

Globalization and The Dynamics of Cultural Identity

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1. Introduction

Revolutionary developments in information and transport technology are changing the current world. Our daily lives are governed by products and images originating from other countries and other cultures. Political, religious, cultural or economic trends emerging in a particular region, group, or time period are now being echoed in large parts of the world. Mutual relationships of dependence between actors are growing. Increasingly, countries and regions have become interconnected through networks that span over the entire globe.

Common wisdom among economists and policy advisers is that the benefits from international integration and globalization are clear and significant. International trade should bring efficiency gains in production and consumption and access to an increased variety of goods and services. This approach is however quite at odds with the deep concerns of other social scientists over globalization and the strong defensive attitudes of anti-globalisation movements and NGOs. Indeed, one of the strongest critics to globalization comes from the fear that such a process might erode national cultures and individual identities. Mass consumption of standardized goods brought up by international trade and Foreign Direct Investment in cultural and other sectors may be seen as negative because it crowds out self-produced, traditional and locally manufactured goods and services or tends to reduce the perceived value of these goods to their so-called "pure" market value. Similarly, migration flows may be perceived as endangering local cultures and creating local political tensions over the provision of public goods in local receiving communities. While there is much discussion in the public debate on globalization and the possible erosion of culture (see for instance the website of UNESCO on cultural diversity), little economic analysis has formally discussed these issues.

The purpose of this paper is to contribute to fill that gap and to study the link between trade openness and cultural diversity, by considering the impact of international integration on local cultural dynamics and cultural identities. Our main objective is to provide a simple benchmark where the dynamics of culture is endogenous and interacts with an international trade equilibrium.

Following the view developed recently by Akerlof and Kranton (2000), we model cultural identity as a positive group externality among agents who share the same culture, which for simplicity is associated to the consumption of one particular good, a "cultural good". The rationale behind this modelling strategy is that there are situations in which some individuals may attach more than purely materialistic and individually centered value to the consumption of particular goods. For such individuals, consumption confers symbolic and non pecuniary value: a sense of cultural identity to belong to a particular community of people sharing the same preferences. In our model, there are two types of agents: standard "homo economicus", who have well defined individual preferences on all

goods, including the cultural good, but do not benefit from the group externality and "homo culturalis" who derive utility both from their individual consumptions and from the group externality. We derive the exact form of the group externality through an explicit matching model. We then use the standard framework of international trade theory to analyze the impact of globalization on culture. For standard "homo economicus" agents, the cultural good does not produce any additional benefit than pure materialistic private value and consumption is therefore solely determined by a market price comparison with other close economic substitutes. "Homo culturalis" agents are however ready to pay a premium for the cultural good attached to their cultural group externality. A given cultural community size (ie. the fraction of "homo culturalis" agents) in society, will therefore determine an equilibrium allocation of resources through usual market clearing conditions.

Within our framework however, the fraction of individuals having a sense of cultural identity is endogenous and comes as the outcome of a dynamic process of parental or peer socialization and transmission of preferences as micro-founded for instance by Bisin and Verdier (2000, 2001) and François (2000). This framework, which builds and extends the cultural anthropology and population dynamics literature (Cavalli Sforza-Feldman (1981) and Boyd-Richerson (1985)), is characterized by: *i*) parents acting consciously to socialize their offsprings to particular cultural traits; *ii*) acquisition of preferences by imitation of individual actions from cultural parents but mediated by the social environment (in particular by the distribution of cultural traits across the population). In this process, parents are paternalistic and may transmit to their children their own preferences over various goods (and thus possibly their sense of cultural identity when they are themselves "homo culturalis"). In such a context, incentives to spend time and resources socializing kids to one's own preferences are positively related to "subjective utility costs" to imagine children different from oneself. More precisely, parents are altruistic with respect to their offsprings but can only perceive the equilibrium consumption pattern of their children through the filter of their own preferences. This naturally provides an incentive to spend resources to socialize children to one's own preferences. Typically also, such "subjective utility costs" are going to depend on relative prices of the different goods children consume and also eventually, for parents who are sensitive to the cultural externality, the size of community of "homo culturalis". According to this process, then over time and generations, the distribution of individuals among the communities evolves and reaches a long run stationary state¹.

Using this approach, our analysis then highlights the existence of a two-sided interaction between cultural dynamics and economic equilibrium. Cultural diversity impacts on prices and the allocation of resources through traditional *demand driven effects*. Indeed, the larger the size of a given cultural community, the larger the demand for its attached cultural good and so, *ceteris paribus*, the larger its equilibrium price. Reciprocally, the nature of the economic equilibrium feeds back on cultural dynamics through a *relative price effect*. The larger the relative price of a given cultural good, the smaller the subjective utility cost for a parent attached to that good to imagine his kid not consuming that particular cultural good, and the less he will be ready to transmit his cultural trait to his offspring. Such an effect, naturally tends to promote cultural diversity within the society. Indeed, the larger a given cultural community, the larger the equilibrium price of the good culturally attached to that community and the lower the incentives of that community to spend efforts perpetuating its trait in society.

We show however that the dynamics of cultural diversity is also shaped by a second mechanism,

¹An alternative model of preference evolution is one of peer socialization (horizontal transmission) in which individuals, with some probability, incur a change of preferences after getting in contact with other agents. Similarly, when the probability of preference shift depends on relative "subjective utility costs" in a straightforward manner, similar dynamics of preferences are obtained.

namely a *cultural identity effect*, which, contrary to the previous one, tends to promote cultural uniformity within the society. It relies on the fact that the larger a given cultural community, the larger its underlying group consumption externality and therefore the larger the "subjective utility" costs for an individual with such preferences to imagine his offspring to be different from him and not enjoying the cultural externality.

A direct consequence of this two-sided interaction between cultural dynamics and economic equilibrium is that, in the long run, preferences are endogenous and depend on supply side characteristics of the economy like factor endowments and technology. The demand side of this economy and in particular the pattern of symbolic value attached to certain goods is determined by the supply side. From a theoretical point of view, this is also a source of non walrasian effects such that an increase in relative abundance of a specific production factor may in fact increase and not decrease the long run equilibrium price of the good using intensively that factor.

From an international trade perspective, it means that the cause of trade between two countries may rely directly and indirectly on differences in factor endowments, directly through the traditional supply side channels, indirectly through the way endowments affect the evolution of preferences between "homo.culturalis" and "homo economicus" agents. We show in our analysis that this feature directly provides a theoretical rationale for the existence of a perceived "home bias" in preferences, a fact extensively discussed in the empirical literature.

Our main result is related to the impact of trade integration on cultural identity. Indeed, we show that openness, by lowering the price of imported international goods substitute to local cultural goods, impacts the local cultural dynamics of a small open economy and therefore changes the long run pattern of cultural sensitivity within the society. This benefits all consumers of the imported goods but it is costly to the proponents of local cultural goods which are close substitutes to the imported goods. As a consequence openness may generate cultural tensions within the society. All in all, we show that openness has a negative impact on welfare as perceived by proponents of local cultural goods when price effects are dominated by cultural identity effects. In a standard competitive trade model, this happens when trade integration takes place between relatively similar countries. On the other hand, openness has a positive impact on welfare when price effects are sufficiently strong, a situation likely to occur when trade integration involves very different countries in term of factor endowments.

The last part of the paper considers then another type of integration often discussed nowadays in the debate on globalization: virtual integration. This aspect comes not because of international mobility of material goods but because of the mobility of information flows across cultural communities. Associated with revolutionary developments in information technologies, our daily lives are now also governed by images originating from all corners of the world. This dimension of global integration is likely to affect the structure of the reference group of any particular individual in the economy. As a matter of fact, residents in any local community, may easily get connected to other people in the world through international networks of information and images. Such mechanisms in turn may stimulate a larger sense of cultural identification to these people, when consuming cultural goods they also tend to value symbolically. Modifying local consumption patterns, this dimension is going to affect the dynamics of local cultural evolution, even without any material trade flows entering the economy. We analyze the cultural consequences of such integration and the potential frictions it may generate within local cultural communities.

This paper is related to the small but expanding literature addressing the links between international trade and culture. Van Ypersele and François (2001) and Ramezzana (2003) study the optimal trade protection in presence of heterogenous preferences over differentiated goods (interpreted as cul-

tural diversity) in a context of non competitive or monopolistic markets. However they do not take into account the collective (or public good) nature of cultural characteristics as is the case in our framework².

Janeba (2004) is the closest to our paper as he also takes the view of cultural identity as a consumption externality as expanded by Akerlof and Kranton (2000). He studies the impact of cultural diversity on the nature of the economic equilibrium under free trade. In a static Ricardian model, he highlights non trivial effects of trade openness on welfare for a given and *exogenous* population of cultural agents. While similar welfare effects are present in our framework, our purpose here is different as we focus on the reverse causal link, namely the impact of trade openness on (*endogenous*) cultural diversity. Hence our analysis is dynamic in nature and provides a framework for analyzing the joint determination of cultural diversity and economic equilibrium.

Such a dynamic analysis of culture is also studied in Bala and Van Long (2004). But their view of culture is different as they look at individual preferences on rival goods rather than cultural identity and consumption externality. More importantly, their cultural dynamics are driven by a exogenous process directly imported from the Darwinian literature in biology, while cultural transmission in our model is founded on a socialization mechanism explicitly grounded on particular microfoundations.

Section 2 presents the static model; in section 3 we study the process which rules the dynamics of cultural diversity. Section 4 is devoted to the analysis of trade openness. Section 5 discusses virtual integration, namely trade in information flows rather than trade in commodities. Finally section 6 concludes.

2. The Model

Consider an economy with three good: two standard "non cultural" goods, Y and Z , and one "cultural" good, X . Good X is a "cultural" good in the sense that some individuals in the economy may attach a sense of cultural identity to it. By cultural identity, we use the Akerlof and Kranton (2000) framework or Janeba (2004) and identify this notion with a positive cultural externality from the consumption of the cultural good by others in the community. We derive the exact form of the cultural externality below. Good Y is a "non cultural" good which we assume is a close (perfect) substitute from a purely economic point of view to the cultural good X . For simplicity, we assume that consumption of goods X and Y are mutually exclusive. Good Z is only partially substitutable to goods X and Y . We take Z as our numéraire good, We consider a non overlapping generation model without demographics overtime. Population at each date t is thus fixed and normalized to 1.

At each date t , there are two types of individuals in society. Individuals of type E , in fraction $1 - q_t$, who are standard economic agents ("homo economicus") and individuals of type C , in fraction q_t , who are cultural agents ("homo culturalis"). In the absence of cultural externality, each agent derives utility from his individual consumptions Cobb-Douglass utility function

$$U = z^{1-\alpha} . c^\alpha \tag{2.1}$$

where z is the consumption of the numéraire good, c is the consumption of either the cultural good X or its perfect substitute "standardized" good Y and $0 < \alpha < 1$.

A cultural externality arises because of interactions between agents. Each period, an agent is matched with another agent. Matching is random. Each match involves a social exchange related to

²See also the recent papers by Konya (2002a) on the role of cultural barriers in international trade and Konya (2001 and 2000b) investigating the relationship between immigration and cultural assimilation.

both the type of the agents and their consumption behavior. The following is the simplest possible specification that gives rise to a cultural externality³:

- If two culturalis agents meet and they have both consumed the cultural good, their utility is multiplied by a coefficient $I > 1$.
- Otherwise, utility is left unchanged by the match.

Given this specification, the expected utility of a homo culturalis who consumes the cultural good X is given by:

$$U^C(x, z) = (1 - q) \cdot z^{1-\alpha} \cdot x^\alpha + q \cdot I \cdot z^{1-\alpha} \cdot x^\alpha \quad (2.2)$$

We denote hereafter

$$I(q) \equiv (1 + q(I - 1))^{1/\alpha} \quad (2.3)$$

So thus get the following reduced form for the utility function of a homo culturalis who consumes the good X :

$$U^C(x, z) = z^{1-\alpha} \cdot (I(q)x)^\alpha \quad (2.4)$$

While the utility function of homo culturalis who consume the good Y and that of homo economicus are given by:

$$U^C(y, z) = U^E(y, z) = z^{1-\alpha} \cdot y^\alpha \quad (2.5)$$

$$U^E(x, z) = z^{1-\alpha} \cdot x^\alpha \quad (2.6)$$

Comparing 2.4 and 2.5 , one can interprete $I(q)$ as the cultural externality associated with the consumption of the cultural good X for homo culturalis agents. Two important properties of the function $I(q)$ are first that it is increasing and convex in the fraction of homo culturalis agents in the society and second that is bounded below by 1.

The problem of a consumer is twofold: he must first choose whether to become a X -consumer or a Y -consumer, then choose the consumption levels of good Z and, respectively, goods X or Y to maximize his preferences subject to his budget constraint. From the specification of the preference structure, it is easy to characterize the pattern of consumption of good X and good Y . Let p_x and p_y the relative prices of good x and good y in terms of good z . An individual of type C strictly prefers to consume good X if and only if $p_x < I(q)p_y$ while an individual of type E strictly prefers to consume good X if and only if $p_x < p_y$.

We now turn to the supply side of our economy. The two standard goods Y and Z are tradable, each one produced with a specific factor of production (let say labor L_Z and L).

$$Z = L_z \quad (2.7)$$

$$Y = L \quad (2.8)$$

³For a specification where the random matching process determines not only the cultural externality but also the transmission of preferences across agents ("horizontal transmission"), see the appendix.

The cultural good X being specific to the culture of each country is non-tradable. It is produced with the same factor of production as its close substitute Y plus some other, culture specific, factor of production which we call K and interpret as a local cultural capital.

$$X = \frac{1}{\beta^\beta(1-\beta)^{1-\beta}} \cdot L^{1-\beta} K^\beta \quad (2.9)$$

With obvious notations, we have under perfect competition:

$$1 = p_z = w_z \quad (2.10)$$

$$p_y = w \quad (2.11)$$

$$p_x = w^{1-\beta} \cdot r^\beta \quad (2.12)$$

The three factors of production are assumed to be immobile and of fixed supply. In the base version of the model, ownership of all three factors is shared equally among all agents. In an extension to the model we endogenize the supply of the local cultural capital by making it a human capital specific to the homo culturalis and thus a function of q . It is to be noted that the only property of the production structure that is crucial for our results is that for given prices of tradable goods, an increase in the local demand for the non-traded cultural good raises its price.

3. Autarkic Equilibrium

At each date t , the cultural composition of the population is given by q_t . For a given q_t , we characterize in the appendix the autarkic equilibrium of this economy. From the discussion above, it is clear that there are only three possible equilibrium regimes:

- Interior regime: $p_y < p_x < p_y \cdot I(q)$. In the interior regime, homo culturalis agents strictly prefer to consume good X and homo economicus strictly prefer to consume good Y . Given that all agents have the same income and given the well known properties of Cobb-Douglas utility functions, it is straightforward to derive the aggregate demand for each good:

$$\begin{cases} (1-\alpha)E = Z \\ \alpha(1-q)E = w \cdot Y \\ \alpha q E = w^{1-\beta} \cdot r^\beta \cdot X \end{cases} \quad (3.1)$$

where E stands for the total expenditure and where prices of each goods have been replaced by their expression in 2.10, 2.11 and 2.12.

Market clearing equations give:

$$\begin{cases} L_z = (1-\alpha)E \\ L = [1-\beta q] \cdot \alpha E / w \\ K = \alpha \beta q E / r \end{cases} \quad (3.2)$$

As can be expected, the higher is the fraction of homo culturalis in the population, the larger is the relative demand for X relative to Y . Since the production of X is relatively more intense in K

and less intense in L than the production of Y , we get that the higher is q , the higher is r and the lower is w . Solving for E , w , and r , we get:

$$\begin{aligned} \frac{L_z}{(1-\alpha)} &= E \\ w &= \frac{[1-\beta q] \cdot \alpha L_z}{1-\alpha} \frac{1}{L} \\ r &= \frac{\alpha \beta q L_z}{1-\alpha} \frac{1}{K} \end{aligned} \quad (3.3)$$

which in turn yields the following prices:

$$\begin{aligned} p_z &= 1 \\ p_y &= \frac{[1-\beta q] \cdot \alpha L_z}{1-\alpha} \frac{1}{L} \\ p_x &= \frac{\alpha L_z}{1-\alpha} \left(\frac{1-\beta q}{L} \right)^{1-\beta} \cdot \left(\frac{\beta q}{K} \right)^\beta \end{aligned} \quad (3.4)$$

A key variable in our subsequent analysis is the "cultural premium", namely the price ratio between the cultural good and its economic substitute. We get that:

$$\frac{p_x}{p_y}(q) = \left(\frac{L}{K} \right)^\beta \cdot \left(\frac{\beta}{1/q - \beta} \right)^\beta \quad (3.5)$$

It can easily be verified that the cultural premium is an increasing function of the fraction of homo culturalis. This is natural since more homo culturalis implies comparatively stronger demand for good X than for good Y . Later in the paper, we shall refer to that property as the "relative price effect" of cultural diversity.

- Pooling regime: $p_x = p_y$: In this regime, the economic agents are indifferent between consuming the two goods X and Y . From equation (3.5) we know that the pooling regime arises for q smaller than \hat{q} where:

$$\left(\frac{L}{K} \right)^\beta \cdot \left(\frac{\beta}{1/\hat{q} - \beta} \right)^\beta = 1 \quad (3.6)$$

- $p_x = I(q)p_y$: in this regime culturalis agents are indifferent between consuming X and consuming Y . From equation (3.5) we know that this regime can be ruled out by assuming that the parameters are such that: $(L/K)^\beta < I(1) = I^\frac{1}{\alpha}$. In what follows, we shall assume that this simplifying assumption is satisfied.

4. Cultural dynamics

The previous section considered the degree of cultural diversity q_t as given at a point of time. This section studies now the evolution of q_t . There are obviously several ways to describe the process of evolution of preferences. Preferences can evolve because of darwinian natural selection and standard replicator types of dynamics based on biological fitness. More realistically in our context, we may think that preferences evolve according to a process of social selection. Here we follow a recent line

of research developed in Bisin and Verdier (2001) and others in different economic contexts⁴. This approach provides a simple micro founded selection process of preferences over time and therefore is able to tie down how economic fundamentals and institutional characteristics may affect the social dynamics of cultural traits in a population of agents. The dynamics of q_t comes through a process of intergenerational transmission of preferences combining vertical and oblique transmission mechanisms (Boyd and Richerson (1985), Cavalli-Sforza and Feldman (1981)). More precisely, parents are imperfectly altruistic with respect to their offsprings (ie. paternalistic) and spend resources to transmit to their children their own preferences over the cultural good they value (and the cultural community they belong to). Incentives to spend time and resources socializing their kid to their own preferences are positively related to the "subjective utility costs" parents have when imagining the actions of their children different from them through the filter of their own preferences. Such "subjective utility costs" to see equilibrium consumption patterns of one's kid through one's own preference structure, naturally depend on relative prices of the different cultural goods and the relative sizes of the different cultural communities. According to this process, over time the distribution of individuals among the communities evolves and reaches a long run stationary state.⁵

Following Bisin and Verdier (2001), we define $V^{cc'}$ the expected utility of an agents whose preferences are of type c and whose consumption choice is the optimal consumption behavior of an individual of type c' . Obviously, for $c = c'$, $V^{cc'}$ represents simply the maximum level of utility achievable by an agent of that type. For $c \neq c'$, $V^{cc'}$ represents the welfare derived from the optimal consumption behavior of an individual of type $c' \in \{C, E\}$ as perceived through the preferences of an individual of a type c . When offsprings are of a different cultural type c' , altruistic parents of type c incur a "subjective utility cost", ΔV^c to see their kids make consumption choices that the parents perceive to be sub-optimal. We denote this subjective utility cost $\Delta V^c = V^{cc} - V^{cc'}$.

Between t and $t + dt$, a fraction λdt of individuals die . Just before dying, they give birth to a offspring which can be immediately socialized to one of the two cultural traits C or E . Transmission of cultural traits and preferences occurs through social learning. Naive children acquire preferences through observation, imitation and adoption of models with which they are matched. This happens at two levels: *i*) inside the family (*vertical* cultural transmission), *ii*) on the outside cultural and social enviroment (*oblique* cultural transmission, . e.g. via teachers, peers, etc.).

Young individuals at birth are "naive" and start without well defined preferences. They adopt, through social learning (to be defined below), a social preference type or a cultural trait and then make economic and social choices by maximizing his preferences.

Socialization of a naive individual occurs in two steps. First the naive child is exposed to the parent model (type E or C) and adopts his parent's preferences with a certain probability τ . Therefore with probability $1 - \tau$ the child is still naive and has yet no well established preferences. In this case oblique cultural transmission occurs. The child is matched randomly with an individual of the old generation

⁴See Bisin and Verdier (1998) in the context of interdependent preferences, Bisin and Verdier (2000) and (2004) for marriage and religion, Francois (2000) for social capital and development, Hauk and Saez -Marti (2002) for corruption, Saez-Marti and Zenou (2004) for racial discrimination, Jellal and Wolf (2002) for intergenerational altruism.

⁵An alternative model of preference evolution is one of peer socialization (horizontal transmission) by which individuals with some probability change preferences after getting in contact with other agents. The probability of preference change may depend on relative "subjective utility costs" reflecting the difficulty individuals face imagining a certain pattern of action in a set of preferences different from theirs. In such a setting, again the evolution of preferences is going to depend on temporary equilibrium economic variables like relative prices and relative quantities an in a straightforward manner, dynamics of preferences qualitatively similar to those of the intergenerational (vertical and oblique) transmission model. will hold. In the main text, we concentrate on the first intergenerational model of social evolution but see the appendix for some microfoundations of the horizontal transmission process.

and adopts then the model of that individual. Transition probabilities P_{ij}^t that a parent of type i has a child adopting a preference of type j are given by:

$$\begin{aligned} P_{CC}^t &= \tau^C + (1 - \tau^C)q_t \\ P_{CE}^t &= (1 - \tau^C)(1 - q_t) \end{aligned} \quad (4.1)$$

$$P_{EE}^t = \tau^E + (1 - \tau^E)(1 - q_t) \quad (4.2)$$

$$P_{EC}^t = (1 - \tau^E)q_t \quad (4.3)$$

where τ^i denotes the probability that a parent of type i socializes directly his own child. For example for P_{CC}^t , a naive child with a parent of type C can acquire the social preference of type C in two ways. With probability τ^C he may be directly socialized by his parent. Otherwise he remains naive and gets socialized by another old generation individual of type C by random matching with probability $(1 - \tau^C)q_t$. Given the transition probabilities P_{ij}^t , the fraction q_{t+dt} of adult individuals of type C is given by:

$$q_{t+dt} = q_t(1 - \lambda dt) + \lambda dt q_t P_{CC}^t + \lambda dt (1 - q_t) P_{EC}^t$$

which after substitution and the continuous time limit $dt \rightarrow 0$ gives:

$$\dot{q}_t = \lambda q_t (1 - q_t) [\tau^C - \tau^E]$$

In our approach, τ^i is the results of rational socialization choices by parents. The motivation for a parent to socialize his child (even though socialization is costly) comes from the fact that *i)* each parent is altruistic but *ii)* he can perceive the welfare of his child only through the filter of his own preferences or culture (as a consequence a parent will want to socialize his child to his own preferences and cultural attitudes, so that the child economic and social choices when adult coincide with those that maximize the parent preferences. Socialization is costly. We assume generally that a parent of type C (respectively E) faces a cost of socialization $V(\tau, q_t)$ (resp. $V(\tau, 1 - q_t)$) which is increasing convex in the socialization effort τ (ie. $V_1 > 0, V_{11} > 0$) and decreasing in the second argument (ie. $V_2 < 0$),. This second property is intended to capture the fact that there are positive cost externalities of socialization across individuals of the same cultural trait. Hence it is less costly to socialize one's kid to one's own preferences if there are many other people sharing that preference around and contributing to make that socialization successful.

Formally, each parent with preferences of type $i \in \{C, E\}$ at time t chooses τ^C to maximize

$$u^i(q_t) + \beta [P^{ii} V^{ii} + P^{ij} V^{ij}] - V(\tau^i, q_t^i) \quad (4.4)$$

where $u^i(q_t)$ denotes the indirect utility from the father economic and social choices at time t (in general they might depend on the distribution of the cultural trait in the population at t , q_t); β is the degree of altruism with respect to kids; P^{ii} and P^{ij} are the transition probabilities of the parent's cultural trait to the child (which, as defined above), depend on τ^i ; V^{ii} (resp. V^{ij}) denote the utility from the economic and social actions of a child of type i (resp. j) as perceived by a parent of type i .

In Bisin-Verdier (2001) a series of results for this general approach to cultural transmission are derived. A characterization of the dynamics of various cultural traits in the population, q_t , depends though on a detailed analysis of the properties of the socialization problem, and in particular on the maps $u^i(\cdot)$, $V^{ii}(\cdot)$, $V^{ij}(\cdot)$. In our present context we may take the following simple parametrization for the cost of socialization function: $V(\tau, q_t) = \Psi(\tau)(1 - q_t)$ with $\Psi(\cdot)$ increasing convex and $\Psi(0) = \Psi'(0) = 0$, $\Psi'(1) = +\infty$. The solution of (4.4) gives

$$\begin{aligned} \tau^C &= \Psi'^{-1}[\beta(V^{CC} - V^{CE})] = \Psi'^{-1}[\beta\Delta V^C] \\ \tau^E &= \Psi'^{-1}[\beta(V^{EE} - V^{EC})] = \Psi'^{-1}[\beta\Delta V^E] \end{aligned}$$

and the dynamics of preferences evolution between "homo culturalis" and "homo oeconomicus" are given by

$$\dot{q}_t = \lambda\beta q_t(1 - q_t)[\Psi'^{-1}(\Delta V^C) - \Psi'^{-1}(\Delta V^E)] \quad (4.5)$$

The next step in our analysis is to derive the equilibrium value of these subjective utility costs for parents of both types, ΔV^C and ΔV^E taking q as given.

Since the total population mass is equal to 1 and since factor ownership is equally shared among the population, individual income is equal to aggregate income and given by 3.3. From 2.5, 2.6 and the optimal consumption rules for Cobb Douglas utility functions, we get:

$$V^{EE} = \frac{\left(\frac{\alpha}{1-\alpha}\right)^\alpha}{p_y^\alpha} \cdot L_z \quad (4.6)$$

$$V^{EC} = \frac{\left(\frac{\alpha}{1-\alpha}\right)^\alpha}{p_x^\alpha} \cdot L_z \quad (4.7)$$

Which, from the definition of ΔV , yields that:

$$\Delta V^E = \left(\frac{\alpha}{1-\alpha}\right)^\alpha \cdot L_z \cdot \left(\frac{1}{p_y^\alpha} - \frac{1}{p_x^\alpha}\right) \quad (4.8)$$

Similarly, from 2.4 and 2.5, we get that:

$$V^{CC} = \frac{\left(\frac{\alpha}{1-\alpha}\right)^\alpha}{p_x^\alpha} \cdot I(q)^\alpha \cdot L_z \quad (4.9)$$

$$V^{CE} = \frac{\left(\frac{\alpha}{1-\alpha}\right)^\alpha}{p_y^\alpha} \cdot L_z \quad (4.10)$$

Which, from the definition of ΔV , yields that:

$$\Delta V^C = \left(\frac{\alpha}{1-\alpha}\right)^\alpha L_z \cdot \left(\frac{I(q)^\alpha}{p_x^\alpha} - \frac{1}{p_y^\alpha}\right) \quad (4.11)$$

A crucial variable for the analysis of the cultural dynamics is the ratio $\Delta V^E/\Delta V^C$. From 4.8 and 4.11, we get:

$$\Delta V^E/\Delta V^C = \frac{1 - \frac{p_y^\alpha}{p_x^\alpha}}{I(q)^\alpha \frac{p_y^\alpha}{p_x^\alpha} - 1} \quad (4.12)$$

From the definition of the pooling zone, it is straightforward that we have:

$$\Delta V^E(q \leq \hat{q})/\Delta V^C(q \leq \hat{q}) = 0$$

In the interior regime, we get from 3.5 and 2.3:

$$\Delta V^E(q > \hat{q})/\Delta V^C(q > \hat{q}) = \frac{\left(\frac{L}{K}\right)^{\alpha\beta} \cdot \left(\frac{\beta}{1/q-\beta}\right)^{\alpha\beta} - 1}{1 + q(I-1) - \left(\frac{L}{K}\right)^{\alpha\beta} \cdot \left(\frac{\beta}{1/q-\beta}\right)^{\alpha\beta}} \quad (4.13)$$

Under mild restrictions on parameters⁶, one can show that 4.13 implies that $\Delta V^E/\Delta V^C$ is a strictly increasing function of q that goes to zero when q goes to \hat{q} as defined in 3.6. When $q = 1$, we get that:

$$\Delta V^E(1)/\Delta V^C(1) = \frac{\left(\frac{L}{K}\right)^{\alpha\beta} \cdot -1}{I - \left(\frac{L}{K}\right)^{\alpha\beta}} \quad (4.15)$$

There exists an interior steady state distribution of preferences if the RHS of 4.15 is less than 1, which amounts to assuming that: $(L/K)^{\alpha\beta} > \frac{I+1}{2}$. Note that since $I > 1$ this assumption is consistent with the earlier assumption we made about parameter values. Basically, what we do is to assume that I is not so small that even culturalis agents would not want to consume the cultural good and that I is not so large that everybody would want to become a homo culturalis. We focus on the more interesting and empirically plausible intermediate scenario.

Note that the relative magnitude of $\Delta V^C(q)$ and $\Delta V^E(q)$ is determined by the combination of two effects. The first effect is what we can call a "cultural identity effect". It comes from the fact that the larger q_t the number of individuals who are cultural, the larger the size of the identity externality and therefore the more costly it is for a homo culturalis parent to see his child become a homo economicus. This effect is present in both the pooling and the interior regime. The second effect is the "relative price effect". The larger q_t the number of cultural individuals in the community, the larger the demand on cultural good x relative to the demand on the non cultural good y and, therefore the larger is the cultural premium. The relative price effect has opposite implications for homo economicus and homo culturalis: it increases the cost for a homo economicus parent to see his child become a homo culturalis and "waste" money on the cultural good which the parent perceives to be perfectly substitutable to the cheaper good Y . On the other hand, it mitigates the cost for a homo culturalis parent to see his child become a homo economicus. The last important thing to notice about the relative price effect is that it appears only in the interior regime.

The dynamics of q under autarky are simple to represent. When q is small so that the economy is under the pooling regime, ΔV^E is equal to zero while ΔV^C is strictly positive (because of the cultural identity effect). Hence, by 4.5, q increases through time, up to the point where we reach the interior regime. From 4.13, we see that the relative price effect kicks in and the efforts of socialization by homo economicus parents increase relative to the efforts of socialization by homo culturalis. A steady state is reached when both types of parents exert the same level of effort, that is when:

$$q^{SS,a}(I - 1) = 2 \left[\left(\frac{L}{K}\right)^{\alpha\beta} \cdot \left(\frac{\beta}{1/q^{SS,a} - \beta}\right)^{\alpha\beta} - 1 \right] \quad (4.16)$$

Equation 4.16 implicitly defines the steady state distribution of preferences under autarky. Under the previous restrictions on parameters, this allows us to get an unambiguous comparative statics results. Not surprisingly, we get that an increase in cultural capital K or in the "identity parameter" I promotes the long run share of homo culturalis $q^{SS,a}$.

More surprisingly we also have that an increase in L induces a decrease in $q^{SS,a}$; which according to (3.4) results in a increase of p_y/p_z . Hence this last feature can be described interestingly as a

⁶This property matters only for the uniqueness of the steady state distribution. Even if the property is not satisfied, all the comparative statics in the paper still hold provided the economy is in a neighborhood of a stable steady state. A sufficient (but far from necessary) condition for the property to hold is:

$$1 - \frac{1}{I} < \alpha\beta \quad (4.14)$$

rationale for the existence of a "perceived" home bias effect. Indeed, from an economic point of view the equilibrium price premium between goods y and z is increasing in the relative abundance of L , the production factor specific to Y . Domestic preferences (viewed in aggregate at the level of the population) are increasingly biased towards the goods produced in relative abundance in the economy. In a sense, this model provides an explanation for the existence of a "home bias effect".

The intuition for this mechanism is the following: an increase in L induces an upward shift in the production of good Y ; the "non cultural" good y becomes relatively cheaper and the price premium (p_y/p_x) is smaller. From this, it follows that for any value q_t , the "subjective cost" function for a "homo oeconomicus" $\Delta V^C(q_t)$ is increased while that of an "homo culturalis" $\Delta V^E(q_t)$ is decreased. Socialization incentives for intergenerational transmission of preferences become biased towards the "homo oeconomicus". The frequency q_t of individuals goes down in the population and the value of the long run interior steady state $q^{SS,a}$ is decreased. This in turn increases the long run relative demand for good Y and interestingly, the long run price premium (p_y/p_z).

5. Trade integration: the small open economy case

Consider now the effect of trade integration on this economy. For this, assume that good x is only potentially valuable as a "cultural" good by people of the local economy and thus is non-tradable. On the other hand, assume that the numeraire good z and good y are perfectly tradable. Suppose also that the economy is a small open economy and that it has comparative advantage in good Z for all values of q . Hence a free trade regime naturally leads our small open economy to import good y and export the numeraire good z , the domestic price of good y being exogenously fixed at the international price level $p_y^f < \frac{[1-\beta]\cdot\alpha}{1-\alpha} \frac{L_z}{L}$. The value of price p_x of the local cultural good x however continues to be determined by local market conditions.

For a given fraction q_t of "homo culturalis" agents in the economy, it is then quite straightforward to describe the equilibrium price of the non tradable "cultural good" x . Using first order conditions of firms and consumers, and market clearing we get:

$$\begin{aligned} E &= L_z + wL + rK \\ w &= p_y^f \\ rK &= \alpha\beta qE \end{aligned}$$

or:

$$\begin{aligned} E &= \frac{L_z + p_y^f L}{1 - \alpha\beta q} \\ w &= p_y^f \\ r &= \frac{\alpha\beta q}{1 - \alpha\beta q} \frac{L_z + p_y^f L}{K} \end{aligned} \tag{5.1}$$

Competitive pricing of good X yields:

$$p_x = w^{1-\beta} \cdot r^\beta = \left(p_y^f\right)^{1-\beta} \left(\frac{\alpha\beta q}{1 - \alpha\beta q} \frac{L_z + p_y^f L}{K}\right)^\beta \tag{5.2}$$

which gives a cultural premium equal to:

$$\frac{p_x}{p_y}(q) = \left(\frac{\alpha\beta}{1/q - \alpha\beta} \frac{L_z/p_y^f + L}{K}\right)^\beta \tag{5.3}$$

Following the same argument as in the previous section, we can show that:

$$\Delta V^C / \Delta V^E = -1 + \frac{q(I-1)}{\left(\frac{\alpha\beta}{1/q-\alpha\beta} \frac{L_z/p_y^f + L}{K}\right)^{\alpha\beta} - 1} \quad (5.4)$$

Equation 5.4 implies that opening to trade reduces the relative efforts of socialization by homo culturalis parents compared to those by homo economicus. This is because of the impact of trade openness on the cultural premium, which exacerbates the subjective cost of a homo economicus parent and mitigates that of a homo culturalis. Finally, we get from 5.4 the steady state distribution of preferences under free trade:

$$q^{SS,trade}(I-1) = 2 \left[\left(\frac{L_z/p_y^f + L}{K}\right)^{\alpha\beta} \left(\frac{\beta}{1/q^{SS,trade} - \beta}\right) - 1 \right] \quad (5.5)$$

Similarly to the autarky case, one can show that the lower is the world price of good Y the lower is the fraction of homo culturalis in the steady state. This is because opening to trade raises the cultural premium which raises the socialization efforts of homo economicus parents and reduces those of homo culturalis parents. This lends support to the argument that trade openness may lead to the erosion of local culture. To investigate the issue further, we now turn to a general equilibrium, two country model.

6. Trade integration: the two country case

In this section we consider two possible scenarios in a two country world that give rise to comparative advantage and thus to static gains from trade. We then analyze the impact of trade openness on the distribution of preferences. The two scenarios we consider are:

(1) trade openness between two countries with the same factor endowments in the tradable sectors $L_z = L_z^*$ and $L = L^*$; but with different endowments in the non tradable cultural sector where $K < K^*$

(ii) trade openness between two countries with different factor endowments in the tradable sectors $L_z/L > L_z^*/L^*$; but with similar endowments in the non tradable cultural sector $K = K^*$.

In both cases, we assume that the two economy have converged to their steady state distribution of preferences prior to opening to trade.

Scenario 1: "Amplification"

Consider two countries such that: $L_z = L_z^*$ and $L = L^*$ but $K < K^*$. From (4.16) the long run autarkic equilibrium is such that:

$$q^a < q^{*a}$$

Using the equilibrium conditions (3.4) we get:

$$\left(\frac{p_z}{p_y}\right)^a = \frac{1-\alpha}{\alpha} \cdot \frac{L}{L_z} \cdot \frac{1}{1-\beta q}$$

So we have:

$$\left(\frac{p_z}{p_y}\right)^a < \left(\frac{p_z^*}{p_y^*}\right)^a$$

Despite the fact that both countries have the same endowments in the factors of production for tradable goods, a comparative advantage arises because of the endogeneity of preferences: a larger

stock of local cultural capital K implies a lower cultural premium, which in turn implies that the steady state fraction of homo culturalis is larger, which lowers the demand for good Y and therefore its autarky price.

The domestic country exports the good Z and imports the good Y . We consider a small trade openness shock: the two economies are located inside the diversification hull. After openness specialization in both countries is incomplete; as there is only one international price for each tradable good we have:

$$w_z = w_z^* \text{ and } w = w^*$$

However the factor prices, r and r^* , are not necessarily equalized for the non tradable (cultural) goods.

The general equilibrium is characterized by six market clearing equations and the trade balance:

$$L_z = \frac{(1-\alpha)E}{w_z} + f_{ex} \cdot \frac{(1-\alpha)E^*}{w_z} \quad (6.1)$$

$$L = \frac{(1-\beta)q\alpha E}{w} + (1-f_{im}) \frac{\alpha(1-q)E}{w} \quad (6.2)$$

$$K = \beta \frac{\alpha q E}{r} \quad (6.3)$$

$$L_z^* = (1-f_{ex}) \cdot \frac{(1-\alpha)E^*}{w_z} \quad (6.4)$$

$$L^* = \frac{(1-\beta)q^*\alpha E^*}{w} + f_{im} \frac{\alpha(1-q)E}{w} + \frac{\alpha(1-q^*)E^*}{w} \quad (6.5)$$

$$K^* = \beta \frac{\alpha q^* E^*}{r^*} \quad (6.6)$$

$$\text{Trade Balance} : f_{ex} \cdot (1-\alpha)E = f_{im} \cdot \alpha(1-q)E \quad (6.7)$$

where E and E^* are the domestic and foreign incomes; f_{ex} . and f_{im} . represent the domestic flows of exports and imports. The trade is assumed *to be balanced* at each date.

Solving the equilibrium with $L_z = L_z^*$ and $L = L^*$ and $K < K^*$, we get that the export flows is:

$$f_{ex} = \frac{\beta(q^* - q)}{2(-\beta q + 1/\alpha)}$$

And the "cultural premium" are given by expressions⁷ close the autarkic one:

$$\frac{p_x}{p_y} = \left(\frac{L}{K}\right)^\beta \cdot \left(\frac{\beta}{\frac{1}{q} - \beta - \Phi(q, q^*)}\right)^\beta \quad (6.8)$$

$$\frac{p_x^*}{p_y} = \left(\frac{L}{K}\right)^\beta \cdot \left(\frac{\beta}{\frac{1}{q} - \beta + \Phi(q, q^*)}\right)^\beta \quad (6.9)$$

where

$$\Phi(q, q^*) = \frac{(1-\alpha)\beta}{2} \left(\frac{q^*}{q} - 1\right) > 0 \quad (6.10)$$

The cultural dynamics in both countries under a free trade regime are given by equations (4.12)-(6.8)-(6.10). Hence we see that the two dynamics are now interdependent: **indeed a larger share**

⁷The expressions hereafter are first order approximates of the true ones.

q^* of culturalis in the foreign country translates into a smaller demand for the tradable good y^*

We are able to characterize the long run equilibria in both countries. They are given by:

$$\begin{aligned} q^{int}(I-1) &= 2 \left[\left(\frac{L}{K} \right)^{\alpha\beta} \cdot \left(\frac{\beta}{1/q^{int} - \beta - \Phi(q^{int}, q^{*int.})} \right)^{\alpha\beta} - 1 \right] \\ q^{*int}(I-1) &= 2 \left[\left(\frac{L^*}{K^*} \right)^{\alpha\beta} \cdot \left(\frac{\beta}{1/q^{*int} - \beta + \Phi(q^{int}, q^{*int.})} \right)^{\alpha\beta} - 1 \right] \end{aligned}$$

From which we get:

$$q^{int.} < q^{aut} < q^{*aut.} < q^{*int.} \quad (6.11)$$

What we observe is that in this first scenario trade openness amplifies the patterns of distribution of preferences across the world: the economy that initially had a larger proportion of homo culturalis, and therefore a comparative advantage in good Y , sees the price of good Y go up after opening up to trade, thereby reducing the cultural premium further and encouraging socialization by homo culturalis parents.

Scenario 2: "Distortion"

We now turn to the case trade openness between two countries with different factor endowments in the tradable sectors but with similar endowments in the non tradable cultural sector. More specifically we assume $L_z > L_z^*$; $L = L^*$ and $K = K^*$.

From (??) the long run autarkic equilibrium is such that:

$$q^{aut} = q^{*aut}$$

Using the equilibrium conditions (??) we get::

$$\left(\frac{p_z}{p_y} \right)^{aut} < \left(\frac{p_z^*}{p_y^*} \right)^{aut}$$

The domestic country exports the good Z and imports the good Y . We consider a small trade openness shock: the two economies are located inside the diversification hull. After openness specialization in both countries is incomplete; as there is only one international price for each tradable good we have:

$$w_z = w_z^* \text{ and } w = w^*$$

However the factor prices, r and r^* , are not necessarily equalized for the non tradable (cultural) goods.

The general equilibrium is characterized by the same market clearing equations (6.1-6.6) and trade balance (6.7) than in the previous section. Solving this equilibrium with $L_z > L_z^*$; $L = L^*$ and $K = K^*$, we get that the export flows is:

$$f_{ex.} = \frac{\frac{L_z}{L_z^*} (1 - \beta q) - (1 - \beta q^*)}{\frac{L_z}{L_z^*} (1 - \beta q) + 2(1 - \alpha)/\alpha}$$

And the "cultural premia" are given by expressions⁸ close to the autarkic one:

$$\frac{p_x}{p_y} = \left(\frac{L}{K}\right)^\beta \cdot \left(\frac{\beta}{\frac{1}{q} - \beta - \Gamma(q, q^*)}\right)^\beta \quad (6.12)$$

$$\frac{p_x^*}{p_y} = \left(\frac{L^*}{K^*}\right)^\beta \cdot \left(\frac{(1-\beta)}{\frac{1}{q^*} - \beta^* + \Gamma(q, q^*)}\right)^\beta \quad (6.13)$$

where

$$\Gamma(q, q^*) = \frac{(1-\alpha)}{(2-\alpha)\frac{L_z}{L_z^*} + \alpha} \left[-\beta \left(\frac{L_z}{L_z^*} - \frac{q^*}{q}\right) + \left(\frac{L_z}{L_z^*} - 1\right) \frac{1}{q} \right] \quad (6.14)$$

$$\simeq \frac{(1-\alpha)}{(2-\alpha)\frac{L_z}{L_z^*} + \alpha} \left(\frac{L_z}{L_z^*} - 1\right) \cdot \left(\frac{1}{q} - \beta\right) > 0 \quad (6.15)$$

The cultural dynamics in both countries under a free trade regime are given by equations (??)-(??)-(6.12)-(6.14). The two dynamics are still interdependent, for similar reasons as in the previous scenario.

We are able to characterize the long run equilibria in both countries. They are given by:

$$q^{int}(I-1) = 2 \left[\left(\frac{L}{K}\right)^{\alpha\beta} \cdot \left(\frac{\beta}{1/q^{int} - \beta - \Gamma(q^{int}, q^{int.})}\right)^{\alpha\beta} - 1 \right]$$

$$q^{*int}(I-1) = 2 \left[\left(\frac{L^*}{K^*}\right)^{\alpha\beta} \cdot \left(\frac{\beta}{1/q^{*int} - \beta + \Gamma(q^{int}, q^{*int.})}\right)^{\alpha\beta} - 1 \right]$$

From which we get:

$$q^{int.} < q^{aut} = q^{*aut.} < q^{*int.} \quad (6.16)$$

The economy with comparative advantage in good Z sees the price of good Y go down compared to autarky. This raises the cultural premium and, as previously, encourages socialization by the homo economicus parents. The opposite phenomenon takes place in the foreign country. As a consequence and even though both economies started with the same pattern of preferences, international trade leads to preferences becoming dissimilar across countries.

7. Conclusion

[to be written]

⁸The expressions hereafter are first order approximates of the true ones.

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Appendix

8. Alternative Modelling Strategy

8.1. Matching Process (horizontal transmission of preferences).

In each generation, there is a continuum of agents. Population is stationary and normalized to 1. There are two possible types (C and E) of preferences (or cultural traits) in the population with q_t the fraction at time t of individuals of type E . Between t and $t + dt$, each agent has a probability λdt to match with somebody else. Matching is random. Each match involves a social exchange which consists in a communication related to agents' behavior. This matching process gives a rationale both for the consumption externality and the dynamics of cultural change.

- If two culturalis agents meet, their utility is multiplied by a coefficient I if those agents consume the cultural good. And both agents keep their type.
- If two economicus agents meet, nothing happens. And both agents keep their type.
- If a culturalis and a economicus agent meet, they try to convince each other to switch their behavioral type

The (expected) utility of a culturalis agent k who consumes the cultural good is given by:

$$U_k^C = (1 - q) \cdot z_k^{1-\alpha} \cdot x_k^\alpha + q \cdot I \cdot z_k^{1-\alpha} \cdot x_k^\alpha \quad (8.1)$$

We denote hereafter

$$I(q) \equiv (1 + q(I - 1))^{1/\alpha} \quad (8.2)$$

the consumption externality. So we have:

$$U_k^C = z_k^{1-\alpha} \cdot (I(q)x_k)^\alpha$$

Cultural dynamics:

When two individuals of the same type match, nothing happens. When two individuals of different types i and j match, individual of type i may shift to the preference structure of type j with some probability P_{ij} . This probability depends on the relative conviction of each agent in their communication game.

More precisely, individual i considers his own behavior (ie: utility U^{ii}) and the behavior of individual j through the filter of his own preferences (ie. utility V^{ij}): then agent i tries to convince agent j to switch his type; we assume that the degree of conviction of i 's speech is a positive function of $\Delta V^i = U^{ii} - U^{ij}$ to which we add ε_i which can be interpreted as a communication noise. Similarly agent j tries to convince agent i to switch his type with a conviction strength equal to: $\Delta V^j + \tilde{\varepsilon}_j = U^{jj} - U^{ji} + \tilde{\varepsilon}_j$.

The issue of this communication game is simple: the agent whose conviction strength is the weaker, loses the game and changes his type: $\Delta V^i + \tilde{\varepsilon}_i \leq \Delta V^j + \tilde{\varepsilon}_j$. Consequently the transition probability from type i to type j is the probability that i loses the game and so is equal to:

$$P_{ij} = F(\Delta V^i - \Delta V^j)$$

where $F(\cdot)$ is the cumulative function of the stochastic variable $\tilde{\varepsilon}_{ji} = \tilde{\varepsilon}_j - \tilde{\varepsilon}_i$. We assume that $\tilde{\varepsilon}_{ji}$ is symmetrically distributed around 0 such that $F(0) = 1 - F(0) = 1/2$.

At the population level, given the transition probabilities P_{ij}^t , the fraction q_{t+dt} of adult individuals of type C is given by:

$$q_{t+dt} = q_t(1 - \lambda dt) + \lambda dt q_t [q_t + (1 - q_t)(1 - P_{CE}^t)] + \lambda dt(1 - q_t)[q_t P_{EC}^t]$$

a fraction $(1 - \lambda dt)$ of agents of type C does not find a match and remains with "homo culturalis" preferences. A number $\lambda dt q_t$ of agents of type C gets matched with somebody randomly (with probability q_t they match with somebody like them and remain of the "homo culturalis" type, with probability $(1 - q_t)$ they match with a "homo oeconomicus" and stay with the same preferences with probability $1 - P_{CE}^t$. Finally a number $\lambda dt(1 - q_t)$ of individuals of type E gets matched with probability q_t with an "homo culturalis and shifts preferences with transition probability P_{EC}^t . Substitution and going to the limit of continuous time gives:

$$\dot{q}_t = \lambda q_t(1 - q_t)[2F(\Delta V^C - \Delta V^E) - 1] \quad (8.3)$$

By assumptions $F(0) = 1/2$ such that $\dot{q}_t = 0$ is equivalent to: $\Delta V^C = \Delta V^E$

8.2. Virtual Integration as a "dilution" effect (1)

In this section we allow for "virtual encounters" where the matching process and communication is extended to cross-country match. There is no trade in commodities.

We still assume that cultural transmission takes place within the country: if two agents from different countries meet, they cannot change their types.

Clearly, this type of virtual integration process results in a dilution of the consumption externality in both countries; expression (8.2) now becomes:

$$I^{vir}(q) = \left(1 + \frac{qL}{L + L^*}(I - 1)\right)^{1/\alpha} \quad (8.4)$$

There is no trade between the two countries, such that this autarkic equilibrium is still described by (??) and the long-run share of culturalis agents is given by (??) and (8.4). This yields:

$$q^{virt.} < q^{aut.}$$

Comments? Simple dilution effect!

8.3. Virtual Integration (2): "dilution" effect & cross-socialization

As in the previous section we allow for "virtual encounters" where the matching process and communication is extended to cross-country match. There is still no trade in commodities. But we add the possibility that cross-country matching may result in transitions between, let say, culturalis from the domestic country and the economicus from the foreign country. So we have to look into the details of the socialization process.

Intuitively, it is clear that a culturalis from one country cannot convince an agent from the other country to change his type: the idea is that cultural goods are non tradable such that they have an infinite price for foreigners!

Let denote C, C^*, E, E^* the four types of agents in this world economy. For the domestic agents, there are four types of match between different types of agents.

Match (E, E^*) is equivalent to a match (E, E)

A Match (C, E) & (C, E^*) are equivalent ?

Match (C, C^*) never results in a transition: indeed for such a match, we have: $\Delta V^C = V^{CC} - V^{CC^*} = V^{CC} - 0$ (A REPENDRE! MIEUX VAUT PRENDRE POUR LES TRANSITIONS DES RATIOS PLUTOT QUE DES DIFFERENCES: V^{CC}/V^{CC^*})

$$\begin{aligned}
q_{t+dt} &= q_t(1 - \lambda dt) + \lambda dt q_t \left[\frac{q_t \cdot L}{L + L^*} + \frac{(1 - q_t) \cdot L}{L + L^*} (1 - P^{CE}) + \frac{(1 - q_t^*) \cdot L^*}{L + L^*} + \right] \\
&\quad + \lambda dt (1 - q_t) [q_t P_{EC}^t]
\end{aligned}$$

A TERMINER !!

8.4. Virtual integration (3): Tradable culture vs local, non tradable culture

Consider that y is a cultural good, such that I is an externality attached to its consumption for the share $(1 - q)$ agents. Same equations than before except that :

$$\Delta V^C = V^E(E_k) \cdot \left[\left(I_C(q) \cdot \frac{p_y}{p_x} \right)^\alpha - 1 \right] \quad (8.5)$$

$$\Delta V^E = V^E(E_k) \cdot \left[(I_E(q))^\alpha - \left(\frac{p_y}{p_x} \right)^\alpha \right] \quad (8.6)$$

where:

$$\begin{aligned}
I_C(q) &= (1 + q(I - 1))^{1/\alpha} \\
I_E(q) &= (1 + (1 - q)(I - 1))^{1/\alpha}
\end{aligned}$$

Then virtual integration has two effects: a dilution effect for the domestic culturalis and potentially an expansion effect for the domestic non culturalis. Indeed under virtual integration the domestic economicus can communicate with other domestic economicus agents *and* foreign economicus agents. And the externalities become:

$$\begin{aligned}
\text{for the culturalis} &: I_C^{vir}(q) = \left(1 + \frac{qL}{L + L^*} (I - 1) \right)^{1/\alpha} \\
\text{for the economicus} &: I_E^{vir}(q) = \left(1 + \frac{(1 - q)L + (1 - q^*)L^*}{L + L^*} (I - 1) \right)^{1/\alpha}
\end{aligned}$$

So for all q we have: $I_C^{aut}(q) < I_C^{vir}(q)$; but it is ambiguous for $I_E^{aut}(q) \leq I_E^{vir}(q)$ as it depends on the value of q^* .

However for all q , we always have:

$$\frac{I_E^{vir}(q)}{I_E^{aut}(q)} > \frac{I_C^{vir}(q)}{I_C^{aut}(q)}$$

But the long run equilibrium is characterized by:

$$\frac{1 + (I_E^{virt}(q^{virt}))^\alpha}{1 + (I_C^{virt}(q^{virt}))^\alpha} = \left(\beta + \frac{1 - q^{virt}}{q^{virt}} \right)^{\alpha\beta} \cdot \left(\frac{K}{L(1 - \beta)} \right)^{\alpha\beta}$$

This leads to:

$$q^{virt.} < q^{aut.}$$