneficial regarding welfare.

Furthermore, multinational firms (MNFs), one of the main engines of globalization, are tempted to invest (FDIs) inside FTAs, because this gives them access to its bigger market or in the hub, for the same reason. Markusen and Venables worked on several models involving the presence of MNFs, under different scenarios. In a Hecksher-Ohlin framework with trade costs and monopolistic competition (Markusen & Venables, 2000), they show that trade liberalization leads to MNFs appearing in countries with similar absolute and relative factor endowments.

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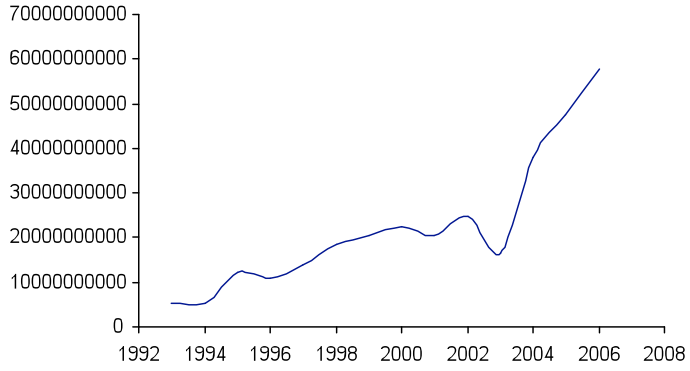
[1] One country, generally a large one (the hub), is at the centre of many bilateral free trade agreements with smaller countries (the spokes).

[2] Manufacturing firms use as inputs their own production or that of other manufacturing firms. This creates some vertical dependence between manufacturing firms, which acts as an agglomeration force in the model. See Krugman and Venables (1995) for more details.

But today we assist to another expanding phenomenon: industrialized country-based MNFs are relocating production plants in developing countries, that is MNFs are establishing or simply extending in countries not having similar factor endowments. Markusen and Venables (1996a) use the same model as Markusen and Venables (2000), but with high and low skilled labour endowments, and find that as restrictions to direct investments are relaxed, low-skilled labour intensive goods manufacturing will be relocated to countries relatively richer in that type of labour.

Fujita and Thisse (2006) also model such FDIs based on the low labour cost in some regions. Headquarters remain clustered in a core region (developed regions), while production plants are allowed to set up in the core region, together with the headquarters (integrated firms) or in a developing region (MNFs) where labour cost is lower. The key parameters in their model are trade costs interacting with communication costs. While trade costs are defined as any impediment to trade between two different regions, communication costs only concern multinationals, for splitting their production process (headquarters and production units are located in different regions). They show how liberalizing trade can trigger the relocation of plants to the regions with lower labour costs, when communication costs are weak. They also discuss the impact of lowering the communication costs (between headquarters and plants) incurred by MNFs. They find that below a certain value of communication costs, further reduction of the latter triggers the relocation of plants from the core to the periphery, regardless of the level of trade costs.

We intend to combine the two types of models, those dealing with FTAs and hub-and-spokes arrangements and those dealing with multinational activity. This is why we choose to integrate a third region to the Fujita and Thisse (2006) model and analyze the impact of globalization on industry relocation and welfare under FTAs and hub-and-spoke frameworks. Then, we test the results of the model through an empirical analysis of the Central and Eastern European Countries (CEECs) FDI stocks, which have known a sharp increase during the last decade and especially, after the CEECs' accession to the EU (Figure 2). The model highlights two main issues. Firstly, wages and communications technology are important determinants of FDIs. Secondly, globalization multiplies location choices in terms of FDIs and this triggers what Baldwin et al. (1996) call investment diversion and disparities between recipient countries, which implies a fierce competition for attracting investors. We find that, as shown by the model, wages and communications technology are significant determinants of FDIs towards the CEECs, together with usual market related factors, such as GDP. Finally, we test whether the Chinese competition has triggered investment diversion from the CEECs to China and we find a significant impact of the relative communication costs on FDIs: the better communications infrastructure in the CEECs triggered investment diversion from China to the CEECs.



Source : World Development Indicators, World Bank

Figure 2. CEECs Foreign direct investment inflows

The paper is organized as follows: section 2 presents the model, section 3 discusses multilateral versus preferential liberalization, section 4 presents an empirical assessment of the model focusing on the CEECs and section 5 concludes.

2 The model

This model is based on Fujita and Thisse (2006) who discuss the relocation of plants triggered by differences in labour productivity, in a two-region framework. In this paper we analyze the relocation of plants triggered by differences in labour productivity, in a three-region framework. Hereafter, the regions are called: the North (*N*), the South (*S*) and the Rest of the World (*RW*). The North is an industrialized region, while the South and the Rest of the World are developing regions. Furthermore, the Rest of the World is assumed less developed than the South: the Rest of the World is more abundant in low skilled labour and its wage rate is smaller than that of the South. One can think of, for instance, Western Europe, South Europe and Eastern and Central Europe, in a multilateral framework, or Western Europe, Eastern and Central Europe and China, if we consider that the first are members of a FTA. There are two production factors: the skilled workers and the unskilled workers and two sectors. The manufacturing sector is under Dixit-Stiglitz competition: each firm produces one horizontally different variety under increasing returns to scale, using both skilled and unskilled workers. The agricultural sector is under perfect competition, using only unskilled labour.

Consumers are supposed to be identical in their preferences, with the same Cobb-Douglas utility function:

$$U = M^{\mu} Z^{1-\mu},\ 0 < \mu < 1 \text{ and } M = \left[\int_0^n x_i^{(\sigma-1)/\sigma} di \right]^{\sigma/(\sigma-1)} \quad (1)$$

M is the consumption of a composite good, standing for all the varieties of manufactured goods, while Z is the consumption of the agricultural good. μ is the share of the expenditure on manufactured goods, n represents the number of varieties produced in the global economy and also the number of firms ($n = n_N + n_S + n_{RW}$), x_i is the consumption of variety i and $\sigma > 1$ is the elasticity of substitution between the different varieties.

The agricultural sector needs $a_r \geq 1$ units of unskilled labour for one unit of output (r is the subscript for region). Furthermore, northern unskilled workers are more productive than southern unskilled workers and southern unskilled workers are more productive then those in the Rest of the World: $a_N = 1$, while $a_{RW} \geq a_S \geq 1$. The global number of unskilled workers L is distributed across regions as follows: $L_N = L_S / a_S = L_{RW} / a_{RW} = L/3$.

The manufacturing firms have a headquarters (HQ) and a production plant. The HQ uses a fixed amount F of skilled labour. With K_H being the world population of skilled workers, the global number of manufacturing firms n is then K_H/F. We suppose all HQ and thus, skilled workers are fully agglomerated in region N, which we will call the core (Fujita and Thisse, 2006). The amount of unskilled labour L_i used by manufacturing firms varies with the level of output and it depends also on the location of the plant. Firms can choose to locate their plant together with their HQ, in the core (integrated firms), or in region S or RW (MNFs). MNFs must take into account the communication costs, which add to the marginal labour requirement β (2). We suppose communication costs are lower in the South than in the Rest of the World.

Inter-regional trade costs for the manufactured goods are "iceberg" type: only $1/\tau$ ($\tau > 1$) of a shipped good arrives at destination. Initially, for our basic scenario, we will suppose that trade costs are the same for all the trade partners: we can imagine the three areas located at the corners of an equilateral triangle, with a trade cost τ in each direction (Fujita, Krugman

and Venables, 1999). Consequently, $\tau_{NS} = \tau_{NRW} = \tau_{SRW} = \tau$. Then, in order to analyze the impact of preferential trade agreements, it will be necessary to modify this assumption. For the study of the free trade areas (FTAs), we will suppose North and South are the members of such an area and engage in bilateral liberalization, while adopting a common external tariff for their exchanges with the Rest of the world. In this case, $\tau_{NS} < \tau_{NRW} = \tau_{SRW}$. As for the "hub and spoke" arrangements, the North will be the "hub" and the two developing regions, the "spokes". Consequently, $\tau_{NS} = \tau_{NRW} < \tau_{SRW}$. The industrial goods are freely exchanged inside the areas. It is also supposed that the agricultural good is freely exchanged between and inside regions.

Under the above assumptions, demand and supply side equilibrium equations can be written. First, the demand side equations will be determined. Maximising the utility under the budget constraint ($Y = PM + p^Z Z$), we find the optimal consumption function for each manufactured variety x_i and for the agricultural good Z:

$$x_i = \mu Y p_i^{-\sigma} P^{\sigma-1} \text{ and } Z = (1-\mu)Y / p^Z \tag{2}$$

where Y is consumer income, p_i is the price of the manufactured variety i, P is the price index of the composite good and p^Z is the price of the agricultural good.

P is given by:

$$P = \left[\int_0^n p_i^{1-\sigma} di\right]^{1/(1-\sigma)} \tag{3}$$

Demand $1-\mu$ for the agricultural good is assumed large enough for it to be produced by the three regions ($(1-\mu)Y > p^Z(\max\{L_r\})/a_r$)[1] and p^Z is chosen as the numeraire ($p^Z = 1$). This allows pinning down the wage rate for the unskilled workers: $w_N^L = 1$, $w_S^L = 1/a_S$, $w_{RW}^L = 1/a_{RW}$.

One can see that the wage rate for the unskilled in region *RW* is smaller than in region *S*, itself being smaller than in region *N*. Thus firms should tend to relocate their plants in region *S* or *RW* in order to minimize their production costs.

The wage rate for the skilled workers $w_N^{K_H}$ will be determined by the zero profit condition.

Under these conditions, regional income can be determined:

$$Y_N = K_H w_N^{K_H} + L/3,\ Y_S = L/3 \text{ and } Y_{RW} = L/3 \tag{4}$$

From (2) and knowing that trade costs must be taken into account into the final price paid by consumers, total demand for variety i produced in region r becomes:

$$x_{r,i} = \mu Y_r p_r^{-\sigma} P_r^{\sigma-1} + \sum_{s=1}^{2} \mu Y_s (p_r \tau_{rs})^{-\sigma} P_s^{\sigma-1} \tau_{rs} \tag{5}$$

with τ_{rs}, trade costs between r and s (s stand for the regions different from r).

Secondly, we turn to the supply side equations. Given that the agricultural sector is the numeraire, only cost and profit functions for the manufacturing firms are left to be determined. There are two types of costs: the fixed cost, which is the wages paid to the skilled workers working for the HQ and the variable cost, which is the wages paid to the unskilled workers working for the plants. The total cost will be different as firms choose to locate their plant in the same region as their HQ or abroad. Knowing that all the HQ are established in region *N*, the total cost function for an integrated manufacturing firm is given by:

[1] See Baldwin et al. (2003) for further details

$$TC_N = w_N^{K_H} F + w_N^L \beta x_{N,i} \tag{6}$$

whereas for a MFN, it will be given by:

$$TC_{NS} = w_N^{K_H} F + w_S^L \beta C_S x_{S,i} \tag{7}$$

or

$$TC_{NRW} = w_N^{K_H} F + w_{RW}^L \beta C_{RW} x_{RW,i} \tag{8}$$

with C_S a mnemonic for communication costs in the South ($C_S > 1$) and C_{RW} for communication costs in the Rest of the World ($C_{RW} > 1$). So, prices charged by MNFs are higher because of the communication costs.
Accordingly, the profit functions of the integrated firms and MNFs are:

$$\pi_N = p_N x_N - w_N^{K_H} F - w_N^L \beta x_{N,i} \tag{9}$$

$$\pi_{NS} = p_S x_S - w_N^{K_H} F - w_S^L \beta C_S x_{S,i} \tag{10}$$

$$\pi_{NRW} = p_{RW} x_{RW} - w_N^{K_H} F - w_{RW}^L \beta C_{RW} x_{RW,i} \tag{11}$$

The equilibrium mill price that maximises profits of integrated firms is found to be:

$$p_N = \frac{\sigma w_N^L \beta}{\sigma - 1} \tag{12}$$

while those of MNFs are:

$$p_{NS} = \frac{\sigma w_S^L \beta C_S}{\sigma - 1} \text{ and } p_{NRW} = \frac{\sigma w_{RW}^L \beta C_{RW}}{\sigma - 1} \tag{13}$$

Given the distribution of labour across regions and the wage rates for unskilled labour, price index P can be re-written as:

$$P_N = \frac{\beta\sigma}{\sigma - 1} n^{-1/(\sigma-1)} \left[\gamma_N + \Phi_{NS} \gamma_S \left(\frac{C_S}{a_S} \right)^{1-\sigma} + \Phi_{NRM} \gamma_{RM} \left(\frac{C_{RM}}{a_{RM}} \right)^{1-\sigma} \right]^{-1/(\sigma-1)} \tag{14}$$

$$P_S = \frac{\beta\sigma}{\sigma - 1} n^{-1/(\sigma-1)} \left[\gamma_S \left(\frac{C_S}{a_S} \right)^{1-\sigma} + \Phi_{NS} \gamma_N + \Phi_{SRM} \gamma_{RM} \left(\frac{C_{RM}}{a_{RM}} \right)^{1-\sigma} \right]^{-1/(\sigma-1)} \tag{15}$$

$$P_{RM} = \frac{\beta\sigma}{\sigma - 1} n^{-1/(\sigma-1)} \left[\gamma_{RM} \left(\frac{C_{RM}}{a_{RM}} \right)^{1-\sigma} + \Phi_{NRM} \gamma_N + \Phi_{SRM} \gamma_S \left(\frac{C_S}{a_S} \right)^{1-\sigma} \right]^{-1/(\sigma-1)} \tag{16}$$

where:

- $\gamma_N = n_N / n$ represents the share of integrated firms
- $\gamma_S = n_S / n$ represents the share of MNFs to the South
- $\gamma_{RW} = n_{RW} / n$ represents the share of MNFs to the Rest of the World
- $\Phi = \tau^{1-\sigma}$, freeness of inter-regional trade ($\Phi = 0$ means prohibitive inter-regional trade costs, $0 < \Phi < 1$)
- $C_{RW} > C_S$

From (5) and (9)…. (16), equilibrium profit functions can be re-written as:

$$\pi_N^* = \frac{\mu F}{\sigma K_H}\left[\frac{Y_N}{\gamma_N + \Phi_{NS}\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma} + \Phi_{NRM}\gamma_{RW}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma}} + \frac{Y_S\Phi_{NS}}{\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma} + \Phi_{NS}\gamma_N + \Phi_{SRM}\gamma_{RW}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma}} + \frac{Y_{RW}\Phi_{NRM}}{\gamma_{RW}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma} + \Phi_{NRM}\gamma_N + \Phi_{SRM}\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma}}\right] - w_N^{K_H}F \quad (17)$$

$$\pi_{NS}^* = \left(\frac{C_S}{a_S}\right)^{1-\sigma}\frac{\mu F}{\sigma K_H}\left[\frac{Y_S}{\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma} + \Phi_{NS}\gamma_N + \Phi_{SRM}\gamma_{RW}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma}} + \frac{Y_N\Phi_{NS}}{\gamma_N + \Phi_{NS}\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma} + \Phi_{NRM}\gamma_{RW}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma}} + \frac{Y_{RW}\Phi_{SRM}}{\gamma_{RW}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma} + \Phi_{NRM}\gamma_N + \Phi_{SRM}\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma}}\right] - w_N^{K_H}F \quad (18)$$

$$\pi_{NRW}^* = \left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma}\frac{\mu F}{\sigma K_H}\left[\frac{Y_{RW}}{\gamma_{RW}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma} + \Phi_{NRM}\gamma_N + \Phi_{SRM}\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma}} + \frac{Y_N\Phi_{NRM}}{\gamma_N + \Phi_{NS}\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma} + \Phi_{NRM}\gamma_{RW}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma}} + \frac{Y_S\Phi_{SRM}}{\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma} + \Phi_{NS}\gamma_N + \Phi_{SRM}\gamma_{RW}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma}}\right] - w_N^{K_H}F \quad (19)$$

As $\pi_N^* = 0$, the skilled workers' equilibrium wage rate must be:

$$w_N^{K_H} = \frac{L\mu\Phi\left(\frac{1}{\gamma_{RM}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma} + \Phi_{SRM}\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma} + \Phi_{NRM}\gamma_N} + \frac{1}{\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma} + \Phi_{SRM}\gamma_{RM}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma} + \Phi_{NS}\gamma_N}\right)}{3K_H\left(\sigma - \frac{\mu}{\gamma_N + \Phi_{NS}\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma} + \Phi_{NRM}\gamma_{RM}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma}}\right)} + \frac{L\mu\left(\frac{1}{\gamma_N + \Phi_{NS}\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma} + \Phi_{NRM}\gamma_{RM}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma}}\right)}{3K_H\left(\sigma - \frac{\mu}{\gamma_N + \Phi_{NS}\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma} + \Phi_{NRM}\gamma_{RM}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma}}\right)} \quad (20)$$

Thus, all the elements necessary to discuss the impact of economic integration on the relocation of production units and welfare are reunited. Given the complexity of the equations, results could not be obtained analytically, but only through numerical simulations.[1]

3 Multilateral versus preferential liberalization

Given that multilateral liberalization has already been presented in a previous paper, we shall focus on preferential liberalization (free trade and hub-and-spokes arrangements), after a brief reminder of the main results of the former.

3.1 Multilateral liberalization

The multilateral liberalization case was a first opportunity to analyse the forces at play and the challenges facing developing as well as developed countries in the globalization process. We have shown in an earlier paper (Vechiu, 2008) that different facets of globalization can lead to different patterns of industrialisation in a three-region model. The reduction of trade costs, as already known in the NEG literature, mainly brings catastrophic agglomeration of industry to the core region. However, in our model, developing regions have the advantage of abundant low cost labour force and this brings some new results.

A trade off appears between the low wages in developing regions and the communication costs incurred by multinational firms, with both parameters directly affecting MNFs' competitiveness because they pass through the prices they charge on the global market. Consequently, a low wage advantage may be offset by high communication costs and vice versa. This trade off is reflected in our model through the parameter C_r/a_r, appearing in the MNFs' profit functions and it also defines the profile of developing regions in attracting FDI. A region where $C_r/a_r > 1$ will generally have a low potential for attracting FDI, because its communication costs are too high and offset the advantage of low wages. On the contrary, a region where $C_r/a_r < 1$ will have a high potential for attracting FDI, as its low wages are combined with relatively lower communication costs. Given the three regions in the model, simulations have been run for different scenarios: for both developing regions having similar profiles, which is a high or low potential for attracting FDI and for developing regions having different profiles (one with a high potential, the other with a low potential for attracting FDI).

3.1.1 Developing regions with similar profiles

If both developing regions have low potential for attracting FDI, trade liberalization will trigger industry relocation to the developed region leading to catastrophic agglomeration. In the case where these two regions have opposite profiles, of course, industry will relocate to the one having a high potential for attracting FDIs.

If both developing regions have high potential for attracting FDI, the opposite is true, also leading to catastrophic agglomeration to one of the developing regions and in this case, obviously, the question is which one of two will it be? Regarding this issue, the answer depends, of course, on their relative competitiveness. Consequently, the developing region which is supposed to become the new core will be the one having the lowest value for C_r/a_r. By assumption, among the two developing regions of the model, the South has the lowest communication costs, but the highest wages, with the opposite being true for the Rest of the World. So, the South is competing with the Rest of the World through the communication costs, while the Rest of the World is competing with the South through wages. This is one of the main contributions of this model: it highlights the competition between FDI developing recipient countries enhanced through globalization. Then, it also puts forward not only the

[1] GAMS numerical simulations

chance that countries have in exploiting their comparative advantages owing to globalization, but also the importance of technology diffusion.

3.1.2 Developing regions with opposite profiles

Finally, when countries' profiles are opposite, the evolution of their share of industry should follow opposite directions, too, as trade liberalization proceeds. So, technically, it is no longer possible for them to have similar evolutions, as it was the case under the first two scenarios. Indeed, when $C_S/a_S < 1$ and $C_{RW}/a_{RW} > 1$, simulations show that industry relocates to the South, whereas for $C_S/a_S > 1$ and $C_{RW}/a_{RW} < 1$, industry relocates to *RW*. Regarding North, it must be mentioned that for $C_S/a_S < 1$ and $C_{RW}/a_{RW} > 1$, it always loses industry, whereas for $C_S/a_S > 1$ and $C_{RW}/a_{RW} < 1$, it may lose as well as gain some industry (when C_{RW}/a_{RW} is very close to 1). These mixed results confirm the fact that with accelerating globalization, modelling methods need to take into account the multi-country aspect of the world economy. The performances of each country are depending not only on its own characteristics, but also on those of its partners and of the global environment.

3.1.3 Welfare analysis

Regarding welfare, an analysis has been conducted through the equivalent variation, which measures the income variation needed to offset a variation in prices, so that the level of utility remains constant. This method is preferable to the one using a simple analysis of prices evolution, because even though prices have impact on welfare, their evolution does not tell anything about the size of this impact. The equivalent variation gives an estimation of the size of this impact, taking into account not only prices evolution, but also consumers' preferences (the share of expenditure on the two types of goods). In the case of trade liberalization, welfare increases in all regions, especially in those accumulating industry.

The reduction of communication costs triggers industry relocation to the region reducing them, regardless of the level of trade costs and wages. Unlike trade liberalization, it has a more controversial impact on welfare, as it increases in the region gaining industry and decreases in the others.

3.2 Free trade arrangements

The impact of the creation of a free trade area with two members is slightly different than the one of multilateral trade liberalization. Then, it will be different with the level of the communication costs and the common external tariff applied to the outside region.

Simulations show that:

(a) for $C_r/a_r > 1$, MNFs tend to relocate their manufacturing units to the core, therefore in an area member of the FTA (Figure 3a). As for the outside region, for a very high external tariff, the impact, although negative, will be very weak on the level of the industry located in this area as well as on welfare level (its share of industry/its welfare drops very little) or there will be no impact at all. Therefore, the greatest loss of industry will be undergone by the South, the developing region member of the FTA. Then, the more the FTA will liberalize its trade with the Rest of theWorld, the more the latter will lose industry and its welfare will drop. These tendencies will be all the more marked that the share of the expenditure on industrial goods is high (μ high) and the industrial goods are differentiated (σ weak).

(b) for $C_r/a_r < 1$, industry relocates towards the South, therefore again a member of the FTA (Figure 3b). Also, *RW* loses its industry and its welfare decreases, a tendency which is stronger as trade is freer between this region and the members of the FTA. Welfare improves inside the FTA and decreases in the outside region, for any level of the communication costs. Thus, we can notice that a region which does not take part in a FTA may not find it beneficial

to liberalize its trade with the FTA members. The more it is protected, the less it will lose industry and the less the prices will increase, when the members of the FTA pursue liberalization.

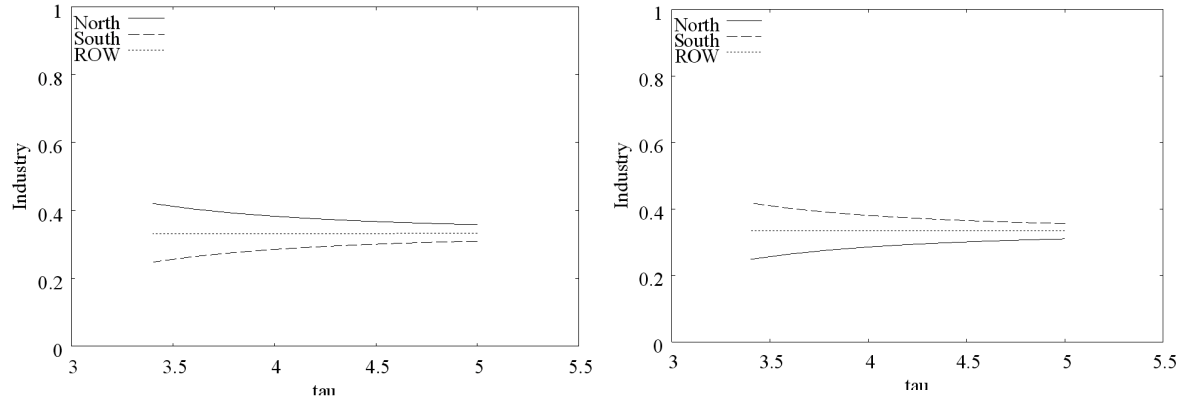


Figure 3. The impact of FTA formation on industry location: (a) $C_r/a_r > 1$; (b) $C_r/a_r < 1$

Compared to the multilateral liberalization case, we can note that, regarding industry accumulation, the asymmetrical members of a FTA will never gain at the same time. There will always be one which will gain at the expense of the other, which is also partly different from the conclusions of Puga and Venables (1997), who found that initially, when liberalization starts from a very high level of trade costs, the members of a FTA saw their shares of industry increase together. This might be explained by the differences in modelling, with regard to the distribution of labour across areas: Puga and Venables model areas with identical factor endowments, whereas our model supposes that certain areas are better equipped than others.

With regard to the reduction of communication costs in the developing regions, the analysis of FTAs does not bring new results compared to the basic scenario.

3.3 Hub-and-spoke arrangements

The modelling of hub-and-spokes liberalization brings also some new results compared to multilateral liberalization.

3.3.1 Developing regions with similar profiles

If both developing regions have a low profile for attracting FDIs, trade liberalization between the "hub" and the "spokes" leads to the agglomeration of the manufacturing units in the "hub", which is the North (Figure 4), regardless of the level of trade costs between the "spokes".

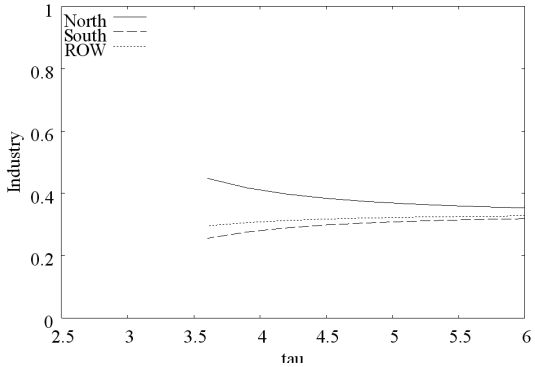


Figure 4. The impact of trade liberalization on industry accumulation ($C_r/a_r > 1$ in both developing regions)

Therefore, North and South will never gain at the same time, regarding industry accumulation, as it was the case with multilateral liberalization. We can conclude that the South will find more interesting the multilateral than the hub-and-spokes liberalization.

When both developing regions have a high profile for attracting FDIs, trade liberalization triggers industry accumulation to these regions. Furthermore, the freer trade between the "spokes", the higher the share of industry located to South (Figure 5a and b).

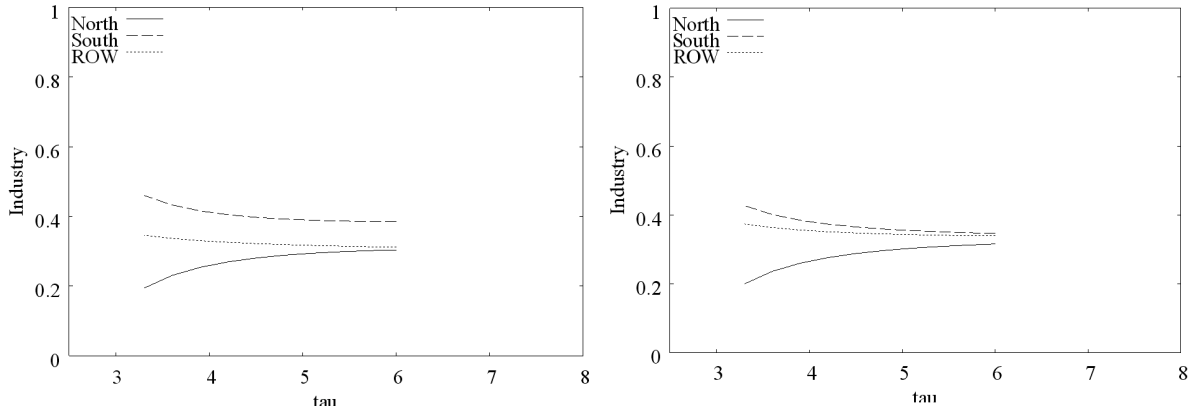


Figure 5. The impact of trade liberalization on industry accumulation, for $C_r/a_r < 1$ in both developing regions: (a) low trade costs between the "spokes"; (b) high trade costs between the "spokes"

3.3.2 Developing region with opposite profiles

Next, the simulations for developing regions with different profiles bring some mixed results. When the South has a high profile for attracting FDIs and the *RW* has a low one, trade liberalization triggers relocation to the South from the other two regions. Furthermore, this tendency is stronger when trade between the "spokes" is freer (Figure 6a and b).

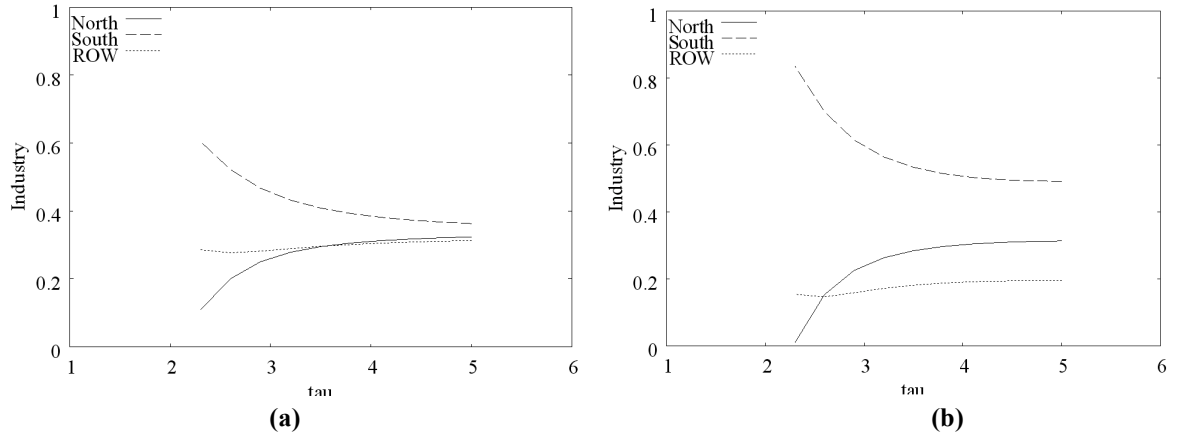


Figure 6. The impact of trade liberalization for $C_S/a_S < 1$ and $C_{RW}/a_{RW} > 1$: (a) high trade costs between the "spokes"; (b) low trade costs between the "spokes"

Then, when *RW* has a high profile for attracting FDIs and South has a low one, it seems that trade liberalization is mostly favourable to North, especially if trade between the "spokes" is costly (Figure 7a and b). Finally, if C_{RW}/a_{RW} is very close to 1, *RW* might even lose some industry.

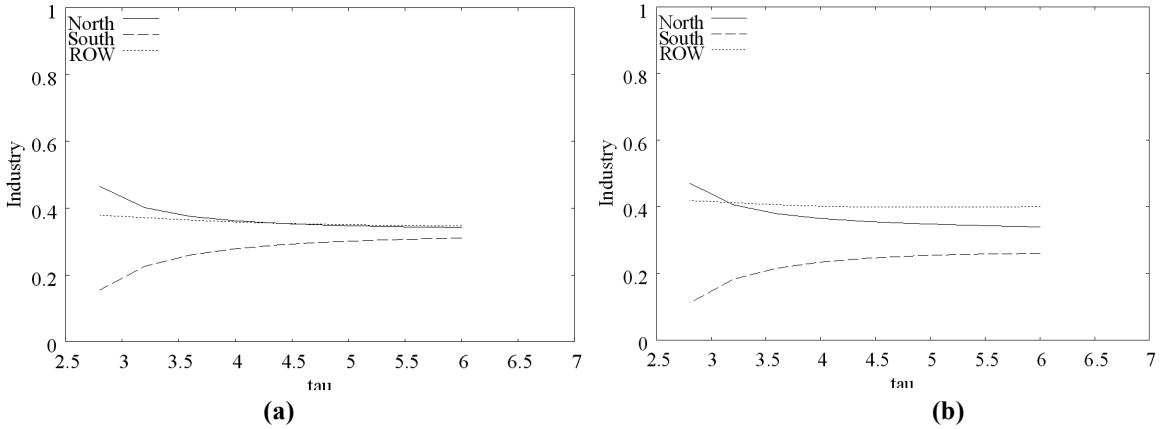


Figure 7. The impact of trade liberalization for $C_S/a_S > 1$ and $C_{RW}/a_{RW} < 1$: (a) high trade costs between the "spokes"; (b) low trade costs between the "spokes"

Once again, the results are partially different from the conclusions of Puga and Venables (1997), which found that for a process rather close to total liberalization, the "hub" remains the core region, one of the "spokes" gains a little industry and the other "spoke" loses almost all its industry. One of the developing regions has a real chance of becoming a core region, namely the South.

Welfare increases in all regions, regardless of the potential for attracting FDIs of the developing regions.

3.3.3 The impact of reducing communication costs

Contrary to the analysis of FTAs, that of hub-and-spokes arrangements brings some new results for the economic integration measured through the reduction of the communication costs between the HQs and the production units of MNFs.

Simulations show that:

(a) for *high trade costs* between the "spokes", reducing communication costs in the South triggers industry accumulation in the "spokes". Once the "hub" loses all its industry, further reduction of southern communication costs leads to industry relocation from the Rest of the World towards the South. Prices increase in the areas losing industry and decrease in the South, but after the total agglomeration in the South, more economic integration causes a drop in prices in all regions.

(b) for *low trade costs* between the "spokes" and for any level of trade costs between the "hub" and the "spokes", the South becomes the core region and its price index drops, whereas the "hub" and the Rest of the World lose all their industry and their price indexes increase. Only after the total agglomeration in the South, more economic integration has a positive impact on welfare in all the areas. In conclusion, a less developed "spoke" has no interest to liberalize its trade with a more developed "spoke" at the same time as the latter is reducing communication costs. Regarding the reduction of communication costs in the Rest of the World, the results are similar to those of reducing southern communication costs.

We have shown that wage differentials and communications and information technology could be a very strong incentive for multinational activity and FDIs, more generally, along with market size or market access and many other factors that couldn't be dealt with in this model. Furthermore, a very important issue that has been brought to light is the competition that may appear between countries in terms of attracting FDIs. If wages are more delicate to manage, there is no doubt about the importance of adopting and implementing the modern technology that allows firms to extend their activity beyond the national limits and take advantage of and, at the same time, create opportunities in different

countries. Consequently, in the next section we shall present an empirical analysis which has been conducted in order to find to what extent the results of our model verify for the CEECs.

4 Foreign direct investments towards the CEECs : an empirical assessment

In this section, an empirical analysis is conducted, based on the linearised operating profit of the MNFs in section 2, together with gravity theory-based considerations. Our purpose is two-folded. First, by examining profit functions, some factors determining MNFs location choice can be identified:

$$\pi_{rs} = \pi_{rs}\left(Y_r, Y_s, \Phi_{rs}, C_r, \frac{w_r}{w_s}\right)$$

where *r* stands for the investing region , s stands for the destination region and the other variables have the usual connotation. Then, we shall test for some competition effects that might appear between developing regions in attracting industrial activity. For both cases, we are interested in the MNFs locating in the CEECs. Considering that the CEECs are intermediary-sized countries, we shall use the operating profit given by (18). Given that monopolistic profit is 0, then the operating profit (Π_{rs}) becomes:

$$\Pi_{NS} = \left(\frac{C_S}{a_S}\right)^{1-\sigma} \frac{\mu F}{\sigma K_H} \left[\frac{Y_S}{\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma} + \Phi_{NS}\gamma_N + \Phi_{SRM}\gamma_{RW}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma}} + \frac{Y_N\Phi_{NS}}{\gamma_N + \Phi_{NS}\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma} + \Phi_{NRM}\gamma_{RW}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma}} + \frac{Y_{RW}\Phi_{SRM}}{\gamma_{RW}\left(\frac{C_{RW}}{a_{RW}}\right)^{1-\sigma} + \Phi_{NRM}\gamma_N + \Phi_{SRM}\gamma_S\left(\frac{C_S}{a_S}\right)^{1-\sigma}} \right] \quad (21)$$

Several transformations can be applied in order to get a simpler expression for profits. First, the fixed costs (*F* and K_H) do not affect the profitability of a location, given that they are the same regardless of the location. Then, following the procedure presented by Head and Mayer (2004), the linearised expression for Π_{rs} can be written as:

$$Log\Pi_{NS} = Log(C_S) + Log(w_N) - Log(w_S) + LogM \quad (22)$$

where $M = \sum \frac{\Phi_{rs} Y_s}{P_s}$ represent Krugman's market potential, with P_s - the price index in region *s*.

4.1 Data and methodology

As data on MNFs profits are difficult to find, a usual solution in the NEG empirics is to use FDI stocks as a proxy (Mayer, 2006). Consequently, we will analyze bilateral FDI stocks received by 10 CEECs[1] from 21 developed members of the European Union and the

[1] Austria, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Iceland, Italy, Japan, South Korea, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States

OECD[1]. Our annual data come from the OECD database (International direct investment by country Vol 2008 release 01) and cover the 1996-2003 period. As a proxy for market size$\left(\frac{Y_s}{P_s}\right)$, we use countries' GDP, coming from the UNCTAD database. Trade costs are measured by distance between capitals (CEPII database). Communication costs are proxied by the number of fixed and mobile lines users per 100 persons (World Bank WDI database), while labour costs are proxied by wages in manufacturing (CEPII Trade and Production database). We choose wages in manufacturing, because our model deals especially with vertical FDIs, seeking low labour costs locations specialized in manufacturing.

Thus the estimation of the parameters associated with (22) will allow assessing the determinants of the CEECs FDI stocks. Then, by implementing relative labour and communication costs considerations, we will be able to test for some competition effects between destination countries, such as predicted by our model. In this respect, we choose to test the impact of Southern European and also, Chinese competition. We chose China, because it is representative for developing South-East Asia, the most dynamic region at the moment and one of the most powerful challengers for the CEECs in terms of inward FDIs. In 2007, China was the third largest FDI recipient from Western Europe and other developed non-European OECD countries, after Latin America and the CEECs, having received more FDIs than all the other major recipients in the region put together: about 24.000 million dollars against 19.000 million dollars[2]. Consequently, we use the relative CEECs-Southern Europe and respectively, CEECs-China labour and communication costs.

An empirical investigation could be considered by the procedure of Ordinary Least Squares (OLS), for each country individually or, by panel data methods or the SUR method, collectively. However a panel data method has the advantage of modelling non observed heterogeneity, which is the effect of omitted variables, so we choose this one. The SUR method has been avoided, as its implementation involved the loss of a considerable numbers of observations.

In order to take into account the unobserved heterogeneity, we carried out several estimations using the different panel-data methods: the pool model, the fixed-effects model, the random-effects model and finally, the random-coefficients model. For the first three models, the elasticities of our dependent variable with regard to the explanatory variables are supposed to be identical for the whole group of observations, while individual specificities relate to the elasticity of the dependent variable with regard to the omitted variables, which nevertheless affect our dependent variable. More precisely, this elasticity of the endogenous variable with regard to the omitted variables (represented by the intercept) is: identical for all individuals in the pool model, specific to each individual in the fixed-effects model and partially specific to each individual in the random-effects model. For the random-coefficients model, the elasticities of the endogenous variable with regard to the explanatory variables are specific to each individual and the intercept is identical for all individuals.

We will present successively, the results relating to the determinants of FDI stocks in the CEECs, particularly those regarding the impact of the communication costs and wage differentials and then, the results relating to the potential competition between CEECs and Southern Europe and CEECs and China in attracting FDIs.

4.2 FDI determinants in the CEECs

In the economic literature, some papers have analyzed the determinants of FDIs and put stress on the importance of labour costs for efficiency-seeking FDIs (Bevan and Estrin,

[1] Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia
[2] Author's calculations, based on the OECD FDI flows by partner country online database.

2000; Nunnenkamp, 2002; Dunning, 2002; Lansbury et al., 1996). For instance, Nunnenkamp (2002) shows that even though the traditional market related factors remain the dominant ones, labour costs also have an important influence on FDI decisions, while Dunning (2002) argues that FDIs in developing countries have become more efficiency-seeking (focusing on labour costs) than market or resource oriented. However, when looking at figures, even if developed economies remain the main engine of FDIs (outward, as well as inward), one cannot deny the more and more accelerating upward trend of FDIs towards developing countries and that these countries are profitable MNFs locations, especially during the last decade. Then, regarding the importance of information and communication technology, the impact of the internet has already been assessed as tremendously reducing intra-firm information asymmetry and thus, communication costs, widening the location choices of MNFs and, with regard to labour intensive sectors, favouring the developing countries which apply FDI enhancing policies (Dunning, 2002; Zaheer and Manrakhan, 2001).

We shall contribute to this existing literature by estimating FDI determinants in the CEECs, based on the formal model presented previously. This specifically reduces to estimating:

$$LnFDI_{rs} = \alpha_1 LnGDP_r + \alpha_2 LnGDP_s + \alpha_3 Ln(d_{rs}) + \alpha_4 Ln(tel_s) + \alpha_5 \left[Ln(w_r^m) - Ln(w_s^m) \right] \quad (23)$$

with FDI_{rs} – the FDI stock of the investing country r in the receiving country s; GDP_r – the GDP of the investing country; GDP_s – the GDP of the destination country; d_{rs} – the distance between the capital of the investing country r and the capital of the destination country s; tel_s – communication technology in the destination country; w_r^m - wages in manufacturing in the investing country r; w_s^m - wages in manufacturing in the receiving country s.

The results are presented in table 1 below:

Table 1: FDI determinants in the CEECs

$\ln(FDI_{rs})$	Pool☼	Fixed-effets☼	Random-effects☼	Random-coefficients¤
$\ln(GDP_r)$	0.89 (0.08)*	0.88 (0.08)*	0.88 (0.08)*	0.86 (0.08)*
$\ln(GDP_s)$	1.70 (0.10)*	1.82 (0.12)*	1.77 (0.10)*	1.98 (0.12)*
$\ln(d_{rs})$	-1.44 (0.11)*	-1.41 (0.11)*	-1.42 (0.11)*	-1.38 (0.11)*
$\ln(tel_s)$	1.71 (0.23)*	2.37 (0.48)*	2.03 (0.33)*	2.88 (0.49)*
$\ln(w_r^m) - \ln(w_s^m)$	0.23 (0.14)***	0.34 (0.15)**	0.28 (0.14)*	0.40 (0.16)*
Intercept	-16.48 (2.30)*		-18.61 (2.73)*	-24.54 (3.50)*
Statistics				
R^2	0.60	0.60	0.59	0.55
DW	2.06	2.05	2.06	1.51
Number of bilateral FDI stocks	60	60	60	60
Number of years	8	8	8	8

Notes: *(**, ***) the null-hypothesis is rejected at 1% (5%, 10%), (.) is the standard error, ☼ - Hildreth-Lu estimation, ¤ - estimation with a simple weighted average of coefficients.

One can see that all the coefficients are statistically significant and have the expected sign. As predicted by our model and the gravity theory, both the GDP of the investing country and of the destination country have a positive impact in their bilateral FDI stock. Trade and communication costs have a negative impact on FDI inflows, while increasing wage differentials trigger FDIs towards the CEECs. The *tel* variable representing the number of fixed and mobile lines users per 100 persons is inversely proportional to communication costs: the more users, the lower the communication costs. This is why its sign is positive, instead of negative, as we would be tempted to believe. Finally, the sign of the wage differential is also positive, as we considered the difference between the wage in the investing country and the wage in the destination country.

4.3 Competing for FDIs: CEECs versus Southern Europe and China

We carried estimations in order to test whether the CEECs' inward FDIs are significantly related to the fact that they have lower labour costs or higher communication costs than Southern Europe (SE). For instance, Lansbury et al. (1996) have already highlighted the fact that economic integration between EU and the CEECs has led to some FDI diversion from Southern Europe to the latter. In the light of our model, Western Europe represents the investing region (North), Southern Europe represents the intermediary-sized developing region (South), while the CEECs represent the smallest developing region (Rest of the World). So, we estimated the impact of CEECs-SE relative wages and communication costs. As a robustness check, first we analyze these two impacts separately and then, simultaneously. For endogeneity reasons, when checking the impact of CEECs-SE relative labour costs, we ignore CEECs labour costs relative to the investing countries. Consequently, in (23), we shall add $\ln(w_s^m) - \ln(w_{SE}^m)$ and/or $\ln(tel_s) - \ln(tel_{SE})$, where, w_{SE}^m represents the wage in manufacturing and tel_{SE}, the communication costs in Southern Europe. The global variables for Southern Europe represent the weighted average of Spanish and Portuguese data[1].

First, table 2 below presents the estimations results for the impact of the CEECs-SE relative wage.

Table 2: The impact of CEECs-SE wage differential

$\ln(FDI_{rs})$	Pool☼	Fixed-effets☼	Random-effects☼	Random-coefficients¤
$\ln(GDP_r)$	1.01 (0.07)*	1.04 (0.05)*	1.02 (0.07)*	1.03 (0.06)*
$\ln(GDP_s)$	1.66 (0.09)*	1.84 (0.13)*	1.74 (0.10)*	2.00 (0.13)*
$\ln(d_{rs})$	-1.61 (0.09)*	-1.63 (0.10)*	-1.61 (0.09)*	-1.58 (0.09)*
$\ln(tel_s)$	1.41 (0.21)*	2.11 (0.52)*	1.78 (0.34)*	2.74 (0.53)*
$\ln(w_s^m) - \ln(w_{SE}^m)$	0.16 (0.18)	0.31 (0.18)	0.26 (0.19)	0.37 (0.23)
Intercept	-14.45 (2.02)*		-17.01 (2.66)*	-24.05 (3.69)*
Statistics				
R^2	0.62	0.62	0.60	0.55
DW	2.01	1.71	2.00	1.43

[1] We used GDP as a weight indicator, so the weights were 0.6 for Spain and 0.4 for Portugal.

Number of bilateral FDI stocks	60 pays	60 pays	60 pays	60 pays
Number of years	8 années	8 années	8 années	8 années

Notes : *(**, ***) the null-hypothesis is rejected at 1% (5%, 10%), (.) is the standard error, ☼ - Hildreth-Lu estimation, ¤ - estimation with a simple weighted average of coefficients.

One can see that general gravity theory-based considerations are confirmed. Traditional market related factors and distance have a very significant and correctly signed impact on FDIs in the CEECs, but there is no significant influence coming from the fact that these countries have lower labour costs than in Southern Europe. So, we cannot conclude that there has been some FDI diversion from SE the CEECs, as a consequence of the wage related comparative advantage of the latter.

Next, in table 3 below, we present the estimations for the impact of the SE relative communication costs.

Table 3: The impact of CEECs-SE relative communication costs

$\ln(FDI_{rs})$	Pool☼	Fixed-effets☼	Random-effects☼	Random-coefficients¤
$\ln(GDP_r)$	0.86 (0.10)*	0.88 (0.08)*	0.87 (0.09)*	0.86 (0.08)*
$\ln(GDP_s)$	1.81 (0.12)*	1.83 (0.12)*	1.81 (0.12)*	1.98 (0.12)*
$\ln(d_{rs})$	-1.40 (0.12)*	-1.41 (0.11)*	-1.42 (0.11)*	-1.38 (0.11)*
$\ln(tel_s) - \ln(tel_{SE})$	2.49 (0.48)*	2.37 (0.48)*	2.38 (0.48)*	2.88 (0.49)*
$\ln(w_r^m) - \ln(w_s^m)$	0.29 (0.16)***	0.34 (0.15)**	0.33 (0.15)**	0.40 (0.16)*
Intercept	-9.82 (2.07)*		-9.87 (2.00)*	-12.00 (1.92)*
Statistics				
R^2	0.58	0.60	0.62	0.55
DW	2.14	2.05	1.71	1.51
Number of bilateral FDI stocks	60 pays	60 pays	60 pays	60 pays
Number of years	8 années	8 années	8 années	8 années

Notes : *(**, ***) the null-hypothesis is rejected at 1% (5%, 10%), (.) is the standard error, ☼ - Hildreth-Lu estimation, ¤ - estimation with a simple weighted average of coefficients.

While CEECs-SE relative wages do not really affect FDIs in the CEECs, we find that CEECs-SE relative communication costs do have an impact on FDIs decisions in these countries. This suggests that if the CEECs had caught up their technology gap with SE, they could have benefited from larger inward FDI stocks.

Finally, table 4 presents the estimations for the simultaneous impact of relative labour and communication costs. Our previous results are consistent with these last estimations, confirming the significant impact of relative communication costs.

Table 4: The simultaneous impact of CEECs-SE relative wage and communication costs

$\ln(FDI_{rs})$	Pool☼	Fixed-effets☼	Random-effects☼	Random-coefficients¤
$\ln(GDP_r)$	1.02 (0.07)*	1.03 (0.07)*	1.03 (0.07)*	1.03 (0.06)*
$\ln(GDP_s)$	1.82 (0.12)*	1.85 (0.12)*	1.84 (0.12)*	2.00 (0.13)*
$\ln(d_{rs})$	-1.57 (0.09)*	-1.60 (0.09)*	-1.59 (0.09)*	-1.58 (0.09)*
$\ln(tel_s) - \ln(tel_{SE})$	2.30 (0.46)*	2.34 (0.48)*	2.31 (0.47)*	2.74 (0.53)*
$\ln(w_s^m) - \ln(w_{SE}^m)$	0.25 (0.20)	0.40 (0.21)	0.36 (0.21)	0.36 (0.23)
Intercept	-10.01 (1.82)*		-10.18 (1.82)*	-17.19 (2.84)*
Statistics				
R^2	0.60	0.62	0.60	0.58
DW	2.03	2.00	2.01	1.55
Number of bilateral FDI stocks	60 pays	60 pays	60 pays	60 pays
Number of years	8 années	8 années	8 années	8 années

Notes : *(**, ***) the null-hypothesis is rejected at 1% (5%, 10%), (.) is the standard error, ☼ - Hildreth-Lu estimation, ¤ - estimation with a simple weighted average of coefficients.

Following the same reasoning, estimations have been conducted in order to test for some competition pressure on the CEECs, coming from the rising economic power of China. In the light of our model, Western Europe represents the core region (North), the CEECs represent the intermediary-sized developing region (South) and China represents the smallest developing region (Rest of the World). Consequently, in (23), we add $\ln(w_s^m) - \ln(w_{CHN}^m)$ and/or $\ln(tel_s) - \ln(tel_{CHN})$, where, w_{CHN}^m represents the Chinese wage in manufacturing and tel_{CHN}, the Chinese communication costs.

Table 5 below presents the results regarding the impact of relative wages.

Table 5: The impact of Chinese wage competition

$\ln(FDI_{rs})$	Pool☼	Fixed-effets☼	Random-effects☼	Random-coefficients¤
$\ln(GDP_r)$	1.01 (0.07)*	1.03 (0.07)*	1.02 (0.07)*	1.03 (0.06)*
$\ln(GDP_s)$	1.64 (0.09)*	1.85 (0.12)*	1.73 (0.10)*	2.00 (0.13)*
$\ln(d_{rs})$	-1.61 (0.09)*	-1.60 (0.09)*	-1.61 (0.09)*	-1.58 (0.09)*
$\ln(tel_s)$	1.32 (0.18)*	2.34 (0.48)*	1.75 (0.34)*	2.74 (0.53)*
$\ln(w_s^m) - \ln(w_{CHN}^m)$	-0.09 (0.16)	-0.40 (0.21)**	-0.21 (0.18)	-0.36 (0.23)
Intercept	-13.78 (2.30)*		-18.61 (2.73)*	-23.85 (3.54)*
Statistics				

R^2	0.62	0.62	0.60	0.54
DW	2.01	2.00	2.00	1.40
Number of bilateral FDI stocks	60	60	60	60
Number of years	8	8	8	8

Notes : *(**, ***) the null-hypothesis is rejected at 1% (5%, 10%), (.) is the standard error, ☼ - Hildreth-Lu estimation, ¤ - estimation with a simple weighted average of coefficients.

While all the previous results are confirmed, one can see that the negative impact of the Chinese competition is confirmed only in the fixed-effect case: the higher the wage differential between the CEECs and China, the lower FDI stocks in the former.

Table 6 below presents the estimates for the relative communication costs.

Table 6: The impact of Chinese communication costs competition

$\ln(FDI_{rs})$	Pool☼	Fixed-effets☼	Random-effects☼	Random-coefficients¤
$\ln(GDP_r)$	1.02 (0.09)*	0.88 (0.08)*	0.89 (0.09)*	0.86 (0.08)*
$\ln(GDP_s)$	1.37 (0.11)*	1.82 (0.12)*	1.76 (0.12)*	1.98 (0.12)*
$\ln(d_{rs})$	-1.61 (0.12)*	-1.41 (0.11)*	-1.45 (0.11)*	-1.38 (0.11)*
$\ln(tel_s) - \ln(tel_{CHN})$	-0.23 (0.33)	2.37 (0.48)*	2.07 (0.46)*	2.88 (0.49)*
$\ln(w_r^m) - \ln(w_s^m)$	-0.17 (0.15)	0.34 (0.15)**	0.28 (0.14)***	0.40 (0.16)*
Intercept	-4.91 (2.24)**		-18.61 (2.73)*	-17.10 (2.49)*
Statistics				
R^2	0.55	0.60	0.57	0.34
DW	2.12	2.05	2.08	1.01
Number of bilateral FDI stocks	60	60	60	60
Number of years	8	8	8	8

Notes: *(**, ***) the null-hypothesis is rejected at 1% (5%, 10%), (.) is the standard error, ☼ - Hildreth-Lu estimation, ¤ - estimation with a simple weighted average of coefficients.

Unlike the impact of Chinese wage competition, it seems that the impact of Chinese communication costs is clearer. The coefficient is statistically significant for almost all models and has the expected sign: the lower the communication costs in the CEECs relative to China, the higher the FDI stocks in the former.

Table 7 below presents the estimates for the simultaneous impact of wages and communication costs.

Table 7: The simultaneous impact of Chinese wage and communication costs competition

$\ln(FDI_{rs})$	Pool☼	Fixed-effets☼	Random-effects☼	Random-coefficients¤
$\ln(GDP_r)$	1.07 (0.08)*	1.03 (0.08)*	1.05 (0.05)*	1.03 (0.06)*
$\ln(GDP_s)$	1.38	1.85	1.79	2.00

	(0.11)*	(0.12)*	(0.12)*	(0.13)*
$\ln(d_{rs})$	-1.65 (0.10)*	-1.60 (0.09)*	-1.64 (0.10)*	-1.58 (0.09)*
$\ln(tel_s) - \ln(tel_{CHN})$	-0.15 (0.35)	2.34 (0.48)*	1.81 (0.49)*	2.74 (0.53)*
$\ln(w_s^m) - \ln(w_{CHN}^m)$	0.13 (0.20)	-0.40 (0.21)**	-0.24 (0.18)	-0.36 (0.23)
Intercept	-5.93 (2.09)*		-18.61 (2.73)*	-24.54 (3.50)*
Statistics				
R^2	0.57	0.62	0.59	0.43
DW	2.04	2.00	1.70	1.14
Number of bilateral FDI stocks	60	60	60	60
Number of years	8	8	8	8

Notes : *(**, ***) the null-hypothesis is rejected at 1% (5%, 10%), (.) is the standard error, ☼ - Hildreth-Lu estimation, ¤ - estimation with a simple weighted average of coefficients.

Finally, the impact of Chinese competition on CEECs' FDI stocks measured by the CEECs-China relative wages and communication costs is the same, either taken separately for each variable or simultaneously.

As predicted by the model in the previous section, some competition does appear between developing countries with regard to attracting FDIs. One of the main sources of competition today is the low labour cost, even though some developing countries have succeeded in specializing in high value added sectors, based on more capital intensive goods. Then, another important source of competition is adopting the latest communication and information technology, in order to attract MNFs. Our model presented in section two implemented this kind of competition: developing countries with relatively higher wages might compensate through lower communication costs, while countries with high communication costs might compensate through lower labour costs. The empirical results presented above seem to confirm the first case. The CEECs have higher labour costs than China, but they catch up this inconvenience by lower communication costs.

5 Conclusions

This article analyzes the evolution of the relocation process and welfare under economic integration within a three-region framework. Economic integration is measured by a reduction in interregional trade costs and by a reduction in the communication costs incurred by multinational corporations having their HQs in an industrialized area and their production units in one of the two developing regions of the model. We analyzed the impact of multilateral liberalization versus free trade and "hub and spoke" arrangements. Under the first scenario, the numerical simulations showed that economic integration seen as trade liberalization (decreasing interregional trade costs) is welfare enhancing for all regions, even though developing regions lose their industry when communication costs are too high. Then, in terms of industry accumulation, it seems that for the intermediary region (the South), multilateral liberalization is always preferable to a free trade area, as it has more chances to attract industrial activity. The region outside a FTA always loses industry, regardless of the level of communication costs. Moreover, simulations also show that the non-member region has no interest in liberalizing trade with the member areas, because it will lose more industry and its prices will increase more. Decreasing communication costs triggers industry relocation

to the region decreasing them, while welfare improves only in the region gaining industry and worsens in the others. The analysis of "hub and spoke" arrangements proved somewhat richer than that of the free trade areas. Trade liberalization between the "hub" and the "spokes" leads to industry accumulation in the "hub" for high communication costs and to industry accumulation in the "spokes" for low communication costs. Furthermore, the "spokes" either gain or lose industry together at the same time. Moreover, the "spokes" may find it beneficial to liberalize trade between them at the same time as economic integration with the "hub". Generally, welfare increases in all regions. The reduction of communication costs leads to the accumulation of industry in both "spokes" when trade costs between them are high. Otherwise, industry accumulates only in the area lowering its communication costs. Consequently, the "spokes" do not find it beneficial to liberalize their exchanges as long as communication costs are falling in one of them. Generally, prices drop in the areas accumulating industry and increase in the areas losing industry.

The simulation results have been confirmed by our empirical analysis on the CEECs FDI stocks. Our empirical analysis contributed to the existing literature at least in two ways: on the one hand, we estimated FDIs determinants based on a formal model and on the other hand, we used the latest data available. Trade and communication costs together with labour costs seem to have a strong impact on inward FDIs in these countries. Their inward FDIs are positively related to adopting communication technology and negatively related to trade and labours costs. The usual market-related determinants are also confirmed: FDIs in the CEECs are positively related to their GDP. As for competition effects between developing countries in attracting FDIs, it seems that FDIs in the CEECs are hindered by the relatively better communication infrastructure in Southern Europe. Finally, we found that CEECs-Chinese relative communication costs have a significant impact, too, in the sense that there is some FDIs diversion from China to the CEECs because communications infrastructure in the latter is better than in the former. Especially when taking into account countries' characteristics through the fixed-effects model, we found that both CEECs-China relative communication costs and CEECs-China relative labours costs have a significant impact on FDIs in the CEECs.

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