ATTITUDES TOWARDS FOREIGN PRODUCTS AND WELFARE WITH CAPITAL MOBILITY

January, 2009

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Abstract.

We develop a model of trade with imperfect competition to study the welfare implications in developing and developed countries of the asymmetry in attitudes towards foreign products. In the developed country, consumers benefit from a better perception of foreign products while the rental rate of capital declines as long as the location of capital remains unchanged. However, when capital is mobile, the developing country hosts more and more capital at the expense of the developed country as the perception of varieties produced in the developed country improves and the surplus of consumers in the developed country can decrease.

Keywords: product of origin; capital location; consumer's surplus.

JEL Classification: F12, F21.

1. Introduction

Different studies in marketing and economic psychology show consumers attach different values to products which are otherwise identical but produced in different countries. Although numerous studies reveal that country of origin matters, standard economic theory of trade and location does not consider this element in consumers and firms behaviour.

A large body of research is dedicated on country of origin effects on product evaluation such as *perceived* quality, attitudes and purchase intentions (see Peterson and Jolibert, 1995, for a survey). Product-country images contain not only cognitive and affective aspects but also normative aspects such as "buy domestic", "consumer ethnocentrism" and "customer voting"[1]. Numerous studies show that country of origin influences significantly product evaluation. From a meta-analysis of country-of-origin research, Verlegh and Steenkamp (1999) show that the country' level of development matters in product evaluation. Products from Less Developed Countries (LDC) appear to be evaluated less positively than products from Developed Countries (DC). For example, US consumers (resp., Canadian) consumers are, *ceteris paribus*, more disposed to purchase Canadian (resp., US) products than Mexican products (Lantz and Loeb, 1996). At the opposite, Indians, South African and Mexican consumers favour more foreign products (see Bara et al., 2000). Hence, firms producing in LDC have greater difficulties to penetrate the developed countries markets. This, in part, may explain why outward foreign direct investments in industrial sectors from developing countries (especially from Brazil, China, India, Malaysia, the republic of Korea, Singapore, and South Africa) to developed countries are becoming important (UNCTAD, 2004). For example, the most important destination of for Indian and Chinese foreign direct investments

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[1] "customer voting" is related to the phenomenon where a consumer, by deciding to avoid or purchase a country's product, votes pro or contra the policies and practices of its government (Smith, 1990). This phenomenon include also ethical considerations (Grolleau et al., 2004).

has been the United-States between 2001 and 2003 while investment activities in Europe from Korean and Taiwanese companies have grown over the last decade.

This paper aims at evaluating the effects of foreign products' perceptions on trade, capital location and welfare. To address this issue, we provide a two-country model with monopolistic competition and capital mobility. Countries are only distinguished from each other by differences in attitudes towards foreign products. This type of differentiation induced by the country of origin is not studied in existing models of trade and location. The model developed by Neven et al. (1991) is a notable exception because they consider that demand is subject to national product bias. However, they assume no capital mobility between countries, while in our model it is endogenous. We will see that some unsuspected results emerge when we take into account the mobility of capital.

Our first result is in line with standard analysis. Consumers living in the developed country always benefit from a rise in the knowledge of foreign products as long as the location of capital remains unchanged. In this case, they consume more varieties and prices decrease due to an increasing price competition between domestic firms and foreign firms. However, taking into account the mobility of capital reveals new results. First, the developing country hosts more and more firms (or capital) at the expense of the developed country as the perception of product improves. Second, and as a direct consequence of the previous result, the surplus of consumers in the developed country can decrease when perception of foreign products improves, whereas the surplus of developing country consumers increases. In other words, a better perception of foreign varieties produced in developing countries favours the convergence of economies. This result means that the international integration of product markets and that the international harmonisation of attitudes towards foreign products have opposite effects on the inequalities among nations since economic geography models show that a fall in trade costs fosters inequalities between countries (see Fujita et al., 1999 and Fujita and Thisse, 2002).

The remainder of the paper is organised as follows. In section 2, we present formally the main assumptions of the model. In section 3, we study the consequences of better perception about varieties produced in developing countries for the prices, rental rate of capital and consumer's surplus when the location of capital is exogenous. The impact of better perception of foreign products on the international allocation of capital is studied in section 4 while a welfare analysis is performed in section 5 by considering the equilibrium allocation of capital. Section 6 concludes and gives some suggestions for future theoretical investigations.

2. Model and some preliminary results

2.1. General assumption.

The economy is made up of two countries, labelled H (the home country or developed country) and F (the foreign or developing country). There are two sectors, a traditional sector (T) and a modern sector (M). The M-sector produces a continuum of varieties of a horizontally differentiated product, using capital as only input. The T-sector produces a homogenous good (the *numéraire*), using labour as only input. The economy is endowed with k units of capital and $2L$ consumers/workers. Workers supply their units of labour inelastically and are not internationally mobile. Consumers have a love for variety of differentiated product. Capital is perfectly mobile between countries and is owned by workers, who also supply inelastically their units of capital. In order to focus on effects of product knowledge on the international allocation of capital and welfare, we assume that technology, endowment in consumers and preferences are identical whatever the country.

Each consumer living in country H (resp., F) is willing to buy a share θ_F (resp. θ_H) of varieties produced in country F (resp., H). There is no imports ($\theta_F=0$) when each consumer values very negatively a foreign country while all varieties produced in the foreign country are imported when consumers do not attach a negative value to foreign products ($\theta_F=1$). In addition, an increase in

θ_F from 0 to 1 means that the perception of varieties produced in country F improves and more products are imported from country F.[2]

One can show that, when $\theta_F=\theta_H$, full dispersion of capital is the only equilibrium spatial configuration, whatever the trade costs. A more interesting situation arises in the case where $\theta_F<\theta_H$.[3] Because our qualitative results depend only on the wedge between θ_F and θ_H, the representative consumer in country F is assumed to know all goods produced in country H ($\theta_H=1$), without loss of generality and let $\theta_F \equiv \theta$. In other words, all varieties produced in country H benefit from a good perception of consumers living in country F and only prices determine the choice. Therefore, country F is the developing country, as it is more difficult for varieties produced in this country to reach the other country.

Notice finally that θ can also be interpreted differently. Indeed, $1-\theta$ can reflect the share varieties for which import to country F is prohibited by the government of country H. In different countries, governments, labour unions, industry groups sponsor campaign in order to establish of a "buy domestic" norm.

2.2. Consumption

Following Ottaviano, Tabuchi and Thisse (2002), preferences are identical across workers located in the same country and are described by the following quasi-linear utility:

$$U = \alpha \int_0^n q(i)di - \frac{\beta-\gamma}{2}\int_O^n q(i)^2 di - \frac{\gamma}{2}\left(\int_O^n q(i)di\right)^2 + z \qquad (1)$$

where $\alpha>0$, $\beta>\gamma>0$ are exogenous parameters, $q(i)$ is the quantity of variety $i\in[0,n]$ and z the quantity of the *numéraire*. In this expression, α measures the intensity of preferences for the differentiated

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[2] Note that θ does not measure the (dis)utility that consumers incur from buying the foreign good, as in Neven et al. (1991). In our case, it measure the share of varieties produced in the foreign country that consumers are willing to buy.

product with respect to the *numéraire*. The condition $\beta>\gamma$ implies that workers have a preference for variety. Each worker is endowed with $z'>0$ units of the *numéraire*. The initial endowment is supposed to be large enough for the consumption of the *numéraire* to be strictly positive at the market outcome. His budget constraint can then be written as follows: $\int_0^N p(i)q(i)di + z = w + z'$ where w is the individual's income and $p(i)$ is the consumer price of variety i.

The average number of products from country F that a representative consumer from country H is willing to buy is θn_F. Given the assumption of symmetry between varieties, solving the consumption problem yields the individual demand function for variety i produced in country $j=H, F$ from a representative consumer located in country H:

$$q_{jH} = a' - [b' + c'(n_H + \theta n_F)]p_{jH} + c'P_H \qquad (2)$$

with

$$a' \equiv \alpha b', \quad b' \equiv \frac{1}{\beta - \gamma + \gamma(n_H + \theta n_F)} \quad \text{and} \quad c' \equiv \frac{\gamma}{\beta - \gamma}b'$$

where p_{jH} is the price of a variety prevailing in country H produced in country j and P_H the price index in country H given by $P_H = n_H p_{HH} + \theta n_F p_{FH}$, p_{HH} (resp., p_{FH}) being the price of each variety produced in country H (resp., F) and consumed in country H.

Given that consumers/workers in country F are willing to buy all varieties produced in country H, their individual demand function is the following:

$$q_{jF} = a - [b + c(n_H + n_F)]p_{jF} + cP_F \qquad (3)$$

where

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[3] The case $\theta_F > \theta_H$ yields symmetrical results since countries are symmetric in endowment, preferences and technology.

$$a \equiv \alpha b, \quad b \equiv \frac{1}{\beta - \gamma + \gamma(n_H + n_F)} \quad \text{and} \quad c \equiv \frac{\gamma}{\beta - \gamma} b$$

with $P_F = n_F p_{FF} + n_H p_{HF}$, p_{FF} (resp., p_{HF}) being the price of each variety produced in country F

(resp., H) and consumed in country F.

2.3. Production.

The traditional sector produces a homogeneous good under perfect competition and constant returns

to scale. One unit of output requires one unit of labour. The T-good is costlessly traded between

countries so that its price is the same everywhere (which is why that good is the natural choice for

the *numéraire*). This implies that the price of the T-good and, at the equilibrium, the workers' wage

is equal to one everywhere.

The modern sector supplies varieties under increasing returns to scale and monopolistic

competition. The production of any variety requires one unit of capital. There exists a one-to-one

correspondence between firms and varieties, so that $n = k$. We consider a market structure with

monopolistic competition with free entry. Varieties of M-good are traded at a cost of t units of the

numéraire per unit shipped between the two countries. In addition, we assume that markets are

internationally segmented so that each firm chooses a delivered price, which is specific to the country

in which its variety is sold. As firms bear trade costs and assuming one unit of capital per firm ($n =$

k), and denoting r_H (resp. r_F) the rental rate of capital in country H (resp. F), profits of a

representative firm in country H are as follows:

$$\pi_H = p_{HH} q_{HH} L + (p_{HF} - t) q_{HF} L - r_H \tag{4}$$

and in country F are given by:

$$\pi_F = p_{FF} q_{FF} L + (p_{FH} - t) \theta q_{FH} L - r_F \tag{5}$$

When producers maximise profits, they take price indices as given. Nevertheless, the market

as a whole has a non-negligible impact on each firm's choice in that each firm must account for the

distribution of all firms' prices through an aggregate statistics (the price index) in order to find its equilibrium price. Thus, the market solution is given by a Nash equilibrium with a continuum of players in which prices are interdependent. The profit-maximising prices are given by:

$$p_{HH} = \frac{2\alpha(\beta-\gamma)+t\gamma\theta n_F}{2\gamma(n_H+\theta n_F)+4(\beta-\gamma)} \qquad (6a) \qquad\qquad p_{FH} = p_{HH} + \frac{t}{2} \qquad (6b)$$

$$p_{FF} = \frac{2\alpha(\beta-\gamma)+t\gamma n_H}{2\gamma(n_H+n_F)+4(\beta-\gamma)} \qquad (7a) \qquad\qquad p_{HF} = p_{FF} + \frac{t}{2} \qquad (7b)$$

As firms' prices net of trade costs are to be positive for any distribution of firms, we assume throughout this paper that

$$t < t_{trade} \equiv \frac{2\alpha(\beta-\gamma)}{\Lambda}$$

where

$$\Lambda \equiv \gamma(n_H+n_F)+2(\beta-\gamma) > 0$$

This condition also guarantees that it is always profitable for a firm to export to the other country.

3. Prices, rental rates of capital and consumer's surplus

In order to disentangle the different mechanisms at work, it is both relevant and convenient to distinguish between we call short-run equilibrium, in which capital is supposed to be immobile, i.e. n_H and n_F are exogenous and, a long-run equilibrium when capital is internationally mobile, i.e. n_H and n_F are endogenous. In this section, we study the impact of θ on (i) equilibrium prices; (ii) rental rate of capital and (iii) consumer's surplus, when the spatial distribution of firms is given.

3.1. Prices

It is easy to check that

$$\frac{\partial p_{HH}}{\partial \theta} = \frac{\gamma n_F[(\gamma n_H+2(\beta-\gamma)]t-2\alpha(\beta-\gamma))}{2(\gamma(n_H+\theta n_F)+2(\beta-\gamma))^2} \leq 0 \text{ when } t \leq t_{trade}$$

and

$$\frac{\partial p_{FF}}{\partial \theta} = 0 \;.$$

In words, a better perception of varieties produced in the developing country (country F) decreases the prices prevailing in the developed country (country H). This means that better perception on varieties increases the price competition among producers serving market H since more varieties are imported from country F. Note that, because markets are segmented, prices in country F are not affected by attitudes towards foreign products of consumers living in country H.

3.2. Rental rate of capital

Due to free entry and exit, there are no profits in equilibrium. This implies that operating profits are equal to the fixed cost paid in terms of capital. In other words, the equilibrium rental rate is determined by a bidding process for capital, which ends when no firm can earn a strictly positive profit at the equilibrium market price. Hence, by introducing (2) (resp., (3)) into (6a) and (7b) (resp., (6b) and (7a)) and by using $\pi_H = 0$ and $\pi_F = 0$, the equilibrium rental rate of capital located in countries H and F given by, respectively,

$$r_H = L[(p_{HH})^2 + (p_{FF} - t/2)^2]/(\beta - \gamma) \tag{8}$$

$$r_F = L[(p_{FF})^2 + \theta(p_{HH} - t/2)^2]/(\beta - \gamma) \tag{9}$$

which increase with prices (given by (6a) to (7b)) whereas we have

$$\frac{\partial r_H}{\partial \theta} < 0 \;,$$

so that the relationship between θ and rental rate of capital in the developed country (country H) is negative due to price competition when the spatial allocation of firms is exogenous. However, the impact on the rental rate of capital in country F is ambiguous. On the one hand, a rise in θ increases

the effective market potential in country H for a firm located in country F. But as it increases price competition in country H, it causes a fall of prices. However, a bit of algebra shows that

$$\operatorname{sgn}\left\{\frac{\partial r_F}{\partial \theta}\right\} = \operatorname{sgn}\left\{2(\beta-\gamma) + \gamma(n_H - \theta n_F)\right\}$$

As a consequence, we have $\partial r_F / \partial \theta > 0$ as long as there are not more firms in country F than in country H (which, as we shall see, is always the case). In other words, without relocation of capital, an improve in the perception of varieties produced in the developing country increases rental rates of capital in this nation and decreases rental rates prevailing in the developed country.

3.3. Consumer's surplus

The expression of surplus for a consumer living in country H is given by:[4]

$$S_H = \frac{a'^2(n_H + \theta n_F)}{2b'} - a'\left(n_H p_{HH} + \theta n_F p_{FH}\right)$$
$$+ \frac{b' + c'(n_H + \theta n_F)}{2}\left(n_H p_{HH}^2 + \theta n_F p_{FH}^2\right) - \frac{c'}{2}\left(n_H p_{HH} + \theta n_F p_{FH}\right)^2 \tag{10}$$

while the consumer surplus of an individual residing in country F is expressed as follows:

$$S_F = \frac{a^2 n}{2b} - a\left(n_H p_{HF} + n_F p_{FF}\right)$$
$$+ \frac{b + cn}{2}\left(n_H p_{HF}^2 + n_F p_{FF}^2\right) - \frac{c}{2}\left(n_H p_{HF} + n_F p_{FF}\right)^2 \tag{11}$$

where

$$\frac{dS_H}{d\theta} = \underset{+}{\frac{\partial S_H}{\partial \theta}} + \underset{-}{\frac{\partial S_H}{\partial p_{HH}}} \underset{-}{\frac{\partial p_{HH}}{\partial \theta}} > 0, \text{ and } \frac{\partial S_F}{\partial \theta} = 0.$$

Consequently, for a given spatial allocation of firms, better perception on varieties raises the surplus of consumers in country H since more varieties are consumed and because of decreasing

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[4] Due to the introduction of θ, the expression of the surplus differs from Ottaviano et al. (2002).

prices. In addition, for a given spatial allocation of firms, the surplus of consumers in country F is not directly affected by the change in the perception parameter, since we have $\partial p_{FF} / \partial \theta = 0$.

To summarize,

Proposition 1. *Assume that the location of capital is fixed. When the perception of foreign products improves, the consumer's surplus only raises in the developed country whereas the rental rate of capital decreases in this country and increases in the developing country.*

4. Asymmetry in perception of foreign products and capital location

We now analyse the role of the perception parameter θ on the location of capital. As there exists a one-to-one correspondence between firms and capital ($n = k$), we can write

$$n_H = \lambda n \quad n_F = (1-\lambda)n$$

where λ is the share of capital or firms located in country *H*. The location of capital depends on the spatial differential of rental rates. A spatial equilibrium is such that, in each country, no firm has an incentive to change location, conditional upon the fact that the markets clear at the equilibrium prices. Formally, a spatial equilibrium arises at $\lambda \in \,]0,1[$ when $\Delta r(\lambda, \theta) = r_H(\lambda, \theta) - r_F(\lambda, \theta) = 0$, or at λ=0 if $\Delta r(\lambda, \theta) \leq 0$, or at λ=1 if $\Delta r(\lambda, \theta) \geq 0$. Such equilibrium always exists because $\Delta r(\lambda, \theta)$ is a continuous function of λ (Ginsburgh *et al*., 1985). An interior equilibrium ($\lambda \in (0,1)$) is stable if and only if the slope of the profit differential is negative in a neighbourhood of the equilibrium ($d\Delta r(\lambda, \theta)/d\lambda < 0$,), whereas agglomerated equilibria ($\lambda = 0,1$) are always stable whenever they exist.

Given (8) and (9), the difference in rental rates of capital between the developed country and the developing country is given by:

$$\Delta r(\lambda,\theta) = \frac{L}{\beta-\gamma}\left[(1-\theta)p_{HH}^{2} + \theta t p_{HH} - t p_{FF} + \frac{(1-\theta)t^{2}}{4}\right] \qquad (12).$$

Observe that $d\Delta r(\lambda,\theta)/d\lambda < 0$ for $\lambda \in [0,1]$ because p_{HH} is a decreasing function of λ while p_{FF} an increasing function of λ. In other words, the slope of $\Delta r(\lambda,\theta)$ is never positive or null. This means that full agglomeration in the developing country is never an equilibrium spatial configuration. To summarize,

Lemma 1. *There exists a single spatial equilibrium for each combination of parameters (a positive share of firms in country F or full agglomeration in country H).*

To determine the spatial equilibrium, we analyse three subcases: $\theta = 1$ (case 1), $\theta = 0$ (case 2) and $1 > \theta > 0$ (case 3).

No negative perception of foreign products ($\theta = 1$).

Because the purpose of the paper is the impact of attitudes towards of foreign products on location, it is important to establish as our benchmark how the spatial allocation of firms is characterised under the assumption for which the country of origin does not matter in consumption. Assuming $\theta = 1$ and introducing (6a) and (7a) in (12), the spatial differential of rents becomes

$$\Delta r(\lambda,1) = \frac{-t^{2}\gamma n L(\lambda-1/2)}{(\beta-\gamma)\Lambda}.$$

Clearly, the full dispersion of capital ($\lambda^{*} = 1/2$) is the single spatial equilibrium. When all consumers do not attach negative values to foreign products ($\theta = 1$), price competition discourages a higher concentration of firms in a single country. This result contrasts with a classical result of new economic geography literature, showing that the dispersion of activities is not a stable equilibrium when transport costs are low enough (see Fujita *et al.*, 1999 and Fujita and Thisse, 2002). Our result arises from the absence of circular mechanisms leading to agglomeration such as input-output

linkages. This feature of our model is not problematic, as is allows us to focus on the effects of perception of foreign products. To sum up,

Proposition 2. *When the country of origin does not matter in consumption ($\theta = 1$), dispersion of capital is favoured.*

4.2. No imports of varieties produced in the developing country ($\theta = 0$).

Suppose now that $\theta=0$. In this case, a firm located in the developing country (country *F*) cannot export to the developed country. We obtain the following proposition:

Proposition 3. *Assume that $\theta=0$. Full agglomeration occurs in country H when t<t* where*

$$t^* \equiv \frac{\Lambda - \sqrt{2\gamma n \Lambda}}{-\gamma n + 2(\beta - \gamma)} t_{trade} < t_{trade}$$

When t*<t<t$_{trade}$, there is a unique stable equilibrium involving partial agglomeration in country H.

Proof. See Appendix A.

This proposition means that the agglomeration of the production is favoured when firms located in country *F* have no opportunity to serve country *H*. In this case, the location of production in country *H* allows firms to serve both markets. However, under certain conditions, it can be profitable to locate in country *F* even though firms do not export. Indeed, the spatial concentration of all capital does not occur when trade costs are high enough. This result requires some comments. Remember that price competition works against agglomeration. Indeed, when trade costs are high enough, firms producing in country *F* can set high prices. Further, the share of local varieties consumption in total consumption in country *F* rises when trade barriers increases. This is due to a substitution effect between local varieties and varieties produced in country *H*. Note that this substitution effect is amplified when the degree of product differentiation is low. As a result, some units of capital are prompted to set up in country *F* in order to benefit from higher price and demand

when trade costs are high enough or when products are weakly differentiated. However, when trade

costs become sufficiently low, all firms set up in a single country.

4.3. The intermediate case ($1 > \theta > 0$).

Finally, suppose that $1 > \theta > 0$. We first determine the threshold value ($\underline{\theta}$) below which full

agglomeration remains a stable equilibrium. When all mobile firms are located in country *H*, the

spatial differential of rental rates is expressed as follows:

$$\Delta r(1,\theta) = \frac{nL}{4\Lambda^2(\beta - \gamma)}\left[-(2\alpha(\beta - \gamma) - \Lambda t)^2\theta + \rho_0 + \rho_1 t + \rho_2 t^2\right]$$

where ρ_0, ρ_1 and ρ_2 are a combination of the exogenous parameters defined in Appendix A. We also

know from this appendix that $\rho_0 + \rho_1 t + \rho_2 t^2 > 0$ for 0<*t*<*t**. Agglomeration remains a stable

equilibrium when $\Delta r(1,\theta) > 0$ or, equivalently, when $\theta < \underline{\theta}$ where

$$\underline{\theta} = \frac{\rho_0 + \rho_1 t + \rho_2 t^2}{(2\alpha(\beta - \gamma) - \Lambda t)^2} = \frac{\rho_0 + \rho_1 t + \rho_2 t^2}{\rho_0 + \rho_1 t + \Lambda^2 t^2}$$

Clearly, we have $\underline{\theta} \in (0,1)$ when 0<*t*<*t** and $\underline{\theta} = 1$ when *t=0*. Further we have,

$$\frac{d\underline{\theta}}{dt} = \frac{-2\Lambda\gamma nt(2\rho_0 + \rho_1 t)}{(\rho_0 + \rho_1 t + \Lambda^2 t^2)^2} < 0 \text{ and } \frac{d^2\underline{\theta}}{dt^2} < 0 \text{ for admissible values of } t.$$

Hence,

Proposition 4. *When $\underline{\theta} \in (0,1)$ a better perception of varieties produced in country F reduces the*

interval of trade costs in which full agglomeration is a spatial equilibrium.

This proposition confirms the intuitive implications of propositions 1 and 2. The more

accessible the developed country is from country *F*, the more capital tends to settle in the developed

country (country *H*). Moreover, $d\underline{\theta}/dt < 0$ implies that the higher the trade costs, the lower the

perception threshold above which industry settles in country *F* (see figure 1). High trade costs thus

implies a dispersion effect, as in most of economic geography models, but here stemming from a quite different mechanism.

Figure 1 about here

Finally, we determine the spatial equilibrium when $\theta \in (\underline{\theta}, 1)$ or when $t^* < t < t_{trade}$. Some tedious calculations show that $\Delta r(1/2, \theta) > 0$. As a result, given that $d\Delta r(\lambda, \theta) / d\lambda < 0$, partial agglomeration ($\lambda^* \in (0,1)$) occurs in country H when $\theta \in (\underline{\theta}, 1)$ and when $t^* < t < t_{trade}$. This result shows that the distribution of firms is always biased in favour of the developed country, which is not surprising, given the assumptions favouring goods produced in this country. In addition, the relationship between λ^* (the spatial equilibrium) and $\theta \in (\underline{\theta}, 1)$ satisfies

$$\frac{d\lambda^*}{d\theta} = \frac{-\partial \Delta r / \partial \theta}{\partial \Delta r / \partial \lambda} < 0$$

because $d\Delta r / d\theta < 0$ (recall that $dr_H / d\theta < 0$ and $dr_F / d\theta > 0$) and $d\Delta r / d\lambda < 0$. Hence, $\lambda^* \in (1/2, 1)$ depends negatively on $\theta \in (\underline{\theta}, 1)$. In other words, *when the perception of varieties produced in country F improves, starting from low levels, the economy moves gradually from agglomeration to dispersion.*

The previous results are summarised in the following proposition and illustrated in figure 1.

Proposition 5. *When $\theta \in (\underline{\theta}, 1)$ or when $t^* < t < t_{trade}$, partial agglomeration of capital occurs in country H. Moreover, a better perception of varieties produced in countryF reduces gradually the international inequalities in terms of activity level.*

To conclude this section, we have shown that the international convergence in the perception of foreign products and commodities prices have opposite effects on international allocation of capital.

5. Capital income, consumers' surplus and perception of foreign products

We now give some elements on the evolution of rental rates of capital and consumer's surplus when the perception of foreign products varies. In section 3, we have shown that, at location of firms given, the rental rate of capital located in country F depends positively on θ and the rental rate of capital in country H diminishes when θ increases while consumers' surplus only raises in country H. However, the analysis is now more complex since the spatial distribution of capital is influenced by attitudes towards foreign goods. It is worth stressing that when full agglomeration of capital occurs (for example for very low values of trade costs), a better perception of varieties produced in country F does not affect the results obtained in section 3 because θ has no impact on the capital location. In what follows, we study the most interesting configuration where capital is located in both countries ($\theta > \underline{\theta}$).

5.1. Capital income.

Regardless of their location, the rental rate for each unit of capital reaches the same value at the equilibrium allocation of capital. Because we have $r_H^* = r_F^* = r^*(\lambda^*)$ as well as $p_{FF}^* = (1-\theta)(p_{HH}^*)^2 / t + \theta p_{HH}^* + (1-\theta)t/4$ (see (12)), the equilibrium rental rate of capital is given by

$$r^*(\theta, \lambda^*) = \frac{L}{\beta - \gamma}(p_{HH}^*)^2 + \frac{L}{\beta - \gamma}\left\{\frac{(p_{HH}^* - t/2)[p_{HH}^*(1-\theta)+t(1+\theta)/2]}{t}\right\}^2$$

Because of the very intricate nature of the relationship between θ and λ^*, given implicitly by $\Delta r^*(\theta, \lambda^*)$, one cannot provide analytical results on the relationship between θ and $r^*(\lambda^*)$. However, it is straightforward to check that a rise in θ decreases the export revenue of firms in country H (given by $(p_{FF}-t/2)^2/(\beta-\gamma)$) and the local sales of firms located in country F (expressed as $(p_{FF})^2/(\beta-\gamma)$) since p_{FF} declines. Those negative effects are higher when trade costs are high. Numerical simulations are required in order to analyse how θ influences the rental rate of capital.

The outcome depends on the relative values of trade costs (see Appendix B.1). Numerical illustrations exhibit an inverted U-shape relationship between the knowledge of foreign products and rental rates of capital when trade costs take intermediate value. When t is relatively low (resp., high), the relationship is positive (resp., negative). Hence, simulations suggest that *a better perception of varieties produced in the developing country increases the equilibrium rental rate of capital when trade costs are low enough.*

In section 3, we have shown that rental rates of capital decrease when the perception of foreign products improves as long as the spatial organisation of production does not change. However, when trade costs are low, better perception of foreign varieties raises the share of capital located in country F, increasing prices in country H, and thus the rental rate of capital. Conversely, returns of capital may decrease when trade costs are high enough because, under this condition, the relative intensity of price competition is high.

5.2. Consumer's surplus

We now analyse the consumer's surplus. The expressions of surplus for a consumer living in country H and country F are given by (10) and (11) respectively. Remember that $\partial S_H / \partial \theta > 0$ and $\partial S_F / \partial \theta = 0$ when the location of capital is given. The analysis of consumers' surplus is more complex when the international distribution of capital is endogenous. Some tedious (but standard) calculations reveal that $\partial S_H / \partial \lambda > 0$ and $\partial S_F / \partial \lambda < 0$. More varieties produced in a country raise the surplus of its residents because of a fall in local prices. Hence, we have:

$$\frac{dS_H^*}{d\theta} = \underbrace{\underset{+}{\frac{\partial S_H^*}{\partial \theta}} + \underset{-}{\frac{\partial S_H^*}{\partial p_{HH}^*}} \underset{-}{\frac{\partial p_{HH}^*}{\partial \theta}}}_{>0} + \underbrace{\underset{-}{\frac{\partial S_H^*}{\partial p_{HH}^*}} \underset{-}{\frac{\partial p_{HH}^*}{\partial \lambda^*}} \underset{-}{\frac{\partial \lambda^*}{\partial \theta}}}_{<0}, \text{ and } \frac{dS_D^*}{d\theta} = \underset{-}{\frac{\partial S_D^*}{\partial \lambda^*}} \underset{-}{\frac{\partial \lambda^*}{\partial \theta}} > 0 \,.$$

It appears that a better perception in country H of foreign products leads to an increasing surplus of consumers living in country F since an increasing number of varieties are produced in country F, inducing lower local prices.

The effect of a better perception of varieties produced in country F on the surplus of consumers living in country H is now ambiguous because they are two competing effects. On the one hand, more varieties are consumed by inhabitants of country H. On the other hand, when the perception of foreign products improves, more varieties are produced in the foreign country. This negative 're-allocation' effect on the surplus of consumers living in country H is higher when trade costs are low because price competition is fiercer. We have to resort to numerical simulations to derive the qualitative effect of a variation in θ, because of the very intricate nature of the relationship between θ and λ. We consider the same values of parameters used to analyse the rental rates of capital (see Appendix B.2.). Even though consumers have a love for variety, simulations reveal that consumer's surplus in country H can depend negatively on θ when trade costs are low enough.[5] In other words,

Proposition 5. *Assume that capital is internationally mobile. A better perception of varieties produced in the foreign country raises the surplus of consumers in the foreign country and, under some of condition, decreases the surplus of consumers in the home country*.

Hence, the inhabitants of the developed countries are generally interested in keeping a low number of imported products in terms of consumer's surplus, contrary to the inhabitants of the developing countries. However, the improvement of perception of foreign products can raise the capital income when trade integration is sufficiently high. It finally should be noted that national welfare ($S_A^* L + r^* n / 2$) may decrease in the developed country, as suggested by numerical

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[5] Recall that the negative effect arising from the mobility of capital is higher when trade costs are low enough.

illustrations in Appendix B.3.[6] Gains in revenue from capital can be lower than the losses in consumers' surplus when perception of foreign products improves.

6. Concluding remarks

Despite the stylised assumptions of this model, we were able to give some insights about the effects of perceptions of varieties produced in the developing countries. When capital is internationally mobile, we show that the developing country hosts more and more firms (or capital) at the expense of the developed country as perception of varieties produced in the developed country improves. As a direct consequence of this result, the surplus of consumers and the capital income in the developed country may decrease when the perception of foreign products improves whereas the surplus of developing country consumers increases.

Our framework is a first step to incorporate explicitly the effects of country of origin in models of trade and location. Our framework could be extended to take into account the diffusion of interest for foreign products among nationals due to word-to-mouth communication maintained by immigrants. Several empirical studies reveal the crucial role of social networks in international and interregional trade (Head and Ries, 1998).

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[6] We assume here that workers own an equal share of capital. This result holds for all distributions of capital owners, even when all of them are located in the developed country.

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Appendix A. Proof of proposition 2

We show that the full agglomeration is a stable equilibrium when $t < t^*$. We know that

$d\Delta r(\lambda, \theta)/d\lambda < 0$, so in order to prove that $\lambda=1$ is a spatial equilibrium, we must have that $\Delta r(1,0) > 0$.

When $\lambda=1$, the spatial differential of rental rate of capital is given by:

$$\Delta r(1,0) = \frac{L}{4(\beta - \gamma)\Lambda^2}\left(\rho_0 + \rho_1 t + \rho_2 t^2\right)$$

where

$$\rho_O \equiv 4\alpha^2(\beta - \gamma)^2 > 0 \quad \rho_1 \equiv -4\alpha(\beta - \gamma)\Lambda < 0 \quad \rho_2 \equiv \Lambda[-\gamma n + 2(\beta - \gamma)]$$

so that $\Delta r(1,0) > 0$ when $t=0$.

First, assume that $n > \bar{n} \equiv 2(\beta - \gamma)/\gamma$ so that $\rho_2 < 0$. We have $\Delta r(1,0) > 0$ if and only if

$$t < t_0^* \equiv t_{trade}.\frac{\Lambda - \sqrt{2\gamma n \Lambda}}{-\gamma n + 2(\beta - \gamma)}$$

It is easy to check that $t_0^* > 0$. Indeed, the numerator and denominator are always of the same sign:

$\Lambda - \sqrt{2\gamma n \Lambda} > 0 \Leftrightarrow -\gamma n + 2(\beta - \gamma) > 0$ (and vice-versa). Further, we can also check that $t_0^* < t_{trade}$ or

equivalently $\Lambda - \sqrt{2\gamma n \Lambda} < -\gamma n + 2(\beta - \gamma)$ or $n > \bar{n}$. As a consequence, we have $\Delta r(1,0) > 0$ for

$0 < t < t^*$, and $\Delta r(1,0) < 0$ for $t^* < t < t_{trade}$ when $n > \bar{n}$.

Consider now the case $n < \bar{n}$. We have $\Delta r(1,0) < 0$ if and only if:

$$t_0^* \equiv t_{trade}.\frac{\Lambda - \sqrt{2\gamma n \Lambda}}{-\gamma n + 2(\beta - \gamma)} < t < t_1^* \equiv t_{trade}.\frac{\Lambda + \sqrt{2\gamma n \Lambda}}{-\gamma n + 2(\beta - \gamma)}$$

It is easy to check that $t_0^* < t_{trade}$ or equivalently $\Lambda + \sqrt{2\gamma n \Lambda} < -\gamma n + 2(\beta - \gamma)$ or, $n < \bar{n}$. It is also

straightforward to see that $t_1^* > t_{trade}$. As a consequence, for admissible values of t, $\Delta r(1,0) < 0$ if and

only if $t > t_0^* \equiv t^*$.

When $t > t^*$ and $\theta = 0$, it is straightforward that the partial agglomeration ($1 > \lambda^* > 1/2$) takes place. Indeed, we have $\Delta r(1/2,0) > 0$. Since dΔr(λ,θ)/dλ<0, at the spatial equilibrium, we have $1 > \lambda^* > 1/2$ when $t > t^*$ and $\theta = 0$.

Appendix B. Numerical illustrations

Following figures show how rental rate of capital, consumer's surplus and national welfare in the developed country (country *H*) changes as θ increases when capital is mobile. The values of parameters are: $\alpha = 4, \beta = 2, \gamma = 1$ and $n = 1$ so that $t_{trade} = 8/3$. Four values of *t* have been analysed: *t=1*; *t=1,5*; *t=2*; *t=2,5*. Note that $\underline{\theta} = 19/25$ when *t=1* and $\underline{\theta} < 0$ when $t \geq 1,5$

B .1 Rental rates of Capital

t=2,5

t=2

t=1,5

t=1
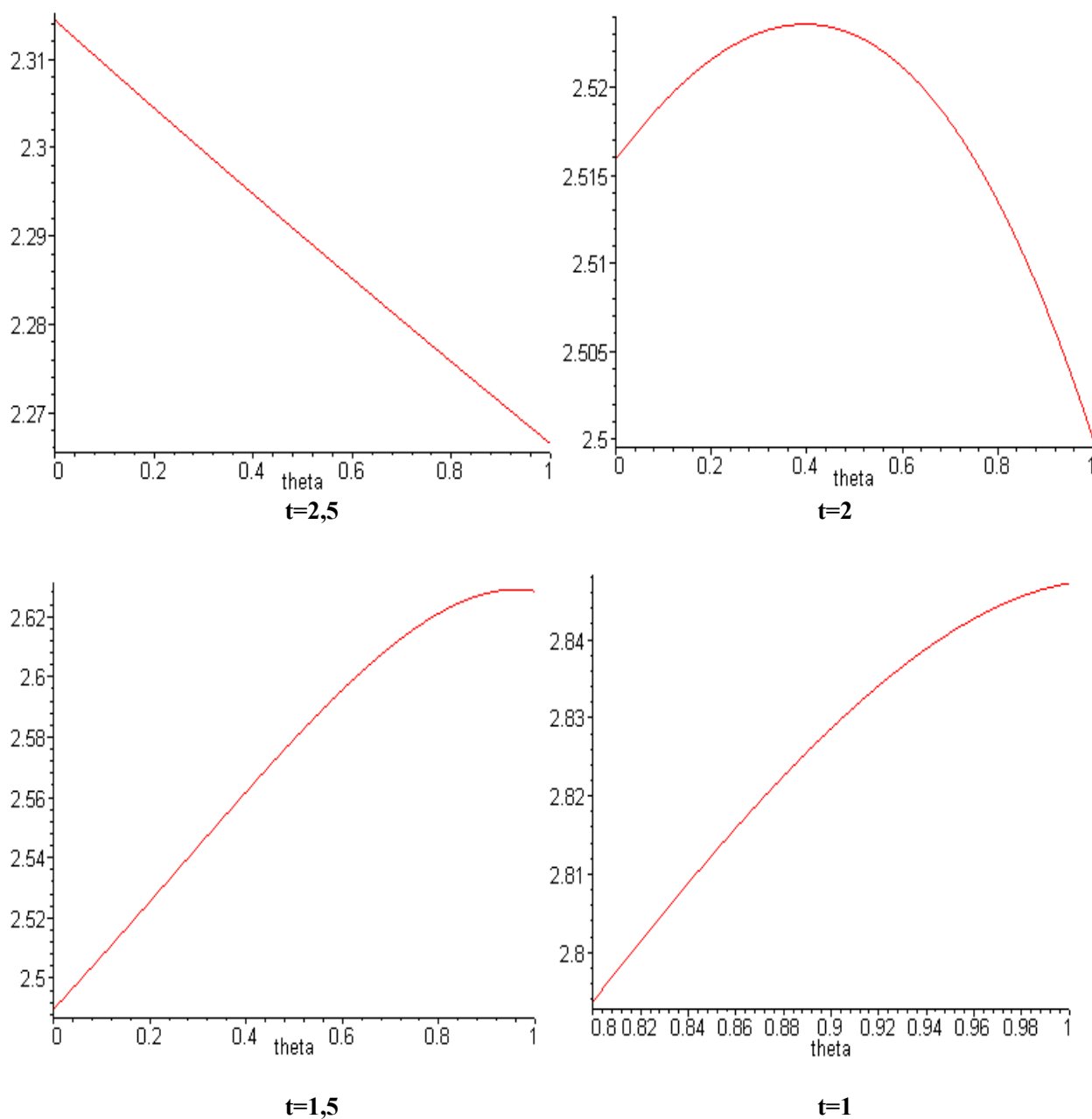
B.2 Consumer's surplus in country H.
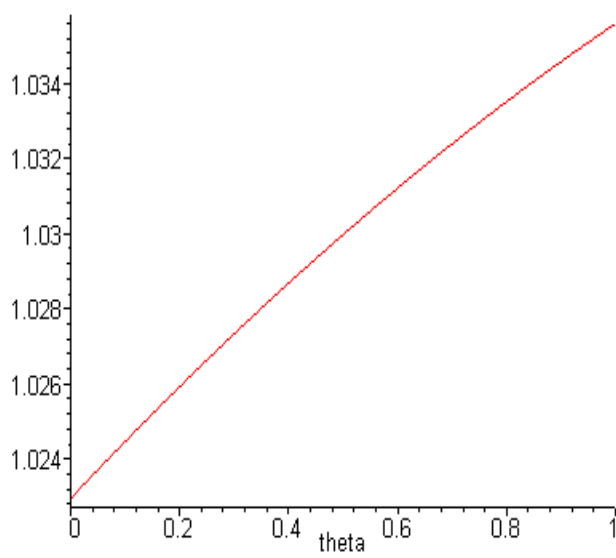
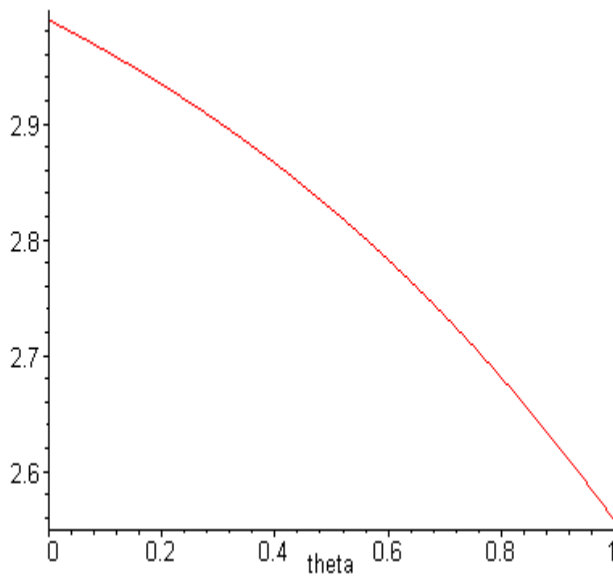

t=2,5
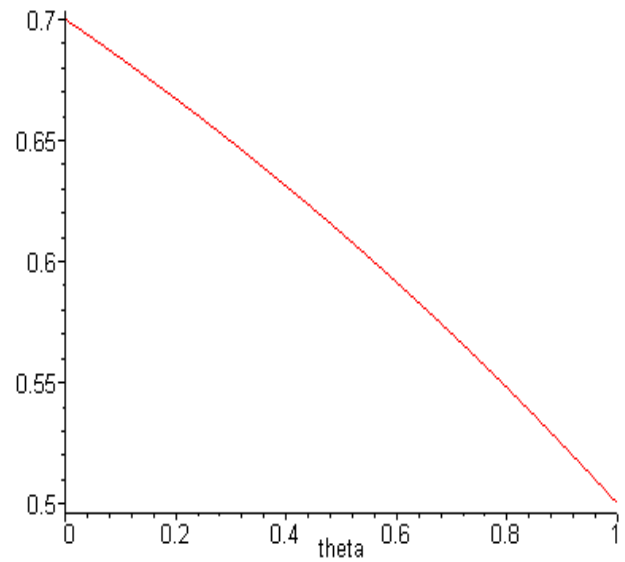
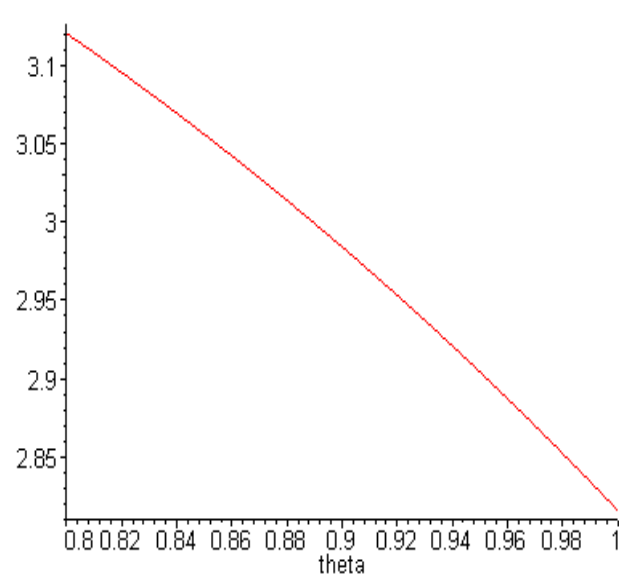

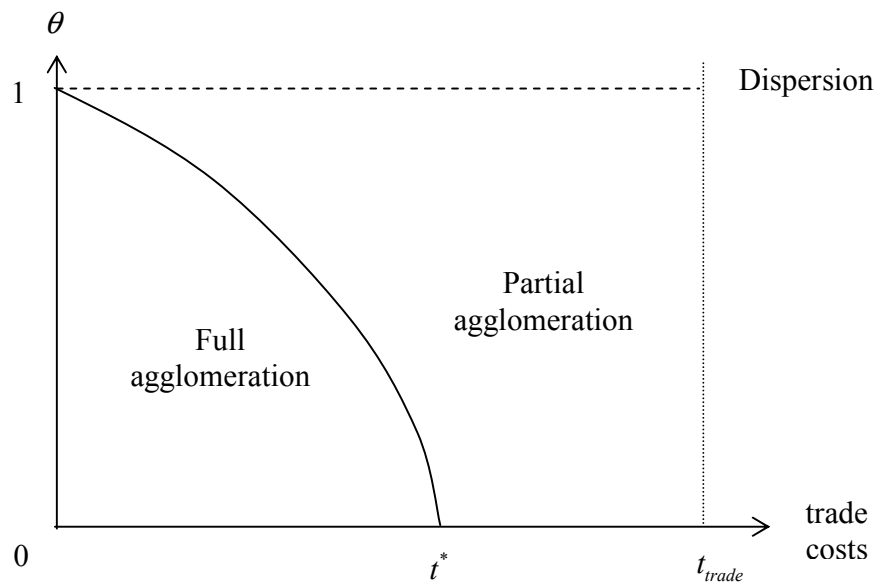**t=2**
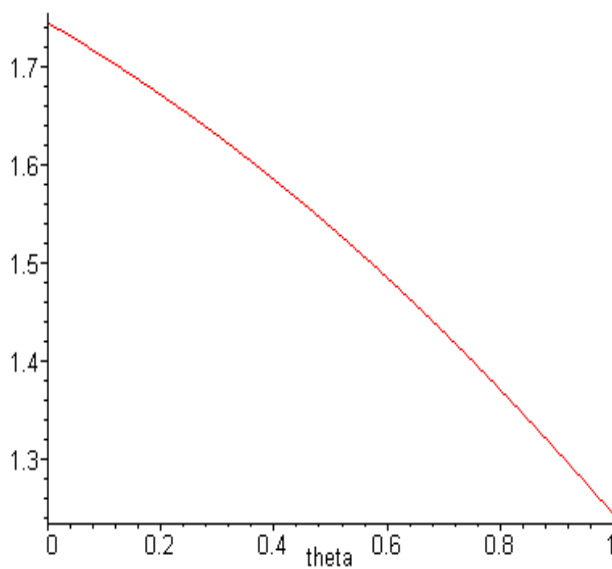
t=1,5
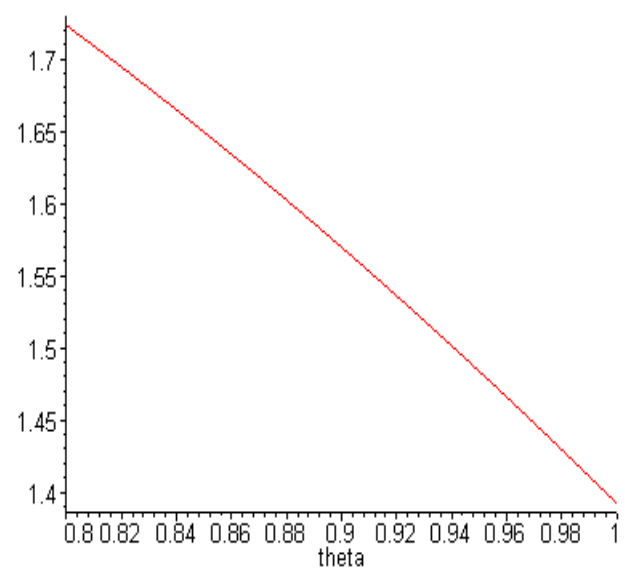
t=1

B.3. Total welfare in country H.
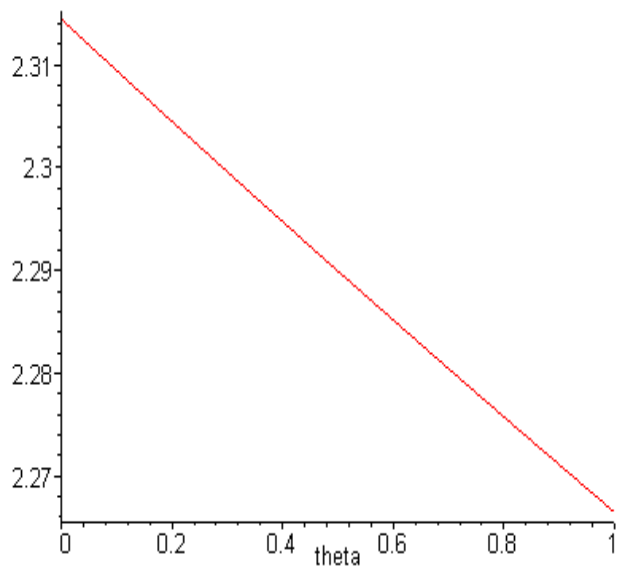
t=2,5
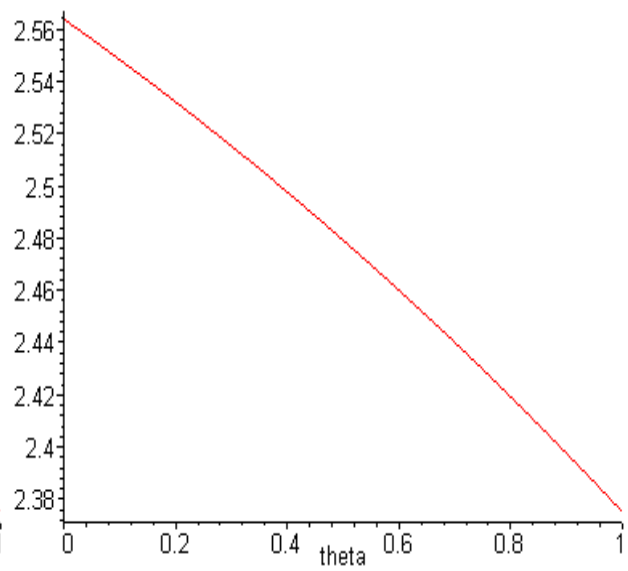
t=2

t=1,5

t=1

Figure 1. Spatial configurations