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<p>PRESERVING RELIGIOUS VALUES THROUGH EDUCATION: ECONOMIC ANALYSIS AND EVIDENCE FROM THE US</p>

Danny Cohen-Zada

Department of Economics
Ben-Gurion University

ABSTRACT This paper describes how religious minority groups preserve their religious values and their group identity through education. Parents in religious minority groups who want to transmit their religious values to their children send them to religious private schools to shelter them from outside influences. However, when their share in the population grows, outside influences are less threatening, and therefore, their desire for religious private schools decreases. We bring empirical evidence across all US states and counties to support this theory. Our findings contribute to an understanding of the demand structure for religious schooling and the means by which religious minorities preserve their identity.

Keywords: segregation, private education, religious education, minority groups

JEL classification: Z12, I20.

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If you are interested in submitting a paper, please contact:

National Center for the Study of Privatization in Education
Box 181, Teachers College,
525 W. 120th Street,
New York
NY 10027-6696
www.ncspe.org
email: ncspe@columbia.edu

1. INTRODUCTION

Most elementary and secondary private schools in the US, as well as in many other countries, are religiously oriented. Enrollment in private elementary and secondary schools in the US in 1993-1994 was 4,970,646, and of this number religious schools served 4,202,195 pupils, or 84.54%.¹ While it has traditionally been argued that parents send their children to private schools to achieve better scholastic outcomes (henceforth referred to as the quality motive),² in this paper, we suggest that in most cases parents send their children to private schools mainly to preserve their social (religious) values (the religious motive).³ We further suggest that this motivation is stronger among parents from religious minority groups. That is, religious minority groups make efforts to establish religious schools in order to preserve their group identity,⁴ and resist assimilation into majority groups.⁵

Indeed, many studies indicate that religious schools do provide better education than public schools.⁶ However, many important facts cannot be explained by this motive alone. For example, if the quality of education in Catholic private schools is higher, and religious interests are secondary, how does one explain the fact that almost all (87.9% in 1989/1990) children attending Catholic schools in the US are from Catholic families?⁷ In addition, if parents send their children to private schools only because they provide better education, why are most private schools religious? These questions beg a further explanation for why parents send their children to private religious schools.

To address these issues, we first present a model of school-choice that incorporates both the quality and the religious motive for sending children to religious schools. In our model, there are two types of households, religious and non-religious, and three types of schools, public, private-secular and private-religious. The quality of the public schools is uniform, while private schools – religious and non-religious – provide a variety of school qualities so that households can achieve higher education quality for their children (quality motive). All parents, both religious and non-religious, want their children to resemble them and to preserve their values. Therefore, religious households who want to shelter their

children from outside influences, send them to religious schools (religious motive). However, as the share of the religious group in the population grows, outside influences become less threatening, and therefore, their need to send their children to religious private schools decreases. Hence, a lower percentage of households from the religious minority group will send their children to religious schooling. Thus, the increase in the share of the religious group in the population has two conflicting effects on the private enrollment rate. On the one hand, it increases the private enrollment rate because religious households have a stronger tendency to send their children to private schools than non-religious households. On the other hand, it decreases the proportion of religious households that send their children to religious schooling, and this has a negative effect on the private enrollment rate. Furthermore, as the share of the religious group in the population increases, the negative effect becomes more pronounced to the extent that it is even stronger than the positive effect. This implies a peak of private enrollment with respect to the share of the religious minority group in the population.

Our model is then applied to the Catholic minority in the US by empirically estimating the relationship between private enrollment and the share of Catholics in the population, using cross-sectional data on US states and counties. Our estimation indicates that the share of Catholic households that send their children to Catholic schools decreases when the share of the Catholic group in the population increases, thus supporting our theoretical result that the share of the religious minority group in the population affects households' decisions. The estimation also supports our theoretical result that there exists a peak of private enrollment with respect to the share of the religious minority (Catholic) group in the population. These results imply that households send their children to religious schooling mainly to preserve their religious identity rather than to achieve better cognitive results.

The religious motive in our model is similar to that of Bisin and Verdier (2000, 2001), who assume that parents wish to transmit their traits to their children in order to explain why cultural minorities try not to intermarry and tend to socialize their children more intensively than cultural majorities. We use a similar motivation to show how religious diversity may

lead to segregation also in schooling, and provide empirical evidence for this.⁸ This pattern indicates that minority groups intentionally segregate themselves from the general population in socializing their children, and do this more intensively when they are a small proportion of the general population in order to retain their identity. This mechanism helps us to understand how religious minorities resist assimilation into the general population.^{9,10}

The importance of the paper is, first, that it describes the means by which religious minority groups preserve their identity, namely religious groups adjust their effort to resist assimilation according to the level of outside influence. When they are a small proportion of the population, outside influences are more threatening, but then they are willing to exercise more effort to socialize their children, and pay for private religious schooling. Second, it contributes to an understanding of the structure of demand for religious schooling, which is essential for designing policies, such as voucher programs, aimed at supporting private education.

The structure of the paper is as follows. In Section 2, we describe the model, set out the comparative statics, and derive our theoretical results. Section 3 recovers the parameters of the utility function. In Section 4, we provide empirical evidence from the US that supports our theoretical results, and Section 5 concludes with a brief summary.

2. FORMAL ANALYSIS

2.1 Basic definition of the model

Consider a population of households of measure 1, consisting of two groups, a religious minority group, R , of measure r , and a non-religious group, N , of measure $1 - r$. We assume for simplicity that each household comprises one parent and one child. The households of each group are indexed by i , and have heterogeneous income levels, y_i . We also assume that the income distribution is identical in the two groups and denote its probability density function by f , its cumulative density function by F , its mean by \bar{y} and its median by y_m .

For simplicity, we let an individual's religious orientation be captured by a discrete variable, k , defined as

$$k = \begin{pmatrix} 1 & \text{if} & \text{religious} \\ 0 & \text{if} & \text{non-religious} \end{pmatrix}$$

We also assume that children may acquire religious values first at home and then in a religious school, or, in their neighborhoods, through imitation and peer influence. The probability that a child will become religious is defined as

$$p_r = w \cdot k_{parent} + (1-w) \cdot e, \quad (1)$$

where e denotes the environment (school/neighborhood) effect on the child. We further assume that if children are sent to a religious school they will acquire strong religious values that will protect them from peer influence. Thus, the environment effect is $e = 1$. Otherwise, if the children are sent to a secular school, public or private, where they do not acquire religious values, their religious values are determined by the environment in the general population. Therefore, the environment effect is equal to the share of the religious group in the general population, $e = r$.

In our model, parents want to transmit their religious traits to their children and take this into account when choosing a school. That is, they do not choose a school for their children only according to the quality of education but also according to the religious values transmitted in the alternative schools, in their quest for their children to resemble them. Let s be the probability that a child will have the same religious orientation as his parent. Then, the probability that a child from a religious household sent to a secular school, public or private, will become similar to his parent (i.e., be religious) is $s = r + (1-r) \cdot e$, while if the child sent to a religious school, the probability is $s = 1$. Similarly, a child from a non-religious

household sent to a secular school will become similar to his parent (i.e., will remain non-religious) with probability $s = 1 - \rho_r = \rho_s$. Otherwise, if he is sent to a religious school he will become like his parent with probability $s = 1 - \rho_r = \rho_s$.

[INSERT TABLE 1 ABOUT HERE]

Households derive utility from a consumption good c , our numeraire; from the quality of their children's education x (the quantity of education is the same for all households); and from the probability that their child will become similar to them, s . The utility function is

$$U(c, x, s) = c^\alpha x^\beta s^\gamma \quad (2)$$

Public education is available free of charge to all households at a uniform quality \bar{x} , funded by an exogenous proportional income tax rate t levied on all households. Private schooling and religious schooling are available as alternatives to public schooling, and can be purchased from a competitively priced private sector at any desired quality.¹¹ Thus, households can choose to forgo public education and instead purchase private or religious education, but this does not reduce their tax liability. We equate educational quality with spending-per-pupil within each local school system.¹² Let q denote the proportion of households that use the public school system, and assume it is always positive. Denoting by p the cost per student of a unit of quality, the government's balanced budget constraint implies that the quality of public schooling is:

$$\bar{x} = t \bar{y} / (q p) \quad (3)$$

2.2 School choice

A non-religious household that sends its child to public school has indirect utility:

$$U_{pu,N}(t, q^e, r, \beta, y_i) = [(1-t)y_i]^\alpha \beta t \bar{y} / (q^e p)^\alpha [1-\beta]^\alpha \quad (4)$$

where q^e denotes the level of public enrollment that households anticipate when making their education decision. A non-religious household always prefers a secular private school to a religious one, given our assumption that private non-religious schooling is available at any desired quality. A non-religious household that sends its child to a secular private school solves:

$$\begin{aligned} \text{Max}_{c,x} U(c, x) &= c^\alpha \beta^\alpha [1-\beta]^\alpha \\ \text{s.t. } c + x p &\leq (1-t)y_i \end{aligned}$$

and has indirect utility ¹³

$$U_{sp,N}(t, r, \beta, y_i) = g_0(\beta) [1-\beta]^\alpha (1-t) y_i^\alpha$$

As opting out of public education does not reduce a household's tax obligations it must be aimed at obtaining a higher quality of education, and as education quality is a normal good, other things being equal, the households that opt out of public schooling will be those with higher incomes. Comparing (4) and (5), we find that for the given exogenous tax level t and anticipated public enrollment q^e , either all non-religious households prefer public education, or there exists a threshold income level ¹⁴

$$y_N(t, q^e) = (t \bar{y}) / [(1-t) q^e g_1(\beta)]$$

such that all non-religious households with incomes below y_N send their children to public school, and all those with incomes above y_N send their children to secular private school. The share of non-religious households that send their children to public schools is then

$$q_N = F(\underline{y}_N(t, q^e)) \quad (7)$$

Similarly, a religious household that sends its child to public school has indirect utility:

$$U_{pu,R}(t, q^e, r, \beta; y_i) = [(1-t)y_i]^\alpha \bar{y} / (q^e p)^{1-\alpha} [\beta \gamma]^\alpha \quad (8)$$

Obviously, a religious household will prefer a religious private school to a secular one. A religious household that sends its child to a religious private school solves:

$$\begin{aligned} \text{Max}_{c,x} U(c, x) &= c^\alpha x^\beta \gamma^\alpha \beta^\alpha \gamma^\alpha x^\alpha \\ \text{s.t. } c + x p &= (1-t)y_i \end{aligned}$$

and has indirect utility

$$U_{pr,R}(t, \beta; y_i) = g_0(\beta) [(1-t)y_i]^\alpha$$

Comparing (8) and (9), we find that for the given exogenous tax level t and anticipated public enrollment q^e , either all religious households prefer public education, or there exists a threshold income level

$$\underline{y}_R(t, q^e, r, \beta) = t \bar{y} [\beta \gamma]^\alpha / [(1-t) q^e g_1(\beta)]$$

such that all religious households with incomes below \underline{y}_R send their children to public school, and all those with incomes above \underline{y}_R send their children to religious school. The share of religious households who send their children to public education is then

$$q_R = F(\underline{y}_R(t, q^e, \beta)) \quad (11)$$

and the religious enrollment rate is

$$Rel = r(1 - q_R) \quad (12)$$

Total public enrollment is then

$$q = r q_R + (1 - r) q_N \quad (13)$$

Substituting (7) and (11) in (13) we obtain

$$q = r F(\underline{y}_R(t, q, r, ?)) + (1 - r) F(\underline{y}_N(t, q)) \quad (14)$$

Partial differentiation of (6) and (10) reveals that \underline{y}_N and \underline{y}_R are both decreasing in q^e , and as $F(\underline{y}(t, 0)) \geq 0$ and $F(\underline{y}(t, 1)) \leq 1$, there exists an equilibrium value of public enrollment q that equates anticipated and actual enrollment rates, implicitly defined by (14).

2.3 Comparative statics

We first analyze the effect of the relative size of the religious minority group, r , on the share of religious households that send their children to public school, q_r . Substituting (13) into (11) and (7), we find that in equilibrium the share of religious and non-religious households that send their children to public schooling are determined respectively by

$$M(q_R, q_N, r) = q_R - F[\underline{y}_R(t, r q_R + (1 - r) q_N, r, w)] = 0 \quad (15)$$

$$N(q_R, q_N, r) = q_N - F[\underline{y}_N(t, r q_R + (1 - r) q_N)] = 0 \quad (16)$$

By total differentiation of (15) and (16) with respect to r we obtain that $dq_R/dr > 0$ (See Appendix A for details), implying that the share of religious households that send their children to religious schooling, $1 - q_R$, decreases in r . This indicates that as the share of the minority group in the population increases, parents feel less need to pay for religious schooling.

Proposition 1: The share of religious households that send their children to religious schools decreases in the share of the religious minority group in the population.

Now consider the effect of the size of the religious minority group, r , on the religious enrollment rate, $r(1 - q_R)$. On the one hand, as the share of the religious minority group r increases, it directly increases the religious enrollment rate. On the other hand, as r increases, the share of religious parents who send their children to religious schooling decreases (according to Proposition 1), and this effect indirectly decreases the religious enrollment rate. Therefore, if there is a stage from which the negative effect becomes more prominent than the positive effect, the religious enrollment rate will begin to decrease and we will obtain a peak of religious enrollment rate with respect to the share of the religious group in the population.

Finally, consider the relationship between total private enrollment, $1 - q$, and the share of the religious minority group in the population. Substituting (6) and (10) into (14) we obtain

$$q = rF\{t\bar{y} / [(1-t)q_1]\} + (1-r)F\{t\bar{y} / [(1-t)q_1]\} \quad (17)$$

Then,

$$q(r=0) = F\{t\bar{y} / [(1-t)q_1]\} \quad (18)$$

$$q(r=1) = F \{ (t \bar{y}) / [(1-t) q^e g_1(?)] \} \quad (19)$$

From (18) and (19) we obtain that

$$q(r=0) = q(r=1) \quad (20)$$

That is, the quality motive for sending kids to private schools is equally strong among religious and non-religious households. Total differentiation of (17) yields

$$dq/dr = \frac{q_R - q_N + y_R f(y_R) [\mathbf{g} \cdot (1 - \mathbf{w})] / [(1 - \mathbf{a}) \cdot (\mathbf{w} + (1 - \mathbf{w}) \cdot r)]}{1 + r \cdot y_R f(y_R) / q + (1 - r) \cdot y_N f(y_N) / q} \quad (21)$$

As the denominator is always positive we find that

$$\text{sign}[dq/dr] = \text{sign}\{z = q_R - q_N + y_R f(y_R) [\mathbf{g} \cdot (1 - \mathbf{w})] / [(1 - \mathbf{a}) \cdot (\mathbf{w} + (1 - \mathbf{w}) \cdot r)]\} \quad (22)$$

Then, it is straightforward that

$$z(r=0) = F(y_N \cdot \mathbf{w}^{g/(1-a)}) - F(y_N) < 0 \quad (23)$$

$$z(r=1) = y_N f(y_N) \mathbf{g} \cdot (1 - \mathbf{w}) / (1 - \mathbf{a}) > 0 \quad (24)$$

From (23) and (24) we obtain that there must be a peak of private enrollment with respect to the share of the religious group in the population, r .¹⁵

Proposition 3: There must be a peak of private enrollment with respect to the share of the religious group in the population.

3. CALIBRATION

In this section we apply our model to analyze the motives of parents to enroll their children in Catholic schools in the US. We calibrate the model to average US data on public, Catholic and private non-Catholic education. Positing a lognormal distribution of income, $\ln y \sim N(\mathbf{m}, \mathbf{s}^2)$, median income is $y_m = \exp(\mu)$ and mean income is $\bar{y} = \exp(\mu + \sigma^2/2)$, which we solve for μ and σ . In 1998, mean US household income was \$52,513 and median household income was \$38,885,¹⁶ implying $\mu = 3.65$ and $\sigma = 0.27$. Denoting the probability density function of the standardized normal distribution by ϕ , its cumulative density function by Φ , and incorporating the lognormal specification in the equilibrium equation (14), we have

$$q = r \frac{\{\ln(y_R(t, q, \bar{y}, r)) - \mu\} \phi + (1-r) \int_{\ln(y_N(t, q, \bar{y})) - \mu}^{\infty} \phi}{\int_{\ln(y_N(t, q, \bar{y})) - \mu}^{\infty} \phi} \quad (25)$$

Setting $q = 90.1\%$, the public enrollment share in school year 1997/8,¹⁷ we obtain

$$q = r \frac{\{\ln(y_R(t, q, \bar{y}, r)) - \mu\} \phi + (1-r) \int_{\ln(y_N(t, q, \bar{y})) - \mu}^{\infty} \phi}{\int_{\ln(y_N(t, q, \bar{y})) - \mu}^{\infty} \phi} = 0.901 \quad (26)$$

We set r equal to the share of Catholics in the US in 1998, 0.27.¹⁸ The share of households that opted for Catholic education in 1997/8 was 4.91%, i.e.,

$$r(1 - q_R) = r \{1 - \int_{\ln(y_R(t, q, \bar{y}, r)) - \mu}^{\infty} \phi\} = 0.0491 \quad (27)$$

Public expenditure per student in 1997/8 was \$6,189.¹⁹ Letting m denote the ratio of school-age children to households, this value corresponds to $(t \cdot \bar{y}) / (q \cdot m)$ in the model. Noting a mean value of $m = 0.5$,²⁰ and substituting household mean income and public enrollment for \bar{y} and q , we obtain that the exogenous tax level, t , is equal to 0.0531.

Substituting (6) and (10) in (26), and (10) in (27), we then have for every given θ two equations in the two unknowns α , β . We solve these equations for $(\alpha, \beta) = (0, 0.25, 0.5, 0.75)$. The calibrated parameters for each θ are presented in Table 2. Our results indicate that θ has no effect on the calibrated value of $\alpha = 0.9304$. However, it increases the calibrated value of β which varies between 0.02 and 0.15 as we increase θ from 0 to 0.75. That is, actual enrollment rates can be explained, through our model, either by low values of both α and β or by high levels of both parameters.

[INSERT TABLE 2 ABOUT HERE]

We now illustrate the relationship between the share of Catholic households that send their children to Catholic schools and the share of the Catholic minority group in the population, for the calibrated parameters α and β and the given exogenous tax level.

[INSERT FIGURE 1 ABOUT HERE]

As Proposition 1 shows, when the share of the Catholic minority group in the population grows, the share of Catholic households that send their children to Catholic schools decreases.

We also illustrate the relationship between Catholic enrollment and the share of the Catholic minority group in the population.

[INSERT FIGURE 2 ABOUT HERE]

Figure 2 indicates that the share of Catholics in the population has a positive concave effect on Catholic enrollment, peaking only for values of θ higher than 0.5, and at high levels of the Catholic share. For $\theta \neq 0.75$, for example, it peaks when the Catholic share in the population is around 85%.

In addition, we illustrate the relationship between private enrollment and the share of the Catholic group in the population.

[INSERT FIGURE 3 ABOUT HERE]

We find that the relationship between private enrollment and the Catholic share in the population is inversely U-shaped.

4. ESTIMATION

In this section, we provide empirical evidence that supports our theoretical results for the Catholic minority in the US. First, we take a cross section of the 50 US States and the District of Columbia in order to estimate the determinants of the share of Catholic households that send their children to Catholic schools. Table 3 presents descriptive statistics. Data for the regressions are from the *County and City Data Book*, except for enrollment in Catholic schools which is derived from *US Catholic Elementary and Secondary Schooling 1989-1990*,²¹ and %Catholic, derived from Bradley et al. (1992). All the data are for 1990, except for enrollment in Catholic schools which is for 1989-1990, and mean income which is for 1989. All shares are presented as percentages. Mean income is average money income per household in thousands of dollars, and density is measured as thousands of people per square mile.

Data on enrollment in Catholic schools were divided by total enrollment in elementary and secondary schools to obtain the Catholic enrollment rate, which corresponds to $r(1 - q_R)$ in our model. This variable was then divided by the share of Catholics in population, r , to obtain a proxy for the share of Catholic households that send their children to Catholic schooling, $1 - q_R$.

The right-hand variables used to explain the share of Catholic households that send their children to Catholic schooling are mean income, population density, % of African-Americans in the population, and percent Catholics in the population.

Catholic share in the population according to Proposition 1 of our model is expected to have a negative influence on the share of Catholic households that send their children to Catholic schooling. That is, as the Catholic share in the population increases, outside influences on the child become less threatening, and therefore, fewer Catholic households are willing to pay for Catholic schooling.

Mean income reflects parents' ability to pay for differentiated private education. Previous studies have generally found a significant positive effect of this variable on the private enrollment rate (Sonstelie 1979, 1982; West and Palsson, 1988; among others). Although our dependent variable is not private enrollment, the reasoning is quite similar and we also expect a positive effect.

Density of population affects the cost of education in general, but more so in private schooling (such as Catholic schooling), where scale effects and transportation costs are generally more pronounced than in public schooling. Previous studies have generally found a significant positive effect of this variable on the private enrollment rate (James, 1987; Buddin et al., 1998; among others).

Share of African-Americans in the population represents the desire of Catholic whites for racial homogeneity at school.²² Previous empirical findings associate a similar positive impact on private enrollment with a high proportion of African-Americans, e.g., Coltfelter (1976), James (1987), Hamilton and Macauley (1991), Schmidt (1992), and McCormick et al. (1994).

Public expenditure per student was used as a proxy for public school quality. Therefore, we would expect this variable to have a negative effect on the share of Catholic households that send their children to Catholic schooling (the quality motive). James (1987) found this variable to be insignificant for elementary schooling, and only slightly significant for secondary schooling.

Percent of population in school age is expected to have a negative effect on the share of Catholic households that send their children to Catholic schooling. When there are many school-age children in the household, households have less money to send their children to private schooling.

Regression results are presented in Table 4, and Table 5 shows the impact of a change of one standard deviation at the mean in each of the right-hand variables on the share of Catholic households that send their children to Catholic schooling. The equation as a whole explains 89% of the variance in the dependent variable, and all the variables are significant and with the predicted signs, with the exception of public expenditure per student (not significant) and household mean income (sign is opposite from that expected). The Catholic share in the population negatively affects the share of households that send their children to Catholic schooling, as predicted according to Proposition 1.

We then estimate an equation for the Catholic enrollment rate. The right-hand variables are the same, except that we also include the share of Catholics squared to allow for a non-linear, inverse U-shape relationship between the Catholic enrollment rate and the share of Catholics in the population. Previous studies assumed a linear relationship between enrollment in private schooling and the share of Catholics in the population and found significant positive effects (Clotfelter, 1976; Long and Toma, 1988, James 1987, Hamilton and Macauley, 1991, among many others.)²³

Regression results are presented in Table 6. The equation explains 82% of the variation in the dependent variable. As expected, the Catholic share has a concave effect on Catholic enrollment, which peaks when the share of Catholics in the population is around 50% (i.e., 0.402/0.008). In other words when Catholics form a local majority their demand for Catholic schooling becomes less pronounced.

Similarly, we estimate an equation for the total private enrollment rate, with the same right-hand variables (see Table 7). The equation explains 64% of the variation in the dependent variable. As the calibrated model predicts, we find a very significant inverse U-shape relationship between the share of Catholics in the population and the private enrollment rate which peaks when the share of Catholics in the population is 51%.

We estimate the last equation also across counties.²⁴ Descriptive statistics for the county data are presented in Table 8, the results are presented in Table 9, and Table 10 presents the impact on the private enrollment rate of a change of one standard deviation at the

mean in each of the right-hand variables. The equation as a whole explains 35% of the variance in the private enrollment rate, and all the variables are very significant. The Catholic share in the population has a concave effect on the private enrollment rate, peaking at about 60%. This is consistent with our hypothesis that parents in religious minority groups send their children to private schools not only to obtain higher education quality, but also to preserve their religious values. When the Catholic group is a small proportion of the population it has a strong need to send its children to Catholic private schools, where they will be sheltered from outside influences. However, when the share of the Catholic group in the population grows, outside influences become less threatening, and the parents' need to send their children to Catholic private schools decreases. Mean income, which is an indicator of parental ability to pay for differentiated private education, has an increasing effect on private enrollment. Density of population, which offers a greater advantage for private schooling than for public schooling, also has an increasing effect. The share of African-Americans also has a positive effect, consistent with the hypothesis that a large African-American minority increases the proportion of whites that chooses private schooling. Also, the decreasing effect of the share of school-age children in the population on private enrollment is as expected.

6. CONCLUDING REMARKS

The objective of this paper was to describe how religious minority groups preserve their religious values and group identity through education. For this purpose, we built a model which distinguished between religious and non-religious households and between secular and religious private schooling. Our theoretical results showed that as the share of the religious group in the population grows, a lower percentage of households from the religious group send their children to religious private schooling. Also, there is a peak of private enrollment with respect to the share of the religious group in the population. Using empirical data across all US states and counties, we tested our theoretical results on Catholic schooling, and found an inverse U-shape relationship between private enrollment and the share of Catholics in the local population that peaks when the Catholic share is about 50%. In other

words, when Catholics form a local majority, their demand for private schooling becomes less pronounced. These findings both highlight the means by which minority groups preserve their identity and contribute to a better understanding of the structure of demand for private education.

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Table 1A: Probability of becoming religious

	Parent
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		Religious	Non-religious
School	Religious	1	1 - ?
	Secular	? ??) r	(1-?) r

Table 1B: Probability of becoming similar to parent

		Parent	
		Religious	Non-religious
School	Religious	1	?
	Secular	? ??) r	1 - (1-?) r

Table 2. Calibration results

?	?	?
0	0.9304	0.0239
0.25	0.9304	0.0394
0.5	0.9304	0.0688
0.75	0.9304	0.1551

Table 3. Descriptive statistics - state data

Variable	Mean	Standard deviation	Median
<i>Private enrolment share, %</i>	8.91		
<i>Mean income (\$000s)</i>	37.06		
<i>% Catholics</i>			
<i>% African-Americans</i>			
<i>Density (000s per square mile)</i>			
<i>Percent of population in school age</i>			
<i>Public expenditure per student</i>			
<i>Catholic enrollment rate</i>			

Table 4. Dependent variable: Share of Catholic households that send their children to Catholic schooling

Variable	Coefficient	<i>t</i> -statistic
<i>Constant</i>	107.21	3.59
<i>Mean income</i>	-0.82	-1.96
<i>Density</i>	22.67	11.14
<i>% Catholics</i>	-0.45	-2.55
<i>% African-Americans</i>	0.48	2.20
<i>Public expenditure per student</i>	-0.001	-0.45
<i>Percent of population in school-age</i>	-2.18	-1.88
<i>Number of observations</i>	51	
$\bar{R}^2 =$	0.89	

Table 5. Impact on the share of Catholic households that send their children to Catholic schooling of a change of one standard deviation at the mean (percentage points)

<i>Mean income</i>	-5.54
<i>Density</i>	31.5
<i>% Catholics</i>	-5.94
<i>% African-Americans</i>	5.80
<i>Public expenditure per student</i>	-1.52
<i>Percent of population in school-age</i>	-4.67

Table 6. Dependent variable: Catholic enrollment rate

Variable	Coefficient	<i>t</i> -statistic
<i>Constant</i>	4.16	0.74
<i>Mean income</i>	-0.094	-1.19
<i>Density</i>	2.75	7.17
<i>% Catholics</i>	0.402	4.94
<i>% Catholics squared</i>	-0.004	-2.95
<i>% African-Americans</i>	0.083	1.97
<i>Public expenditure per student</i>	0.0001	0.37
<i>Percent of population in school-age</i>	-0.167	-0.77
<i>Number of observations</i>	51	
$\bar{R}^2 =$	0.82	

Table 7. Dependent variable: Total private enrollment rate

Variable	Coefficient	t-statistic
<i>Constant</i>	8.28	1.52
<i>Mean income</i>	0.104	1.36
<i>Density</i>	-0.398	-1.07
<i>% Catholics</i>	0.34	4.31
<i>% Catholics squared</i>	-0.0033	-2.45
<i>% African-Americans</i>	0.18	4.30
<i>Public expenditure per student</i>	-0.0002	-0.63
<i>Percent of population in school-age</i>	-0.44	-2.06
<i>Number of observations</i>	51	
$\bar{R}^2 =$	0.64	

Table 8. Descriptive statistics - county data

Variable	Mean	Standard deviation	Median
<i>Private enrolment share, %</i>	5.55		
<i>Mean income (\$000s)</i>	30.08		
<i>% Catholics</i>			
<i>% African-Americans</i>			
<i>Density (000s per square mile)</i>			
<i>Percent of population in school age</i>			

Table 9. Dependent variable: Private enrollment rate – County data

Variable	Coefficient	t-statistic
<i>Constant</i>	2.30	3.22
<i>Mean income</i>	0.15	13.74
<i>Density</i>	0.27	4.86
<i>% Catholics</i>	0.26	19.77
<i>% Catholics squared</i>	-0.002	-10.33
<i>% African-Americans</i>	0.13	23.00
<i>Percent of population in school-age</i>	-0.25	-8.55
<i>Number of observations</i>	3100	
$\bar{R}^2 =$	0.35	

Table 10. Impact on the private enrollment rate of a change of one standard deviation at the mean
(percentage points)

<i>Mean income</i>	1.123
<i>Density</i>	0.383
<i>% Catholics</i>	2.71
<i>% African-Americans</i>	1.87
<i>Percent of population in school-age</i>	-0.68

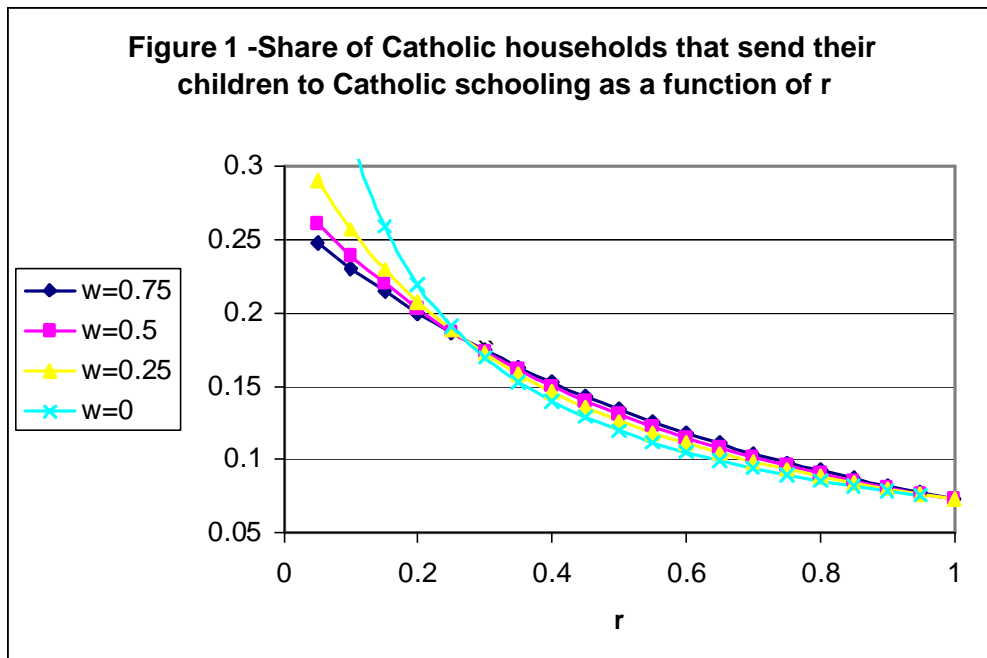


Figure 2 -Catholic enrollment as a function of r

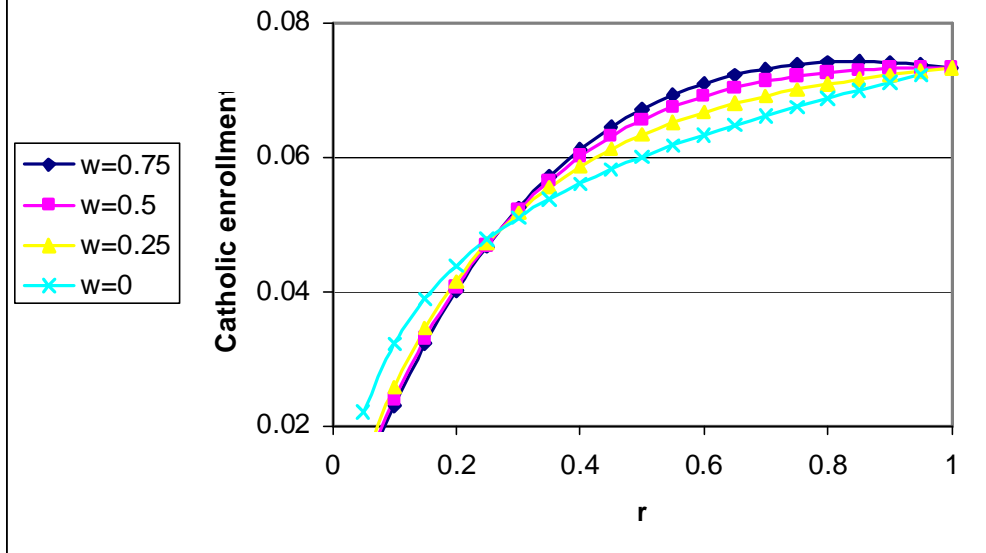
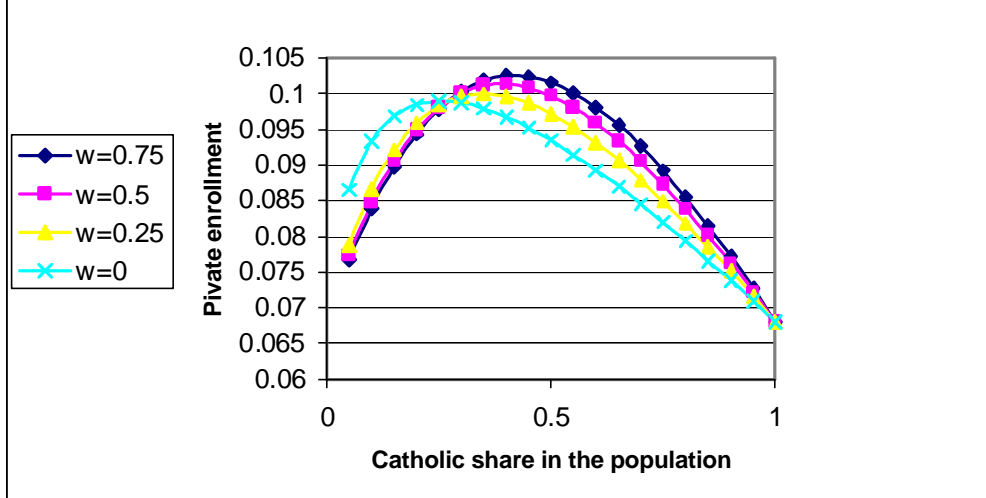


Figure 3 - Private enrollment, $1-q$, as a function of r



Appendix A:

$$M(q_R, q_N, r) = q_R - F \left\{ t \bar{y} \left[\frac{1 - \tau}{1 - t} \right] \frac{1}{[(1-t)(r q_R + (1-r) q_N) g_1(\cdot)]} \right\} = 0 \quad (\text{A1})$$

$$N(q_R, q_N, r) = q_N - F \left\{ t \bar{y} \left[\frac{1 - \tau}{1 - t} \right] \frac{1}{[(1-t)(r q_R + (1-r) q_N) g_1(\cdot)]} \right\} = 0 \quad (\text{A2})$$

Total differentiation of (A1) and (A2) with respect to r yields:

$$\frac{dM}{dq_N} \cdot \left(\frac{dq_N}{dr} \right) + \frac{dM}{dq_R} \cdot \left(\frac{dq_R}{dr} \right) = - \frac{dM}{dr} \quad (\text{A3})$$

$$\frac{dN}{dq_N} \cdot \left(\frac{dq_N}{dr} \right) + \frac{dN}{dq_R} \cdot \left(\frac{dq_R}{dr} \right) = - \frac{dN}{dr} \quad (\text{A4})$$

Then, from (A3) and (A4) we obtain that

$$\frac{dq_R}{dr} = \frac{\frac{dN}{dr} \cdot \frac{dM}{dq_N} - \frac{dM}{dr} \cdot \frac{dN}{dq_N}}{\frac{dN}{dq_N} \cdot \frac{dM}{dq_R} - \frac{dM}{dq_N} \cdot \frac{dN}{dq_R}} \quad (\text{A5})$$

where the partial derivatives of M and N are

$$\frac{dM}{dr} = - f_{\bar{y}} \left\{ \frac{1 - \tau}{1 - t} \right\} \frac{1}{(q_N - q_R) / q}$$

$$\frac{dM}{dq_N} = f_{\bar{y}} (1 - r) / q$$

$$\frac{dM}{dq_R} = 1 + f_{\bar{y}} r / q$$

$$\frac{dN}{dr} = - f_{\bar{y}} \frac{1}{(q_N - q_R) / q}$$

$$\frac{dN}{dq_N} = 1 + f_{\bar{y}} (1 - r) / q$$

$$\frac{dN}{dq_R} = f_{\bar{y}} r / q$$

Substituting the following partial derivatives into (A5) we find that

$$dq_R/dr = \frac{f(y_R) \cdot y_R \cdot g \cdot (1-w) / \{ (1-a)[w+(1-w) \cdot r] \} \cdot [1 + f(y_N) \cdot y_N \cdot (1-r)/q] + f(y_R) \cdot y_R \cdot (q_N - q_R)/q}{1 + f(y_N) \cdot y_N \cdot (1-r)/q + f(y_R) \cdot y_R \cdot r/q} > 0$$

¹ Digest of Education Statistics, 2000, Table 62.

² The traditional attitude towards private schooling led many researchers to model the demand for private schooling to be motivated only by differences in desired quality between households with different income levels (Rangazas 1995, Epple and Romano 1996, Glomm and Ravikumar 1998, Nechyba 2000, among others). In these models, high-income households that are not satisfied with the uniform low-quality public schools send their children to private schooling. Thus a low quality public school system stimulates the growth of high quality private schools for those who can afford it.

³ James (1987, 1993) also supports an important religious motive for sending children to private schools. She claims that because people have diverse tastes about the kind of education to be consumed (rather than differentiated tastes about quantity), and the public system is constrained to be relatively uniform, people prefer the product variety offered in the private sector. She argues that much of this taste differentiation stems from religious differences that concern group identity. She also empirically supports her theory by showing that the wide range across countries in the percentage of total enrollments in private rather than public schools is due to differentiated demand which stems mainly from religious heterogeneity.

⁴ As James (1987) points out, this hypothesis can explain the high number of private schools and colleges established by minority groups all over the world (for example, the Sikhs in India, and the Chinese and Indians in Malaysia). It can also explain “why the ‘melting pot theory’ and the general belief in assimilation of minorities to majority values led to the ‘common school’ movement in the nineteenth and twentieth

centuries” (page 4), and why many Catholic private schools emerged in the US as a response by a group that did not want to be fully assimilated. In addition, it explains “why in countries where a dominant group seeks to impose its language or values on others, private schools were prohibited or restricted” (for example, this was the case in Holland and France in anti clerical periods.) The high proportion of students who attend privately managed schools in the Netherlands (two - thirds) can also be explained by this hypothesis because it was a “response to the pervasive religious cleavage which dominated at the turn of the century” (James 1993, page 577).

⁵ This claim is supported by the large number of private schools in the US established by religious minority groups. In 1993-1994, for example, 32% of all private schools were Catholic and 18% were Conservative Christian schools. Other religious affiliated schools accounted for about 13% of all private schools, and these were sponsored by various religious groups: about one quarter were Seventh-Day Adventist; 15%, Missouri Synod Lutheran; 10% Episcopal; 6% Hebrew day, 8% other Jewish; and the remainder, other religious groups. Unaffiliated religious schools accounted for 16% of all private schools. (Private Schools in the US – A Statistical Profile, 1993-1994). In addition, Bisin and Verdier (2000) provide evidence that supports this claim for minority ethnic groups.

⁶ For example, Evans and Schwab (1995) find that attending a Catholic high school raises the probability of finishing high school or attending college by 13 percentage points. Coleman, Hoffer and Kilgore (1982) find that increments in achievement due to attendance in Catholic schools are about one grade level, and Sander (1997) observed that eight years in a Catholic school in the US is associated with higher vocabulary, mathematics, and reading test scores.

⁷ National Catholic Educational Association, 1990.

⁸ Another channel through which minority groups preserve their identity is to congregate in communities in order to achieve a public school suitable to their tastes. In this case they have less need for private education.

⁹ Bisin and Verdier (2000) point to Basques, Catalans, Corsicans, Irish Catholic in Europe, Quebecois in Canada, and Jews of the Diaspora as examples of ethnic and religious minorities that have remained faithful to their language and cultural traits.

¹⁰ Our paper is also related to studies that deal with the consequences of cultural segregation. Lazear (1999) shows that when there is no common culture, economic agents interact with each other less efficiently, and this undermines the effectiveness of production and exchange. Gradstein and Justman (2000, 2001) relate Lazear's result to education and show that extreme polarization, which may result when different cultural groups separately determine the social content of their school curricula, undermines economic growth. In another paper, Gradstein and Justman (2002) show that subsidizing private education and regulating its content can achieve a Pareto improvement. This is based on the assumption that by regulating private education one can promote cultural assimilation, which contribute to the efficiency of interaction between economic agents.

¹¹ In this we neglect the fixed costs of education, which especially limit quality choice in smaller communities. We also abstract from the possibility of privately supplementing public education.

¹² There is substantial empirical evidence that material resources, do indeed have a significant effect on scholastic achievement and classroom behavior (Krueger, 1998, Card and Krueger, 1996, among many others). Of course, this does not imply that spending increases in themselves are an effective strategy for improving public education (Hanushek, 1986, 1996).

$$^{13} g_0(\mathbf{a}, p) = \mathbf{a}^a [(1-\mathbf{a})/p]^{1-a}$$

$$^{14} g_1(\mathbf{a}) = \mathbf{a}^{a/(1-a)} (1-\mathbf{a})$$

¹⁵ Theoretically, there may be more than one local maximum point of private enrollment with respect to r . However, both the calibration of the model and the empirical estimation indicate that the relationship between private enrollment and the share of the religious group in the population is inversely U-shaped.

¹⁶ Per capita money income was 20,120 and there were 2.61 persons per household (Statistical Abstract of the United States, 2000, Tables 737, 753, 63).

¹⁷ The number of children enrolled in public schools in 1997/8 was 46,126,897 (Digest of Educational Statistics 2000, Table 41). The corresponding number for private schools was 5,076,119, implying a public enrollment rate of 90.1%. Out of total private enrollment, 2,514,699 students were enrolled in Catholic parochial schools, implying 4.91% of total enrollment (Digest of Educational Statistics, 2000, Table 60).

¹⁸ Statistical Abstract of the United States (2000), Table 75.

¹⁹ Digest of Educational Statistics 2000, Table 169.

²⁰ The number of students enrolled in elementary or high school in 1997/8 was 51,203,016 (see note 20) and the number of households in 1998 was 101,041,000 (Statistical Abstract of the US, 2000, Table 63), implying 0.5 (elementary and secondary) students per household.

²¹ National Catholic Educational Association, 1990.

²² Micro studies indicate that African-Americans themselves are less likely to attend private schools.

²³ James (1993) is the only empirical paper that allows for a non-linear relationship between private enrollment and the Catholic share in the population. This was done

by constructing a Catholic weight variable, $WT_{ca} = \text{Minimum}(r, 1-r)$, which is maximized when Catholics are a large minority or small majority ($r = 0.5$) of the population.

²⁴ School choice equations are more appropriate to be estimated across counties. We first used state level data because we didn't have data on Catholic enrollment across counties, which we needed in order to demonstrate Propositions 1 of our model. However, we did have data on total private enrollment rates across all of the 3100 US counties, and therefore we estimated the last equation also across counties.