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## ABSTRACT

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### **Diversity and Growth**

The diversity of social interaction within economic communities affects productivity and growth, and is itself shaped by economic conditions. These reciprocal effects raise the possibility of multiple equilibria, of setting a socially polarized economy stagnating in poverty on a new path of social integration and economic growth through external intervention or an internal political initiative. This paper describes a simple analytical model that captures these reciprocal effects, and sheds light on the role of government capacity, community leadership, federation and external credit or aid, in achieving economic growth through social integration.

**JEL Classification:** O11, Z10, Z18

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## 1. Introduction

Globalization, migration, and technological innovation have intensified the interaction—and friction—among people of different cultural, religious, and ethnic backgrounds living and working within shared political boundaries. In the developing world, borders drawn arbitrarily by colonial powers created artificial states comprising disparate, sometimes hostile, ethnic and religious groups; in advanced, industrialized countries, waves of economic immigrants from countries around the world are viewed as threatening the social fabric of the host country. Some countries have met this challenge successfully, integrating diverse populations with varied religious, ethnic, and racial backgrounds, and creating conditions that dispose them to work together and benefit from their diversity. Others remain plagued by persistent religious and ethnic strife that inhibits economic growth. The dynamic reciprocal interaction between economic development and cultural, religious and ethnic diversity presents new opportunities for collective action with potentially far-reaching benefits. Recent contributions to the literature have begun addressing some of these issues but the reciprocal interaction between diversity and growth remains an underexplored topic.<sup>1</sup>

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<sup>1</sup> Ashraf and Galor (2011, 2013) argue that cultural assimilation and diffusion are the key to understanding long run determinants of economic development worldwide; Ager and Brueckner (2013, 2017) add historical analysis of the contribution of cultural diversity to economic growth in the United States. Lazear (1999) and Botticini and Eckstein (2005), among others, demonstrate the important economic effect of relations between ethnic groups, and the interaction between ethnicity and occupational choices and stratification. Akerlof and Kranton (2000) and Constant and Zimmermann (2008) address the formation of ethnic identities and groups. Laitin (1992) describes the tensions between multiculturalism and state formation in the context of Africa's language politics.

The model of reciprocal interaction between the degree of polarization among the ethnic, cultural or religious subgroups of a community and its economic performance, developed in this paper, points to the possibility of multiple equilibria. A poorly endowed economy with a large degree of social polarization is caught in a persistent state of limited interaction among ethnic groups and poor economic performance where a high-level equilibrium is possible were it able to follow a path of mutually reinforcing productive investment and reduced polarization. This superior trajectory is the growth path of successful immigrant economies where cultural diversity fuels growth. The formal framework we propose, which extends Gradstein and Justman (2002), indicates conditions and policies that allow countries to bridge over sectarian rifts and reap the benefits of cultural diversity.

Banfield's (1958) pioneering study of a poor community in southern Italy illustrates this reciprocal effect. Banfield identified the lack of social capital and the primacy of familial loyalties in this community as the main cause of its poverty, pointing to enhanced productive interactions between small family-based units as a necessary condition for economic development, while recognizing that their poverty was itself a barrier to greater cooperation and further growth. Thus, the extreme poverty of this community was both the consequence of the limited productive interaction between its constituent sub-groups, and its cause.<sup>2</sup>

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<sup>2</sup> These seminal observations found subsequent confirmation in the influential work of Fukuyama (1995) and Putnam (2000), and more specifically in Easterly and Levine's (1997) study of the links between interethnic strife in African countries and their underdevelopment. Econometric evidence of positive cross-country correlations between measures of social capital and economic development by Knack and Keefer (1997) and

We model this formally by positing a socially polarized economy comprising two culturally distinct sub-groups. Diversity is beneficial for production—some interaction between the two subgroups is more productive than none—but beyond a certain measure, excessive social polarization reduces productivity.<sup>3</sup> This is consistent with Ashraf and Galor’s (2011, 2013) empirical identification of a level of population diversity that is optimal for long-run growth, balancing the productive benefits of diversity against its costs. However, parents may seek to perpetuate their children’s cultural separateness, generating greater polarization than is optimal for growth, possibly motivated by their desire to remain close to their children (Bisin and Verdier, 2000, 2001; Gradstein and Justman, 2002), or by the intrinsic value they associate with the preservation of their collective cultural identity.<sup>4</sup> At the same time, the economic value of reduced social polarization depends on the level of investment in the economy. This reciprocal complementarity of investing in productive assets and reducing social polarization raises the possibility of a poor economy—riven by cultural alienation, and not offering sufficient material incentives for a narrowing of inter-

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Zak and Knack (2001), as well as the causal effect of social capital on growth identified by Algan and Cahuc (2010), provides broader support for this view. Related findings on the negative correlation between fractionalization across ethnic or linguistic lines and economic growth, reviewed in Alesina and La Ferrara (2005), indicate that these insights apply widely, though possibly not to the most affluent countries.

<sup>3</sup> Additional work, such as Kuran and Sandholm, 2008, and Saez-Marti and Zenou (2012) also explores cultural integration, but ignores its productivity and growth impact – which is a main focus of this paper.

<sup>4</sup> We treat the interaction between culture and economic development as a black box, focusing our attention on its implications. See Shayo (2009) for a discussion of how social identities are shaped. In Esteban and Ray’s (2011) analysis, ethnic polarization is detrimental for productivity because of the conflict it causes. Albornoz, Cabrales and Hauk (2014) offer a detailed microeconomic analysis of social interaction and productivity, which they apply to academic authorship. We analyze these issues in a macro-economic framework.

ethnic differences—stagnating in a low-level equilibrium, while a potentially feasible high-level equilibrium lies beyond its reach.

This suggests an initial role for strong central government in moving the economy out of its low-level equilibrium, if it has the capacity to commit credibly to future action; and a further role in coordinating the rate of social convergence. Absent coordination, the speed of convergence may be too slow, as each subgroup ignores the beneficial external effect of its social convergence on the other group; or too fast, as individuals in each group ignore the effect of their actions on their group identity. Ethnic leadership can delay the erosion of cultural identity at the cost of slower growth. A federal government, which allows both internal coordination within ethnic groups and coordination among them, can be beneficial in the long run but may be welfare-inferior in the short run, possibly undermining the stability of a federation in its earlier stages.

Our contribution to the existing literature is twofold. First, we embed social interactions among groups of individuals in an economic growth framework, allowing for complementarity between intergroup polarization and reduced investment in human capital. This leads to the possibility of multiple equilibrium trajectories, the realization of which depends on initial conditions. There has been extensive analysis of social interactions, but their interplay with economic growth has not been explored. Our second contribution consists of an explicit welfare analysis, with suggested policy implications designed to correct for the market failures we identify and improve social and economic outcomes in multicultural societies.

The rest of the paper proceeds as follows. Section 2 introduces the basic model.

Section 3 presents a static analysis. This is followed by a dynamic analysis in Section 4. Section 5 explores the role of government, the importance of commitment, the role of community leadership, the advantages of federation, and the possible need for external intervention. Section 6 offers some brief concluding remarks.

## 2. The basic model

We begin by formulating a benchmark model. Consider a successive generations economy operating in discrete time  $t = 0, 1, 2, \dots$ , populated by a unit measure of households indexed by  $i$ ,  $0 \leq i \leq 1$ , and divided into two equally sized subgroups, red and blue, indexed by  $j = r, b$ .<sup>5</sup> Each household comprises a parent and a child, with all individuals living for two periods. Denote the income of family  $i$  in group  $j$  in period  $t$  by  $y_{ijt}$ , and assume that incomes are initially identical across households; this will imply that the same also holds true in subsequent periods, allowing us to abstract from distribution effects. Individuals are also characterized by their social orientation in each period. Denote the social orientation of the parent in household  $i$  in group  $j$  in period  $t$ , by  $p_{ijt}$ ,  $0 \leq p_{ijt} \leq 1$ ; denote the average social orientation of group  $j$  in that period by  $\pi_{jt}$ ,  $j = r, b$ ; and let  $\Delta_t$  denote the distance between the two group averages,  $\Delta_t = |\pi_{rt} - \pi_{bt}|$ . Assume that initially each group is internally uniform, with initial social orientations  $\pi_{r0} = 0$  and  $\pi_{b0} = 1$ .

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<sup>5</sup> The distinctions between these groups might be tribal, ethnic, linguistic, cultural or religious (or all of the above). Population size is constant over time. Bar-Gill and Fershtman (2015) consider the possibility that fertility decisions serve to perpetuate cultural identity. We abstract from this interesting dimension here.

Parents make all decisions. In each period, they divide their household income  $y_{ijt}$  between consumption  $c_{ijt}$  and investment in their children's human capital,  $k_{ij,t+1}$ :<sup>6</sup>

$$y_{ijt} = c_{ijt} + k_{ij,t+1} \quad (1)$$

and they determine their children's social orientation  $p_{ij,t+1}$ . These decisions are independent but inter-connected, as social orientation affects productivity, as well as affecting welfare directly.

The human capital of an individual is productive through interaction with another individual, with productivity a function of the social distance between the two. If  $p$  and  $p'$  are the social orientations of two individuals, then  $|p - p'|$  is the social distance between them; and  $d(|p - p'|)$  is the productivity of their interaction, where  $d$  is a differentiable concave function,  $0 < d < 1$ , with  $d(\underline{\Delta}) = 0$  for some  $0 < \underline{\Delta} < 1$ . Thus the productivity of interaction among any pair of individuals within a cohort increases with the social distance between them when this distance is small enough—some diversity is better than none—but decreases with social distance beyond an optimal level of divergence. The expected productivity of a random interaction for an individual member  $i$  of group  $j$ ,  $\Phi_{ijt}$ , is  $i$ 's average social distance from other individuals in the cohort, weighted by the probability of each interaction:

$$\Phi_{ijt} = \int_{l \neq i} d(|p_{ijt} - p_{lt}|) \omega_{ilt} dl$$

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<sup>6</sup> We abstract from physical capital, focusing on the impact of linguistic, cultural or social polarization on the efficiency of acquired productive skills.

where  $\omega_{ilt}$  is the probability that individual  $i$  interacts productively with individual  $l$  in period  $t$ , defined for all  $l \neq i$ . We consider, as benchmarks, two extreme forms of social organization: segregation, in which individuals interact only with individuals in their own group, with equal probability; and integration, where they interact with equal probability with all individuals in their cohort.<sup>7</sup>

Income is then derived via the production function

$$y_{ijt} = A k_{ijt}^{\Phi_{ijt}} \quad (2)$$

where  $A > 0$ . Thus, the marginal product of skills depends on the social context in which they are used: the marginal product of human capital is maximized at the internal level of diversity  $\underline{\Delta}$ . Ashraf and Galor (2011, 2013) provide empirical support for this assumption, finding that diversity has both benefits and costs for productivity—too little diversity leads to reduced levels of innovative activity, excessive diversity generates distrust—so that the relationship between diversity and marginal productivity has an inverse U shape.<sup>8</sup> As  $p_{b0} - p_{r0} = 1 > \underline{\Delta}$ , the initial state of the economy is such that in an integrated economy, reducing polarization raises productivity. If groups are internally uniform in period  $t$  and the economy is integrated, the expected productivity of any individual in that period is  $\Phi_{ijt}$

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<sup>7</sup> We abstract from the mechanism of segregation and from the process through which subgroups choose between segregation and integration. Separate education systems are a possible mechanism, raising barriers of language, religious practice or behavioral norms, which inhibit interaction (Carvalho and Koyama, 2016). These assumptions greatly simplify the analysis, allowing it to be imbedded in a growth model. The network literature allows these probabilities to differ depending on individual identities (Jackson, Rogers and Zenou, 2017).

<sup>8</sup> The benefits of diversity for innovation seem to be particularly relevant for highly productive people. Thus, Freeman and Huang (2014) find that scientific papers co-authored by scholars with diverse ethnicity have more impact than those by scholars of the same ethnicity.

$= \Phi_t = \frac{1}{2} d(0) + \frac{1}{2} d(\Delta_t)$ ; and if it is segregated,  $\Phi_{ijt} = d(0)$ .

Parents' direct preferences regarding their children's orientation have two aspects. Parents suffer a psychic cost from the social distance between their children and themselves, which we assume for simplicity is linear in social distance,  $\sigma |p_{ij,t+1} - p_{ijt}|$ ; and they experience disutility from the anticipated erosion of their group's social identity, equal to  $\xi |\pi_{j,t+1} - \pi_{jt}|$  for  $j = r, b$  where  $\sigma$  and  $\xi$  are positive constants.<sup>9</sup>

Parents in period  $t$  choose  $k_{ij,t+1}$  and  $p_{ij,t+1}$  so as to maximize their utility, which equals:

$$U_{ijt} = \log(c_{ijt}) + \log(y_{ij,t+1}) - \sigma |p_{ij,t+1} - p_{ijt}| - \xi |\pi_{j,t+1} - \pi_{jt}| \quad (3)$$

subject to the budget constraint (1) and given the production function (2). Positive utility is derived from current consumption and from the child's anticipated future income; disutility stems from the distance in social orientation between parent and child, and from the erosion of group identity.

We assume initially that parents make these decisions individually, and focus our attention on equilibrium sequences of decisions on  $k_{ij,t+1}$  and  $p_{ij,t+1}$  that are mutually consistent in each period.

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<sup>9</sup> The erosion of cultural identity at the individual and sub-group level will be equal *ex post* but not *ex ante*.

### 3. Single-period analysis

#### 3.1. Decentralized equilibrium

We begin by analyzing equilibrium choices in the first period, first for an integrated economy, then for a segregated economy. We assume for concreteness a specific form for the productivity function  $d$ ,  $d(\Delta) = d_0 + \alpha \Delta (1-\Delta)$  for some  $\alpha > 0$ , so that  $d'(\Delta) = \alpha (1-2\Delta)$ ,  $d'(0) = \alpha$ ,  $d'(1) = -\alpha$ , and  $d$  is maximized at  $\underline{\Delta} = 1/2$ . Initial incomes are identical and social orientation is initially uniform within each group, and this will imply that this holds also in the next period. We omit household and group indexes where this causes no confusion.

In an integrated economy, children interact equally with all others in their cohort. We posit that if initial income is uniform across all households then this will hold in subsequent periods; and if subgroups are socially homogenous initially with social orientations symmetric around the mid-point ( $p_{r0} = 0$  and  $p_{b0} = 1$ ), then this will also hold in the next periods with  $p_{r1} = 1/2 - 1/2\Delta_1$  and  $p_{b1} = 1/2 + 1/2\Delta_1$ , so  $\Delta_1 = |p_{b1} - p_{r1}|$ . Under these assumptions,

$$\Phi_{ij1} = \Phi_1 = \Phi(\Delta_1) = 1/2 d(0) + 1/2 d(\Delta_1) = d_0 + 1/2 \alpha \Delta_1 (1-\Delta_1) \quad (4)$$

for all households, and so

$$\partial \Phi_{ir1} / \partial p_{ir1} = 1/2 \alpha - 1/2 \alpha (1-2\Delta_1) = \alpha \Delta_1 \quad \text{and} \quad \partial \Phi_{ib1} / \partial p_{ib1} = -\alpha \Delta_1 \quad (5)$$

We focus our attention on a Nash equilibrium, where each household conditions its decisions on the assumed choices of other households, and acts as if it has no effect on their

decisions, and consider mutually consistent decisions. Thus household  $i$  in group  $j$  conditions its choice of  $p_{ij1}$  and  $k_{ij1}$  on other households' choosing  $\pi_{b1}$  and  $\pi_{r1}$  (there is no inter-dependence in the choice of  $k_1$ ). Then there is a possibility of an interior solution with:

$$k_1 = y_0 \Phi(\Delta_1) / (1 + \Phi(\Delta_1)) \quad \text{and} \quad (6a)$$

$$\alpha \Delta_1 \log(k_1) - \sigma = 0 \quad (6b)$$

for some  $\Delta_1 < 1$ , which implicitly determines  $k_1$  and  $\Delta_1$ . Noting that  $\Phi(1) = d_0$ , such an equilibrium exists whenever  $\alpha \log(y_0 d_0 / (1 + d_0)) - \sigma > 0$ .

Alternatively, we have a corner solution at the initial social distance  $\Delta_1 = 1$ , with  $k_1 = y_0 d_0 / (1 + d_0)$ , if

$$\alpha \log(y_0 d_0 / (1 + d_0)) - \sigma \leq 0 \quad (7)$$

Rearranging terms, this implies that a corner solution holds if  $y_0$  is below the threshold income:

$$Y = e^{\sigma/\alpha} (1 + 1/d_0) \quad (8)$$

Note that  $Y$  increases with  $\sigma$ , the marginal disutility of intergenerational alienation.<sup>10</sup> This corner solution also characterizes the equilibrium of the segregated economy.

When  $y_0 > Y$ ,  $\Delta_1$  is determined, following (6a) and (6b), from the implicit equation:

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<sup>10</sup> The corner solution  $\Delta = 0$  is never an equilibrium, as it is never in any parent's interest to reduce  $\Delta$  below  $\underline{\Delta}$ .

$$\Delta \log [y_0 \Phi(\Delta) / (1 + \Phi(\Delta))] = \sigma / \alpha \quad (9)$$

Figure 1 illustrates this equilibrium. It follows immediately from the figure that the equilibrium polarization level increases in the intergenerational social distance parameter  $\sigma$  and decreases in initial income  $y_0$ .<sup>11</sup>

Then  $p_{r1} = 1/2 - \Delta_1$  and  $p_{b1} = 1/2 + \Delta_1$ ; and  $k_1$  is determined by (6a). The initial symmetry and intra-group uniformity of social orientation carries over to the next period, as posited, as does the uniformity of next period income, which equals (in either case):

$$y_1 = Ay_0^{\Phi_1} [\Phi_1 / (1 + \Phi_1)]^{\Phi_1} \quad (10)$$

where  $\Phi_1 = \Phi(\Delta_1)$ , as defined by (4), and consumption is  $c_1 = y_0 - k_1$ .

The utility level of each parent in the initial period is then (in either case):

$$U = (1 + \Phi_1) \log y_0 + \log A + g(\Phi_1) - 1/2 \sigma (1 - \Delta_1) - 1/2 \xi (1 - \Delta_1) \quad (11)$$

where  $g(\Phi) = \Phi \log \Phi - (1 + \Phi) \log (1 + \Phi)$  is a decreasing function of  $\Phi$ . Parents choose the interior equilibrium when  $y_0 > Y$ , i.e., when initial income is high in relation to the marginal disutility of intergenerational alienation; and they choose the corner equilibrium, with  $\Delta_1 = 1$ , when  $y_0 < Y$ , in which case,  $\Phi_1 = d_0$  and the last two terms of (11) vanish.

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<sup>11</sup> The second-order condition holds for, say, “red” household  $i$  when the derivative of its utility with respect to  $p_{ir1}$  is decreasing; and as  $\Delta$  declines when  $p_{ir1}$  increases, this holds where  $\Delta \log [y_0 \Phi(\Delta) / (1 + \Phi(\Delta))]$  is increasing.

### 3.2. Pareto efficient allocations

Equilibrium in an integrated economy may result in excessive polarization, because parents in each group ignore the external beneficial effect of reducing polarization on the productivity of the other group; or it may result in excessive convergence because parents ignore its corrosive effect on their collective identity. This may apply to the choice between interior and corner equilibria and to the level of polarization in an interior solution. Only in a knife-edge case will these two opposing effects balance out.

To see this more formally, consider a Pareto optimal choice of social orientations and investment decisions  $p_{jt+1}$  and  $k_{t+1}$  in an integrated economy. Given our assumption of identical incomes and uniform social orientation within groups, and symmetry between groups (and the absence of intertemporal dependence), we can focus on identical choices of investment and uniform choices of social orientations within groups, and represent the utility of any parent in the initial cohort as follows:

$$U_{i0}(k, \Delta) = \log(y_0 - k) + \log A + \Phi(\Delta) \log k - \sigma(\frac{1}{2} - \frac{1}{2}\Delta) - \xi(\frac{1}{2} - \frac{1}{2}\Delta) \quad (12)$$

where  $\Phi(\Delta)$  is given by (4). Then if initial income  $y_0$  is below the threshold:

$$Y^* = e^{(\sigma+\xi)/2\alpha} (1 + 1/d_0) \quad (13)$$

the corner equilibrium, with maximal polarization, is optimal for parents. Comparing (13) to the threshold level for a corner equilibrium given by (8),<sup>12</sup> we find that when initial income is below both thresholds, equilibrium in both the integrated and segregated

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<sup>12</sup> Note that when  $\sigma > \xi$ ,  $Y > Y^*$ , and when  $\sigma < \xi$ ,  $Y < Y^*$ .

economies results in maximal polarization, and this is optimal for parents. When initial income is between the two thresholds, if  $\sigma > \xi$  parents choose maximal polarization in an integrated economy where reducing polarization would increase their welfare and produce stronger growth. However, when initial income is between the two thresholds and  $\sigma < \xi$ , parents in an integrated economy choose an interior equilibrium where the corner equilibrium with maximal polarization would produce greater welfare for them (though weaker growth). Thus, in this case, absent intervention, parents are better off in a segregated economy than in an integrated economy.

If initial income is above the threshold  $Y^*$  then integration is more efficient, with an interior level of polarization  $\Delta^* < 1$ , and investment level  $k^*$  that satisfy:

$$k^* = y_0 \Phi(\Delta^*) / (1 + \Phi(\Delta^*)) \quad \text{and} \quad (14a)$$

$$\alpha \Delta^* \log(k^*) - \frac{1}{2} \sigma - \frac{1}{2} \xi = 0 \quad (14b)$$

Comparing these conditions to (6a) and (6b), the first order conditions for an interior equilibrium, we find that the equilibrium outcome produces less growth and greater polarization when  $\sigma > \xi$ , and *vice versa*.

In a segregated economy there is nothing to be gained from cultural convergence, and so parents' choice of their children's social orientation coincides with their own,  $p_{ir1} = 0$  and  $p_{ib1} = 1$ , and social polarization remains maximal. The result, with respect to investment, consumption, next-period income, and utility is identical to the corner solution of an integrated economy; the only difference being that in a segregated economy the corner

solution obtains at any level of initial income. As there are no cultural (or other) externalities in a segregated economy, this equilibrium cannot be improved upon without integrating the economy.

The corner equilibrium, with maximal social polarization, produces minimal growth; even a marginal reduction of social polarization would raise next period incomes, though this may not yield greater welfare for parents if the marginal psychic cost of intergenerational alienation or of the erosion of group identity is high. When initial income is high enough to support an interior equilibrium in an integrated economy, an integrated economy generates faster growth than a segregated economy and results in less social polarization; and if  $\xi$  is small enough it will also yield greater parental welfare.<sup>13</sup>

Collecting results,

**Proposition 1.**

- (a) If initial income is below both thresholds,  $Y$  and  $Y^*$ , given by (8) and (13), then the equilibrium in a segregated and an integrated economy is the same, and it maximizes parents' welfare.
- (b) If initial income is above both thresholds, then parents in a segregated economy would benefit from integration. If parents care more about intergenerational alienation than about the erosion of group identity ( $\sigma > \xi$ ) so that  $Y > Y^*$ , then

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<sup>13</sup> The segregated equilibrium is identical to the corner equilibrium of an integrated economy.

parents in an integrated economy would benefit if polarization were reduced from its equilibrium level; and *vice versa*.

(c) If initial income is between the two thresholds and  $Y > Y^*$ , then parents in a segregated economy would benefit from integration, and parents in an integrated economy would benefit from less polarization than obtains in equilibrium, and *vice versa*.

(d) If initial income is between the two thresholds and  $Y < Y^*$ , then parents in an integrated economy benefit from segregation; segregation maximizes parents' welfare.

#### 4. Multiple steady states

We now proceed to a dynamic analysis of our model, considering a multiple progression of temporal equilibria that converge over time to a steady state, defined as an equilibrium income level and social orientation that are constant over time. Multiple steady states are possible because of the mutual feedback between income and polarization. Which of these the economy converges to depends on the initial level of income.

In a segregated economy the only possible steady state is a low-income steady state with maximal polarization, where  $\Delta = 1$ ; productivity,  $\Phi = \Phi(1) = d_0$  is minimal; and – since in this case  $y_I = A(y_0 d_0 / (1 + d_0))^{d_0}$  – steady state income  $Y^S$  is:

$$Y^S = A^{1/(1-d_0)} [d_0 / (1 + d_0)]^{d_0 / (1-d_0)} \quad (15)$$

The equilibrium trajectory, in this case, converges monotonically to  $Y^S$ , and polarization is permanently maximal.

In an integrated economy, there are two possible steady states, the low-income steady state of a segregated economy described above, and a higher-income, interior steady state with a lower level of polarization. At this steady state, (6a) and (6b) imply that social distance and income are determined by the two equations:

$$Y = A^{1/(1-\Phi(\Delta))} [\Phi(\Delta)/(1+\Phi(\Delta))]^{\Phi(\Delta)/(1-\Phi(\Delta))} \quad (16a)$$

$$Y = e^{\sigma/\alpha\Delta} [1 + 1/\Phi(\Delta)] \quad (16b)$$

Denote  $\Delta^I$  and  $Y^I$  the solution of (16). If  $A$  is large enough and  $d_0$  is small enough then  $Y^S < Y^I$ , and we assume this to be the case.<sup>14</sup> It implies that utility is greater at the interior steady state.

Collecting results,

**Proposition 2.** The steady state to which an integrated economy converges depends on the position of  $Y$ , the threshold level of output given by equation (8) in relation to the two steady-state levels of output,  $Y^S$  and  $Y^I$ , and to initial income  $y_0$ :

- (i)  $Y^S < Y^I \leq Y$ . For any  $y_0$ , polarization is always maximal and income converges to  $Y^S$
- (ii)  $Y \leq Y^S < Y^I$ . For any  $y_0$ , income and polarization converge monotonically to their

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<sup>14</sup> For this to hold it is sufficient that  $A \geq 2$  and  $d_0 \leq 0.4$ .

steady state levels  $Y^I$  and  $\Delta^I$ .

(iii)  $Y^S < Y < Y^I$  and  $y_0 < Y$ . Polarization is always maximal and income converges monotonically to  $Y^S$ .

(iv)  $Y^S < Y < Y^I$  and  $y_0 > Y$ . Income and polarization converge monotonically to their steady state levels  $Y^I$  and  $\Delta^I$ .

In either steady state, the social distance between parent and child converges to zero, so welfare is greater at the higher-income steady state.

When the economy converges to the interior steady state, polarization decreases too slowly (quickly) if the marginal disutility of intergenerational alienation is greater (smaller) than the disutility of erosion of collective identity.

## **5. Welfare analysis and policy implications**

Three sources of "market failure" in the model analyzed in the preceding sections serve as a conceptual basis for possible welfare-improving intervention by non-market forces. There is an inter-group externality, the beneficial effect of one group moving towards the other, on the other group's productivity; there is an intra-group externality, the benefit of maintaining group identity; and there is the complementarity between poverty and social polarization, where poverty suppresses the incentive for bridging cultural differences and excessive polarization inhibits growth. When the inter-group externality is stronger than the intra-group externality, a strong central government can increase welfare by coordinating a reciprocal acceleration of cultural convergence. It seems less suited to acting in the opposite direction, promoting the retention of separate cultural identities when the

intra-group externality is stronger. In this case, promoting leadership within each subgroup can promote internalization of the benefit of group identity. A federal structure allows both internal coordination within each subgroup and inter-group accommodation. The interaction between poverty and social polarization suggests that external intervention may be necessary, for example, through a one-time infusion of material resources, which can allow the economy to extricate itself from a low-level equilibrium.

Welfare analysis within a single generation is relatively straightforward within our framework. As we assume uniform initial incomes and within-group cultural uniformity, these externalities act on all agents in the same way, and internalizing them yields a Pareto improvement. This does not hold in a dynamic setting where different generations have different objectives, and welfare analysis rests, implicitly or explicitly, on the relative weights given to the welfare of present and future generations. Single-period analysis places all weight on the current parent generation, similar to applying a very high discount rate; a very low discount rate focuses the analysis on steady state outcomes. Rather than stipulate a specific discount rate we refer to the single-period and steady state outcomes as two extreme benchmark cases out of a spectrum of possible assumptions.

### **5.1 Reciprocal convergence through government coordination**

Getting the two groups to reciprocally implement the socially optimal level of polarization, beyond what is individually optimal, depends on the central government's ability to effectively commit to and enforce social orientations. An important example of such policies, explored in Kremer and Sarychev (1998), Gradstein and Justman (2002, 2005)

and Ortega and Tangeras (2008), is centralized coordination of the social and cultural orientation of education curricula in schools serving all cultural subgroups.<sup>15</sup> This implies state control of the cultural content of education, precluding ethnic or religious subgroups from pursuing their own cultural agendas in parallel to public education,<sup>16</sup> but it does not preclude centralized state education supporting separate cultural identities; indeed the optimal trajectory of development will often require it, especially in its early stages. Absent a credible government commitment to centralized coordination, both the level of investment in human capital, and the degree of social polarization will generally deviate from their optimal levels.

Specifically, suppose that the government is benevolent and interested in maximizing the aggregate welfare in each period. Further, suppose that it is able to set the social orientation for each group, correctly anticipating individual resource allocations. It is easy to see that the (subgame perfect) equilibrium will then satisfy equations (14a) and (14b), resulting in the symmetric Pareto-optimal allocation. When the state's capacity to govern enables it to commit to determining each group's social orientation—for example, by controlling school curricula—this can be used to implement the first best trajectory of social polarization, investment, and income levels. Our argument that the link between the state's capacity to govern and the rate of economic development works through its ability or inability to affect social orientation is consistent with the frequent appearance of social

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<sup>15</sup> Aspachs, Clots-Figueras, Costa and Masella (2008), Clots-Figueras and Masella (2013) and Cantoni, Chen, Yang, Yuchtman and Zhang (2017) provide empirical evidence on education shaping preferences and attitudes.

<sup>16</sup> Of course, some coordination, internalizing some of the external effect, will generally be preferable to none.

polarization coupled with poverty in weak states.<sup>17</sup> Summarizing,

**Proposition 3.** The government's ability to implement the first best outcome through the coordination of a reciprocal reduction of social polarization hinges on its ability to commit to and enforce a path of mutual social convergence. This is a channel through which a strong capacity to govern promotes economic development.

## 5.2 Community leadership

Where inter-group externalities call for non-market intervention by the central government, intra-group externalities—the desire to preserve community identity—call for communal leadership. Indeed, if each community can be mobilized to act collectively in determining its social orientation, taking that of the other community as given while leaving investment to be decided individually, equilibrium conditions for an interior, single-period Nash equilibrium are characterized by equation (6a), which remains unchanged, and the following equation, which replaces (6b):

$$\alpha \Delta^c \log(k^c) - \sigma - \xi = 0 \quad (17)$$

for  $\Delta^c < 1$ , where the superscript  $c$  denotes an equilibrium with community leadership. This holds provided parents' income  $y$  is greater than the threshold:

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<sup>17</sup> Rotberg (2004) provides a comprehensive analysis of state weakness and Bates (2008) offers a specific focus on Africa in this regard. The link between ethnic strife and weak central government works in both directions.

$$Y^c = e^{(\sigma+\xi)/\alpha} (1+ 1/ d_0) \quad (18)$$

Otherwise, a corner solution holds, identical to the corner solution without community leadership, with  $\Delta^c = 1$  and  $k^c = y_0 d_0 / (1+ d_0)$ .

Comparing (18) to (8) and (13), we find that  $Y^c$  is greater than both  $Y$  and  $Y'$ ; community leadership strengthens community identity. This can lead to a corner solution with maximal polarization and minimal productivity, when a corner solution is not optimal, or when an equilibrium without community leadership would result in an interior equilibrium. Comparing (17) to (14) which determines the optimal single-period outcome, we find that the interior equilibrium with community leadership always generates too much cultural polarization—and too little investment. Communal decision-making internalizes the intra-group externality but not the intra-group external effect of polarization on productivity. Comparing (17) to (6b) we find that communal decision-making always generates a larger degree of polarization than individual decision making. This is necessarily worse for parents only if the marginal inter-group externality  $\sigma$  is greater than the marginal intra-group externality  $\xi$ .

Summing up,

**Proposition 4.** Community leadership that internalizes the external cost of losing communal identity increases social polarization in equilibrium. Unless segregation is optimal, this results in excessive polarization.

The preceding discussion abstracted from the agency problems of community leadership, assuming leaders faithfully represent their communities, in line with our

assumption that communities are internally homogeneous. However, if the marginal cost of intergenerational alienation varies across individuals, and social orientation choices are made autonomously by each community, through representation by popularly elected community leaders, then voters may strategically vote for leaders with more extreme positions than their own. By committing to a stronger communal position on social identity, they aim to induce a more advantageous outcome when community leaders implicitly negotiate to reach a Nash equilibrium.<sup>18</sup> Thus, strategic considerations can result in communities selecting leaders more resistant to reducing social polarization than the community at large, resulting in low levels of investment and growth.<sup>19</sup> In particular, immigrant communities often follow leaders committed to preserving their cultural identity even at the cost of reduced economic prosperity.<sup>20</sup> This may or may not constitute a social welfare improvement, depending on the relative utility weight of cultural erosion. We develop these results formally in the Appendix.<sup>21</sup>

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<sup>18</sup> For related work on strategic delegation and further references, see Harstad (2010).

<sup>19</sup> See also Prummer and Siedlarek (2017) and Verdier and Zenou (2016) on the effect community leaders have on cultural preservation. We go beyond their analysis in our emphasis on the endogenous sources of polarizing leadership.

<sup>20</sup> This would appear to be more likely when community identity is defined by religion than, say, by language.

<sup>21</sup> These results are developed in the context of a single-period equilibrium. In a fully dynamic context, from the perspective of a social planner more concerned with the welfare of future generations than are the current generation of parents, the cost of extreme community leaders preserving social polarization—possibly advocating segregation—is yet greater.

Summarizing,

**Proposition 5.** When communities are heterogeneous in the marginal cost of intergenerational alienation, strategic voting will lead to the election of communal leaders who are more extreme in their position on social polarization than their constituencies, resulting in greater polarization.

### 5.3 Federation

Federation between the two communities in an integrated economy can address both the inter-group externality and the intra-group externality, and thus achieve outcomes that yield greater welfare than the non-cooperative Nash equilibria described above in the long run, but implementation may not be straightforward. Specifically, assume a federative arrangement between two groups of equal size, whereby in each period  $t$  one of the two groups is randomly selected to lead the federation and determine  $p_{ij,t+1}$ . Then, if community  $r$  is initially chosen, it will set  $p_{ir,1} = p_{r0}$  and  $p_{ib,1} = p_{r0} + \underline{\Delta}$ , where  $\underline{\Delta}$  is the productivity-maximizing level of polarization; and if community  $b$  is initially chosen, it will set  $p_{ib,1} = p_{b0}$  and  $p_{ir,1} = p_{b0} + \underline{\Delta}$ . Whichever occurs, from that period on it is in all parents' interest to set their children's social orientation equal to their own. Consequently,  $\underline{\Delta}$  remains the level of social polarization in all periods, resulting in maximal productivity and promoting growth; and social identities are stable. Thus, in the long run, the outcome of such a federative arrangement welfare-dominates the outcome achieved when social orientations are chosen individually or communally.

However, this does not necessarily apply in the short run, when the expected *ex ante* utility of a parent is initially (before the identity of the first federation leader is determined):

$$U_{i0}(k^f) = \log(y_0 - k^f) + \log A + \Phi(\underline{\Delta}) \log k^f - \frac{1}{2}(\sigma + \xi) \underline{\Delta} \quad (19)$$

where

$$k^f = y_0 \Phi(\underline{\Delta}) / (1 + \Phi(\underline{\Delta})) \quad (20)$$

This results in an expected utility of

$$U^f = (1 + \Phi(\underline{\Delta})) \log y_0 + \log A + g(\Phi(\underline{\Delta})) - \frac{1}{2}(\sigma + \xi) \underline{\Delta} \quad (21)$$

Comparing (21) to (11) we obtain that *ex ante* the expected utility of a first-generation parent in a federation is greater than under a non-cooperative equilibrium whenever  $\sigma + \xi$  is small enough in relation to the productivity advantage a federation offers. When  $\sigma + \xi$  is sufficiently large, the psychic cost of intergenerational alienation and erosion of community identity outweighs the productivity benefits of federative decision-making.<sup>22</sup>

**Proposition 6.** Federative arrangements are beneficial relative to individual or communal determination of social orientation, in the long run. However, if the psychic cost of intergenerational alienation and the erosion of community identity is high, it offers a lower level of immediate welfare for the first generation of parents who decide on federation.

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<sup>22</sup> We assume, for simplicity that agents are risk-neutral. If they are risk-averse, the uncertainty of the federation outcome is a further disadvantage.

This potential short run disadvantage of federative arrangements may explain why such arrangements are not observed more commonly in fractionalized countries.

#### **5.4 External injection of material resources**

A third source of market failure in our model is the complementarity of investment and reduced social polarization, which may result in the economy stagnating in a socially polarized, low income equilibrium though a higher level equilibrium is possible. In some cases, discussed above, it is possible to move from a low to a high-level equilibrium through the efforts of a central government inducing or brokering some measure of reciprocal convergence. However, this is not always enough. In a resource-poor economy, where parents have little to invest and hence little to gain from social convergence—and much to lose from an erosion of their separate cultural identity, as when (7) holds with inequality—it may be in their interest to maintain a culturally stable, highly polarized, segregated economy. The end result then is low income and high polarization in the steady state. In this case, a one-time external injection of resources might be needed to move the economy to higher plane, raising parents' income above the threshold  $Y$  that inhibits convergence and initiating a spurt of sustained growth.<sup>23</sup>

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<sup>23</sup> For example, direct foreign aid or credit could fund subsidies for investment in human capital, say by directly subsidizing school construction or vocational education. This one-time external infusion of resources could be repaid from taxes on the added income of future generations.

**Proposition 7.** When the parent generation favors segregation, because parents value their separate cultural identities, and low initial incomes constrain investment, so that incentives for reducing social polarization are weak, a one-time injection of external resources can extricate the economy from its low-level equilibrium and set it on a trajectory of stronger growth.

## **6. Conclusion**

We develop a simple model that captures the reciprocal effect between social polarization among the different cultural communities that comprise an economy and its productivity and economic growth: growth is shaped by the extent of social polarization while also affecting the rate at which polarization is reduced. This reciprocity raises the possibility of multiple equilibria: the stagnating low-level equilibrium of a poorly endowed socially polarized economy, and the high-level equilibrium of a prosperous, culturally integrated economy enjoying strong growth.

We then use this framework to highlight three sources of potential market failures, and outline steps that might be taken by non-market forces to address them. They are: the beneficial effect of one group moving towards the other on the other group's productivity, an inter-group externality; the benefit of maintaining group identity, an intra-group externality; and the complementarity between poverty and social polarization, where poverty suppresses the incentive for bridging cultural differences, and excessive polarization inhibits growth.

When the inter-group externality is stronger than the intra-group externality, central government can increase welfare by coordinating a reciprocal acceleration of cultural convergence, e.g., through a centralized school system. This requires the government to be able to commit to an optimal trajectory and enforce it, highlighting a channel through which a strong capacity to govern promotes economic development. In the opposite case, when the intra-group externality is stronger, strong leadership within each subgroup may be needed to internalize the benefit of group identity and promote the retention of separate cultural identities. However, when communities are heterogeneous in the marginal cost of intergenerational alienation, strategic voting may lead to the election of communal leaders who are more extreme in their position on social polarization than their constituencies, resulting in excessive polarization. A federative arrangement can address both inter-group and intra-group externalities, and thus substantially improve welfare in the long run, but may be less popular in the short term. Finally, the mutual reinforcement of poverty and social polarization suggests that external intervention may be necessary to extricate a resource-poor, ethnically riven economy from a low-level equilibrium, through a one-time infusion of external credit or aid, which could jump-start a trajectory of sustained growth.

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## Appendix: The choice of social orientation by elected community leaders

We assume that social orientation choices are made autonomously and collectively by each community, and compare direct voting on social orientation to social orientation determined by representative community leaders elected by popular vote. Assume also that  $\sigma$ , the parameter value of aversion to intergenerational distance, varies across individuals, and denote its individual values  $\sigma_i$ ; and that in each period  $\sigma_i$  is identically and independently distributed in each community. Denote by  $G$  its cumulative distribution function, and assume that  $G$  is continuous in the interval  $[0, \Sigma]$ , where  $\Sigma$  is not too large (in a sense that made clear below).

Consider first the case where each community directly determines the social orientation of its next generation,  $\pi_{j,t+1}$ , by majority vote; and that a Nash equilibrium between communities holds. The utility  $U_{ijt}$  of individual  $i$  in community  $j$  is then a function of individually determined investment,  $k_{ij,t+1}$ , and communally determined social orientation,  $\pi_{j,t+1}$ . Substituting the production function for next generation output in  $U_{ijt}$ :

$$U_{ijt} = \log(c_{ijt}) + \log(Ak_{ijt}^{\Phi_{ijt}}) - \sigma_i |\pi_{j,t+1} - \pi_{jt}| - \xi |\pi_{j,t+1} - \pi_{jt}| \quad (\text{A1})$$

The level of investment that maximizes (A1) subject to the budget constraint then satisfies (6a); and the preferred social orientation of voter  $i$  in community  $j$  satisfies (20), with  $\sigma_i$  replacing  $\sigma$  there. This, in turn, implies that the preferred distance  $|\pi_{j,t+1} - \pi_{jt}|$  monotonically increases in  $\sigma_i$ , which implies that the household with the median value of  $\sigma_i$  is decisive. Let  $\sigma_m$  denote this median value. Then the equilibrium communal levels of social orientation determined by majority voting satisfy:

$$\alpha \Delta^c \log(k^c) - \sigma_m - \xi = 0 \quad (\text{A2})$$

Now consider the case where in each period, communities select their respective leaders through majority voting, and these leaders determine their communities' social orientation, with investment again determined individually.<sup>24</sup> The equilibrium levels of communal social orientation by leader  $L_j$  of community  $j$  are given as follows:

$$\text{If } \sigma_{Lb} > \sigma_{Lr} \text{ then } \alpha \Delta^c \log(k^c) - \sigma_{Lr} - \xi = 0, \text{ and } p_{b1} = p_{b0} \quad (\text{A3a})$$

$$\text{If } \sigma_{Lr} > \sigma_{Lb} \text{ then } \alpha \Delta^c \log(k^c) - \sigma_{Lb} - \xi = 0, \text{ and } p_{r1} = p_{r0} \quad (\text{A3b})$$

It follows by total differentiation of (A3) that a leader's preferred level of social orientation is more extreme the larger is  $\sigma_{Lj}$ . As individual utilities decrease in intergenerational distance, it follows that in equilibrium both communities select as their leaders individuals with the highest aversion to intergenerational distance,  $\Sigma$ . The equilibrium distance is then determined by:<sup>25</sup>

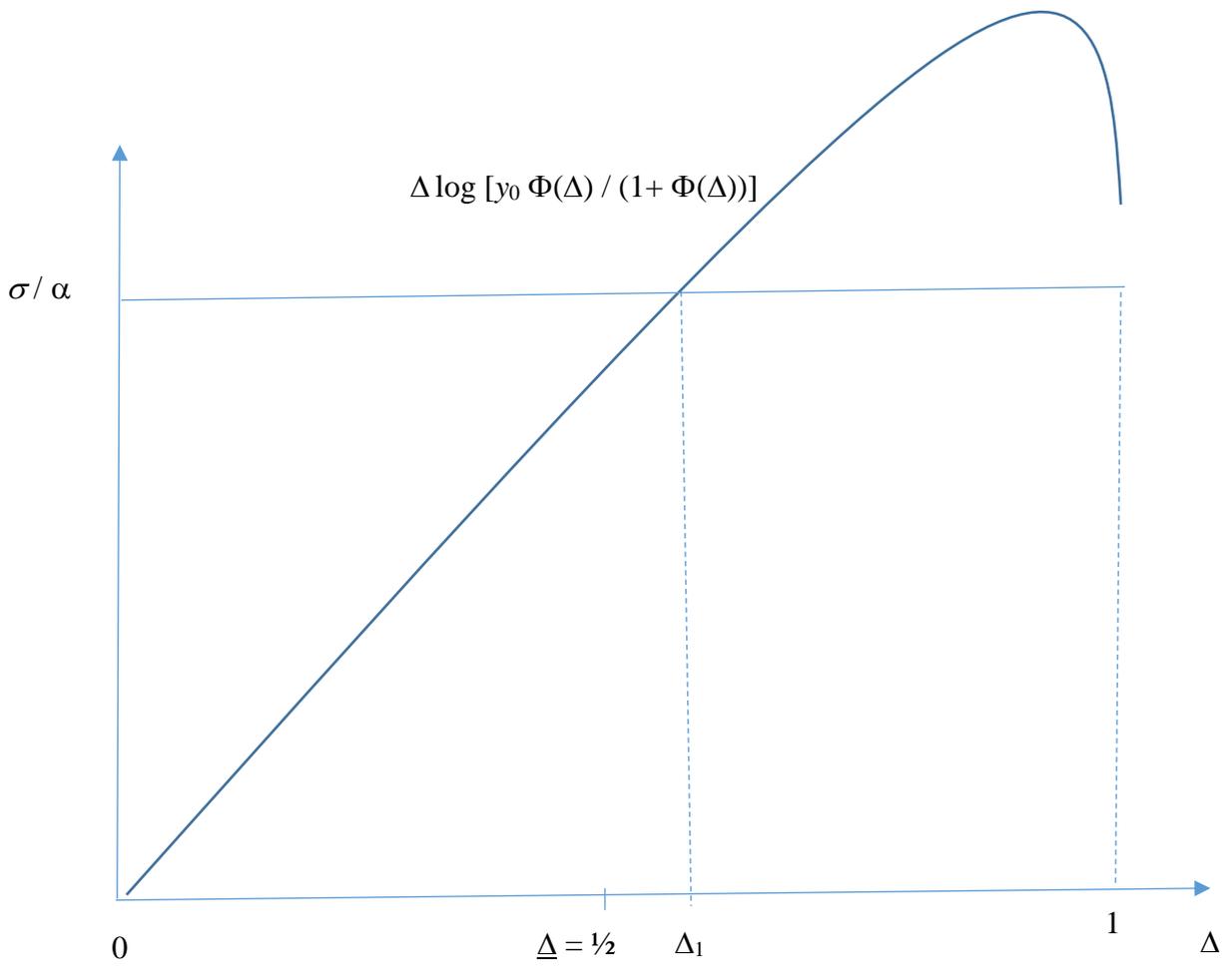
$$\alpha \Delta^c \log(k^c) - \Sigma - \xi = 0 \quad (\text{A4})$$

Comparing (A4) to (A2), we observe that delegation of decision making to elected leaders induces a larger degree of polarization, and hence a lower level of investment, than direct voting over social orientations within the communities. However, the welfare implications of delegation are ambiguous: if the disutility of cultural erosion is large, then a majority of households may prefer the greater polarization that results under delegation.

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<sup>24</sup> We make the simplifying assumption that these individual decisions are made simultaneously with collective choices of social orientation, and omit individual subscripts "i" where this does not cause confusion.

<sup>25</sup> This holds if  $\Sigma$  is small enough, so that (A4) holds for an internal value of  $\Delta^c$ . If  $\Sigma$  is larger, then the corner solution  $\Delta^c = 1$  obtains.



**Figure 1. The equilibrium level of social polarization**