

# Public Education and the Melting Pot

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## Abstract

This paper proposes a theoretical framework that combines the role of education as a cultural melting pot with its function as an instrument of human capital accumulation, thus highlighting the important role of education finance in promoting social cohesion. Our analysis shows that an education regime that offers free uniform public education while requiring minority parents to pay twice for culturally distinct private education creates excessively powerful incentives for cultural assimilation. This indicates scope for Pareto improvement by simultaneously subsidizing private education—through vouchers or tax credits—and regulating its content. Subsidizing private schooling without regulating its content increases social polarization, which countervails its potential academic benefits and may partly explain the strong opposition to voucher experiments in practice. The impact of variation in the rate of immigration on cultural assimilation, and the role of multiculturalism in the public school system are also considered.

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## 1 Introduction

In this paper, we focus on the role of public education as an “agent of cultural standardization” that draws immigrant children closer to the majority culture by weakening their ties to the traditional values on which their parents were raised (Katz, 1976). This view of education as a key element of the melting pot is incorporated here within the framework of a simple growth model in which the productivity of human capital is predicated on cultural proximity, and education is both an instrument of human capital accumulation and a catalyst of cultural assimilation.

In the United States, public schools have historically enjoyed substantial success in assimilating large groups of immigrants in a common culture. While ethnic and cultural divisions remain a potential source of social tension, the United States continues to be a melting pot in which people from widely varying backgrounds assume a common cultural identity in the course of two or three generations. Some immigrant ethnic groups may retain their separate identities for longer periods, but, in general, the cultural assimilation of immigrants in the United States has proceeded smoothly.<sup>1</sup> This success is partly attributable to the regime of public finance of education in the United States, which does not exempt parents who opt out of public education from education taxes, thus effectively requiring them to “pay twice” for educating their children privately. Clearly, this provides a strong economic incentive for parents belonging to cultural minorities to send their children to public schools where they will be more rapidly assimilated in the dominant national culture. Conversely, proposals to subsidize private schooling through vouchers or tax credits weaken these incentives and thus threaten to increase social polarization.<sup>2</sup>

The formal framework developed in this paper to examine this effect integrates the role of education in promoting social cohesion within a simple dynamic model of growth driven by human capital accumulation through education. It posits that the productivity of economic

transactions is negatively related to the cultural distance between the transacting agents.<sup>3</sup> This implies that minority parents can contribute to the material well-being of their children by raising them in the mainstream culture, but only at the cost of diluting their traditional minority values and weakening the bond between parent and child.

An education system that offers minority parents tax-funded free public schooling in the mainstream culture while requiring them to pay twice for private education in the minority culture promotes the cultural assimilation of minority children, thereby reducing productivity losses from cultural heterogeneity. We show, however, that financing public education in this manner is not fully efficient because the rate of assimilation in the majority culture that it imposes on the minority is too rapid;<sup>4</sup> there is scope for a mutually beneficial contract under which private education is subsidized and its content regulated.<sup>5</sup> While in many contexts the basic trust that is needed for centralized regulation of private school curricula is lacking, it may still be in the majority's interest to subsidize private education—through education vouchers, tuition tax credits, etc.—without regulating its content. Our analysis of the majority's interests in this regard highlights the need to weigh the academic and fiscal advantages of partially subsidizing private education against the loss of social cohesion that it entails. This potential loss partly explains why such measures remain largely untried despite their popularity with beneficiaries, and despite empirical indications that they need not have an adverse effect on public school finances.<sup>6</sup> Further extensions of the analysis allow us to consider the effect of variation in the immigration rate on cultural assimilation, and the role of multiculturalism in public schools.

Several empirical papers have recently described the adverse effect of ethnic heterogeneity on economic welfare, which we assume here. Cross-country analyses by Easterly and Levine (1997) and Knack and Keefer (1997) find that ethnic heterogeneity adversely affects the quality of services provided by the central government, promotes corruption and rent-

seeking, leads to inefficient policies, and reduces growth rates. The adverse effect of ethnic and racial heterogeneity on social policies are indicated by Alesina et al. (1999); and their effect on urban growth in a cross-section of communities in the United States is demonstrated by Glaeser et al. (1995).<sup>7</sup> Our paper extends work by Bisin and Verdier (2000, 2001) and Lazear (1999) who examine different aspects of cultural assimilation, but do not consider the role of public education. In our previous work, Gradstein and Justman (2001), we study its effect on income growth, but abstract from the institutional aspects of education finance on which we focus here.<sup>8</sup>

The structure of the paper is as follows. Section 2 begins by laying out the basic definition of an economy populated by an indigenous, culturally stable majority and a distinct immigrant population, in which education both builds human capital and determines cultural orientation. It then analyzes the benchmark case of decentralized education in which the minority group independently sets its own education policy, balancing the economic cost of cultural separatism against the emotional benefits of raising one's child in one's own traditions. Section 3 then goes on to analyze a system of public education in which minority parents can "opt out" of the public system and pay for private schooling while continuing to pay the full education tax. Section 4 examines the incentives for the majority to offer school vouchers. Section 5 extends the basic analysis to consider the role of public education in the cultural assimilation of new immigrants. Section 6 considers the possibility of cultural accommodation in the public school system, and Section 7 concludes.

## **2 Definition of the Model**

### ***2.1. Basic assumptions***

Consider an economy with a population of households of measure one indexed by  $i$ , each comprising a parent and child and operating in discrete time periods  $t$ . Households are

characterized by cultural identity and income. We assume that cultural identity can be represented by a one-dimensional numerical scale, and that the population initially consists of two uniform groups: an indigenous, culturally immobile majority and a distinct, potentially assimilating minority. Without loss of generality we locate the permanent cultural orientation of the majority at the origin, and denote by  $d_0 > 0$  the uniform initial cultural orientation of the minority; this will imply that future minority cohorts also have a uniform cultural orientation, which we denote  $d_t$ .<sup>9</sup> Let  $w_t$  denote the measure of the majority in period  $t$ , so that  $1 - w_t$  is the measure of the minority. The initial share of the majority,  $w_0$ , is given, and we assume that  $w_0 > 1/2$ , which will imply that in subsequent periods  $w_{t+1} = w_t > 1/2$ . Thus the extent of cultural heterogeneity in any period  $t$  is measured in two dimensions: the size of the minority  $1 - w_t$ , and the cultural distance between the two groups,  $d_t$ .

Denote the income of household  $i$  in period  $t$  by  $y_{it}$ , and the distribution of income in the majority and minority groups respectively by  $F_t(y)$  and  $G_t(y)$ , where the initial distributions  $F_0(y)$  and  $G_0(y)$  are given. Income is produced by parents in proportion to the amount of human capital they acquired as children,  $h_{it}$ , modified by an exogenous parameter  $a_{it}$  that captures an individual's innate ability and her access to technological opportunities, and by a productivity coefficient  $P_{it}$  that is a function of cultural distance,

$$y_{i+1} = a_{i+1} h_{i+1} P_{i+1} \tag{1}$$

We assume that the  $\{a_{it}\}$  are i.i.d. with a skewed distribution such that their mean value in any given generation always exceeds their median; and that the initial distribution of  $a_{i0}$  is uncorrelated with the initial income distribution, implying the absence of a correlation in future periods, too.<sup>10</sup> The productivity coefficient  $P_{it}$  is taken as the mean productivity of numerous chance encounters that individual  $i$  is assumed to have in period  $t$  with other

individuals in her cohort. Denoting by  $p(d)$  the productivity of a single transaction between individuals separated from each other by the distance  $d$ , internal cultural uniformity in each group implies that:

$$P_{it} = \begin{cases} w_i + p(d_i)(1 - w_i) & \text{if individual } i \text{ belongs to the majority} \\ w_i p(d_i) + 1 - w_i & \text{if individual } i \text{ belongs to the minority} \end{cases} \quad (2)$$

We assume that  $p(0) = 1$ ,  $p(d_0) < 1$ ,  $p'(d_0) < 0$ , and  $p''(d) < 0$ .<sup>11</sup>

Both human capital and cultural identity are acquired through education. The amount of human capital accumulated by a child,  $h_{i+1}$ , is assumed equal to spending per pupil in her school. Her cultural orientation is determined by the type of school she attends: schooling at a majority-supported school produces a cultural orientation located at the origin,  $d_{i+1} = 0$  (the majority cultural orientation), while schooling at a minority-supported school produces a cultural orientation determined by the parents of the children in the school. The cost of schooling is not affected by cultural orientation, and both types of schools are assumed to be equally efficient.

Parents make all schooling decisions on behalf of their children, for whom they have an altruistic regard. The utility which the parent of household  $i$  in period  $t$  maximizes is an increasing function of current household consumption,  $c_{it}$ , and of the anticipated income of her child in the next period,  $y_{i+1}$ ; and a decreasing function of the social distance between parent and child,  $C(d_{it} - d_{i+1})$ , where  $C(0) = 0$  and  $C$  is increasing and convex. To fix ideas, we posit

$$U_{it} = (1 - \mathbf{a}) \log(c_{it}) - C(d_{it} - d_{i+1}) + \mathbf{a} \log(y_{i+1}) \quad (3)$$

where  $0 < \mathbf{a} < 1$  represents the degree of parental altruism and  $y_{i+1}$  is given by (1).

## 2.2. Decentralized schooling

It will be useful to begin with the benchmark case of decentralized schooling in which the minority maintains a separate school system and is not required to participate in funding majority schools. In this case, each parent individually chooses the cultural type of school her child will attend—majority or minority—and the level of investment in her child’s human capital; and minority parents also collectively determine the cultural orientation of their schools (the cultural orientation of majority schools is fixed at the origin). Maximization of the utility function (3) over  $h_{it+1}$  subject to the budget constraint:

$$y_{it} = c_{it} + h_{it+1} \tag{4}$$

yields a solution that does not depend on cultural orientation, because of the separable form of the utility function:

$$h_{it+1} = \mathbf{a} y_{it} \quad \text{and} \quad c_{it} = (1 - \mathbf{a}) y_{it} \tag{5}$$

The separable form of the utility function also implies that school choice is independent of income, and as all minority parents initially have the same cultural orientation they all want the same cultural orientation for their children’s schooling. Hence, along the transition path the two population groups retain their internal cultural homogeneity, and do not change in size,  $w_{t+1} = w_t$ , as long as they remain distinct.

Utility maximization by minority parents with respect to their desired cultural orientation therefore yields one of the following three conditions along the transition path.

Either

$$C'(d_t - d_{t+1}) + \mathbf{a} p'(d_{t+1}) w_0 / [p(d_{t+1}) w_0 + 1 - w_0] = 0 \quad (6)$$

at an interior point on the equilibrium path; or

$$C'(0) + \mathbf{a} p'(d_t) w_0 / [p(d_t) w_0 + 1 - w_0] \geq 0 \quad (7)$$

and  $d_{t+1} = d_t$  is a steady state in which some degree of polarization is perpetuated; or

$$C'(d_t) + \mathbf{a} p'(0) \leq 0 \quad (8)$$

and  $d_{t+1} = 0$  is a steady state in which the minority is fully assimilated in the majority culture. Equation (6) optimizes the trade-off between a parent's desire to bring up her child in her own cultural orientation and her concern for the child's future material well being, which depends on assimilation in the majority culture.<sup>12</sup> The convexity of  $C$ , the concavity of  $p$ , and the fact that  $p$  decreases in the relevant range guarantee that the second order condition is satisfied and that (6) has at most one solution. Moreover, it follows from the second order condition that (8) does not hold if and only if (7) holds for some positive value of  $d_t$ ; and that (7) can have at most one solution. Hence the equilibrium described by (6) has a unique steady state given by either (7) or (8).

The equilibrium path we have described is not efficient. Under decentralized schooling the minority community, when making its educational decisions, disregards the benefits of reduced polarization for the majority. A Pareto improvement can be achieved by the majority paying the minority to align minority school curricula more closely to the majority culture and thus accelerate its cultural assimilation. Summing up:

*Proposition 1.* When schooling is decentralized there exists a unique equilibrium path along which the minority draws culturally closer to the majority, and which converges to a unique steady state. If inequality (8) holds then the minority is entirely assimilated in the majority in the steady state; if it does not hold then the minority retains a separate cultural identity given by (7). In either case, the equilibrium path is not efficient: a Pareto improvement can be achieved by the majority paying the minority to accelerate its assimilation.

### **3 Public Education**

A Pareto improving contract that requires minority schools to adopt a curriculum closer to the mainstream may be difficult to implement.<sup>13</sup> Instead, the majority may use its political power unilaterally to accelerate the assimilation of the minority. One way of creating incentives for more rapid assimilation of the minority is through a system of public education funded by an education tax in which parents who send their children to private schools are not exempt from this tax, but must pay twice for their children's education—paying the education tax that finances public schooling as well as their own private tuition. Such a system benefits the majority in two ways: it draws the minority closer to the majority while also reducing the tax price of public education.

#### ***3.1. Institutional description***

Assume an education system in which state schools are funded by a proportional income tax of  $t_t$ , determined by a majority of parents and levied on all parents irrespective of the type of school they choose for their children. The revenue raised through the income tax is used to provide a uniform level of schooling for children in public schools. Letting  $Y_t$  denote the total

amount of income in period  $t$ , the amount of human capital accumulated by a child attending a state school is then

$$h_{it+1} = \mathbf{t}_t Y_t / w_{t+1} \quad (9)$$

The amount of private consumption by a household with income  $y_{it}$  that sends its child to a state school is

$$c_{it} = (1 - \mathbf{t}_t) y_{it} \quad (10)$$

Private education is paid for out of after tax income, and to simplify the analysis we assume that private schools must supply the same quality of education as public schools, which in the present context implies that spending per pupil in private schools must equal the level of spending given by equation (9). This implies that majority parents always send their children to public schools. Combining (2), (3), (9) and (10), the utility level of a majority parent is

$$U_{it} = (1 - \mathbf{a}) \log [(1 - \mathbf{t}_t) y_{it}] + \mathbf{a} \log \{ a_{it+1} (\mathbf{t}_t Y_t / w_{t+1}) [w_{t+1} + p(d_{t+1})(1 - w_{t+1})] \} \quad (11)$$

and the utility level of a minority parent choosing to send her child to public school is

$$V_{it}^{pub} = (1 - \mathbf{a}) \log [(1 - \mathbf{t}_t) y_{it}] - C(d_t) + \mathbf{a} \log \{ a_{it+1} (\mathbf{t}_t Y_t / w_{t+1}) [w_{t+1} + p(d_{t+1})(1 - w_{t+1})] \} \quad (12)$$

Given that the quality of private schooling is dictated by (9), the private consumption of the parent of a child attending private school is

$$c_{it} = (1 - \mathbf{t}_t) y_{it} - \mathbf{t}_t Y_t / w_{t+1} \quad (13)$$

The cultural orientation of private schools  $d_{t+1}$  is collectively determined by all parents of children attending these schools. The utility level of these parents is:

$$V_{it}^{pr} = (1 - \mathbf{a}) \log [(1 - \mathbf{t}_t) y_{it} - \mathbf{t}_t Y_t / w_{t+1}] - C(d_t - d_{t+1}) + \mathbf{a} \log \{ a_{it+1} (\mathbf{t}_t Y_t / w_{t+1}) [p(d_{t+1}) w_{t+1} + 1 - w_{t+1}] \} \quad (14)$$

The sequence of events in each period is as follows. First, the majority of parents determine the education tax rate  $\mathbf{t}_t$ , anticipating the future decisions of the minority. Then each minority parent individually decides whether her child will attend public or private school, anticipating the cultural orientation of private education. Finally, the parents of private school children collectively determine the cultural orientation of private education. An equilibrium is a sequence of such consistent decisions.

### ***3.2. Equilibrium analysis***

We solve the model recursively, beginning our analysis with the choice of cultural orientation in private education, after the tax rate and individual school choice have already been determined. By assumption, the choice of curriculum in private education is made collectively by parents who have decided to opt out of the public school system. Given our assumption that private schools must supply the same quality of education as public schools, only minority parents have an incentive to choose private education. Their preferred cultural orientation is derived by maximizing the utility function in (14), differentiation of which yields the first-order condition:

$$C'(d_t - d_{t+1}) + \mathbf{a} p'(d_{t+1}) w_{t+1} / [p(d_{t+1}) w_{t+1} + 1 - w_{t+1}] = 0 \quad (15)$$

Equation (15) determines the collective choice of cultural orientation in private schools. Differentiation of the left-hand side of (15) reveals that it is declining in  $d_{t+1}$ , which ensures that the second order condition holds, and increasing in public school enrollment  $w_{t+1}$ , which implies that the chosen value of  $d_{t+1}$  is a decreasing function of  $w_{t+1}$ . Thus the larger is the relative size of the majority the closer is the cultural orientation of minority schools to the majority culture.

Minority parents individually choose the type of school to which they send their children (after the tax rate has been set). This choice is predicated on the anticipated cultural orientation of minority schools, described by equation (15), and on a working assumption regarding the level public enrollment; in equilibrium we require that these anticipations are correct. Parental utility is given by (12) when the child attends public school, and by (14) when she attends private school; parent  $i$  opts for private school if and only if (14) exceeds (12). The utility differential between (12) and (14) is

$$V_{it}^{pub} - V_{it}^{pr} = (1 - \mathbf{a}) \log\{ [(1 - \mathbf{t}_t) y_{it}] / [(1 - \mathbf{t}_t) y_{it} - \mathbf{t}_t Y_t / w_{t+1}] \} - [C(d_t) - C(d_t - d_{t+1})] + \mathbf{a} \log\{ [w_{t+1} + p(d_{t+1})(1 - w_{t+1})] / [p(d_{t+1}) w_{t+1} + 1 - w_{t+1}] \} \quad (16)$$

where  $w_{t+1}$  should be taken here to denote the anticipated fraction of the population attending public school. This utility differential is clearly decreasing in income, implying that there is a threshold income level  $\underline{y}(w_{t+1})$ , contingent on anticipated public enrollment, such that all minority parents with income above this threshold send their children to private school, while those with income below it send their children to public school. Parents must pay twice for

their children's education if they opt out of public school, and poorer parents are less able to afford the added expense. Consequently, only more affluent parents choose to retain their cultural orientation by sending their children to a private school.

We require that, in equilibrium, minority parents' anticipations regarding public enrollment are realized. Recalling that  $G_t(y)$  denotes the distribution of income in period  $t$  among minority parents,  $G_t(\underline{y}(w_{t+1}))$  is the fraction of these parents who send their children to public school. As all majority parents send their children to public school, in equilibrium we must have

$$w_{t+1} = w_t + G_t(\underline{y}(w_{t+1})) \quad (17)$$

A sufficient condition for (17) to have a unique solution in  $w_{t+1}$  is that the derivative of its right-hand side is less than one:

$$g_t(\underline{y}(w_{t+1})) \underline{y}'(w_{t+1}) < 1 \quad (18)$$

where  $g_t$  is the density function of  $G_t$ . This depends on the effect of anticipated public enrollment  $w_{t+1}$  on the threshold income level. Differentiating (16) with respect to  $w_{t+1}$  reveals that it has a mixed effect. An increase in public enrollment reduces spending per pupil in public education, which also lowers the cost of private schooling, favoring private education and lowering the threshold; but at the same time, increased public enrolment also implies a larger cultural majority in the next period, and hence a greater productivity loss from sending one's child to a minority school, which raises the threshold.<sup>14</sup> Inequality (18) holds if the latter effect is comparatively not too large, which we will assume to be the case.

We complete our analysis by characterizing the education tax rate chosen by the majority of parents. It is the preferred tax rate of a parent in the cultural majority, which is derived by maximizing (11) with respect to  $t_t$ , while anticipating the equilibrium determination of  $d_{t+1}$  and  $w_{t+1}$ . The first-order condition is

$$-(1-a)/(1-t_t) + a/t_t + a \{ [-p(d_{t+1})/w_{t+1} + (1-w_{t+1})p'(d_{t+1})(\partial d_{t+1}/\partial w_{t+1})](\partial w_{t+1}/\partial t_t) \} / [w_{t+1} + p(d_{t+1})(1-w_{t+1})] = 0 \quad (19)$$

Absent the effect of the tax rate on public enrollment, the chosen tax rate would be  $t_t = a$ . However, differentiation of (16) with respect to  $t_t$  reveals that it has a negative effect on the utility differential between private and public schooling, implying a positive relationship between the tax rate and the equilibrium level of public school enrollment—as might be expected.<sup>15</sup> This has opposing effects on majority parents' choice of the tax rate: on the one hand, it directly lowers spending per pupil in the public system; on the other hand, it indirectly draws the cultural orientation of the minority closer to the majority, which will increase the future productivity of majority children. If the former effect dominates, a tax rate greater than  $a$  will be adopted; if the latter effect dominates, the chosen tax rate will be less than  $a$ .

The above analysis indicates a dynamic equilibrium path, along which the share of public enrollment grows continually while minority schools draw closer to the majority culture. Comparing it to the decentralized equilibrium, we observe that  $w_t$ , the fraction of the population subscribing to the majority culture, is higher in each period under public education than under decentralized private education. Consequently, because of the inverse relationship between  $w_t$  and  $d_t$ , the cultural distance between the two groups is smaller under public education than under a decentralized school system.<sup>16</sup> Thus public education achieves a

higher degree of cultural homogeneity than the decentralized school system in regard to both the relative size of the majority and the cultural proximity between the two groups. Finally, note that revealed preference implies that the cultural majority favors public education over decentralized private education. A tax rate of  $t_t = a$  would induce some cultural assimilation of the minority as well as increasing spending per pupil in public education, compared to decentralized private education, which is a welfare improvement for the majority; the tax rate that is actually chosen can only result in further improvement. Collecting results:

*Proposition 2:* Under a system of public schooling in which sending one's child to private school does not reduce one's education tax liability, if inequality (18) holds there exists a unique equilibrium path along which the economy is less culturally polarized than along the path that results when schooling is decentralized. The majority prefers this system to decentralized schooling.

This equilibrium is not fully efficient. As private school parents determine their school curriculum unilaterally, first-order conditions imply that the marginal effect of a small reduction in  $d_{t+1}$  on minority school parents is negligible. However the same change will have a non-negligible benefit for majority parents. It follows that both the minority and the majority can gain from the majority subsidizing private education and the minority aligning the cultural orientation of its schools more closely to the majority culture. A coordinated choice of school financing and minority school curriculum content can make everyone better off. Summing up,

*Proposition 3.* The centralized equilibrium path is not efficient. The minority and the majority can both gain if the majority partially subsidizes private education and the minority accelerates the rate at which its schools draw closer to the majority culture.

#### 4 Vouchers: Subsidized Decentralization

Contingent contracts that subsidize private minority schooling in return for changes in the private school curriculum, though they constitute a Pareto improvement over centralized public education, may be difficult to implement in practice.<sup>17</sup> It is possible, however, that subsidizing private education—through tuition tax credits, education vouchers, or by directly defraying some of the costs of private education—may be desirable for the majority—and hence a Pareto improvement—even without a reciprocal change in the cultural orientation of minority schooling.<sup>18</sup> If private enrollment is sufficiently elastic with respect to the rate of subsidization, such a subsidy can reduce the tax price of public education, and thus increase spending per pupil in the public system without raising taxes. Indeed, numerical analyses have shown that such an increase is likely for typical parameter values, in the United States.<sup>19</sup> If this were the only consideration, such subsidies should be widely observed. That they are not—even limited, experimental school voucher programs are hotly contested—suggests that any fiscal benefits are outweighed by the detrimental effect of increased private enrolment on cultural homogeneity. We examine these effects formally in the context of our model.

Let  $s$  denote the amount of a voucher that households can use to partially defray the cost of sending their children to private school. For a given tax rate, the quality of human capital of a child attending a state school is then

$$h_{it+1} = [\mathbf{t}_t Y_t - s(1 - w_{t+1})]/w_{t+1} \quad (9')$$

where  $w_{t+1} = w_{t+1}(s)$  is itself a function of the subsidy. The utility level of a member of the cultural majority can then be written as follows:

$$U_{it} = (1 - \mathbf{a}) \log [(1 - \mathbf{t}_t) y_{it}] +$$

$$\mathbf{a} \log \{ a_{it+1} [(\mathbf{t}_t Y_t - s(1 - w_{t+1})) / w_{t+1}] [w_{t+1} + p(d_{t+1})(1 - w_{t+1})] \} \quad (11')$$

and that of a minority parent who sends her child to public school is

$$V_{it}^{pub} = (1 - \mathbf{a}) \log [(1 - \mathbf{t}_t) y_{it}] - C(d_t) + \mathbf{a} \log \{ a_{it+1} [(\mathbf{t}_t Y_t - s(1 - w_{t+1})) / w_{t+1}] [w_{t+1} + p(d_{t+1})(1 - w_{t+1})] \} \quad (12')$$

Retaining our assumption that investment in human capital must be equal in both types of school,  $(\mathcal{G})$  also represents the quality of human capital of a child attending private school.

The parent of such a child then has private consumption of

$$c_{it} = (1 - \mathbf{t}_t) y_{it} - [\mathbf{t}_t Y_t - s(1 - w_{t+1})] / w_{t+1} + s = (1 - \mathbf{t}_t) y_{it} - \mathbf{t}_t Y_t / w_{t+1} + s / w_{t+1} \quad (13')$$

The utility level of a parent who chooses to send her child to a private school is therefore

$$V_{it}^{pr} = (1 - \mathbf{a}) \log [(1 - \mathbf{t}_t) y_{it} - \mathbf{t}_t Y_t / w_{t+1} + s / w_{t+1}] - C(d_t - d_{t+1}) + \mathbf{a} \log [a_{it+1} (\mathbf{t}_t Y_t - s(1 - w_{t+1}) / w_{t+1}) (w_{t+1} p(d_{t+1}) + 1 - w_{t+1})] \quad (14')$$

This implies that the condition which determines cultural orientation in private schools is the same as before and given by (15).

Comparing (12') and (14'), a minority parent will send her child to public school if and only if

$$(1 - \mathbf{a}) \log \{ [(1 - \mathbf{t}_t) y_{it}] / [(1 - \mathbf{t}_t) y_{it} - \mathbf{t}_t Y_t / w_{t+1} + s / w_{t+1}] \} - [C(d_t) - C(d_t - d_{t+1})] > \mathbf{a} \log \{ [w_{t+1} + p(d_{t+1})(1 - w_{t+1})] / [(w_{t+1} p(d_{t+1}) + 1 - w_{t+1})] \} \quad (16')$$

As in the earlier discussion, for a given tax rate, this uniquely determines an income threshold such that minority parents whose income is below this level send their children to public school and those with income above the threshold send their children to private school.<sup>20</sup> This cutoff level is the value of  $y_{it}$  that satisfies (16') with equality, where  $d_{t+1}$  is determined by equation (15). Differentiation reveals that public enrollment  $w_{t+1}$  is a decreasing function of the private school voucher  $s$  as would be expected. The majority determines the education tax rate anticipating the decisions of the cultural minority as before. The first-order condition that the majority's decision satisfies is similar to (19).

We now consider the effect of a voucher on the utility of a majority voter, given by (11'), so as to determine conditions in which it benefits the majority to subsidize private schooling unilaterally. Differentiating (11') with respect to  $s$  we note first that a voucher is beneficial to the majority if and only if it leads to higher future income. Equation (11') highlights the two channels through which the voucher exerts its effect:<sup>21</sup> the cost of polarization  $w_{t+1} + p(d_{t+1})(1 - w_{t+1})$ , and spending per student  $[t_t Y_t - s(1 - w_{t+1})] / w_{t+1}$ . The derivative of the cost of polarization with respect to the voucher amount is

$$\begin{aligned} & \partial [(w_{t+1} + p(d_{t+1})(1 - w_{t+1}))] / \partial s = \\ & \{ [1 - p(d_{t+1})] + (1 - w_{t+1}) [\partial p(d_{t+1}) / \partial d_{t+1}] [\partial d_{t+1} / \partial w_{t+1}] \} [\partial w_{t+1} / \partial s] \end{aligned} \quad (20)$$

Note that  $\partial d_{t+1} / \partial w_{t+1}$  is determined from (15) and is negative as was established earlier, and that  $\partial p(d_{t+1}) / \partial d_{t+1}$  is negative by assumption in the relevant range. As  $\partial w_{t+1} / \partial s$  is also negative, it follows that (20) is negative, illustrating the voucher's detrimental impact on the utility of majority households, deriving from its inhibiting effect on the rate of cultural assimilation. The derivative of spending per student is

$$\frac{\partial [(t_t Y_t - s(1 - w_{t+1})) / w_{t+1}]}{\partial s} = - (1 - w_{t+1}) / w_{t+1} - (t_t Y_t - s) (\partial w_{t+1} / \partial s) / w_{t+1}^2 \quad (21)$$

In general, this has an ambiguous sign that depends on  $\partial w_{t+1} / \partial s$ , the degree in which public and private enrollment rates are responsive to the size of the voucher. When the response is relatively inelastic, the voucher is ineffective in reducing public enrollment, causing spending per student in public education to fall (at a given tax rate). In this case, the voucher exerts a detrimental effect on the utility of majority households through both channels. Only when private enrollment responds elastically to the size of the voucher can it increase public school spending per student, and only when this positive effect outweighs the detrimental effect of the voucher on social cohesion will the majority support a voucher system that subsidizes private education.

Equations (20) and (21) indicate when this might be the case. As a larger and larger fraction of the population is enrolled in public schools and assimilated in the majority culture, i.e., as  $w_{t+1}$  tends to unity, or as the degree of polarization of the remaining minority,  $d_{t+1}$ , tends to zero, so that  $p$  tends to one, the marginal effect of a voucher on cultural assimilation is negligible. Then, if the elasticity of enrollment with respect to the size of the voucher is large enough so that the voucher has a positive effect on the quality of public schooling, the net effect will be positive. Vouchers are less likely to harm the majority the smaller is the minority and the less culturally distant it is from the majority.<sup>22</sup>

If the amount of the voucher is also endogenously determined by the politically decisive cultural majority then it must satisfy the first order condition:

$$\frac{\partial [(t_t Y_t - s(1 - w_{t+1})) / w_{t+1}]}{\partial s} [w_{t+1} + p(d_{t+1})(1 - w_{t+1})] / \partial s \leq 0 \quad (22)$$

with equality when the optimal voucher is positive. The equilibrium in this case—comprising the majority’s choice of education tax rate and voucher amount, and the minority’s determination of private enrollment and cultural orientation in of private schools—is again inefficient because these decisions are uncoordinated. In particular, marginally increasing the voucher above the level determined by (22) while simultaneously drawing private school curricula closer to the mainstream would benefit all parents. Summing up,

*Proposition 4.* A necessary condition for vouchers to benefit the majority is that they increase spending per student in public education, which is more likely to happen when public school enrollment is elastic with respect to the size of the voucher. Such gains must be weighed against increased cultural polarization, which is least harmful to the majority when the minority is small and less culturally polarized from the majority. If the majority unilaterally determines the amount of the voucher so as to maximize its utility—without coordinating the curriculum content of minority schools—the result is an inefficiently small voucher.

## 5 Immigration and Public Education

The large waves of immigration to the United States in the nineteenth and early twentieth century provided a major impetus for the development of systems of public education, which continue to play an important role in assimilating new immigrants. In this section we extend the basic model so as to study explicitly the interaction between migration flows and the assimilating effect of public education.<sup>23</sup> Population is no longer constant over time, but grows and changes in composition.

To fix ideas, let  $N_t$  denote the measure of the population in period  $t$ , and assume that there is positive population growth from immigration every year,  $N_t > N_{t-1}$ , but no natural growth.<sup>24</sup> Then—extending our previous line of analysis—there are three types of parents in each period  $t > 0$ : majority culture parents in measure  $w_t$  with cultural orientation  $d = 0$ ;

veteran minority parents in measure  $m_t = N_{t-1} - w_t$ , all with cultural orientation  $d_t$ ; and newcomers in measure  $n_t = N_t - N_{t-1}$  with cultural orientation  $\underline{d}$ , which is assumed to be at least as far removed from the mainstream culture as the cultural orientation of the minority in the initial period, i.e.,  $\underline{d} \geq d_0$ . The effect of cultural polarization on productivity is then:

$$P_{ii} = \begin{cases} [w_t + p(d_t) m_t + p(\underline{d}) n_t] / N_t & \text{if individual } i \text{ belongs to the majority} \\ [p(d_t) w_t + m_t + p(\underline{d} - d_t) n_t] / N_t & \text{if individual } i \text{ belongs to the minority} \\ [p(\underline{d}) w_t + p(\underline{d} - d_t) m_t + n_t] / N_t & \text{if individual } i \text{ is a newcomer} \end{cases} \quad (2')$$

We assume, as before, that majority parents determine tax rates (or education quality), and veteran minority parents determine the orientation of minority schools; newcomer parents only choose which school their children will attend. The children of newcomers are then no longer newcomers, but belong either to the veteran minority group or the majority, depending on the type of school their parents chose for them.

Under decentralized education, veteran minority parents clearly choose to send their children to their own schools, whose cultural orientation they have determined. Newcomers, choosing between majority and minority schools, assess the utility differential between minority and majority schooling, which is

$$\begin{aligned} DU^m &= -C(\underline{d} - d_{t+1}) + C(\underline{d}) + \mathbf{a} \log [p(d_{t+1}) w_{t+1} + m_{t+1} + p(\underline{d} - d_{t+1}) n_{t+1}] \\ &\quad - \mathbf{a} \log [w_{t+1} + p(d_{t+1}) m_{t+1} + p(\underline{d}) n_{t+1}] \end{aligned} \quad (23)$$

But this must be positive from the convexity of  $C$  and the revealed preference of veteran minority parents.<sup>25</sup> Thus newcomers also choose minority schools.

It follows that  $w_t = w_0$  for all  $t$ , implying that the share of the veteran minority group,

$m_t = N_{t-1} - w_0$ , is growing, which weakens the incentive for minority parents to move towards the mainstream majority. To fix ideas, assume the measure of migrants in each period is constant,  $n_t = n$ , so that  $m_t = 1 - w_0 + (t - 1)n$ . The first-order condition determining the minority parents' choice of cultural orientation at an interior point then takes the form:

$$C'(d_t - d_{t+1}) + \mathbf{a} [p'(d_{t+1}) w_0 - p'(\underline{d} - d_{t+1}) n] / [p(d_{t+1}) w_0 + 1 - w_0 + (t - 1) n + p(\underline{d} - d_{t+1}) n] = 0 \quad (24)$$

from which it follows, by total differentiation, that  $d_{t+1}$  is an increasing function of  $n$ . Thus a larger flow of immigration, absent public education, exacerbates the negative effect of polarization on majority parents.<sup>26</sup>

The equilibrium analysis of a public education that requires parents to pay twice for private education proceeds similarly to that presented in Section 3. The condition determining the cultural orientation of the minority is:

$$C'(d_t - d_{t+1}) + \mathbf{a} [p'(d_{t+1}) w_{t+1} - p'(\underline{d} - d_{t+1}) n_{t+1}] / [p(d_{t+1}) w_{t+1} + m_{t+1} + p(\underline{d} - d_{t+1}) n_{t+1}] = 0 \quad (25)$$

As above, differentiation reveals that the larger is the number of immigrants the less closely will the minority move towards the cultural orientation of the majority. The threshold income level, above which parents choose private schooling, is implicitly determined by:

$$V_{it}^{pub} - V_{it}^{pr} = (1 - \mathbf{a}) \log\{ [(1 - \mathbf{t}_t) y_{it}] / [(1 - \mathbf{t}_t) y_{it} - \mathbf{t}_t Y_t / w_{t+1}] \} - [C(d_t) - C(d_t - d_{t+1})] + \mathbf{a} \log\{ [w_{t+1} + p(d_{t+1}) m_{t+1} + p(\underline{d}) n_{t+1}] / [p(d_{t+1}) w_{t+1} + m_{t+1} + p(\underline{d} - d_{t+1}) n_{t+1}] \} = 0 \quad (26)$$

where for immigrant families,  $d_t = \underline{d}$ .

Differentiation of (26) reveals that this difference is decreasing in  $n_{t+1}$ . Thus the larger is the number of immigrants the lower is the threshold income level and the larger the number of minority parents, both veterans and newcomers, who choose private schooling for their children. This is consistent with Lazear's (1998, 1999) finding that the likelihood of an immigrant to the United States learning English is inversely related to the proportion of the local population that speaks her/his language.

Convexity of  $C$  ensures that (26) decreases in  $d_t$  as well, which implies that veteran minority members are more inclined to send their children to a public school than new immigrants with similar incomes. The success of public education in assimilating new immigrants thus depends on their relative level of income. If it is similar to the veteran minority, and the rate of immigration high enough, then the fraction of the population opting for minority-culture private schools may actually increase over time, and public education will not achieve cultural assimilation. If, however, new immigrants have relatively low incomes, then public education provides strong incentives for them to enroll their children in public schools where they will more rapidly assimilate in the mainstream culture. In this sense, poor immigrants pose less of a long-term cultural threat to the host country than wealthier immigrants. Summing up,

*Proposition 5.* If education is decentralized, a higher rate of immigration increases cultural polarization. Public education is an effective tool of cultural assimilation when immigrants are poor or few in number, but may not be effective in dealing with large numbers of more affluent immigrants.

## **6 Multiculturalism in Public Schools**

Our assumption that the cultural orientation of public schools is immobile and does not respond to minority needs does not fully capture the variety of public education in the United States. Curricula in public schools have been adjusted in various times and places to

accommodate the preferences of immigrant minorities, for example, through bilingual education. Instruction in German was introduced at the state level in Ohio as early as 1839, and despite occasional setbacks spread widely throughout the nineteenth and early twentieth century, especially in the Midwest. This trend was reversed in the early twentieth century as anti-German sentiment in the wake of World War One led to the dismantling of all bilingual education by the 1920s. More recently, the large influx of Spanish-speaking immigrants spurred a revival of bilingual education, initially among Cuban immigrants in Florida in the early 1960s, and later in Texas, California and others states. Again, an anti-immigration backlash has recently led voters in California and Arizona to approve measures that eliminate bilingual education in their states.

In this section we extend our basic framework to allow public schools to adjust their cultural orientation to minority needs. We revert to our original assumption of a fixed population of measure one, for simplicity of exposition. Let  $D_{t+1}$  denote the cultural orientation of public schools in period  $t$ , where initially  $D_0 = 0$ , and assume that in each period majority parents choose both the cultural orientation of public education and the education tax rate. The productivity function then assumes the form:

$$P_{it} = \begin{cases} w_t + p(d_t - D_t)(1 - w_t) & \text{if individual } i \text{ belongs to the majority} \\ w_t p(d_t - D_t) + 1 - w_t & \text{if individual } i \text{ belongs to the minority} \end{cases} \quad (27)$$

Majority parents always send their children to public school, and achieve utility

$$U_{it} = (1 - \mathbf{a}) \log [(1 - \mathbf{t}_t) y_{it}] - C(D_{t+1} - D_t) + \mathbf{a} \log [a_{i+1}(\mathbf{t}_t Y_t / w_{t+1})] + \mathbf{a} \log [w_{t+1} + p(d_{t+1} - D_{t+1})(1 - w_{t+1})] \quad (28)$$

The utility level of a minority parent choosing to send her child to public school is

$$V_{it}^{pub} = (1 - \mathbf{a}) \log [(1 - \mathbf{t}_t) y_{it}] - C(d_t - D_{t+1}) + \mathbf{a} \log [a_{it+1}(\mathbf{t}_t Y_t / w_{t+1})] + \mathbf{a} \log [w_{t+1} + p(d_{t+1} - D_{t+1})(1 - w_{t+1})] \quad (29)$$

and the utility of a minority parent choosing to send her child to private school is

$$V_{it}^{pr} = (1 - \mathbf{a}) \log [(1 - \mathbf{t}_t) y_{it} - \mathbf{t}_t Y_t / w_{t+1}] - C(d_t - d_{t+1}) + \mathbf{a} \log [a_{it+1}(\mathbf{t}_t Y_t / w_{t+1})] + \mathbf{a} \log [p(d_{t+1} - D_{t+1})w_{t+1} + 1 - w_{t+1}] \quad (30)$$

Private school parents' preferred cultural orientation is determined by the first-order condition

$$C'(d_t - d_{t+1}) + \mathbf{a} p'(d_{t+1} - D_{t+1}) w_{t+1} / [p(d_{t+1} - D_{t+1})w_{t+1} + 1 - w_{t+1}] = 0 \quad (31)$$

differentiation of which reveals that  $d_{t+1}$  is a decreasing function of public school enrollment  $w_{t+1}$ , and an increasing function of the majority's cultural orientation  $D_{t+1}$ . Thus the larger is the relative size of the majority the closer the minority moves towards the majority culture. However, the more accommodating is the majority's cultural orientation to the minority the less accommodating is the minority to the majority. Nonetheless, as  $\partial d_{t+1} / \partial D_{t+1} < 1$ , the degree of polarization between the two cultural groups decreases.

We now turn to minority parents' choice of the type of school for their children. The utility differential between public and private schooling is

$$V_{it}^{pub} - V_{it}^{pr} = (1 - \mathbf{a}) \log \{ [(1 - \mathbf{t}_t) y_{it}] / [(1 - \mathbf{t}_t) y_{it} - \mathbf{t}_t Y_t / w_{t+1}] \} - [C(d_t - D_{t+1}) - C(d_t - d_{t+1})]$$

$$+ \mathbf{a} \log [w_{t+1} + p(d_{t+1} - D_{t+1})(1 - w_{t+1})] - \mathbf{a} \log [p(d_{t+1} - D_{t+1}) w_{t+1} + 1 - w_{t+1}] \quad (32)$$

Differentiation of (32) with respect to the tax rate  $\mathbf{t}_t$  reveals the expected positive relationship between the tax rate and the equilibrium level of public school enrollment. Differentiation of (32) with respect to the cultural orientation of public schools  $D_{t+1}$  yields

$$\begin{aligned} \partial (V_{it}^{pub} - V_{it}^{pr}) / \partial D_{t+1} &= C'(d_t - D_{t+1}) \\ &- \mathbf{a} p' \left\{ 1 / [p + w_{t+1} / (1 - w_{t+1})] - 1 / [p + (1 - w_{t+1}) / w_{t+1}] \right\} \end{aligned} \quad (33)$$

where  $p$  and  $p'$  are evaluated at  $d_{t+1} - D_{t+1}$ . The sign of the derivative is generally ambiguous, as the derivative of  $C$  is positive, the derivative of  $p$  is negative, and  $w_{t+1} > 1/2$  implies that the difference in the curly brackets is also negative. The majority's accommodation to the minority culture reduces the psychic cost to the minority parent of sending her child to public school, but also reduces the differential material gain to the child from attending public school. In general, the net effect is positive when expected public enrollment  $w_{t+1}$  is sufficiently small, and negative when  $w_{t+1}$  is closer to unity. We will focus on the latter case, which assumes a small minority, in keeping with our implicit assumption that the majority is in full control of the political machinery.

The preferred education tax rate of a parent in the cultural majority is derived by maximizing (28) with respect to  $\mathbf{t}_t$  while anticipating the equilibrium determination of  $d_{t+1}$  and  $w_{t+1}$ . The first-order condition with respect to the tax rate is

$$\begin{aligned} \partial U_{it} / \partial \mathbf{t}_t &= -(1 - \mathbf{a}) / (1 - \mathbf{t}_t) + \mathbf{a} / \mathbf{t}_t - \mathbf{a} (\partial w_{t+1} / \partial \mathbf{t}_t) / w_{t+1} \\ &+ \mathbf{a} (\partial w_{t+1} / \partial \mathbf{t}_t) [1 + (1 - w_{t+1}) p' (\partial d_{t+1} / \partial w_{t+1}) - p] / [w_{t+1} + p (1 - w_{t+1})] = 0 \end{aligned} \quad (34)$$

where  $p$  and  $p'$  are evaluated at  $d_{t+1} - D_{t+1}$ . The first-order condition with respect to  $D_{t+1}$  is

$$\begin{aligned} \partial U_{it} / \partial D_{t+1} = & -C'(D_{t+1} - D_t) - \mathbf{a} (\partial w_{t+1} / \partial D_{t+1}) / w_{t+1} + \\ & \mathbf{a} [1 - p + p' (\partial d_{t+1} / \partial D_{t+1} - 1)(1 - w_{t+1})] (\partial w_{t+1} / \partial D_{t+1}) / [w_{t+1} + p(1 - w_{t+1})] \end{aligned} \quad (35)$$

where  $p$  and  $p'$  are again evaluated at  $d_{t+1} - D_{t+1}$ . When the minority share is small, so that (33) is negative and  $\partial w_{t+1} / \partial D_{t+1} < 0$ , the second term on the right-hand side of (35) is positive—the majority, by moving its cultural orientation towards the minority, enjoys a direct advantage from reduced public school enrollment, which increases spending per student; and the third term is negative—the children of the cultural majority experience a relative productivity loss.<sup>27</sup> When the positive effect is stronger than the negative effect (evaluating (35) at  $D_{t+1} = D_t$ ) majority parents will elect to reinforce multicultural elements in public schools curricula.

This suggests that the introduction of multicultural elements in public school curricula typically arises in the early stages of a wave of migration, when the share of the minority is small. As the share of the minority increases with continued migration, the relationship between  $D_{t+1}$  and  $w_{t+1}$  is reversed, as are the signs of the second and third terms on the right-hand side of (35), signifying a possible backlash against multiculturalism in public education. Combining the results of the last two sections, our analysis suggests that as increased migration allows minority groups to gain political influence in the school districts in which they are concentrated, and use it to strengthen bilingual education in the public schools, broader forces at the state and federal level will work to curtail these initiatives.

## 7 Concluding Remarks

Public education has traditionally been viewed as a key element of the melting pot, a vehicle

for cultural integration of new immigrants that promotes efficient communication between ethnic groups and reduces ethnic tensions. A public -school financing regime that does not exempt those who educate their children privately from paying education taxes, thus requiring them to pay twice for their children's schooling, creates strong incentives for social integration. In this context, education reforms aiming at improving scholastic achievements through vouchers and education tax credits that subsidize private education countervail this effect and undermine social cohesion.

The simple analytical model presented in this paper highlights the dual role of education in building human capital and fostering social cohesion. It shows, in the first instance, that both decentralized and uniform public education are inefficient in this regard: decentralized education is too slow in assimilating the minority while mandatory payment of an education tax to finance public education in the majority culture is too rapid. There is thus scope for a mutually beneficial contract under which the financial burden of private education is lessened while its cultural content is more closely aligned to the majority culture.

However, centralized regulation of private schooling may be difficult to implement, in practice. We therefore also consider the effect of a voucher program that subsidizes private education without regulating its content, identifying conditions under which the majority will find in its best interest to offer such a program. While vouchers are beneficial for the majority attending public education when the elasticity of enrollment with respect to the size of the voucher is large enough, we argue that this net effect on spending must be weighed against the adverse cultural impact of education vouchers that undermine the assimilation of minority cultures. Moreover, we show that without regulation of private school curricula the amount of the voucher is inefficiently low.

We then consider the impact of the rate of immigration and its composition on cultural homogeneity. We show that public education is more effective in promoting cultural

assimilation when immigrants are poor or few in number, but less so in dealing with large numbers of high-income immigrants. Thus poor immigrants may be less of a cultural threat to the absorbing economy than wealthier immigrants. Finally, we indicate conditions under which it may be in the majority's interest to accommodate the minority and incorporate elements of minority culture in its own curriculum. Such elements inhibit the cultural assimilation of the minority, yet may be acceptable to the majority when the minority share is small. This indicates the possibility of cyclical patterns in which multiculturalism is allowed to gather strength in specific geographic concentrations of new immigrants in the early stages of a new wave of immigration, and is then curtailed by a cultural backlash at the state or national level when the minority share grows larger.

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<sup>1</sup> See Glazer (1983) for an authoritative account of ethnic cleavages in the United States, and DiPasquale and Glaeser (1996) for an economic perspective. Edwards and Richey (1963) and Green (1990) provide historical accounts of the central role that public schooling has played in assimilating large numbers of immigrants in the United States over the last century. The emergence of government intervention in schooling in the eighteenth and nineteenth century in continental Europe was also closely tied to its socializing role in the course of nation building (Good and Teller, 1969; Green, 1990), and public education has played an important role in efforts to forge new national identities in the multi-ethnic developing countries that emerged in the second half of the twentieth century. For further discussion of the predominant role of ideology in private schooling see James (1993) and references therein.

<sup>2</sup> Of course, this depends on the curriculum content of both public and private schools. Glazer (2001) provocatively contrasts the trend to multiculturalism in public schools with the greater adherence of Catholic schools to traditional American values, suggesting that the roles of public and private schooling may have been reversed in this regard. However, the signs of a backlash to the current trend are already apparent, for example, in California's Proposition 227 and Arizona's Proposition 203, which require English-only instruction in public schools. Moreover, multicultural initiatives are inherently local in nature. We discuss these issues further in Sections 5 and 6.

<sup>3</sup> Jencks (2001) discusses various measures of cultural convergence. Language skills and citizenship rates provide mutually consistent indications of differences in the assimilation rates of Asians, Latinos and Mexicans: "... half the Asians who had come to America as adults were fluent English speakers in 1989 compared to a quarter of all Latinos and an eighth of the Mexicans. ... Among Mexican immigrants legally admitted to the United States in 1982 only 22 percent had become American citizens by the end of 1997, compared to about 40 percent of those who came here from the Caribbean and well over half of those from Asia." (Part II, p.95) Intermarriage rates track the assimilation of individual ethnic groups over time. Comparing the children and grandchildren of immigrants, Jencks estimates that "the proportion marrying outside their own ethnic group rose from 43 to 73 percent among Italians, from 53 to 80 percent among Poles, from 74 to 91 percent among Czechs, and from

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76 to 92 percent among Hungarians.” (Part I, p. 59). Our reduction of cultural distance to a single dimension should be seen as a theoretical convenience representing a far richer multi-faceted characteristics space.

<sup>4</sup> We also show that a fully decentralized system assimilates the minority too slowly.

<sup>5</sup> Examples of partially regulated decentralized systems that achieve such cultural compromises can be found *inter alia* in the Netherlands, in Israel, and in Canada’s Ontario, in the form of publicly funded education sub-systems, organized along religious lines, that enjoy some measure of curricular autonomy while subscribing to a core of common cultural values.

<sup>6</sup> See West (1997) for a useful survey of the limited experience with vouchers, which have yet to be adopted on a significant scale anywhere in the United States (though programs in Cleveland and Milwaukee under review by the Supreme Court may grow significantly if approved). See Chubb and Moe (1990) for a comprehensive statement in favor of education vouchers, and Peterson’s (1999) more recent succinct argument in support of further experimentation. Quantitative analyses indicate that vouchers should have little or no detrimental effect on public school spending per pupil (Hoyt and Lee, 1998, among others). Nonetheless, in November 2000, voucher proposals were overwhelmingly voted down in Michigan (Proposal 00-1) and California (Proposition 38).

<sup>7</sup> These effects are also revealed in experimental evidence, Glaeser et al. (2000) finding a negative relationship between ethnic heterogeneity and trust, and Fershtman and Gneezy (2001) explicitly demonstrating the adverse effect of ethnic heterogeneity on the efficiency of economic transactions.

<sup>8</sup> Our emphasis on the difficult commercial interaction between individuals from different social groups is related to Bénabou’s (1996, 2000) analyses of social heterogeneity and growth, though he focuses on income as a source of social heterogeneity; and to Kremer and Sarychev’s (1998) study of the socializing role of education, which ignores, however, its material effect.

<sup>9</sup> A more general approach would allow continued migration in each period and endogenous determination of the cultural orientation of both majority and the minority schools. We consider these possibilities in Sections 5 and 6.

<sup>10</sup> Thus, we disregard at the present stage any intergenerational correlation in incomes.

<sup>11</sup> This formulation is consistent with assuming that cultural polarization adversely affects income through inefficiencies in communication (Lazear, 1999). We assume that  $p$  is declining from some point on, and specifically that it is declining at the initial distance  $d_0$ .

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This does not rule out the possibility that some measure of cultural distance is beneficial, i.e.,  $p'(0)$  may be positive. In Gradstein and Justman (2001) we derive  $p$  as the product of two factors: the probability that two individuals separated by cultural distance  $d$  will succeed in cooperating with each other, which is a monotonically decreasing, concave function of  $d$ ; and the economic output that their cooperation will produce if they succeed, which we assume is weakly increasing in  $d$  (reflecting the potential benefits of diversity) and concave. Alternative formulations focus on wasteful rent-seeking between competing ethnic groups as detracting from aggregate productivity (Gradstein and Justman, 2000)

<sup>12</sup> Chiswick (1978, 1991), among others, has shown that cultural—more specifically, linguistic—assimilation positively affects immigrants' earnings. This is the relationship captured in the second term of equation (6).

<sup>13</sup> We expand on this difficulty in Gradstein and Justman (2001).

<sup>14</sup> The envelope theorem implies that the indirect effect of a change in  $w_{t+1}$ , through its effect on the orientation of minority schools, can be ignored.

<sup>15</sup> A higher tax rate increases the incentive for minority parents to send their children to public schools, as their marginal loss of utility from the resulting reduction in consumption is greater than that of the majority parents who set the tax rate.

<sup>16</sup> This can also be seen directly by comparing (6) and (15).

<sup>17</sup> Attempts at centralized state supervision and regulation of private schooling in the United States are highly controversial. In particular, the constitutional separation of church and state fundamentally limits the ability of the state to intervene in sectarian schools that account for 85% of private enrollment.

<sup>18</sup> These different methods of subsidizing private education vary in their practical implications, but are equivalent for the purpose of the present analysis.

<sup>19</sup> See, e.g., Hoyt and Lee (1998) and Cohen-Zada and Justman (2000), among others.

<sup>20</sup> As noted above, majority parents have no incentive to send their children to private school in our model as education spending per pupil is constrained to be equal in all schools.

<sup>21</sup> Note that the envelope theorem allows us to ignore the effect of the voucher on the tax rate, as the tax rate is chosen by the median voter so as to maximize her utility.

<sup>22</sup> This is possibly reflected in the difference between the more ethnically homogeneous European countries, such as France, Germany, and Sweden, where private education is subsidized, and the more ethnically diverse United States, where it is not.

<sup>23</sup> Different aspects of immigration policy attest to the significance of cultural assimilation.

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Many host countries require a long naturalization process, and in the United States, a basic knowledge of English and of American history is also required. The United States also restricts cultural diversity by allocating quotas for permanent residency partly in proportion to the composition of the population by country of origin (Lazear, 1998). The controversy surrounding bilingual instruction in schools is one indication of the important role of education in assimilating new immigrants.

<sup>24</sup> Endogenizing the immigration decision is left for future work.

<sup>25</sup> A veteran minority parent's utility differential between minority and majority schooling is

given by  $DU^v = -C(0) + C(d_{t+1}) + \mathbf{a} \log[p(d_{t+1})w_{t+1} + m_{t+1} + p(\underline{d} - d_{t+1})n_{t+1}]$

$- \mathbf{a} \log[w_{t+1} + p(d_{t+1})m_{t+1} + p(\underline{d})n_t]$ , which is positive by revealed preference. And

$DU^m - DU^v = [C(d_t) - C(\underline{d} - d_t)] - [C(d_t) - C(0)]$  must be positive from the convexity of  $C$  (and the mean value theorem).

<sup>26</sup> The derivative of  $d_{t+1}$  with respect to  $n$  has the sign of:  $-p'(d - d_{t+1})[p(d_{t+1})w_0 + 1 - w_0] - p'(d_{t+1})w_0 + [t + p(\underline{d} - d_{t+1})]$  which is positive because  $p$  is declining in the relevant range. Only when the minority is fully assimilated does this effect disappear, but migration also has the effect of postponing and possibly preventing full assimilation. This, in fact, is one of the rationales for the majority to adopt immigration policies that restrict and monitor the inflow of immigrants—which we ignore in the present analysis.

<sup>27</sup> As  $\partial d_{t+1} / \partial D_{t+1} < 1$  and  $p' < 0$  it follows that  $p'(\partial d_{t+1} / \partial D_{t+1} - 1) > 0$ .