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Attitudes towards foreign products and welfare with capital mobility

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 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

Perception des produits étrangers et bien-être avec mobilité du capital

Résumé

Nous étudions les implications, en terme de bien-être dans les pays en développement et développés, de l'asymétrie dans les comportements des consommateurs vis-à-vis des produits étrangers. Pour traiter cette question, nous développons un modèle de commerce international avec concurrence imparfaite et mobilité du capital. Nous montrons que, dans le pays développé, le surplus des consommateurs s'élève suite à une amélioration de la perception des produits étrangers tandis que le revenu du capital décroit tant que le capital est internationalement immobile. Toutefois, lorsqu'il est mobile, le pays en développement peut accueillir une part croissante de capital dès que la perception des produits étrangers par les consommateurs du pays développé s'accroit. Ceci s'accompagne d'une détérioration du surplus de ces derniers.

Mots-clefs : produit d'origine, localisation du capital, surplus du consommateur

Classification JEL : F12, F21

Attitudes towards foreign products and welfare with capital mobility

1. Introduction

Studies in marketing and economic psychology show that 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 the behaviour of consumers and firms.

A large body of research is dedicated to 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 significantly influences product evaluation. From a meta-analysis of country-of-origin research, Verlegh and Steenkamp (1999) show that the country's level of development matters in product evaluation. Products from Less Developed Countries (LDC) appear to be evaluated less positively than products from Developed Countries. For example, US (resp., Canadian) consumers are, *ceteris paribus*, more disposed to purchase Canadian (resp., US) products than Mexican products (Lantz and Loeb, 1996). By contrast, Indian, South African and Mexican consumers favour more foreign products (see Bara et al., 2000). Hence, firms producing in LDC have greater difficulties in penetrating the developed countries markets. This, in part, may explain why outward foreign direct investment 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 for Indian and Chinese foreign direct investment was the US between 2001 and 2003 while investment activities in Europe by Korean and Taiwanese companies have grown over the last decade.

[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 includes also ethical considerations (Grolleau et al., 2004).

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 their attitudes towards foreign products. This type of differentiation according to 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 capital mobility is allowed. 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 their perception of foreign products so long as the location of capital remains unchanged. In this case, they consume more varieties and prices decrease due to 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 their products improves. Second, and as a direct consequence of the previous result, the consumer surplus in the developed country can decrease when perception of foreign products improves, whereas consumer surplus in the developing country 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 markets and that the international harmonisation of attitudes towards foreign products have opposite effects on the inequalities among nations. Indeed, economic geography models show that a fall in trade costs generally fosters inequalities between countries (see Fujita et al., 1999 and Fujita and Thisse, 2002) while the international harmonisation of attitudes towards foreign products lowers the international inequalities.

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 on the prices, rental rate of capital and consumer surplus of a better perception of varieties produced in developing countries when the location of capital is exogenous. The impact of a 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 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 the only input. The T-sector produces a homogenous good (the *numéraire*), using labour as the 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 the differentiated products. Capital is perfectly mobile between countries and is owned by workers, who also supply inelastically their units of capital. In order to focus on the effects of product perception on the international allocation of capital and welfare, we assume that technology, consumer endowments 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 are no imports (θ_F=0) when each consumer values totally negatively a foreign country, while all varieties produced in the foreign country are imported when consumers do not have any negative bias for foreign products (θ_F=1). In addition, an increase in θ_F from 0 to 1 means that the perception of varieties produced in country *F* improves so that more products are imported from country *F*.

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 $\theta_F<\theta_H$.[2] Since 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* (θ_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

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

choice. Therefore, country *F* is considered as the developing country, as it is more difficult for varieties produced in this country to reach the other country.

Notice finally that θ could also be interpreted differently. Indeed, $1-\theta$ may reflect the share of varieties for which imports from country *F* are prohibited or hampered by the government of country *H*. In various countries, governments, labour unions, and/or industry groups sponsor campaigns in order to establish a "buy domestic" norm. In addition, instead of considering θ as the share of varieties produced in the foreign country that consumers are willing to buy, we could alternatively assume that a consumer living in country *H* receives less utility from a foreign variety than from a variety produced locally. Nevertheless, both approaches lead to the same qualitative results because, as we will see below, the effects on prices and demand are similar. In order to simplify the analysis, in our model we prefer to consider θ as the share of varieties produced in the foreign country that consumers in country *H* are willing to buy.

2.2. Consumption

Following Ottaviano et al. (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 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. The worker's budget constraint can thus be written as follows: $\int_0^n p(i)q(i)\mathrm{d}i + z = w + z'$ where w is the individual's income and $p(i)$ is the consumer price of variety i. It is worth stressing that the use of quasi-linear preferences makes the model analytically tractable.

We could alternatively use a constant elasticity of substitution (CES) function à la Armington as in the model of trade without capital mobility developed in Crozet and Erkel-Rousse (2004). In this model, domestic and foreign goods differ also by some perceived characteristics resulting from national differences. Although our approach based on a quasi-linear utility is not much used in international trade literature, this system of preferences generates variable markups, whereas the usual CES functional form displays constant markups. The main drawback of the quasi-linear utility is that it implies constant wages so that this formulation cannot be used to study the effects of consumer attitudes on the labour market. However, although quasi-linear preferences rank far behind homothetic preferences in general equilibrium models of trade, Dinopoulos et al. (2007) find that this system of preferences behaves reasonably well in general equilibrium frameworks. All the basic theorems of international trade theory hold as in the case of homothetic preferences. In addition, as shown by Ottaviano and Thisse (2004), models of location under monopolistic competition with CES preferences and with quasi-linear preferences lead to the same results in terms of capital location. Finally, quasi-linear preferences enable us to provide analytical results and allow for a precise study of the welfare impacts of the various parameters (see Ottaviano and Thisse, 2004).

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* of 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=H,F* 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:

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

where

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

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 the reason why this good is the natural choice for the *numéraire*). This implies that, at the equilibrium, the price of the T-good and the worker's wage are 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 $n = k$, the number of units of capital. We consider a market structure with monopolistic competition and free entry. Varieties of the 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) as 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 statistic (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:

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

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

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 surplus

In order to disentangle the different mechanisms at work, it is both relevant and convenient to distinguish between what we call a short-run equilibrium (where capital is supposed to be immobile, i.e. n_H and n_F are exogenous) and long-run equilibrium (where 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 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 a better perception of 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*.

Remember that an alternative modelling strategy consists of considering that the consumer living in country *H* receives less utility from each foreign variety. In this case, the impact of attitudes towards foreign products on prices is identical.[3] Indeed, if the marginal utility arising from the consumption of a foreign product at given prices increases, then price competition in country *H* becomes fiercer.

3.2. Rental rate of capital

Due to free entry and exit, there are no profits at equilibrium. This implies that the 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, introducing (2) into (6a) and (7b) as well as (3) in (6b) and (7a)) and using $\pi_H = 0$ and $\pi_F = 0$ yields the following equilibrium rental rate of capital located in countries *H* and *F*:,

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

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

[3] For example, we can make α, β, and γ dependent on θ even if the interpretation is not equivalent. In our case a consumer in country *H* simply skips randomly foreign products (with probability (1 – θ). After he has made his choice, his ex post utility does not however depend on the country of origin.

which increase with prices (given by (6a) to (7b)). Remember that p_{FF} is not affected by θ while p_{HH} decreases with θ. It is straightforward to check that

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

so that the relationship between θ and the rental rate of capital in the developed country (country *H*) is negative due to fiercer price competition leading to lower markups when the spatial allocation of firms is exogenous. However, the impact of θ 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, on the other hand, as it increases price competition in country *H*, product prices fall on this market. However, using 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 improvement in the perception of varieties produced in the developing country increases the rental rates of capital in this country and decreases rental rates prevailing in the developed country.

3.3. Consumer surplus

Reporting (2), (3), (6) and (7) in the expression of utility (1), the expression of surplus for a consumer living in country *H* is given by:[4]

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

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

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

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

where

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

Consequently, for a given spatial allocation of firms, a better perception of varieties produced in country *F* raises the consumer surplus in country *H* since more varieties are consumed and because of decreasing prices. In addition, for a given spatial allocation of firms, the consumer surplus in country *F* is not directly affected by the change in the perception parameter, since we have $\partial p_{FF} / \partial \theta = 0$.

To summarise,

Proposition 1. *Assume that the location of capital is fixed. When the perception of foreign products improves in the developed country, consumer surplus increases in the developed country. The rental rate of capital decreases in the developed 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 difference in the 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 (λ = 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:

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

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} is 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 summarise,

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).

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

Since the purpose of this paper is to study the impact of attitudes towards foreign products on location, it is important to establish as our benchmark how the spatial allocation of firms is characterised when the country of origin does not influence consumption. Assuming θ =1 and introducing (6a) and (7a) in (12), the spatial differential of rents becomes

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

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 the 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 it 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. Case 2: No imports of varieties produced in the developing country ($\theta = 0$).

Suppose now that θ=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 θ=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 agglomeration of 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 the consumption of local varieties in total consumption in country *F* rises when trade barriers increase. 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 both higher prices and greater 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. Case 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,

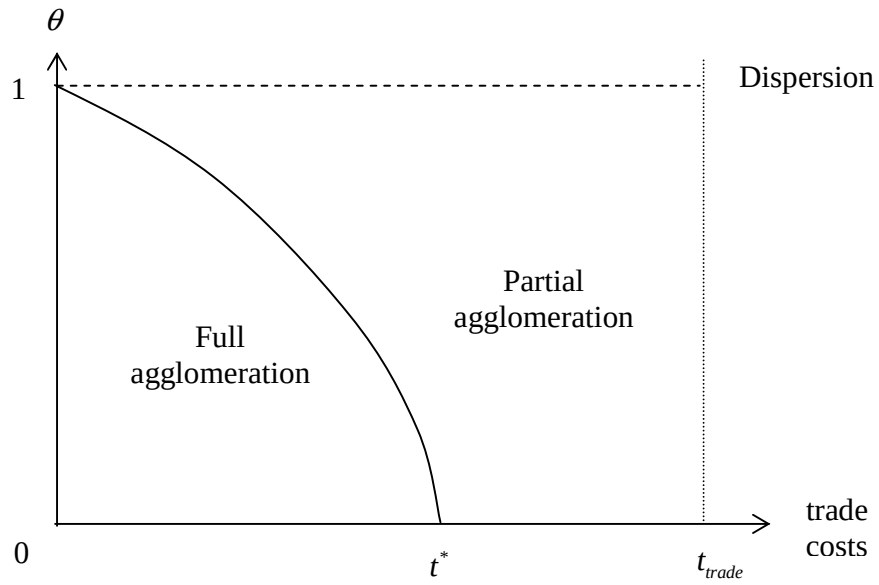
$$\frac{d\underline{\theta}}{dt} = \frac{-2\Lambda\gamma nt(2\rho_0 + \rho_1 t)}{(\rho_0 + \rho_1 t + \Lambda^2 t^2)^2} < 0 \text{ and } \frac{d^2\underline{\theta}}{dt^2} < 0 \text{ for admissible values of } t.$$

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). Thus, high trade costs imply a dispersion effect, as in most of economic geography models, but here stemming from a quite different mechanism.

Figure 1: Spatial configurations



Finally, we determine the spatial equilibrium when $\theta \in (\underline{\theta},1)$ or when $t^*<t<t_{trade}$. Some lengthy 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 country F gradually reduces 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 trade costs have opposite effects on the international allocation of capital.

5. Welfare and perception of foreign products

As shown by Ottaviano et al. (2002), total welfare is given by the sum of consumer surplus and the consumers' income. In our case, total welfare in each country is given by:

$$W_j^* = S_j^* L + r^* \overline{n}_j + w^* L$$

with $j=H,F$ and $w^* = 1$ whereas $\overline{n}_j$ is the mass of capital owned by the residents of country j (an exogenous parameter). In other words, total welfare in each country changes with the perception of foreign products through the consumer surplus and the returns of capital. In section 3, we have shown that, for a given spatial configuration, 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 consumer surplus only increases in country *H*. However, the analysis is now more complex since the spatial distribution of capital is influenced by attitudes towards foreign goods, except when all units of capital are invested in country *H* (for example, for very low values of trade costs). Indeed, under full agglomeration, a better perception of varieties produced in country *F* does not affect the results obtained in section 3 because θ has no impact on capital location. As a result, in this section we study the most interesting configuration where capital is located in both countries ($\theta > \underline{\theta}$).

Since it is not feasible to derive analytical results for changes in welfare, we first mention the different effects at work. More precisely, we give some elements on the evolution of rental rates of capital and consumer surplus when the perception of foreign products varies. Then, we use numerical simulations to explore the relationship between θ and W_j^*.

5.1. Capital income

Regardless of its 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

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

Owing to 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 $(p_{FF}\text{-}t/2)^2/(\beta\text{-}\gamma)$) and the local sales of firms located in country *F* (expressed as $(p_{FF})^2/(\beta\text{-}\gamma)$) 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). Graphical illustrations exhibit an inverted U-shape relationship between the perception 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 to capital may decrease when trade costs are high enough because, under this condition, the relative intensity of price competition is higher.

5.2. Consumer surplus

We now analyse consumer 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 consumer surplus becomes 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:

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

It appears that a better perception of foreign products in country *H* leads to an increasing consumer surplus 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 consumer surplus of country *H* is now ambiguous because there 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 consumer surplus 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 parameter values as those used to analyse the rental rates of capital (see appendix B.2). Even though consumers have a love for variety, simulations reveal that consumer surplus in country *H* can depend negatively on θ when trade costs are low enough.[5] In other words,

Proposition 6. *Assume that capital is internationally mobile. A better perception of varieties produced in the foreign country raises consumer surplus in the foreign country and, when trade costs are sufficiently low, decreases consumer surplus 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, an improvement in the perception of foreign products can raise capital income when trade integration is sufficiently high.

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

Finally, we can evaluate the impact of θ on total welfare (W_j^*) for each country. We assume in graphical illustrations that countries own an equal share of capital. It appears that welfare decreases in the developed country, as suggested by the graphical illustrations in appendix B.3. The gains in revenue from capital are lower than the losses in consumer surplus when the perception of foreign products improves. This result holds for all spatial distributions of capital owners, even when all of them are located in the developed country. In other words, even though the residents of the developed country can consume more foreign varieties, total welfare of this country may decrease because of a relocation of capital. Note that in the developing country, total welfare increases with a better perception of their products when trade costs are low enough or when the share of capital owned by the developing country is low enough.

6. Concluding remarks

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

Our framework is a first step in incorporating 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 the interest for foreign products among nationals due to word-of-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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Appendix A: Proof of proposition 3

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 λ=1 is a spatial equilibrium, we must have that $\Delta r(1,0) > 0$. When λ=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:

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

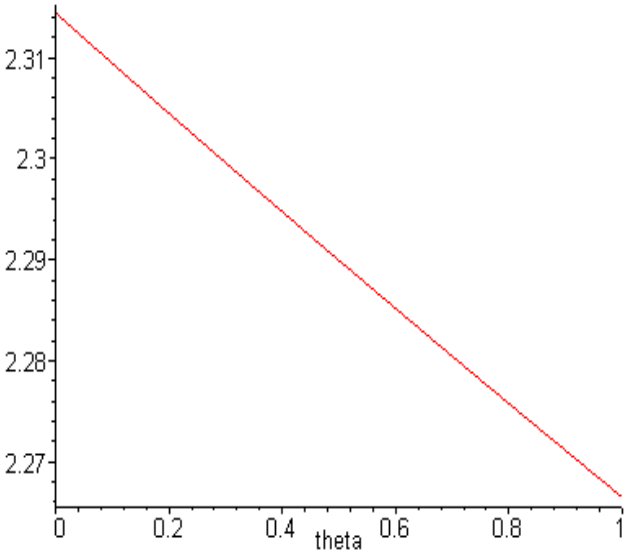
It is easy to check that $t_0^* < t_{trade}$ or equivalently $\Lambda + \sqrt{2\gamma n\Lambda} < -\gamma n + 2(\beta-\gamma)$ or, $n < \bar{n}$. It is also straightforward to see that $t_1^* > t_{trade}$. As a consequence, for admissible values of *t*, $\Delta r(1,0) < 0$ if and only if $t>t_0^* \equiv t^*$.

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 $d\Delta r(\lambda,\theta)/d\lambda<0$, at the spatial equilibrium, we have $1 > \lambda^* > 1/2$ when $t > t^*$ and $\theta = 0$.

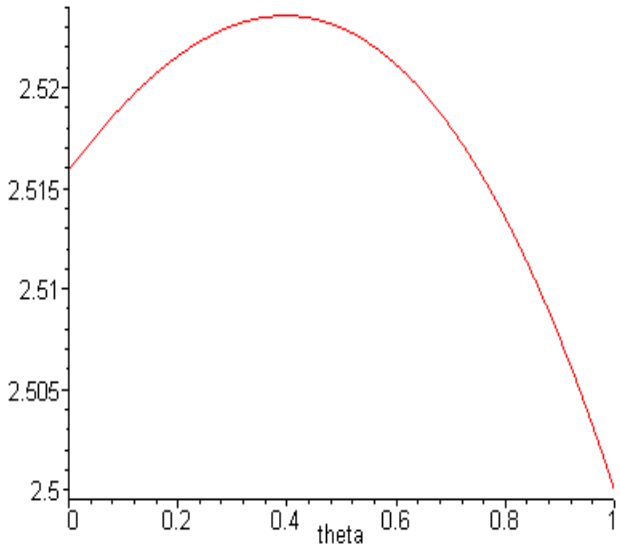
Appendix B: Graphical illustrations

The following figures show how rental rate of capital, consumer surplus and national welfare in the developed country (country *H*) change 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**



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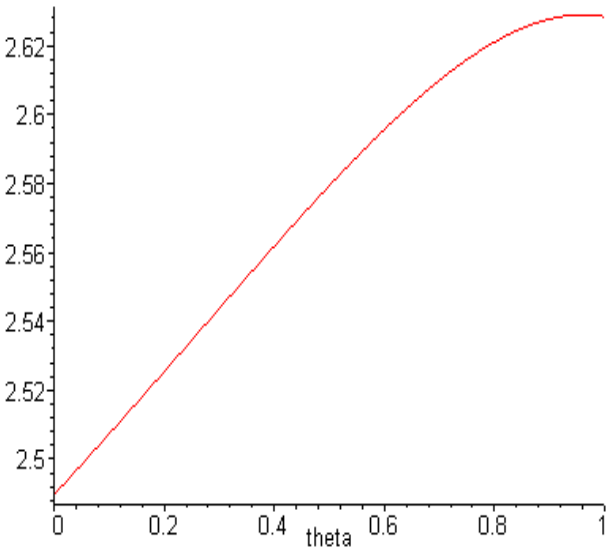
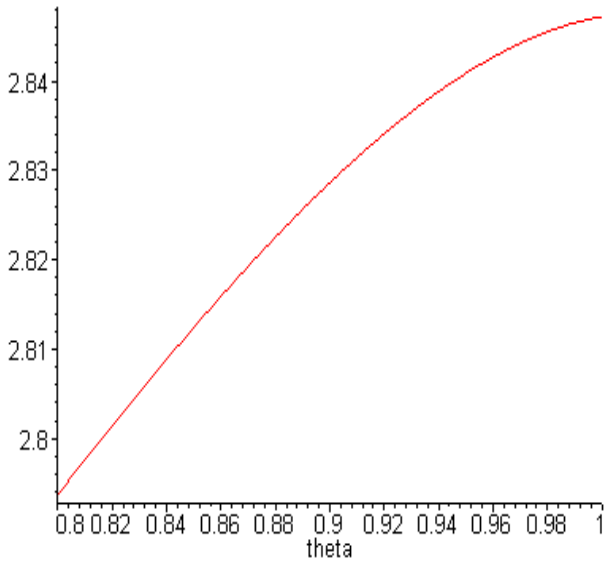
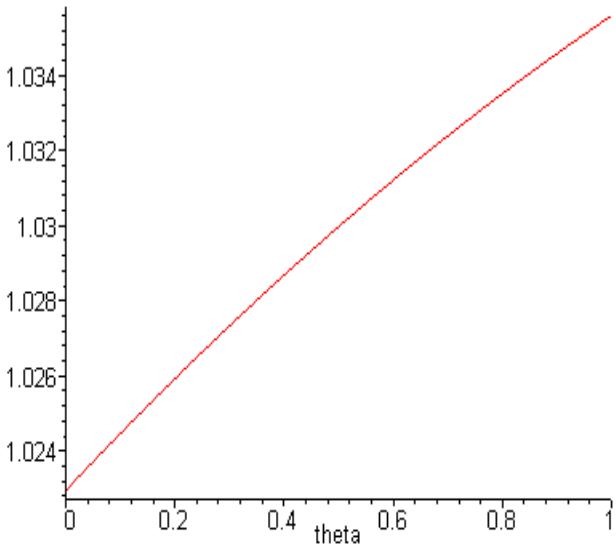


***t*=1.5**

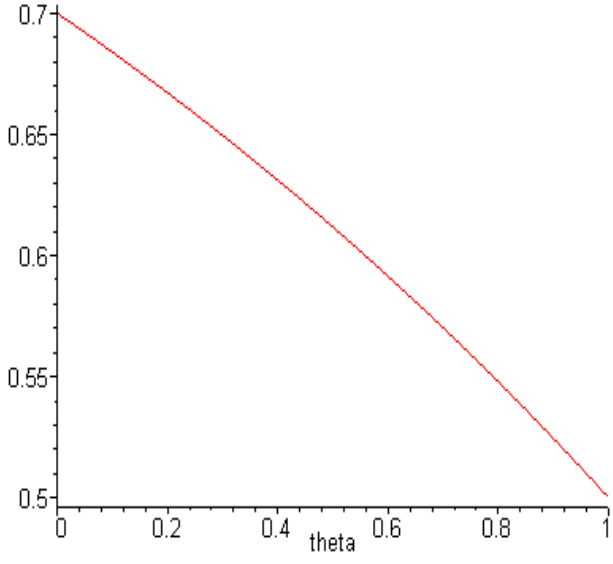


***t*=1**

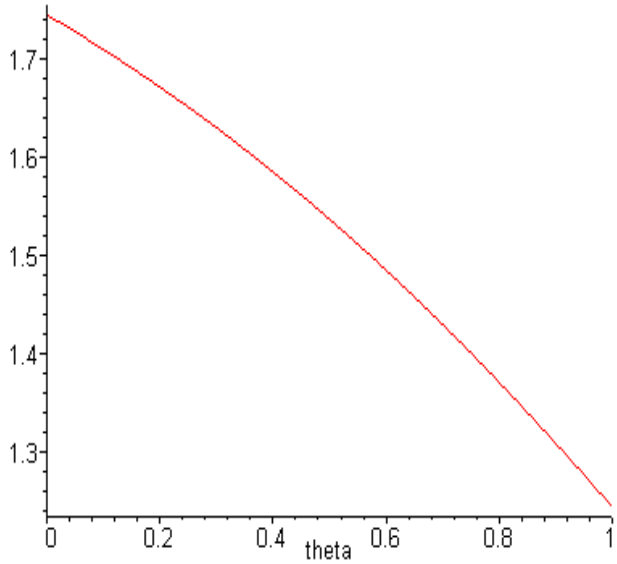
B.2: Consumer surplus in country *H*



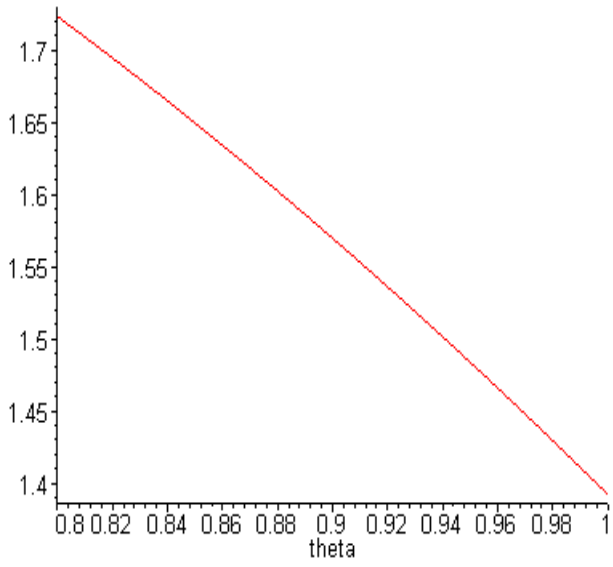
***t*=2.5**



***t*=2**

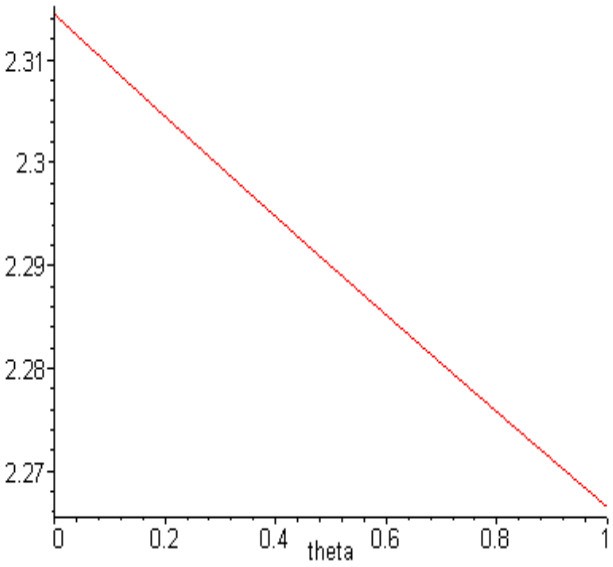


***t*=1.5**

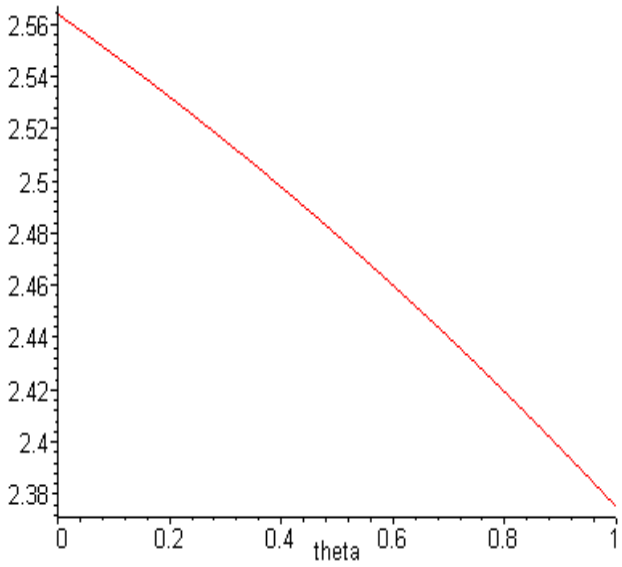


***t*=1**

B.3: Total welfare in country *H*



***t*=2.5**



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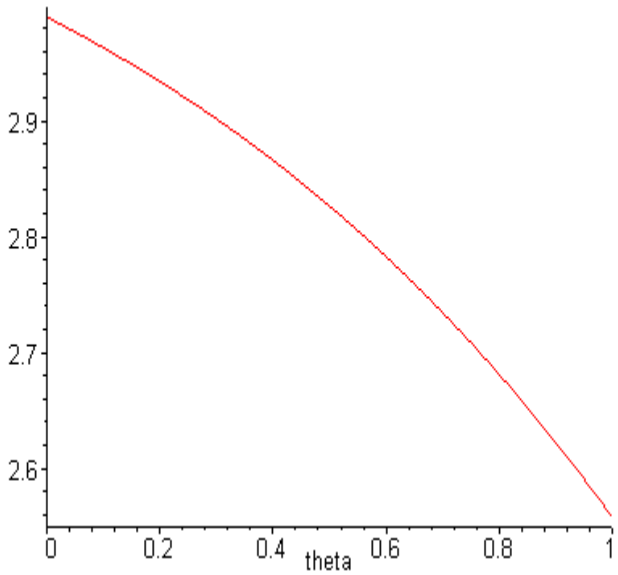
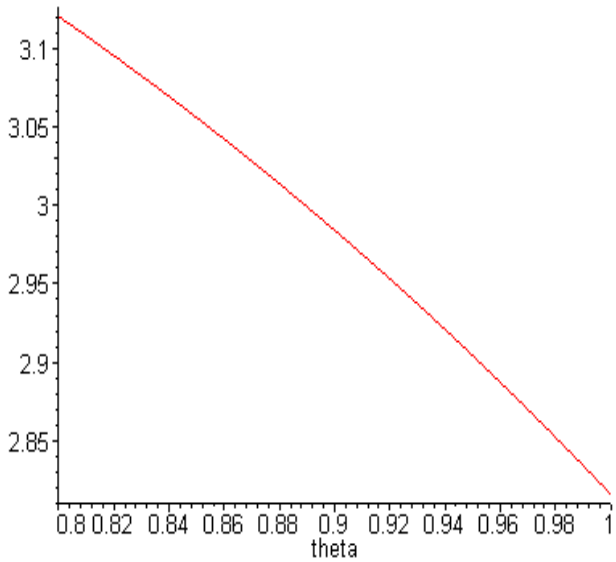


***t*=1.5**



***t*=1**

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