

**PRESERVING RELIGIOUS VALUES THROUGH
EDUCATION:
ECONOMIC ANALYSIS AND EVIDENCE FROM THE US ***

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ABSTRACT

This paper presents a theoretical model of religious segregation in education that predicts an inverse U-shape relationship between private school enrollment and the share of religious minority groups in the population. In our model parents in religious minority groups want to transmit their religious values to their children. When they are a small proportion of the population they have a strong need to send their children to religious private schools, where, hopefully, they will be sheltered from outside influences. But when the share of the religious minority group in the population increases, outside influences are less threatening, and the desire for religious private schools decreases. We check this theory empirically using data on private school enrollment rates and the Catholic share in the population across 3100 counties in the US. The empirical results support our theory by showing that the share of Catholic households that send their children to Catholic schools decreases in the share of Catholics in the population, and that there is an inverse U-shape relationship between private enrollment and the share of Catholics in the population. Our findings contribute to understanding the mechanism under which religious minorities try to preserve their identity, as well as the structure of demand for religious schooling.

Keywords: segregation, private education, religious education, minorities.

JEL classification: Z12, I20.

1. INTRODUCTION

Most elementary and secondary private schools in the world are religiously oriented. For example, enrollment in private elementary and secondary schools in the US in 1993-1994 was 4,970,646. Of this number, religious schools served 4,202,195 pupils, 84.54%.¹ While it has traditionally been argued that parents send their children to private schools to achieve better scholastic outcome, in this paper we suggest that in most cases parents send their children to private schools mainly to preserve their social (religious) values.² 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 the group identity, and to resist assimilation into majority groups.³

Indeed, many studies indicate that religious schools do provide better education than public schools.⁴ However, many important facts cannot be explained by this motive only. For example, in the US, opting out of the public school system does not

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, and thus a low quality public system stimulates the growth of high quality private schools to meet the demand of those willing and able to pay the price.

³ 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 School in the US – A Statistical Profile, 1993-1994). Bisin and Verdier (2000) also provide much evidence that support this claim. They refer to O'Brien and Fugita (1991) who describe how important was the development of Japanese schools for Japanese families after World War II in the US. They mention also Gussin Paley (1995) who documents African Americans in Chicago's South Side who make a trade off between the low academic quality of black public schools and the undesired exposure to "white culture" in integrated schools. Similar attitudes are encountered in other ethnic groups (for example, see, Mayer (1985) for Jews, Tyack (1974) for Germans, and Glazer (1997) for African Americans).

reduce a household's school tax liabilities, and therefore only makes sense if it is perceived that private schools provide a better education. Yet, average tuition in religious schools equals approximately only half of spending per student in public schools or in secular private schools.⁵ In that case, for religious households to send their children to religious schools only for the motive of achieving higher educational quality, religious schools would have to be more than twice as effective as public schools. However, though it seems likely that religious schools do provide higher quality education, it is not plausible that it is more than twice as effective. Furthermore, if the quality of education in private schools was higher, and religious interests were 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.⁶ In addition, if parents send their children to private schools only because they provide better education, why are most private schools religious? Hence, it seems that we need a further explanation for why parents send their children to private religious schools.

In this paper we suggest that religious parents send their children to religious schooling mainly to preserve their religious values (henceforth referred to as the religious motive) rather than to achieve better cognitive results (the quality motive).⁷

⁴ 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.

⁵ In 1993/4, expenditure per pupil in public elementary and secondary schools was \$5,767; more than twice the average in Catholic schools, \$2,178; and about twice the tuition in other religious schools, \$2,915 (Digest of Education Statistics, 2000, Table 62).

⁶ National Catholic Educational Association, 1990.

⁷ James (1987, 1992) 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 that attend private rather than public schools is due to differentiated demand which stems mainly from religious heterogeneity.

We also suggest that this motivation is stronger among parents from religious minority groups. That is, religious minority groups establish religious schools to preserve the group identity and to resist assimilation into majority groups.⁸ We begin by presenting 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). In our model, 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 schooling (religious motive). However, as the share of the religious group in the population increases, outside influences become less threatening, and therefore, their need to send their children to religious private schools decreases. In that case, a lower percentage of households from the religious minority group 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 number of religious households in the population and this has a

⁸ This hypothesis can explain the high number of private schools and colleges established by minority groups all over the world (for example, Muslims and Parsees, Sikhs in India, and 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, and why many Catholic private schools emerged in the US as a response by a group that did not want to be fully assimilated (James, 1987). 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, 1992).

positive effect on the private enrollment rate. 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. This implies an inverse U-shape relationship between private enrollment and the share of the religious minority group in the population.

This 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 each of the 3100 US counties. Our estimation indicates that the share of Catholic households that send their children to Catholic schooling 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 an inverse U-shape relationship exists between private enrollment and the share of the religious minority (Catholic) group in the population.⁹ 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 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

⁹ This empirical result, which is consistent with our model, modifies James' (1987) empirical assumption of a linear relationship between the private school enrollment rate and the share of Catholics in the population.

evidence of this.¹⁰ This pattern indicates that minority groups purposely 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.^{11,12}

The importance of the paper is, first, that it describes the mechanism by which religious minority groups preserve their identities, 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 understanding the structure demand for religious schooling. It indicates a nonlinear relation between enrollment in private schools and the share of the religious minority group in the population. This is a feature that should be taken into account when trying to evaluate policy programs

¹⁰ Another channel through which minority groups preserve their identity is to congregate themselves together in order to get a school of their tastes by local government production. In this case in which minority groups are concentrated in the same geographic area there is less scope for private education.

¹¹ Bisin and Verdier (2000) provide much evidence that religious minorities do resist assimilation into the general population. For example, they mention Herberg (1955) who noticed that assimilation of immigrants was failing to occur in the US, and suggested that the “three great faiths” (Protestant, Catholic and Jewish) might constitute a “triple melting pot”. Another example is Glazer and Moynihan (1963) who studied the five major ethnic groups of New York City and concluded that even along ethnic traits, assimilation was preceeding at best very slowly. Bisin and Verdier mention also Mayer (1979) who concluded that Orthodox Jewish communities were facing a “cultural Renaissance” rather than complete assimilation as anticipated by most social scientists. Basques, Catalans, Corsicans, Irish Catholic in Europe, Quebecois in Canada, and Jewish of the Diaspora are also given as examples of religious minorities who have remained strongly attached to their language and cultural traits.

¹² Our paper is also related to studies that deal with the consequences of cultural segregation. Lazear (1999) shows that the absence of a common culture inhibits the ability of economic agents to interact with each other and undermines the efficiency of production and exchange. Gradstein and Justman (2000, 2001) relate Lazear’s result to education and show that when different cultural groups separately determine the social content of their school curricula excessive polarization can result, with less than optimal growth. Gradstein and Justman (2002) show that while free public education requires minority parents to pay twice for culturally distinct private education, it creates excessively powerful incentives for cultural assimilation, thus indicating scope for a Pareto improvement by simultaneously subsidizing private education and regulating its content.

that affect private education.

The structure of the paper is as follows. Section 2 describes the model. Section 3 sets out the comparative statics, and derives the theoretical results. Section 4 recovers the parameters of the utility function. In Section 5 we estimate the relationship between private enrollment and the share of Catholics in the US, and Section 6 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 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 .

We assume that the individuals' religious orientation can be captured by a single variable, $0 \leq k \leq 1$, located in the unit interval, and also that each of the two groups of parents are uniform with regard to religious characteristics $k_{parent, R} = 1$ and $k_{parent, N} = 0$. As we want to focus our analysis on the role of schooling, we further assume that children arrive at school without well-defined religious beliefs, which they may acquire in a religious school, or, in their neighborhoods, through imitation and peer influence. We further assume that if the children are sent to a religious school they will acquire strong religious values that will protect them from peer influence. In this case, their religious characteristics are $k_{child, rel} = 1$. 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 this case their religious characteristics are equal to the share of religious households in the general population, $k_{child, sec} = r$.

We assume that parents make all household decisions and that they wish to transmit their own religious traits to their children, and do not care only about their children's material success. 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 to their children in the alternative schools.¹³

The religious proximity between a parent and child is defined as:

$$s_i = 1 - \left| k_{i, parent} - k_{i, child} \right| \quad (1)$$

Then, a religious household that sends its child to a secular school, public or private, obtains $s_i = r$, while a religious household that sends its child to a religious school obtains $s_i = 1$. Similarly, a non-religious household that sends its child to a secular school obtains $s_i = 1 - r$. Otherwise, it obtains $s_i = 0$.

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 religious proximity between them and their children, s_i .

The utility function is

¹³ Bisin and Verdier (2000) supply much evidence to support the claim that parents wish to transmit their own traits and culture to their children, and do not just internalize some measure of their children material success.

$$U(c, x, s) = c^\alpha x^{1-\alpha} s^\gamma \quad (2)$$

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 in any desired quality.¹⁴ Thus households can choose to forgo public education and instead purchase private education or religious education, but this does not reduce their tax liability. We equate educational quality with spending-per-pupil within each local school system.¹⁵ 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:

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

¹⁴ 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.

¹⁵ There is substantial empirical evidence that material resources, especially reduced class size—on which there is a voluminous literature—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).

where q^e denotes the level of public enrollment which 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 in any desired quality. A non-religious household that sends its child to a secular private school solves:

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

and has indirect utility ¹⁶

$$U_{sp,N}(t, r, y_i) = g_0(\alpha, p) (1-r)^\gamma (1-t) y_i \quad (5)$$

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 ¹⁷

¹⁶ $g_0(\alpha, p) = \alpha^\alpha [(1-\alpha)/p]^{1-\alpha}$

¹⁷ $g_1(\alpha) = \alpha^{\alpha/(1-\alpha)} (1-\alpha)$

$$\underline{y}_N(t, q^e) = (t \bar{y}) / [(1-t) q^e g_1(\alpha)] \quad (6)$$

such that all non-religious households with incomes below \underline{y}_N send their children to public school, and all those with incomes above \underline{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:

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

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:

$$\text{Max}_{c,x} U(c, x) = c^\alpha x^{1-\alpha} r^\gamma = c^\alpha x^{1-\alpha}$$

$$\text{s.t. } c + xp = (1-t)y_i$$

and has indirect utility

$$U_{rp,R}(t, y_i) = g_0(\alpha, p) (1-t)y_i \quad (9)$$

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

$$\underline{y}_R(t, q^e, r) = (t \bar{y} r^{\gamma/(1-\alpha)}) / [(1-t) q^e g_1(\alpha)] \quad (10)$$

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

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

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 y_N and y_R are both decreasing in q^e , and as $F(y(t, 0)) \geq 0$ and $F(y(t, 1)) \leq 1$ there exists an equilibrium value of public enrollment q that equates anticipated and actual enrollment rates, implicitly defined by (14).

3.

C

COMPARATIVE STATICS

We first analyze the effect of the relative size of the religious minority group, r , on the share of religious households that sends their children to public school, q_r . Substituting equation (13) into equations (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

$$M(q_R, q_N, r) = q_R - F \left\{ (t \bar{y} r^{\gamma/(1-\alpha)}) / [(1-t)(r q_R + (1-r) q_N) g_1(\alpha)] \right\} = 0 \quad (15)$$

$$N(q_R, q_N, r) = q_N - F \left\{ (t \bar{y}) / [(1-t)(r q_R + (1-r) q_N) g_1(\alpha)] \right\} = 0 \quad (16)$$

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 . 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.

When there is no religious group, i.e., when $r = 0$, there is also no religious schooling, that is,

$$Rel(r = 0) = 0 \tag{17}$$

However, when all the population is religious, i.e., when $r = 1$, religious enrollment, $1 - q_R$, is positive, that is,

$$Rel(r = 1) = 1 - q_R > 0 \tag{18}$$

When the entire local population is religious, households send their children to religious schools only because of the quality motive. That is, rich households send their children to religious schools because there they can choose the quality of education they most desire for their children, while the quality of the public schools is uniform.

From (17) and (18) we can conclude that there must be a range of values for r under which the religious enrollment rate increases with the share of the religious minority group in the population. Therefore, if there exists a unique pair (r^*, q^*) which satisfies

$$d[r(1-q_R)] / dr = 1 - q_R - r \, dq_R/dr (q, r) = 0 \quad (19)$$

the relationship between religious enrollment and r is inversely U-shaped.

Proposition 2: If there exists a unique pair (r^*, q^*) that satisfies equation (19) then there is an inverse U-shape relationship between the religious enrollment rate and the share of the religious minority 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

$$q = r F \{ (t \bar{y} r^{\gamma/(1-\alpha)}) / [(1-t) q g_1(\alpha)] \} + (1-r) F \{ (t \bar{y}) / [(1-t) q g_1(\alpha)] \} \quad (20)$$

Then,

$$q(r=0) = F \{ (t \bar{y}) / [(1-t) q^e g_1(\alpha)] \} \quad (21)$$

$$q(r=1) = F \{ (t \bar{y}) / [(1-t) q^e g_1(\alpha)] \} \quad (22)$$

From (21) and (22) we obtain that

$$q(r=0) = q(r=1) \quad (23)$$

Total differentiation of (20) yields

$$dq/dr = \frac{q_R - q_N + y_R f(y_R) \gamma / (1 - \alpha)}{1 + r \cdot y_R f(y_R) / q + (1 - r) \cdot y_N f(y_N) / q} \quad (24)$$

As the denominator is always positive we find that

$$\text{sign}[dq/dr] = \text{sign}[q_R - q_N + y_R f(y_R) \gamma / (1 - \alpha)] \quad (25)$$

Then, it is straightforward that

$$dq/dr(r=0) = -q_N < 0 \quad (26)$$

$$dq/dr(r=1) = y_R f(y_R) \gamma / (1 - \alpha) > 0 \quad (27)$$

From (23), (26) and (27) we obtain that the relationship between public enrollment and the share of the minority group in the population is U-shaped. In that case, it is

straightforward that the relationship between total private enrollment and the share of the religious minority group in the population is inversely U-shaped.¹⁸

Proposition 3: The relationship between the total private enrollment rate and the share of the religious minority group in the population is inversely U-shaped.

4. CALIBRATION

In this section we apply our model to analyze the motives of parents for enrolling 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, $\ln y \sim N(\mu, \sigma^2)$, 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 \$38,885,¹⁹ implying $\mu = 10.568$ and $\sigma = 0.7752$. 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:

$$q = r \Phi \{ [\ln(\underline{y}_R(t, q, \bar{y}, r)) - \mu] / \sigma \} + (1 - r) \Phi \{ [\ln(\underline{y}_N(t, q, \bar{y})) - \mu] / \sigma \} \quad (28)$$

¹⁸ According to these equations, the possibility still exists that there is more than one local maximum point of private enrollment with respect to r . At this stage of the paper we neglect this possibility, but both the calibration of the model and the empirical estimation indicate that this possibility does not occur in reality.

¹⁹ 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).

Setting $q = 90.1\%$, the public enrollment share in school year 1997/8,²⁰ we obtain:

$$q = r \Phi \{ [\ln(\underline{y}_R(t, q, \bar{y}, r)) - \mu] / \sigma \} + (1-r) \Phi \{ [\ln(\underline{y}_N(t, q, \bar{y})) - \mu] / \sigma \} = 0.901 \quad (29)$$

We set r equal to 0.27, the share of Catholics in the US in 1998.²¹ The share of households that opted for Catholic education in 1997/8 was 4.91%, i.e.,

$$r(1 - q_R) = r [1 - F(\underline{y}_R(t, q, \gamma_R))] = 0.0491 \quad (30)$$

Public expenditure per student in 1997/8 was \$6,189.²² 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 $m = 0.5$,²³ 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 (29), and (10) in (30), we then have two equations in the two unknowns α and γ . Solving them we obtain that $\alpha = 0.9304$, and $\gamma = 0.0239$.

²⁰ 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).

²¹ Statistical Abstract of the United States (2000), Table 75.

²² Digest of Educational Statistics 2000, Table 169.

²³ The number of students enrolled in elementary or high school in 1997/8 was 51,203,016 (see note 15) and the number of households in 1998 was 101,041,000 (Digest of Educational Statistics 2000, Table 63), implying 0.5 (elementary and secondary) students per household.

We now illustrate the relationship between private enrollment and the share of the Catholic group in the population, for the calibrated parameters α and γ .²⁴

[INSERT FIGURE 1 ABOUT HERE]

As predicted according to Proposition 3, the relationship between the two variables is inversely U-shaped.

We also 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.

[INSERT FIGURE 2 ABOUT HERE]

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

5. ESTIMATION

In this section, we empirically illustrate the theoretical results for the Catholic minority in the US. First, we take a cross section of 51 US States in order to estimate the determinants of the share of Catholic households that send their children to Catholic schooling. Data for the regressions are from the County and City Data Book, except for enrollment in Catholic schools which is derived from the US Catholic

²⁴ This is easy to implement because, as we already showed, for every value of r there exists a unique private enrollment rate which solves equation (31).

Elementary and Secondary Schooling 1989-1990,²⁵ and %Catholic, derived from Bradley et al. (1992). All the data refer to 1990, except for enrollment in Catholic schools (1989-1990), and mean income (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 schooling 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 is expected to have a negative influence on the share of Catholic households that send their children to Catholic schooling, according to Proposition 1 of our model. That is, as the Catholic share in the population increases, outside influences on the child become less threatening, and therefore, less Catholic households are willing to pay for Catholic schooling.

Mean income is taken as an indicator of parental 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.

²⁵ - National Catholic Educational Association, 1990.

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 signifies a desire for racial homogeneity by Catholic whites living in a racially mixed society.²⁶ 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.

Share of school age children in the population 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 cannot afford to send all their children to private schooling. Therefore, if they do not want to discriminate between their children they send all of them to public schooling.

Regression results are presented in Table 1. The equation as a whole explains 89% of the variance in the dependent variable, and all the variables are significant and with reasonable signs, with the exception of public expenditure per student and

²⁶ - Micro studies indicate that African-Americans themselves are less likely to attend private schools.

household mean income. 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, as demonstrated by Proposition 2 of our model. 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.)

Regression results are presented in Table 2. 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 just under 50%: 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. The equation explains 64% of the variation in the dependent variable. As theoretically shown in Proposition 3, 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.²⁷ The results are presented in Table 4. 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 minority group is a small proportion of the population it has a strong need to send its children to religious private schools, where they will be sheltered from outside influences. When the share of the religious minority group in the population increases, outside influences become less threatening, and the parents' need to send their children to religious 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 as well has a positive effect, consistent with the hypothesis that a large African-American minority increases the proportion of whites who 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

²⁷ 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 and 2 of our model. However, we did have data on total private enrollment rates across all of the 3100 counties in the US, and therefore we estimated the last equation also across counties.

This paper describes the mechanism under which religious minority groups preserve their identities. Our model shows that parents from religious minority groups, who wish their children to resemble them, and are afraid of outside influences from the neighborhood, purposely segregate their children from the general population by sending them to religious schools, for which they pay, in addition to their tax obligations. As the share of the minority group in the population increases, these influences become less threatening, and therefore, households are less willing to pay for religious schooling. The share of parents from the religious group who send their children to religious schooling therefore decreases. This implies an inverse U-shape relationship between private enrollment and the share of religious minority groups in the population.

This hypothesis is then supported by data on private school enrollments and on the Catholic share in the population across all of the 3100 US counties. The empirical results indicate that the share of Catholic households that send their children to Catholic schools decreases in the share of Catholics in the population, and also that there is an inverse U-shape relationship between private enrollment and the share of Catholics in the population.

Our model is important not only for understanding the behavior of religious minorities but also for understanding the structure of demand for religious schooling, which comprises approximately 85% of all private education in the US. It shows that enrollment in private schools is mostly motivated by parents from religious minorities who want their children to preserve their values. These features should be taken into account when evaluating proposed policy programs that affect private education.

Table 1. 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 2. Dependent variable: Catholic enrollment rate

Variable	Coefficient	<i>t</i> -statistic
<i>Constant</i>	4.16	0.74
<i>Mean income</i>	-0.093	-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 3. Dependent variable: Total private enrollment rate

Variable	Coefficient	<i>t</i> -statistic
<i>Constant</i>	8.28	1.52
<i>Mean income</i>	0.104	1.36
<i>Density</i>	-0.4	-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>	-0.0003	-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 4. Dependent variable: Private enrollment rate – County data

Variable	Coefficient	<i>t</i> -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	

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Appendix A:

Total differentiation of (15) and (16) with respect to r yields:

$$dM / dq_N \cdot (dq_N / dr) + dM / dq_R \cdot (dq_R / dr) = -dM / dr \quad (A1)$$

$$dN / dq_N \cdot (dq_N / dr) + dN / dq_R \cdot (dq_R / dr) = -dN / dr \quad (A2)$$

Then, from (A1) and (A2) we obtain that

$$dq_R / dr = \frac{dN / dr \cdot dM / dq_N - dM / dr \cdot dN / dq_N}{dN / dq_N \cdot dM / dq_R - dM / dq_N \cdot dN / dq_R} \quad (A3)$$

where the partial derivatives of M and N are

$$dM/dr = -f(y_R) \cdot y_R \{ \gamma / [(1-\alpha)r] + (q_N - q_R) / q \}$$

$$dM/dq_N = f(y_R) \cdot y_R (1-r) / q$$

$$dM/dq_R = 1 + f(y_R) \cdot y_R \cdot r / q$$

$$dN/dr = -f(y_N) \cdot y_N (q_N - q_R) / q$$

$$dN/dq_N = 1 + f(y_N) \cdot y_N (1-r) / q$$

$$dN/dq_R = f(y_N) \cdot y_N \cdot r / q$$

Substituting the following partial derivatives into (A3) we find that

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

Figure 1 - Private enrollment as a function of r

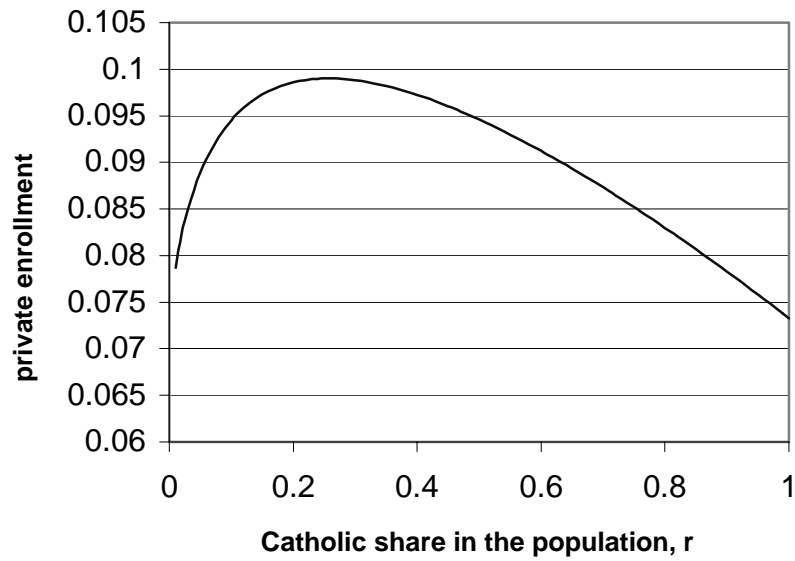


Figure 2 - Share of Catholic households that send their children to Catholic schooling as a function of r

