Trade, FDI and Migration

Fabien Candau

Trade, FDI and Migration.

Fabien Candau (UPPA, CATT)

Abstract

This article provides a theoretical synthesis of the New Economic Geography to analyse the links between trade, FDI and migrations. We find that liberalizing from high trade costs, a country can attract both capital and labour - the bifurcation pattern is a gradual peripheral exodus of worker associated with capital flight from the periphery - but after a threshold of trade costs, opening trade generates return migration toward the periphery while capital remains agglomerated in the core. The model is built on the assumption that factors are sector specific. By relaxing this assumption and by providing a second model where workers are mobile between industries (vertically linked) but also between countries we confirm this result.

JEL classification: F12; R12

Keywords: Economic geography; migration costs; FDI.

1 Introduction

What is Globalization? Ask a first year student, he will answer that it is the integration of national economies into the world economy through trade, capital flows, and migration. But surprisingly, while this term appears repeatedly in all newspapers, it is often analyzed partially through a focus on only one variable. Even in academic literature, the whole picture is rarely taken. Indeed, there are few models that analyse simultaneously these three flows and their interconnection.

To illustrate this, consider a particular economy with:

i) symmetry in factor endowments between countries

ii) identical technologies across space

iii) constant returns to scale and perfect competition

Relaxing i), you will have the Heckscher (1918), Ohlin (1933) and Mundell (1957) model which predicts that capital and labor should move in opposite directions: capital scarce countries should attract capital, while labor scarce countries should attract labor. In analyzing facts, such a result is debatable. For instance, the United States has attracted a high share of the world capital during the past decades but also a significant part of the world workers. Such a result does not belong exclusively to this second global century. Economists interested in the age of mass migration before 1914[1] clearly indicate that the United States absorbed capital and labor and five European nations sent out both (France, Germany, Italy, Spain and the UK).

The theoretical substitutability between factors is also found between trade and international factor movements. Capital flows or migrations by reducing endowment differences eliminate the trade cause in standard models. A result which seems dubious in an era of high financial integration and significant trade exchanges.

By relaxing i) and ii) one obtains the HOS model with Ricardian features of Kemp (1966), Jones (1967) and Purvis (1972). Purvis (1972) in particular shows that the introduction of capital mobility into a free trade framework can increase the volume of trade. Thus, factors mobility and trade are substitutes when technologies differ. Lastly, in three different models, Markusen (1983) relaxes successively ii) and iii) by adding technological advantages, external economies of scale and monopoly, which allows him to conclude that the substitutability between "trade in goods and factors is in fact a rather special result which is a general characteristic only of factor proportions models". But with Neary (1995) one can consider that these separated models do not give a simple general equilibrium model of trade and factor mobility.[2] Building on a two-country version of the specific-factors model of Jones (1971) with international capital flows, this author shows that the complementarity found by Markusen depends on the assumption that capital is used in the exporting sector.

In the New Economic Geography which relaxes iii), the disconnection between the location choice of workers and capital, at least on the theoretical ground, is striking: Martin and Rogers (1995) and Robert-Nicoud (2006) have built a model on footloose capital where labour is immobile while Krugman (1991)[3] focuses on the mobility of labour. A comparison of the two models has been brilliantly done in Baldwin et al. (2003) but no bridge has been built until now between these models.[4] We propose to fill this gap by merging them, which allows analysing the complementarity between capital flows, migration and trade through pecuniary externalities.

In the current model, migration leads to expenditure shifting because workers spend their incomes locally and expenditure shifting leads to production shifting because firms earn more by relocating their activities near the demand. Moreover a circular causality is also generated by this relocation because more production in one country implies a fall of imported goods and thus reduces the cost of living. If we now introduce capital, this circular causality may be reinforced

[1] See for instance Hatton and Willamson (2006).

[2] More precisely Neary (1995) writes "International factor movements are a pervasive and integral part of the world economy. Yet the study of such factor movements remains peripheral in courses and textbooks on international trade theory. Many models of the process exist of course, but they are generally presented as ancillary rather than central to the theory. In part, this is because there is no simple general equilibrium model in which determinate levels of international trade and international factor mobility coexist".

[3] See also Forslid and Ottaviano (2003) and Pfluger (2004)

[4] The sole exception is Borck, Pflüger and Wrede (2007). However the model differs in many points.

because agglomeration of capital implies a decrease in prices of goods that are produced with this factor under increasing returns. Ceteris paribus this raise the real wage where agglomeration occurs which attracts more migrants. But this circular causality can be broken by urban costs. Indeed, following recent empirical researches showing that immigration clearly impacts on house prices at least in small countries[5], we integrate land rent and commuting costs. These urban features imply a dispersion of individuals only when trade is free enough while capital does not follow this dispersion and remains agglomerated. Agglomeration of one factor leads to the agglomeration of the other, but dispersion of one factor is not necessary sufficient to foster a dispersion of the second one. Our model thus mainly focuses on small countries, but it is important to notice that our definition of a small country differs strongly from the one retained in international trade. Indeed we consider as a small country, a country that has land constraint. Thus this definition includes countries with high GDP such as Japan. Concerning this country the link between trade, migration of entrepreneurs and urban costs, as it is described in our model, is illustrated in Fujita et al. (2004) who consider that on account of higher wages and land prices in the three largest metropolitan areas (Tokyo, Osaka, Nagoya), the growth rate of net migration has been affected. In particular authors have pointed out:

> *"Given the high valued yen and the high wage rate in Japan together with the successive reduction in 'transport costs', many large manufacturing firms successively moved an increasing share of their labor-intensive operations to the low-wage countries (in particular, those in East Asia). [...] The continued growth of Tokyo, meanwhile, fuelled the ever rising land-prices there since the mid 1970s, which soon spread to other major cities in Japan. Such an accelerating increase in land prices ended up creating huge 'bubbles' in land markets in Japan by the late 1980s, which busted in the early 1990s. This burst of land markets (together with stock markets) destroyed the foundations of the traditional financial system of Japan, resulting in the prolonged recession since the early 1990s [which] quickly curtailed the net migration to the Tokyo MA, resulting in a negative rate of net migration to the Tokyo MA in 1994 which happened for the first time since 1955."*

We do not model such a complex story, but try to capture the basic idea that migration can destroy itseft by rising land-prices.

This model is obviously based on specific assumptions concerning agglomerative and dispersive forces. In order to see whether it produces pecular results in reason of pecular assumptions, we propose a second model with different assumptions.

[5] Degen and Fischer (2009) shows that the impact of immigration on house prices represents almost two thirds of the total price increase in Switzerland. Saiz (2007) finds that when the inflow of migrants represents 1% of a city's population then there is an increase in house prices by 2% in U.S. cities (see also Gonzalez and Ortega (2009) concerning the Spanish market who find similar results).

Indeed, urban features are removed and Ethier's (1982) formulation of international economics is adopted by working with vertical linkages between firms which are mobile at the global level[6]. Moreover in this model, workers are also mobile between countries and between sectors.[7] This generates new forces but similar results: trade liberalization leads to an agglomeration of firms and workers in a first stage, but in a second one while firms stay agglomerated, workers choose to leave the core for the periphery.

The choice to present two different models is not unique in the literature.[8] We obviously also emphasize the main differences between these models, and this may be interesting for empirical analysis[9] on FDI, trade and migration where urban costs are rarely integrated.

2 Footloose capital and entrepreneurs in the City

Consider an economy with two regions (labelled $r = 1, 2$) and three sectors, two monopolistic sectors (labelled $k = A, B$) that produce differentiated products under increasing returns to scale using skilled and unskilled workers (h) in sector A and capital (K) in sector B ; and a constant return to scale sector (labelled C) that produces a homogeneous good under perfect competition. Each region is formed by a city spread along a one-dimensional space X. The amount of land available at each location $x \in X$ is equal to one. Skilled workers (also called entrepreneurs in the literature) are mobile from one city to the next but also inside each city. More precisely skilled workers who own one unit of land are spread along a line, and because their business is located in the middle of this line (called the Central Business District (CBD)), they need to commute. Indeed all firms located in region r set up a headquarters at the CBD situated at the origin $x = 0$ of X. For sake of simplicity, we assume that the unskilled live at the suburb where the land rent is null and do not need to commute to work. Capital owners also live at the periphery of cities and are immobile from one region to the other. Capital freely moves to the region with the highest

[6] More precisely we work on the Ottaviano and Robert-Nicoud (2006) which is a simplification of the Krugman and Venables (1995) model.

[7] We integrate the probabilistic migration of Tabuchi and Thisse (2002), Murata (2003) and Russek (2010), that stresses taste heterogeneity in residential location in the vertical linkages model.

[8] For instance Helpman (1998) proposes a model with product differenciation à la Dixit-Stiglitz and another one with homogeneous goods and external economies of scale. From these two different models, similars results are obtained, trade liberalization fosters dispersion in a presence of a given amount of housing which allows the author to conclude that there is nothing peculiar in his result.

[9] Several theoretical models are also used to check the robustness of results and to analyse the main determinants of bilateral trade in the literature on gravity equations. For instance Evenett and Keller (2002) distinguish four kinds of 2x2x2 models 1) Increasing Returns Sectors (IRS) with perfect specialization between countries 2) a Heckscher-Ohlin-based perfect specialization model called HO multicone 3) an IRS model incorporating imperfect specialization model, called IRS/HO unicone 4) an HO-based imperfect specialization, namely unicone HO model. In the same spirit, Feenstra, Markusen, and Rose (2001) propose to derive gravity equations from models with increasing returns and differenciation and then with homogeneous goods and segmentation (reciproqual dumping models). See Candau and Dienesch (2011) for a survey on the various theoretical foundations of similar gravity equations.

nominal reward. Nominal rewards of capitalist and entrepreneurs are denoted ω_r^k with $k = A, B$ and $r = 1, 2$ and each skilled worker owns an equal share of the Aggregate Land Rent (ALR) where he resides. The standard micro-foundations of this urban framework concerning skilled workers can be found in Alonso (1964) and Fujita (1989)[10] and can be described as follows.

Commuting costs have a direct impact on the labour force of skilled workers. Each skilled consumes one unit of land, supplies one unit of labor, and commutes to the CBD. Hence, in equilibrium, skilled are equally distributed around the CBD of region r whose urban landscape is therefore given by $[-h_r/2, h_r/2]$ with h_r the number of skilled workers in region r. Commuting costs have an iceberg form, thus implying that the effective labor supply by a skilled worker living at a distance $\mid x \mid$ from the CBD is given by:

$$s(x) = 1 - 2\theta \mid x \mid \;\text{ with } x \in [-h_r/2, h_r/2] \tag{1}$$

where θ (with $\theta < 1$) is skilled worker' commuting cost, $\mid x \mid$ measures distance to CBD. Indeed as the number of skilled in one city is h_r, the maximal distance from the CBD is $\frac{h_r}{2}$, thus the total labour supply net of commuting cost in one city is equal to :

$$S_r = \int_{-h_r/2}^{h_r/2} s(x)dx = h_r(1 - \theta h_r/2). \tag{2}$$

As land rent at both edges of the segment is normalized to zero, if ω_r^A is the wage of skilled near the CBD, then wage net of commuting costs earned at both edges is[11]:

$$s(h_r/2)\omega_r^A = s(-h_r/2)\omega_r^A = (1 - \theta h_r)\omega_r^A. \tag{3}$$

Because consumers are identical in terms of preferences and income, at equilibrium they must reach the same utility level. Thus skilled workers who live on the fringe of the segment only receive a net wage of $(1 - \theta h_r)\omega_r^A$ but pay no land rent. On the contrary, workers who live near the CBD do not pay significant commuting costs, but the price of the services yielded by land is higher in this location. Thus, the increase in nominal wage near central places offsets land rent. Figure 1 depicts this situation.

[10] See among others Krugman and Livas (1996), Murata and Thisse (2005), Behrens and Robert-Nicoud (2008) and Candau (2008, 2009) who also use this framework in different models.

[11] We can notice that when an entrepreneur moves from one city to the other then the line segment becomes longer because a new unit of land is added at the extremity of the city (each entrepreneurs owns one unit of land). By assumption however the CBD is still in the middle of the segment. Then one can imagine that the CBD change along this line to locate it in the middle again. All these assumptions are standard and identical to Murata and Thisse [2005] and Krugman and Livas [1996]. Obviously we can notice with Krugman and Livas that "ideally the need for a central business district would itself be derived from the model, but this is left for later research".

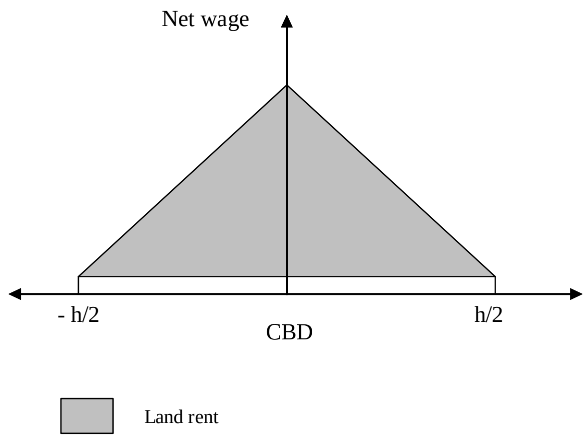

Figure 1: Land rent

In Figure 1, the vertical axis measures the net wage in the city, while the horizontal axis shows the size of this city. Because each entrepreneur owns one land unit, this size only depends on their number. As Figure 1 shows a move from the suburb to the CBD implies a decrease in commuting and therefore an increase in net wage, but also an equivalent increase in land rent which equalizes utility among individuals.

In other terms, the following condition must be verified:

$$s(x)\omega_r^A - R_r(x) = (1 - \theta h_r)\omega_r^A,$$

where $s(x)$ is the total amount supplied by a skilled worker who lives on the fringe of the CBD, $R_r(x)$ is the land rent prevailing at x in region r, while the right-hand side represents the wage net of commuting costs earned at both edges given by (3). By inserting expression (1) into this system we find the following land rent:

$$R_r(x) = \theta(h_r - 2 \mid x \mid)\omega_r^A \quad \text{with } x \in [-h_r/2, h_r/2].$$

From this equation we can find the Aggregate Land Rent (ALR):

$$ALR_r = \int_{-h_r/2}^{h_r/2} R_r(x)dx = \frac{\theta h_r^2 \omega_r^A}{2}.$$

While on the one hand, Tabuchi [1998] assumes that there are absentee landlords, and on the other, Helpman [1998] assumes that the aggregate land rent is owned at the global level, here it is considered with Murata and Thisse [2005] that each skilled worker owns an equal share of the ALR where they reside. Thus their non salaried income is:

$$\frac{ALR_r}{h_r} = \frac{\theta h_r \omega_r^A}{2}. \tag{4}$$

Each household's preferences take the Dixit (1990) form introduced by Pflüger (2004) in the NEG literature:

$$
\begin{aligned}
U_r &= a \ln C_r^A + (1-a) \ln C_r^B + C^C, \\
\text{where} \quad C_r^k &= \left[\int\limits_{i \in n_r^k} m_{rr}^k(i)^{\frac{\sigma-1}{\sigma}} di + \int\limits_{i \in n_s^k} m_{rs}^k(i)^{\frac{\sigma-1}{\sigma}} di \right]^{\frac{\sigma}{\sigma-1}} \\
\text{with } k &= A, B \text{ and } r, s = 1, 2 \text{ with } r \neq s
\end{aligned}
$$

where C_r^k is the consumption of a k manufactures aggregate, n_r^k is the set of k varieties produced in region r and n_s^k varieties k produced in region s ($r, s = 1, 2$), $\sigma > 1$ is the elasticity of substitution among these varieties. m_{rr}^k represents consumption of particular variety produced and consummed locally in country r, while m_{rs}^k represents the consumption in r of a variety produced in s. C^C is the consumption of an homogeneous good which is produced under constant return to scale using unskilled workers.

Varieties are exchanged between regions under transaction costs which take the form of iceberg costs: $\tau > 1$ units of the variety must be sent from the origin for one unit to arrive at destination. In contrast there are no trade costs within a region and varieties A and B are traded at the same cost.

Then the solution to the utility maximization problem generates the following demands in r for a typical variety produced respectively in location r and s:

$$
\begin{aligned}
m_{rr}^A(i) &= a \frac{Y_r}{(P_r^A)^{1-\sigma}} p_r^A(i)^{-\sigma}, \; m_{rr}^B(i) = (1-a) \frac{Y_r}{(P_r^B)^{1-\sigma}} p_r^B(i)^{-\sigma} \\
m_{rs}^A(i) &= a \frac{Y_r}{(P_r^A)^{1-\sigma}} p_s(i)^{-\sigma} \tau^{-\sigma}, \; m_{rs}^B(i) = (1-a) \frac{Y_r}{(P_r^B)^{1-\sigma}} p_s^B(i)^{-\sigma} \tau^{-\sigma}
\end{aligned} \tag{5}
$$

with P_r^k the price index in r for k varieties:

$$
P_r^k = \left[\int\limits_{i \in n_r^k} p_r^k(i)^{1-\sigma} di + \int\limits_{i \in n_s^k} p_s^k(i)^{1-\sigma} \tau^{1-\sigma} di \right]^{\frac{1}{1-\sigma}}, \tag{6}
$$

2.1 Supply

2.1.1 Sector C

Perfect competition ensures that the traditional good is priced at its marginal cost. Moreover this good is chosen as the numéraire, and since it is traded costlessly, the nominal wage rate is unity in country 1 and 2. Moreover unskilled workers are equally spread between regions 1 and 2, thus:

$$
L = L^* = L^w/2 \tag{7}
$$

where L^w is the world population of unskilled normalized to one.

2.1.2 Sector A and B

The sole difference between sector A and B is that factors of production differ. For sake of simplicity everything else is identical. In particular concerning the cost function, the production of a typical variety of manufactured goods involves α units of capital and skilled services as a fixed cost in the sector A and B respectively. The variable cost requires β units of unskilled workers in A and B. But as unskilled are located outside the city, it is assumed that production is being conducted in suburban areas which raises the marginal cost by a factor φ. In other words the firm is spatially fragmented with headquarter in the CBD and plants at the periphery. Thus φ can be understood as communication or transport costs between unskilled that perform routine tasks at the periphery and skilled workers or capital that are used to perform service tasks in the CBD (financial tasks for instance). Such a cost function, which is in essence an assumption of convenience, turns out to be justifiable on empirical grounds. Moreover a similar modelling has been used by Fujita and Thisse (2006) with firms fragmented at the international level[12]. Thus the total cost of producing $y_r^k(i)$ units of a typical manufactured variety is:

$$TC_r^k(i) = \alpha\omega_r^k + \beta\varphi y_r^k(i), \tag{8}$$

Such a cost function is widely used in the literature (see for instance Forslid and Ottaviano (2003)), which also assumes that $\alpha = 1$ and $\beta = \frac{\sigma-1}{\sigma}$. Workers are qualified of skilled since they enter in the fixed cost of production. In the spirit of Forslid and Ottaviano (2003), they are necessary to the firm in order to develop a new idea that gives its characteristics to the variety.

Thus each firm is a monopolist in the production of its variety and maximizes its profit with:

$$y_r^k(i) = m_{rr}^k(i) + \tau m_{sr}^k(i) \tag{9}$$

According to the Dixit-Stiglitz monopolistic competition, a typical firm sets the following price:

$$p_r^k(i) = \beta\varphi\sigma/(\sigma-1) = \varphi \tag{10}$$

With the input-output coefficient equals to the reverse of the mark-up, prices are equal to one where the variety is produced and to $\tau\varphi$ when the variety is imported.

Under free entry, profits are always equal to zero, which, using (8) and (10), gives the level of output:

$$y_r^k(i) = \frac{\sigma}{\varphi}\omega_r^k. \tag{11}$$

In equilibrium, a typical firm employs one unit of factor, so that the total demand is n. As skilled labour supply is exactly S, and capital supply is K, the equalization gives the number of varieties

[12] See also Robert-Nicoud (2008) and for a brillant review of the implication of the increase in international offshoring see Baldwin (2006).

produced in each sector:

$$n_r^A = S_r \tag{12}$$
$$n_r^B = K_r. \tag{13}$$

The number of varieties B in one region is thus identical to the quantity of capital while the number of varieties produced by the sector A is proportional to the number of skilled workers. One can prove that: The more symmetric the spatial distribution of skilled workers, the larger the total mass of varieties A in the economy. Indeed by inserting S_1 given by (2) in (12) and by differentiating the total mass of varieties with respect to h_1 (the sum of the population is normalized to one: $h_1 + h_2 = 1$), we get $\partial(n_1^A + n_2^A)/\partial h_1 = \partial(S_1 + S_2)/\partial h_1 = \theta(1 - 2h_1)$ and $\partial^2(n_1^A + n_2^A)/\partial h_1^2 = \partial^2(S_1 + S_2)/\partial h_1^2 = -2\theta < 0$. Thus, the number of varieties is maximized at $h_1 = 1/2$ and declines as h_1 increases. *This corresponds to Proposition 1 of Murata and Thisse (2005) who clearly states the intuition behind this result:*

> *"Intuitively, when the economy is dispersed, commuting costs are lower, thus implying that more labor is available for the industrial sector. The fact that the total mass of varieties varies with the spatial distribution of workers makes our model more general than the existing ones in which the total number of varieties is constant regardless of the spatial distribution of firms. More precisely, Proposition 1 shows that agglomeration generates two types of costs for the workers: higher urban costs as well as a narrower range of varieties."*

With Murata and Thisse (2005) it is worth stressing that there is no technological spillovers here. This may be an simple extension of our work because capital is already integrated.

2.1.3 Market clearing

By equalizing the total demand of varieties addressed to a northern firm to its supply we get[13]:

$$\omega_1^k = \Theta\frac{\varphi}{\sigma}\left[\frac{S_1 + L_1}{n_1^k + \phi n_2^k} + \phi\frac{S_2 + L_2}{\phi n_1^k + n_2^k}\right] \tag{14}$$
$$\omega_2^k = \Theta\frac{\varphi}{\sigma}\left[\phi\frac{S_1 + L_1}{n_1^k + \phi n_2^k} + \frac{S_2 + L_2}{\phi n_1^k + n_2^k}\right] \tag{15}$$
$$\text{with } \Theta = a \text{ for } k = A \tag{16}$$
$$\text{and } \Theta = 1 - a \text{ for } k = B \tag{17}$$

Migration to region 1 ($h_1 \uparrow$) increases nominal reward there and decrease it in region 2. That's the **market access** effect. Its evolution is worth stressing:

[13] Similar expressions have been obtained in the literature. In sector A equations (14) and (15) are similar to those obtained in the quasi-linear FE model of Pflüger (2003). In sector B, similar equations have been used in Pflüger (2001) to analyse ecological dumping.

Proposition 1 *Migration plays positively on the market access but this positive effect decreases with trade liberalization and with urban costs.*

Proof. By considering that price indexes are constant, one obtains: $\frac{\partial \omega_1^k}{\partial h_1} = \Theta \frac{\varphi}{\sigma}\left[\frac{1-\theta h_1}{P_1^k} + \phi \frac{\theta(1-h_1)-1}{P_2^k}\right]$. Then by starting from a symmetric case where $P_1^k = P_2^k$ one can verify that $sign(\left.\frac{\partial \omega_1^k}{\partial h_1}\right|_{h_1=1/2}) = sign(1 - \frac{\theta-\theta\phi+2\phi}{2})$ and because $1 - \frac{\theta-\theta\phi+2\phi}{2} > 0$ if $\theta < 2$ which is verified by definition, one can conclude that $\left.\frac{\partial \omega_1^k}{\partial h_1}\right|_{h_1=1/2} > 0$. Moreover $sign(\frac{\left.\frac{\partial \omega_1^k}{\partial h_1}\right|_{h_1=1/2}}{\partial \phi}) = sign(\frac{\theta-2}{2}) < 0, \forall \theta < 1$ and $sign(\frac{\left.\frac{\partial \omega_1^k}{\partial h_1}\right|_{h_1=1/2}}{\partial \theta}) = sign(-\frac{1-\phi}{2}) < 0$. ■

One can notice that FDI ($K_1 \uparrow$) does not impact on this effect.[14]

In opposition to this agglomerative force, more firms in region 1 ($n_1^k \uparrow$) foster competition and reduce nominal reward (if $\phi < 1$). That's the market crowding effect.

In the long run factors are mobile, capital and skilled workers move towards the nation with the highest rewards. A standard assumption is to consider that capital owners are immobile internationally and that rents from capital earned abroad are repatriated. Thus by denoting Ω^B the differential rewards:

$$\Omega^B = \omega_1^B - \omega_2^B$$

there is a stable total agglomeration in region 1 if $\left.\Omega^B\right|_{K_1=1} \geq 0$, a stable agglomeration of capital in region 2 if $\left.\Omega^B\right|_{K_1=0} \leq 1$ and a stable dispersed equilibrium if $\left.\frac{d\Omega^B}{dK_1}\right|_{K_1=1/2} < 0$.

Concerning skilled workers, in the long run, they are mobile between countries and migrate towards the nation with the highest indirect utility. Utility maximization yields the indirect utility function V_1^H in region 1 and V_2^H in region 2 which allows to get the following indirect utility differential $\Omega^A = V_1^H - V_2^H$:

$$\Omega^A = a(1-\sigma)\ln(P_2^A/P_1^A) + (1-a)(1-\sigma)\ln(P_2^B/P_1^B) + (Y_1 - Y_2) \quad (18)$$

$$\text{with } Y_r = (1 - \frac{\theta}{2}h_r)\omega_r^A \text{ with } r = 1, 2 \quad (19)$$

where $(1 - \frac{\theta}{2}h_r)\omega_r^A$ comes from the income of land ownership $(\theta h_r \omega_r^A/2)$ and from the wage net of commuting costs earned at both edges $((1-\theta h_r)\omega_r^A)$.

In this equation of migration two additional forces appear : on the one hand the term $(1-\theta h_r/2)$, creates a dispersive force independently of trade costs, which is the land market-crowding effect. On the other hand the third term P_2^k/P_1^k is an agglomerative force, indeed goods are cheaper in the agglomerated area because imports are lower and thus the burden of trade costs too. This last force is the **supplier market access**. Let's analyse its change with respect to trade costs.

Proposition 2 *Migration and capital entry play positively on the supplier access but this positive effect decreases with trade liberalization.*

[14] Baldwin et al. (2004, sect 16.2 p.394) also use this quasi linear footloose capital to study tax competition.

Proof. In sector A relative price index are given by $\frac{h_1+\phi(1-h_1)}{\phi h_1+(1-h_1)}$, thus $\frac{\partial(\frac{h_1+\phi(1-h_1)}{\phi h_1+(1-h_1)})}{\partial h_1} = \frac{(1-\phi)(1+\phi)}{[\phi h_1+(1-h_1)]^2} > 0$ and then $\frac{\partial(\frac{(1-\phi)(1+\phi)}{[\phi h_1+(1-h_1)]^2})}{\partial\phi} = \frac{-2\phi[\phi h_1+(1-h_1)]^2 - \overbrace{\frac{\partial([\phi h_1+(1-h_1)]^2)}{\partial\phi}}^{+}}{[\phi h_1+(1-h_1)]^4} < 0$. The same results are obtained in the B sector by replacing h_1 by k_1 in price indices. ■

A new circular causality comes from the pecuniary externalities between sector A and B. Indeed contrary to the symmetric FC model where neither demand-linked nor cost-linked circular causality is generated (see Baldwin et al. 2003, p.82), here from (14 with $k = B$) it is clear that more skilled workers in region 1 generate more outlets and profits in sector B and thus attract capital. This new entry of capital reduces the price index in sector B which (according to (18)) increases the attractiveness of region 1 for skilled workers. This new migration can in turn attract capital and so on.

2.2 Location choice

The relationship between migration and capital flow in sector B is obtained by solving $\Omega^A = 0$ with respect to K_1 and gives:

$$K_1 = \frac{L(-1+\phi) - (\theta-2)\phi + 2h_1(-1+(\theta-1)\phi) + h_1^2(1-\phi)\theta}{[2+2L+(2h_1-1-2h_1^2)\theta]\,(\phi-1)} \tag{20}$$

Let's first observe that the location of capital equalizing capital rents internationally is strictly increasing in h_1 from autarky to free trade. This means that migration always attracts capital. Figure 2.b and 2.c represents such a result by plotting equation (20), i.e the location of capital K_1, as a function of skilled workers h_1 for two different level of trade openning.

Such a result comes from the fact that migration induces a spatial expenditure shifting (market access effect) for firms operating in sector B.

Thus if $h_1 = 1/2$ dispersion is always a stable equilibrium regardless of the value of trade costs, but if $h_1 > 1/2$ then partial agglomeration occurs in sector B. This partial agglomeration ends up by a total agglomeration of capital if $K_1 = 0$. Thus by solving (20) with such a value one obtains the level of trade costs at which a total agglomeration of capital in region 1 occurs:

$$\phi^K = \frac{3 - 2h_1(1-\theta) - \theta(1+h_1^2)}{2h_1 + 1 - h_1^2\theta} \tag{21}$$

Such an expression is very useful since it allows using equation (20) for all trade levels between autarky and ϕ^K (which satisfies $\Omega^B\big|_{K_1=1} = 0$) and $K_1 = 1$ for all levels of trade costs between ϕ^K and free trade.

Thus, by using the share of capital as a function of skilled workers (equation (20)) in nominal wages ((14) and (15) with $k = A$) and by inserting these expressions in the location choice of entrepreneurs (equation (18)) one can analyse how migration evolves according to trade liberalization. By this mean, numerical simulation in Figure 2.a and 2.c are obtained.[15] The horizontal axis represents the share of skilled workers in region 1 and the vertical axis Ω^A.

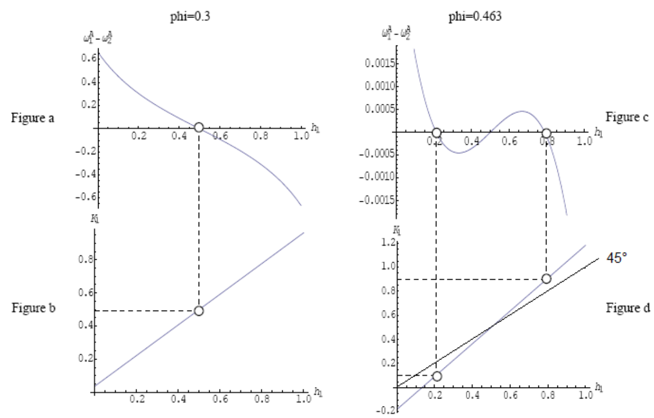

Figure 2

For high trade costs ($\phi = 0.3$) dispersion of skilled workers ($h_1 = 1/2$) is stable which ensures, as we have just pointed out, that dispersion of capital is also a stable equilibrium. Figure 2.b represents such a result by plotting the location of capital (20) as a function of skilled workers h_1.

When trade is liberalized, agglomeration of entrepreneurs (Figure 2.c) and capital (Figure 2.d) occurs gradually and one can observe that the agglomeration of capital emerges sooner than that of skilled workers[16]. Indeed in Figure 2.c when 80% of skilled workers are agglomerated in region 1[17] (for $\phi = 0.463$), this region already hosts 90% of FDI.

When trade is liberalized even more, a total agglomeration of capital occurs, nominal rewards in sector B are higher in region 1 than in region 2 ($\Omega^B > 0$). The literature speaks about an agglomeration rent to illustrate this situation. More liberalization yields a total agglomeration of skilled workers but for lower trade costs the land market crowding effect dominates agglomeration forces, the costs of living in the big cities being too high for skilled workers who come back in their region of origin.

The diagram below sums up these results by plotting the location of capital and entrepreneurs with respect to trade freeness. It illustrates that agglomeration of capital occurs gradually and stays stable until free trade while agglomeration of entrepreneurs only occurs for intermediate level of trade costs. This result obviously comes from urban costs, without them agglomeration of both

[15] Parameters: $\sigma = 1.1, \theta = 0.1, a = 0.9$

[16] We have done numerous simulations to check this result, and it seems surprisingly robust. Indeed K_1 given by (20) and plotted for instance in Figure 2.d is above the 45° line which explains why agglomeration of capital occurs sooner. For higher commuting costs, the relationship between capital and workers is below the 45° line indicating that total agglomeration of entrepreneurs may occur sooner than that of capital. But for these high levels of commuting costs, dispersion of entrepreneurs is the sole stable equilibrium.

[17] We focus here on cases where agglomeration occurs in region 1. But in reason of multiple equilibria agglomeration in region 2 is also an equilibrium and thus a similar reasonning can be done by considering this polar case.

factors are stable even for low trade costs. This reveals the importance of these costs around free trade.

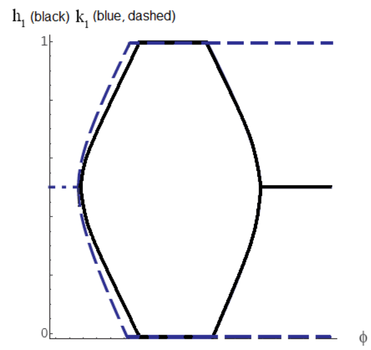

Figure 3

To conclude, we retain the following result: agglomeration of capital attracts skilled workers, while dispersion of skilled workers does not generate a dispersion of capital. In other words, agglomeration of skilled workers and capital is a virtuous circle for the region that hosts these factors, while dispersion of skilled is not a vicious circle for FDI which still benefits of an agglomeration rent when trade is liberalized.

These results need however to be confirmed. Indeed, our model is clearly specific, perhaps the most critical assumption concerns the sector specific factor we use. This assumption has been presented by Caves (1971), who considered that capital can be a composite factor that is more mobile between two identical sectors of different countries than between two different sectors of the same region. One believes that such a relationship can also be applied to highly skilled workers, but that limits the generality of our analysis. Moreover the empirical findings of the domestic versus international capital mobility do not fully support the capital sector specific assumption[18] and lastly one wants to introduce other agglomeration forces such as vertical linkages between firms and other dispersive forces such as migration costs (attachment to home, costs of moving etc) to test the robustness of our result.

3 Location of unskilled workers and of firms with vertical linkages

The model is based on Ottaviano and Robert-Nicoud (2006), ORN hereafter. The economy is composed of two regions, two sectors (superscript B and C) and one factor of production, labour (L). This factor is freely mobile between sectors, thus we relax the factor specific sector assumption previously made. Moreover this factor is mobile across countries, but incurs migration costs which

[18] See for instance Reitzes and Roussland (1988).

vary from one worker to another. These are monetary costs (such as travel costs or the costs of moving out etc) and/or psychological costs (such as attachment to home etc).

Regions are labelled as previously with a subscript $r = 1, 2$. The utility function for a typical individual in r takes a Dixit-Stiglitz form. More precisely the upper tier utility is a Cobb-Douglas function, the individual spends a share μ of income Y_r on the composite manufacturing good C^B and a share $1-\mu$ on the homogenous good C^C. The industrial good is a composite of n^w varieties (w for world) captured by a constant elasticity of substitution $\sigma > 1$ between any pair of varieties k. The dual of this, the indirect utility function is given by:

$$V_r = \frac{Y_r}{P_r^{\mu}} \tag{22}$$

$$P_r = \left(\int_{i=0}^{n^w} p(k)^{1-\sigma} dk\right)^{1/(1-\sigma)} \tag{23}$$

where P_r is the price index in the region r.

As in the previous model the homogeneous good C^C is produced under perfect competition and constant returns to scale whereas the industrial sector produces different varieties under increasing returns to scale. Firms evolve in a monopolistic competition framework in the wake of Dixit-Stiglitz (1977) and Ethier (1982), which means that the different varieties that consumers buy are also used as an input (in addition to labour) into the production of each variety. This well-known tricky assumption allows presenting input-output linkages without introducing two sorts of industries.[19] Labour and composite input enter in the variable cost and fixed cost via a Cobb-Douglas function, more precisely the following total cost is considered:

$$TC_r(i) = \alpha\omega_r^{1-\rho} P_r^{\rho} + \beta\omega_r^{1-\gamma} P_r^{\gamma} y_r(i)$$

with γ and ρ the elasticities of substitution between the inputs in fixed and variable costs and ω the workers' nominal wage. From this equation, we assume that $\gamma = 0$, thus the fixed costs only depend on industrial goods while the variable costs are only a function of labour. Such a cost function is in the spirit of Flam and Helpman (1987) who also assume that different inputs impact differently on fixed and variable costs. Since the price of the homogenous good is taken as the numéraire, under perfect competition and without trade costs we get: $\omega_r = 1$ and this gives:

$$TC_r(i) = \alpha P_r^{\rho} + \beta y_r(i)$$

ORN make an additional simplification by assuming that the technology to produce industrial varieties use intermediate inputs in the same proportion that consumers spend their incomes: $\rho = \mu$.

By maximizing its pure profit (denoted Π while operating profit are denoted π such as in region r: $\Pi_r = \pi_r - \alpha P_r$ with $\pi_r = (p_r - \alpha)y$), a typical firm in region r sets the following price:

$$p_r(i) = \frac{\sigma\beta}{\sigma - 1} \tag{24}$$

[19] See Venables (1996) for a more complete modelling where the same industry is not as here both downstream and upstream.

Thus, when inserting this price in (23) one can observe that, at the difference with Puga (1998), there is no recursivity in the definition of the price index, which makes the present model much more tractable than the original one. With this price, profit in r is:

$$\Pi_r = \frac{\beta}{\sigma - 1} y(i) - \alpha P_r^{\rho} \tag{25}$$

which gives under free entry and exit:

$$\alpha P_r^{\rho} = \frac{\beta}{\sigma - 1} y(i) \tag{26}$$

Trade in industrial goods occurs under the assumption of 'iceberg trade costs': τ units must be shipped for one unit to arrive in the other region. The delivered price p_s of a variety produced in r is τp_r which gives $p_s = \tau \frac{\sigma\beta}{\sigma-1}$. These trade costs can be interpreted as a package of transaction costs, tariff and non tariff costs, transport costs and time costs. To simplify notation, it is assumed with the literature that β is equal to the reverse of the mark up (i.e $\beta = \frac{\sigma-1}{\sigma}$). This simplifies price to unity when goods are sold locally and to τ when they are sold abroad. From this and (23), the northern price index is:

$$P_1 = (n_1 + \phi n_2)^{\frac{1}{1-\sigma}} \tag{27}$$

where $\phi = \tau^{1-\sigma}$ ($\phi \in [0,1]$) is a measure of trade openness. For instance, with $\phi = 0$ countries are in autarky while $\phi = 1$ is a situation of free trade.

By using the Shephard's lemma for the total cost, the Roy identity on the indirect utility, the market clearing condition is obtained and given in region 1 by:

$$y_1 = \mu \left[\frac{L_1 + n_1\pi_1}{w_1(n_1 + \phi n_2)} + \phi \frac{L_2 + n_2\pi_2}{w_2(\phi n_1 + n_2)} \right] \tag{28}$$

with

$$\pi_1 = \frac{y_1}{\sigma} \tag{29}$$

From this equation (and its twin) in the South one obtains y_1 (and y_2):

$$y_1 = \frac{\mu(L_1(\phi n_1 + n_2) + L_2(n_1 + \phi n_2)\phi + \mu\sigma^{-1} L_1 n_2(\phi^2 - 1))}{\mu\sigma^{-1}\left[n_2(n_1 + \phi n_2) + n_1(\phi n_1 + n_2)\right] + \mu^2\sigma^{-2} n_1 n_2(\phi^2 - 1) - (\phi n_1 + n_2)(n_1 + \phi n_2)} \tag{30}$$

Two forces drives the level of output in one region, the **supplier access** effect (via price index) and the market crowding effect. The former is an agglomerative force, firms like to locate close to their customers as this decreases their shipping costs. Thus relocations of firms in the region with the higher market potential entails a growth of production in this location. The latter is a dispersive force, firms do not like to locate close to their competitors as this reduces their output prices and bid up input prices.

In the long run, firms choose the location of production according to pure profits. With Ottaviano and Robert-Nicoud (2006) it is assumed that each new firms are created (closed) in each region as long as profits are positive (negative) or as long as $\frac{\pi_r}{P_r^{\rho}}$ is larger than unity (which is equivalent indeed $\Pi_1 = \pi_1 - \alpha P_1^\rho = 0 \Leftrightarrow \frac{\pi_r}{\alpha P_r^\rho} = 1$ thus firm enter if $\frac{\pi_r}{\alpha P_r^\rho} > 1$). This term is labelled q_r (in reference to the q-ratio of Tobin):

$$q_r \equiv \frac{\pi_r}{P_r^\rho} \tag{31}$$

More precisely, it is assumed that firms enter and exit by a laws of motion such as $\dot{n_r} = n_r(q_r - 1)$ which can be rewritten by using the share of firms located in one region ($s_1 = \frac{n_1}{n_1+n_2}$ the share in region 1, and n^w the number of firm in the world such as $n^w = n_1 + n_2$):

$$\dot{s_1} = s_1(1-s_1)(q_1 - q_2), \quad \dot{n}^w = n^w(s_1 q_1 + (1-s_1)q_2 - 1) \tag{32}$$

the first equation indicates that firms are created in region 1 as long as production is more profitable there and the second equation shows that the total number of firms increase as long as profits are positive.

However and as we have seen the location of firms depends partially on the location of workers.

Unskilled workers incur mobility costs which differ between individuals, these migration costs takes the form used by Tabuchi and Thisse (2002). With V_1^L the indirect utility in 1, the probability that a worker will choose to reside in 2 is given by:

$$\mathbb{Q}_1 = \frac{\exp[V_1^L/\theta]}{\exp[V_1^L/\theta] + \exp[V_2^L/\theta]} \tag{33}$$

where θ represents migration costs. The law of motion follows Tabuchi and Thisse (2002) and Russek (2008):

$$\frac{dL_1}{dt} = (1 - \frac{L_1}{L})\mathbb{Q}_1 - \frac{L_1}{L}\mathbb{Q}_2$$

A spatial equilibrium arises when $\frac{dL_1}{dt} = 0$. $\frac{dL_1}{dt} = 0$ gives $(1-L_1)\frac{\exp[V_1^L/\theta]}{\exp[V_1^L/\theta]+\exp[V_2^L/\theta]} = L_1 \frac{\exp[V_2^L/\theta]}{\exp[V_1^L/\theta]+\exp[V_2^L/\theta]}$ and by using the logarithm on the RHS and LHS, one gets : $\Omega^C - \theta \log \frac{L_1/L}{1-L_1/L} = 0$, where Ω^C represents workers' indirect utility differential that drives migration ($\Omega^C = V_1^L - V_2^L = \frac{1}{(s_1+\phi s_2)^{\mu/1-\sigma}} - \frac{1}{(\phi s_1+s_2)^{\mu/1-\sigma}}$). Thus $\Omega^C - \theta \log \frac{L_1/L}{1-L_1/L} = 0$ gives:

$$L_1 = \frac{L}{1 + \exp(-\Omega^C/\theta)} \tag{34}$$

By inserting (34) in (30) and by using (29), (31) one can compute $q_1 - q_2$ which allows to analysing the location of firms (see (32)). In Figure a, b and c, we plot $q_1 - q_2$ with respect to s_1 for different values of trade costs ϕ and migration costs θ. One can see that trade liberalization leads to a progressive agglomeration of firms. Indeed in Figure a, the market crowding effect is the strongest force, relocation in region 1 generates a slump of profits which become negative there and positive in region 2. Thus dispersion remains stable. But for a smaller level of trade costs, it becomes profitable for firms to relocate. Around 80% of firms choose the region 1 (or 2 according to multiple equilibria) in Figure b. For even smaller trade costs the agglomeration becomes progressively total in Figure c. In these two cases, the cluster of firms allows decreasing the shipping costs between upstream and downstream firms and moreover the local spending of new entrepreneurs increases the demand in region 1. Then, these two agglomerative forces overcome the market crowding effect.[20]

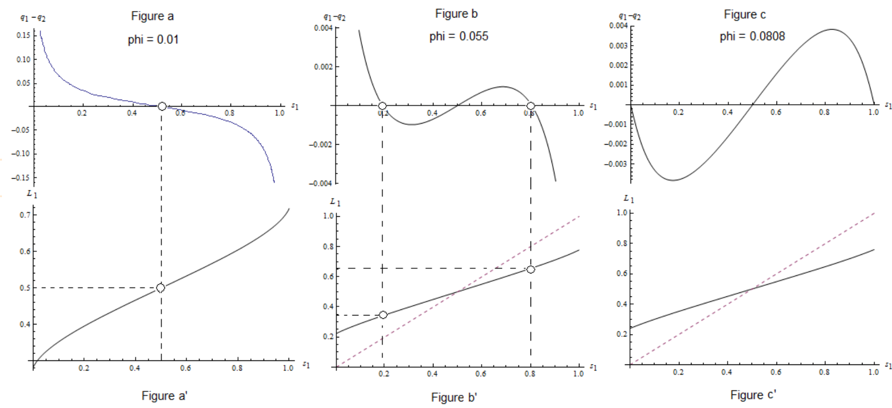

Figure 4

In Figure a', b' and c', we also plot L_1 with respect to s_1 by using (34). One can see that the agglomeration of firms is linked to workers' agglomeration. However, the total agglomeration of firms occurs for a lower level of trade liberalization than workers' agglomeration. Indeed in Figure c, all firms are agglomerated in region 1 (or in region 2 according to multiple equilibria), while this country attracts less than 80% of workers. When all firms are agglomerated, the differential of real wage is simplified by $\Omega^C = 1 - \phi^{\mu/\sigma-1}$. Thus, because $\sigma > 1$, more trade liberalization decreases the relative welfare in the region 1 Ω^C, which leads to a dispersion of workers (see (34)). The diagram below sums up these results by plotting the location of firms and workers with respect to trade freeness.

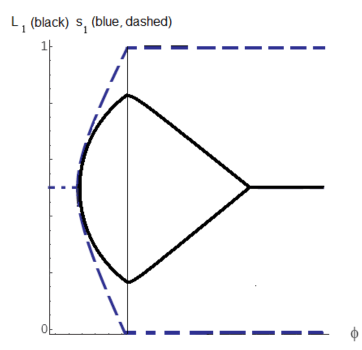

Figure 5

Figure 5 illustrates that agglomeration of firms occurs gradually and stays stable until free trade, while a partial agglomeration of workers occurs only for intermediate levels of trade costs. To check the robustness of this result we have run numerous simulations and we have found the same trend with however one difference: the bifurcation diagram can be different according to migration costs.

[20]Parameters: $\sigma = 2, a = 1, \mu = \rho = 0.4, \theta = 0.55, L = 1$.

Indeed with higher migration trade liberalization generate a sudden and catastrophic agglomeration instead of the progressive process obtained here.

To conclude this theoretical section, we retain the main result of the two models:

Proposition 3 *By liberalizing trade from high trade costs, a country can attract both capital and labour - the bifurcation pattern is a gradual peripheral exodus of workers associated with capital flight from the periphery - but after a threshold of trade costs, opening trade generates return migration toward the periphery while capital remains agglomerated in the core.*

4 Concluding remarks

The literature on FDI and migration is now burgeoning, but the lack of theoretical foundation and the absence of one facet of globalization - trade - is problematic in term of static comparative and in terms of omitted variables. We have shown theoretically that the relationship between FDI and migration depends heavily on trade costs because these costs impact on the supply (cost linkage) as well as on the demand (demand linkage). We have also emphasized the importance of urban costs. The need to build market access and supplier access on trade data (à la Redding and Venables (2004)) and to take a closer look on urban costs are certainly promising road of research.

References

Alonso, W. 1964. *Location and land use.* Cambridge, MA :Harvard University Press.

Baldwin, R., 2006. Globalisation: The great unbundling(s). Finnish Prime Minister's Office (hei.unige.ch/~baldwin/PapersBooks/).

Baldwin, R.E., R. Forslid, P. Martin, G.I.P. Ottaviano, F. Robert-Nicoud. 2003. *Economic geography and public policy*, Princeton University Press, Princeton NJ USA.

Behrens K., and F. Robert-Nicoud. 2008. Survival of the Fittest in Cities: Agglomeration, Selection and Polarisation. *SERC discussion paper 12*.

Borck, R., M. Pflüger and M. Wrede. 2009. A simple theory of industry location and residence choice. *Journal of Economic Geography*, doi:10.1093/jeg/lbp046.

Candau F., 2008, Good Governance, Trade and Agglomeration. *Papers in Regional Science.* Vol 87 Issue 4, pp 483-504.

Candau F., 2008, ENTREPRENEURS' LOCATION CHOICE AND PUBLIC POLICIES: A SURVEY OF THE NEW ECONOMIC GEOGRAPHY. *Journal of Economic Surveys* Vol. 22, No. 5, pp. 909–952

Candau, F. 2009. Is agglomeration desirable? Forthcoming in *Annals of Economics and Statistics.*

Candau F. and E. Dienesch. 2011. A Survey on the Micro-Foundations of the Trade Gravity Equation. Université de Pau et des Pays de l'Adour, miméo.

Cave, R.E. 1971. International corporations: the industrial economics of foreign investment. *Economica* 38, 1-27.

Degen K and Fischer A, 2009, Immigration and Swiss House Prices. *CEPR* No. 7583.

Dixit, A. 1990. *Optimization in Economic Theory.* Second Edition, Oxford University Press.

Dixit, A.K. and J.E. Stiglitz. 1977. Monopolistic competition and optimum product diversity. *American Economic Review.* 67 (3), 297-308.

Evenett, Simon J. and Wolfgang Keller. 2002. On Theories Explaining the Success of the Gravity Equation. *The Journal of Political Economy* 110(2): 281-316.

Feenstra, R, Markusen J R, Rose,Andrew K. 2001. Using the gravity equation to differentiate among alternative theories of trade, *Canadian Journal of Economics*, vol. 34(2), pages 430-447.

Flam, H. and H. Helpman. 1987. Vertical product differentiation and North-South trade, *American Economic Review*, 77 (5), 810-822.

Forslid, R., Ottaviano, G. I. P., 2003. An Analytically Solvable Core-Periphery Model. *Journal of Economic Geography* 3, 229-240.

Fujita, M., 1989. *Urban Economic Theory, land use and city size.* Cambridge university press.

Fujita, M., Thisse J., 2006. Globalization and the evolution of the supply chain: Who gains and who looses? *International Economic Review* 47 (3), 811-836.

Gonzalez, L. and F. Ortega, 2009. Immigration and Housing Booms: Evidence from Spain, *IZA DP No. 4333.*

Hatton, T. J. and Williamson, J. G. 2006. *World Mass Migration: Two Centuries of Policy and Performance*, MIT Press.

Heckscher, E., 1918., *The Continental System : An Economic Interpretation* (English translation : Clarendon Press, Oxford)

Helpman, H. 1998. The Size of Region, In D. Pines, E. Sadka, and I. Zildcha (eds.). *Topic in public economics. Theorical and Applied Analysis.* Cambridge: Cambridge University Press, 33-54.

Jones, R.W. 1967. International capital movements and the theory of tariffs and trade. *Quarterly Journal of Economics* 81, 1-38.

Jones, R.W. 1971. A three-factor model in theory, trade and history, In *Trade, Balance of Payments and Growth: Essays in Honor of Charles C. Kindleberger*, ed. J.N. Bhagwati et al. (Amsterdam: North-Holland).

Kemp, M.C. 1966. The gain from international trade and investment: a neo-Heckscher- Ohlin approach. *American Economic Review* 56, 788-809.

Krugman, P. 1991. Increasing returns and economic geography. *Journal of Political Economy* 99, 483-99.

Krugman, P. and R. E. Livas. 1996. Trade policy and the third world metropolis. *Journal of Development Economics*, 49, 137-150.

Krugman, P. and Venables AJ. 1995. Globalization and the Inequality of Nations, *Quarterly Journal of Economics*, 110, 857–880.

Markusen, J.R. 1983. Factor movements and commodity trade as complements. *Journal of International Economics* 19, 341-56.

Martin, P. and C.A. Rogers. 1995. Industrial location and public infrastructure. *Journal of International Economics* 39, 335-351.

Mundell, R.A. 1957. International trade and factor mobility. *American Economic Review* 47, 321-35.

Murata, Y. and J-F. Thisse, 2005. A simple model of economic geography à la Helpman-Tabuchi, *Journal of Urban Economics*, 137-155.

Neary, P., 1995. Factor Mobility and International Trade, *The Canadian Journal of Economics*, 28, 4-23.

Ohlin, B. 1933. Interregional and International Trade (Harvard University Press, Cambridge MA) Revised version published in 1968.

Ottaviano, G. and F. Robert-Nicoud. 2006. The 'genome' of NEG models with vertical linkages: A positive and normative synthesis. *Journal of Economic Geography*, 6(2), 113-39.

Pflüger, M., 2001. Ecological Dumping under Monopolistic Competition, *Scandinavian Journal of Economics* 103(4), 689-706.

Pflüger, M., 2004. A simple, analytically solvable, Chamberlinian agglomeration model, *Regional Science and Urban Economics* 34, 565-573

Puga, D., 1999. The rise and fall of regional inequalities. *European Economic Review* 43, 303-334.

Purvis, D.D. 1972. Technology, trade and factor mobility. *Economic Journal* 82, 991-9.

Redding S. and A.J. Venables. 2004. Economic geography and international inequality. *Journal of International Economics* 62 (1), 53–82.

Reitzes J. D. and D. J. Rousslang, 1988. Domestic versus International Capital Mobility: Some Empirical Evidence, *Canadian Journal of Economics*, vol. 21(2), pages 312-23,

Robert-Nicoud, F. 2008. Offshoring of Routine Tasks and (De)industrialisation: Threat or Opportunity and for Whom? *Journal of Urban Economics*. 63(2), 517-35.

Russek, S. 2008. Taste heterogeneity, labor mobility and economic geography - A critical reconsideration and correction. *Economics Bulletin* 18(1): 1-13

Saiz, A. 2007. Immigration and Housing Rents in American Cities, *Journal of Urban Economics* 61(2), 345-371.

Tabuchi, T. 1998. Urban Agglomeration and Dispersion: A Synthesis of Alonso and Krugman. *Journal of Urban Economics* 44(3), 333-351.

Tabuchi, T. and J.-F. Thisse. 2002. Taste heterogeneity, labor mobility and economic geography. *Journal of Development Economics*, 69: 155-177.

Venables, AJ. 1996. Equilibrium locations of vertically linked industries. *International Economic Review* 37, 341-359.