Essays in the Economics of Private Education: Theory and Evidence from England

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Declaration

The work presented in this dissertation is my own.

Abstract

This thesis investigates the relationship between the demand for private education and the distribution of income, state school quality, religion and political allegiance in England. Chapter 2 focuses on how the demand for private education, both secular and religious, is affected by the distribution of income. Theoretically and empirically, I find that private schools in general locate in areas with high income levels, high income inequality and low spending per pupil in state schools. However, religious (Muslim and Jewish) schools locate where the fraction of the relevant religious individuals is high and where the religious individuals are relatively poor. Chapter 3 studies the relationship between the demand for private education and local state school quality, and how this varies with household income and preferences for education. Consistent with theoretical predictions, I find robust empirical evidence of a non-linear relationship between the demand for private education and for local state school quality such that it is positive at lower income levels and negative at higher income levels. Finally, chapter 4 explores the relationship between religious and political allegiance and private schooling choices. I find that the relationship between religion and private education varies greatly across religious groups, and is strongest for non-mainstream denominations. The strength of the association between religious and political allegiance and private schooling depends significantly on the intensity of religious beliefs. However, the greater demand for private education among non-Christians does not appear to be driven primarily by religious motives but rather by stronger preferences for education. I also find that private school demand is significantly associated with respondents' political allegiance.

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Chapter 1

Overview

Private sector alternatives to publicly provided education is a key policy issue. Proponents claim that private schooling frees up resources in the public sector and invigorates the public sector through increased competition. By contrast, critics worry that private schools attract the most able and wealthy pupils to the detriment of the viability of the state schools. Much of the focus in the economics of education literature has been on the effect of private education on educational outcomes. Instead, this thesis revolves around three main themes related to the demand for and supply of private education: the distribution of income, religion and ethnicity and the quality of the public sector.

Chapter 2 studies the relationship between the demand for and supply of private education, both secular and religious, and the distribution of income. I develop a simple theoretical model of private school demand where I show that private school demand is positively related to mean income levels as well as to mean-preserving increases in income inequality. Religious preferences for private schooling dampen the effect of mean-preserving spreads on demand. Furthermore, it follows from the model that mean income levels are lower in the religious relative to the secular private sector, even if the income distributions of secular and religious individuals are identical.

To test the predictions of the model, I estimate a count data model of the location of secular and religious (Muslim and Jewish) private schools, based on a unique dataset composed of micro level English school and income data, and of Census data. The results are consistent with the theoretical model: I find that private schools in general locate in areas with high income levels, high income inequality and low spending per pupil in state schools. However, religious schools locate where the fraction of the relevant religious individuals is high and where the religious individuals are relatively poor.

Next, Chapter 3 investigates the relationship between the demand for private education and local state school quality, and how this varies with household income and preferences for education. As opposed to chapter 2 where I modeled private school demand as a discrete choice, I here let the choice be continuous and argue that this has important implications for the interaction between the public and private sector. The main features of the theoretical model are as follows: Households simultaneously choose residential location and educational quality. Local state school quality is determined by residential location and is cheaper per unit than private education, yet there are limits on the maximal quality levels available in the public sector. Households may divide their consumption of education between the public and private sectors, but they cannot relocate. In this context, we may find either a positive or a negative correlation between private school demand and local state school quality in a cross-section of households, depending on the distribution of income. To test the model's predictions, I construct a unique data set from 14 years of British Social Attitudes Survey data on household characteristics matched to disaggregated school, house price and census data. Empirically, I measure state school quality by pupil performance on standardized tests. Consistent with the theoretical predictions, I find robust empirical evidence that the association between state school quality and private school demand

declines in household income such that it is positive at lower income levels and negative at higher income levels.

Finally, chapter 4 explores the relationship between religion, political allegiance and private schooling choices based on English survey data. Controlling for detailed household covariates, I find strong and robust associations. The relationship between religion and private education varies considerably across religious groups, and is strongest for non-mainstream denominations (Roman Catholic, Muslim, Hindu and Jewish). However, the greater demand for private education among non-Christians does not appear to be driven primarily by religious motives but rather by stronger preferences for education. Coupled to the findings of Chapter 2, it appears that members of minority non-Christian religious denominations are segmented into low income members who are attracted by own-religious private education, while richer members are attracted to secular private education. I also find evidence that political beliefs and allegiance affects private schooling decisions. Stating support for the Conservative party which views private education favorably is associated with a significantly higher propensity to choose private education. The converse holds for individuals who support the Labour party which takes a very critical stance towards private education. Furthermore, the association of private schooling with religion and political allegiance significantly strengthens in the intensity of religious beliefs (frequency of attending religious services, prayer, self-rated degree of religiosity or belief in God) and political allegiance (the degree of identification expressed with a political party), respectively. While further research is required to make a stronger case that the statistical relations observed are causal, the results suggest that religion and political beliefs play important roles in non-trivial economic decisions.

Chapter 2

Income Inequality and the Demand for Secular and Religious Private Education. Theory and Evidence from England

2.1 Introduction

In most countries, despite heavily subsidized or free public provision of education, the private school sector is substantial. Individuals typically choose to pay for private education because they can get education of a higher quality or of a different type (for instance religious) than is available in the public sector.

Consumption in the private school sector may be desirable if the private sector is more efficient, or if the resulting competitive pressure on state schools enhances overall academic performance. From a redistributive perspective, to the extent private sector consumption by high-income individuals frees up resources in the public sector, it may imply that universal public sector provision of education is effectively targeted to low-income individuals[1]. On the other

[1] Altonji, Elder and Taber (2002a, b) find no strong evidence that religious private schools are more effective than secular state schools. Gibbons and Silva (2006) come to the same conclusion regarding state aided faith schools in England. The point of view that schools compete on quality and competition is beneficial for overall academic performance is advocated in Hoxby (1994, 2000, 2002), while it is questioned in Hastings, Kane and Steiger

hand, if peer effects matter for educational outcomes[2] and private schools attract the most able and motivated pupils and teachers, private education may also have negative implications for the public sector. Finally, there is a separate set of concerns relating to the role of religious private schools. This is especially true of those affiliated with religious minority groups with beliefs and norms that in some cases conflict with those of the wider society, such as Muslims[3] and conservative Christian denominations, which have relatively poor academic outcomes and are also the fastest growing private school sectors in England and the US, respectively[4]. It is therefore of interest to understand what determines private school entry and to what extent religious schools are different from other schools.

In this paper, I focus on the relationship between private school demand and the distribution of income. I develop a simple model of private school demand. Parents choose education for academic and, in the case of religious individuals, for non-academic reasons. Academic quality beyond a fixed public sector level and satisfaction of preferences for religious schooling can only be obtained, at a cost, in the private sector[5]. I investigate how private school

(2005), Hsieh and Urquiola (2006) and Rothstein (2005). The latter argument is made in Besley and Coate (1991).

[2]See e.g. Altonji, Taber and Huang (2004), Hsieh and Urquiola (2006), Gibbons, Steve and Shqiponje Telhaj (2006).

[3]See The Economist January 20th 2005 and August 11th 2005.

[4]Author's own analysis of English school data (see Figures 2.2-2.3), and the National Center for Education Statistics (2006) for the US. However, Muslim and conservative Christian schools also charge much lower fees than other private schools. There is no conclusive evidence on whether religious schools perform better or worse than other schools once selection and differences in resources is taken into account. On Catholic schools, see also Altonji et al (2002).

[5]Examples of such non-academic reasons to choose private education first and foremost include religion. Religious schools constitute more than half of private schools in England, though not all are "truly religious". As will be argued below, I consider Muslim and Jewish schools to be "truly" religious. Non-academic aspects of education are arguably also important motives when choosing schools that teach according to particular pedagogical philosophies such as Steiner, Montessori or Waldorf schools, international schools or schools that cater to particular expatriate communities using native language teachers. These latter schools types, along with Muslim and Jewish schools, are among the fastest growing in England, in terms of both school and pupil numbers.

demand is affected by income inequality, and how this effect differs between secular and religious private education.

The three main findings of this paper are: First, private school demand is positively related to mean-preserving increases in income inequality. Second, religious preferences for private schooling reduce the effect of mean-preserving income spreads on private school demand. Third, mean income levels are lower in religious relative to secular private schools. The intuition is as follows: There exists a minimum income threshold that induces private sector consumption. When inequality rises, holding mean income constant, the fraction of the population with income above this threshold rises if the threshold is sufficiently high (or private school demand sufficiently low). The marginal effect on private school demand of increasing inequality increases in the threshold value (up to a point). Since there is an additional motive for private sector consumption for religious individuals, the secular income cutoff is higher for secular than for religious individuals. As a consequence, the marginal effect of increasing inequality is generally higher for secular than for religious private school demand. Furthermore, it follows that mean income levels are lower in the religious relative to the secular private sector.

To test the models predictions, I use the statistical model of count data developed by Hausman, Hall and Griliches (1984) and Cameron and Trivedi (1986). Following the approach of Downes and Greenstein (1996), I investigate the relationship between the number of private schools in a small geographic area and the characteristics of schools and of the population in that area. Specifically, I investigate the location choices of secular and religious (Muslim and Jewish) English private schools at the postcode district level (on average 95.000 inhabitants), based on a rich data set composed of micro level school and income data, and of Census data. Consistent with the model, I find that private schools in general locate in areas with high income levels, high income

inequality and low spending per pupil in state schools. This does not hold for religious schools. In particular, religious schools locate where the fraction of the relevant religious individuals is high and where the religious individuals are relatively poor.

There is sizeable literature modelling individuals' choice between consuming publicly provided private goods, such as education, in the public or private sector. A few examples are Stiglitz (1974), Besley and Coate (1991) and Epple and Romano (1996, 1998). My model most closely resembles that of Besley and Coate. This is a discrete choice model between free, publicly financed public sector consumption and private sector consumption where individuals can get their desired quality level at a cost. They focus on public sector quality levels that only induce the poor to consume in the public sector. I extend this model by introducing a continuous income distribution. This feature of the model makes it feasible to meaningfully explore the implications for private school demand, and the composition of demand, of changes to the income distribution. In addition, I add religious preferences for private education. With a few exceptions like Besley and Ghatak (2005), Dixit (2002) and Kremer and Sarychev (1998), the existing theoretical literature on education does not consider individuals' preferences for other attributes of education than pure academic quality or academic achievement. The two former posit that worker motivation economizes on the need for explicit monetary incentives to elicit effort, while the latter is concerned with the costs of ideological and cultural segregation. The present paper does not consider these issues.

There is only a very small related empirical literature on private school location which basically consists of Downes and Greenstein (1996, 2002) who analyze location determinants of incumbent and new private schools, respectively, in California 1978-79[6]. While my results on private school demand are

[6]There also exists a small literature on charter schools. Glomm, Harris and Lo (2001) and

largely consistent with their findings, this paper is an improvement and extension of the existing literature in this area. The data employed in this paper is considerably richer that employed in previous studies. This is particularly true of the quality and level of disaggregation of the data on income, religion and qualifications and labour market activity split up according to religion. Moreover, there is comprehensive data on private schools, from which the entry and exit, size and academic performance of both secular and religious schools can be identified with a high degree of reliability over a period of 11 years, which is also unparalleled.

The remainder of the chapter is organized as follows. Section 2.2 introduces the model. Section 2.3 provides background information and describes the data. Section 2.4 presents the empirical approach to testing the predictions of the model. Section 2.5 discusses the empirical results. Section 2.6 reviews the robustness of the results. Section 2.7 concludes.

2.2 The Model

In this section, I develop a simple theoretical model of demand for private education. There are two goods, a continuous income distribution, and religious and secular individuals facing a discrete choice between public sector consumption and secular or religious private education.

2.2.1 Set-up

For now, I shall ignore the distinction between secular and religious education which will be introduced in section (2.2.3) below. Consider an economy with two goods, a numeraire x and an indivisible good, education, of which

Mirikitani (2003) study charter school entry in Michigan and California in 1998 (regressing on school market characteristics in 1992), and in Texas 1996-2001, respectively. Filer and Munich (2001) study new choice-based schools in the Czech Republic.

all individuals consume one unit. However, education is available at different levels of "quality" denoted by q. I am agnostic about what constitutes "school quality". Beyond assuming "school quality" to be a normal good, I make no assumptions regarding educational production functions, including how and why "school quality" matters for households[7]. I assume that income is continuously distributed with finite support between $[\underline{y}, \overline{y}]$. In the public sector tax-financed education of a fixed quality level q_g is provided free of charge, whereas individuals can consume education at their desired quality level q^* in the private sector at a cost. Producers are assumed behave competitively and the market price of one unit of quality q is pq.

Preferences: Individuals have identical Cobb-Douglas preferences over educational quality, q, and other goods x :

$$u(q, x) = q^{\alpha} x^{1-\alpha} \tag{2.1}$$

2.2.2 Private School Demand

Conditional on consuming in the private sector, solving for q^* yields $\frac{\alpha y}{p}$. The utility of individuals with income y is thus maximized by consuming in the public sector if $q_g^{\alpha} y^{1-\alpha}$ exceeds $yp^{-\alpha}\psi$, where $\psi = \alpha(1-\alpha)^{1-\alpha}$. If there exists a value of income $\widehat{y} \in [\underline{y}, \overline{y}]$ at which an individual is indifferent between purchasing private education and using the public sector, then all individuals

[7]School quality might relate to spending per pupil or peer composition. The importance of school quality along these dimensions might relate concretely to performance in school, or on education or earnings later in life. Per pupil spending or a certain peer composition might also be valued by parents in its own right, even if it produces no tangible outcomes. It is further conceivable that "school quality" matters differentially for different households depending on the ability of their children. The relationship between private education investment decisions related to a child's ability. Parents might feel that a child of high ability will do well almost regardless of the education it receives. On the other hand, it might also be that parents with particularly gifted children feel that there is a higher payoff to providing them with a superior quality of education. For instance, Gibbons and Telhaj (2006) find evidence that higher-ability pupils gain more (in terms of test scores) from high-ability peers than do low-ability pupils.

with income above

$$\widehat{y} = q_g p \psi^{-\frac{1}{\alpha}} \tag{2.2}$$

demand private education[8]. This result says that we expect selection into private education by income. It is driven by the quality of education being a normal good while the quality of public provision is fixed. Furthermore, a lower quality level in the public sector q_g encourages private school demand.

2.2.3 Private School Demand and Income Inequality

Consider the impact on overall private school demand of a mean-preserving spread of income. Suppose income is distributed according to the Pareto distribution with shape parameter $\gamma > 1$ and scale parameter κ. Private school demand, the proportion of individuals consuming in the private sector, is then given by:

$$D\left(q_g, p; \delta\right) = P\left(\ y > \widehat{y}\right) = \left(\frac{\widehat{y}}{\kappa}\right)^{-\gamma} \tag{2.3}$$

for $y, \widehat{y} \geq \kappa > 0$, where $\delta = (\alpha, \gamma, \kappa)$. The shape parameter γ is an inverse measure of the mean value of and dispersion income for $\gamma > 1$[9]. A mean-preserving spread of income can then be represented by a *decrease* in γ subject to mean income $\overline{y} = \frac{\gamma\kappa}{\gamma - 1}$ remaining constant. Substituting the scale parameter κ as a function of $\overline{y}$ into $D\left(q_g, p; \delta\right)$ yields

$$D'\left(q_g, p; \delta\right) = \left(\frac{\gamma}{(\gamma - 1)} \frac{q_g p \psi^{\frac{1}{\alpha}}}{\overline{y}}\right)^{-\gamma} \tag{2.4}$$

On this basis, I derive the following result on income inequality and private

[8]This result holds if the utility given private sector consumption is increasing faster in y than given public sector consumption. Differentiating utility in each case, we have that this is true if $\alpha > 0$.

[9]For $\gamma \leq 1$, the expected value is infinite.

school demand.

Proposition 2.1 *If* $q_g p > \kappa \psi^{-\frac{1}{\alpha}} e^{\frac{1}{\gamma-1}}$, *then a mean-preserving spread of income increases private school demand.*

Proof. See Appendix.

This result says that, as long as private school demand is sufficiently small, or equivalently the income threshold is sufficiently high, the following is true: When income inequality increases, holding mean income constant, there is an increase in the fraction of individuals with income above $\widehat{y}$, and a decrease in the fraction of individuals with income below $\widehat{y}$. Hence, a mean-preserving spread increases private school demand.

Note that the assumption of Proposition 1 requires the income cutoff to be greater than mean income $\overline{y} = \frac{\gamma\kappa}{\gamma-1}$, since $e^{\frac{1}{\gamma-1}} > \frac{\gamma}{\gamma-1}$[10]. Barring extreme initial levels of income inequality, $\widehat{y} > \kappa e^{\frac{1}{\gamma-1}}$ means that less than $5-30$ percent of the population consume in the private sector[11]. In practice, 7 percent of English pupils attend private school.

To illustrate this graphically, Figure 2.1 depicts private school demand, $P(y > \widehat{y})$, as a function of the income threshold $\widehat{y}$ at two different degrees of inequality, but with the same level of mean income $\overline{y} = 3$. When income inequality increases, holding mean income constant, there is an increase in the fraction of individuals with income above the intersection between the light and dark curves, and a decrease in the fraction of individuals with income below that intersection.

Finally, this result can be related to leading inequality measures such as the Gini, which I use in the empirical analysis. Given the Pareto distribution,

[10] However, $\kappa e^{\frac{1}{\gamma-1}}$ converges to $\frac{\gamma\kappa}{\gamma-1}$ as income inequality *decreases*, or γ increases. In the limit, when $\gamma \to \infty$, both expressions are equal to κ, the scale parameter

[11] If $\gamma = 1.5$ and 3, respectively, the equivalent values of private school demand $D(\widehat{y}; \gamma, \overline{y})$ with $\widehat{y} > \kappa e^{\frac{1}{\gamma-1}}$ are 5 and 22 percent.

as well as generalizations of the Pareto, such as the Singh-Maddala[12], mean-preserving spreads imply increases to the Gini coefficient, and thus income inequality, except for implausible parameter values (see online appendix). I now consider how overall demand for private education can affect the magnitude of the impact of a mean-preserving spread.

Proposition 2.2 *If* $q_g p < \psi^{-\frac{1}{\alpha}} \frac{e^{\frac{1}{\gamma}+\frac{1}{\gamma-1}}}{\kappa}$, *then the effect of a mean-preserving spread of income on private school demand increases in the income threshold* $\widehat{y}$.

Proof. See Appendix.

Proposition 2 says that there is a monotonic increase in the impact of a mean-preserving income spread on private school demand as the threshold increases (and thus demand decreases), up until a point $\widehat{y} = \frac{e^{\frac{1}{\gamma}+\frac{1}{\gamma-1}}}{\kappa}$[13] after which it declines, though the impact remains positive[14].

2.2.4 Religious versus Secular Education

Now consider the existence of two groups of individual types, secular (s) and religious (r). Individual types are distributed independently of income, but religious individuals obtain additional utility if they consume religious education. It is only possible to do so in the private sector, where, independent of academic quality, there exists two *types* j of education, secular and religious. The possibility of obtaining religious education thus provides an additional

[12]. While the Pareto is only a rough approximation of actual income distributions, the Singh-Maddala (also known as Burr XII) generally outperforms other prevalent income distributions, see Kleiber and Kotz (2003: 209).

[13]Note $\widehat{y} < \frac{e^{\frac{1}{\gamma}+\frac{1}{\gamma-1}}}{\kappa}$ is a sufficient, but not necessary condition for for Proposition 2 to hold.

[14]$\widehat{y} < \frac{e^{\frac{1}{\gamma}+\frac{1}{\gamma-1}}}{\kappa}$ means that more than $5-10$ percent of the population consume in the private sector, with the fraction increasing in γ, that is, income equality.

motive for private sector consumption for religious individuals. In accordance, the basic utility function may be extended as follows:

$$u(q, \theta, x) = (\theta q)^{\alpha} x^{1-\alpha} \tag{2.5}$$

where θ is a match specific component of utility where $\theta = R > 1$ if $i = j = r$, that is if religious individuals get religious education, and $\theta = 1$ otherwise. For simplicity suppose that, conditional on quality, secular and religious education is equally costly to produce. The respective thresholds in the secular and religious sectors are:

$$\widehat{y}_s = q_g p \psi^{\frac{1}{\alpha}} \text{ and } \widehat{y}_r = \frac{q_g p \psi^{\frac{1}{\alpha}}}{R} < \widehat{y}_s$$

Secular and religious private school demand, the proportion of each type consuming in the private sector, is then equal to

$$D_i(q_g, p; \delta) = \left(\frac{q_g p \psi^{\frac{1}{\alpha}}}{\kappa} \theta_i \right)^{-\gamma}, i \in \{r, s\} \tag{2.6}$$

where $\theta_s = 1$ and $\theta_r = R^{-1}$. That is, religious private school demand is higher than secular private school demand, or $D_r > D_s$.

Corollaries 1 and 2 follow from the religious income threshold that induces private sector consumption being lower than the equivalent secular threshold, $\widehat{y}_r < \widehat{y}_s$, and, in the case of Corollary 1, from Proposition 3:

Corollary 2.1 *If* $q_g p \psi^{\frac{1}{\alpha}} < \frac{e^{\frac{1}{\gamma}} + \frac{1}{\gamma - 1}}{\kappa}$, *a mean-preserving spread of income increases private school demand by more in the secular than in the religious private school sector*

Note that it is possible that a mean-preserving spread increases secular private school demand while reducing religious private school demand if $\widehat{y}_r$

and $\widehat{y}_s$ lie on opposite sides of $y = \kappa e^{\frac{1}{\gamma-1}}$.

Corollary 2.2 *Mean income is lower in the private religious sector than in the private secular sector.*

This implies that we should expect a less positive correlation of school location and the income levels of potential private school consumers in the case of religious private schools than in the case of secular private schools.

2.2.5 Extension

Suppose that school quality in some (unspecified) way depends on the mean income level of consumers. This may be due to peer quality, or due to the fees that it is optimal to set which in turn affects quality, but the mechanism is immaterial for present purposes. As before, religious and secular individuals share the same Pareto income distribution. The mean income level in private school sector m is given by $\pi_m = E[y|y \in \Theta_m]$ where Θ_m is the set of income types consuming in sector m. However, if demand for high quality education dominates the demand for religious education for high income religious individuals, the lower mean income levels in religious private schools schools may lead the religious individuals with income above some thresholds, say, $\widetilde{y}_r$ and $\widetilde{\widetilde{y}}_r$ to consume public or secular private education, respectively, rather than private religious education. Hence, relative to the previous scenario, mean income levels in religious private schools further decreases.

To put this formally, equilibrium is then a set of income thresholds:

$$\widehat{y}_r^*, \widetilde{y}_r^* \; \widetilde{\widetilde{y}}_r^* \text{ and } \widehat{y}_s^* \tag{2.7}$$

and a corresponding set of mean income levels π_m^* in each sector m such that:

$$
\begin{aligned}
&(i) \quad \pi_r^* = E\left[y|\widehat{y}_r^* \leq y < \widetilde{y}_r^*\right] \\
&(ii) \quad \pi_s^* = \rho\left(1 - F\left(\widetilde{\widetilde{y}}_r^*\right)\right) E\left[y|y \geq \widetilde{\widetilde{y}}_r^*\right] + (1-\rho)\left(1 - F\left(\widehat{y}_s^*\right)\right) E\left[y|y \geq \widehat{y}_s^*\right] \\
&(iii) \quad \pi_g^* = \rho\left(F\left(\widehat{y}_r^*\right) E\left[y|y < \widehat{y}_r^*\right] + F\left(\widetilde{y}_r^*, \widetilde{\widetilde{y}}_r^*\right) E\left[y|\widetilde{y}_r^* \leq y < \widetilde{\widetilde{y}}_r^*\right]\right) \\
&\qquad + (1-\rho) F\left(\widehat{y}_s^*\right) E\left[y|y < \widehat{y}_s^*\right]
\end{aligned}
\tag{2.8}
$$

where ρ denotes the fraction of religious individuals in the population, the cumulative distribution function of the Pareto distribution is $F(x) = 1 - \left(\frac{x}{\kappa}\right)^{-\gamma}$, and let $F(x,z)$ denote $(F(z) - F(x))$ and $\widetilde{\widetilde{y}}_r^* = \widehat{y}_s^*$ if $\widetilde{\widetilde{y}}_r^* > \widetilde{y}_r^*$.

An interesting implication of this extension to the model is that if $\widehat{y}_r$ and $\widetilde{y}_r$ are relatively low, mean income in the religious sector may be lower than the mean income level of the population at large. If additionally ρ is relatively low and $\widetilde{\widetilde{y}}_r^*$ and $\widehat{y}_s$ are relatively high, mean income may also be lower in the private religious sector than in the public sector. This is true under the initial assumption that the religious and secular income distributions are identical, but may also hold if religious individuals are on average richer than secular individuals. These outcomes are not possible in the basic version of the model, where mean income levels in the religious private school sector always surpass mean income levels in the public sector as well as the population average.

I now turn to investigate whether the theoretical results hold up empirically. I start by discussing basic background information and descriptive statistics of relevance to studying private education in England, before proceeding to confront the predictions of the model with more rigorous empirical analysis.

2.3 Data, Background Information, and Descriptive Statistics

In this section, I briefly describe the main data sources and provide some background information on English private education as well as descriptive statistics on the distribution of income, and on religion and socioeconomic characteristics of different religious groups in England. The Data Appendix, section 6, provides a more detailed description of the data sources.

2.3.1 Private Schools

The school data stems from the Department of Education and Skills. School level data on all, public and private, schools in England is available for the period 1993-2005. It is also possible to derive information about religious affiliation of private school through this data source.

Roughly 7 percent of English pupils attend private[15] schools[16]. While private schools must register with the state Department for Education and Skills and comply with some basic regulations[17], they are free to set fees and ad-

[15]Private schools are generally called "independent schools" because of their freedom to operate outside of government regulation. I will stick to the term private schools. Independent secondary schools are often - somewhat confusingly - called "public schools", though this term is primarily used of the older and more prestigious schools, like Winchester, Eton, and Harrow.

[16]Based on data from the Department of Education and Skills, 1996-2006. This data stems for the Department of Education and Skills. School level data on all, public and private, schools in England is available for the period 1993-2005. See Appendix B for more detailed description of the data

In comparison, the equivalent figure is around 4 percent in Scotland, 6 percent in Sweden, 10 percent in the US, 12 percent in Denmark and 17 percent in France. However, such comparisons should be made with caution. In England, private schools receive no state funding.

[17]The regulations setting out the standards that all independent schools in England must satisfy as a condition of registration registration cover the quality of education provided, the spiritual, moral, social and cultural development of pupils, the welfare, health and safety of pupils, the suitability of proprietors and staff, the premises and accommodation, the provision of information and the way in which complaints are handled. See further http://www.legislation.gov.uk/si/si2003/20031910.htm.

missions rules[18]. The overall fraction of pupils in private education has been very stable over the past decade (see Figure 2.2, panel 2). There is, however, a great deal of regional variation: Only 3 percent of pupils in the North East attend private schools as opposed to 11 percent in London. Also within London there is much variation with some Local Education Authorities (schools districts) having 25-50 percent of pupils educated in private schools, while the equivalent figure for other areas is 1-3 percent. Private schools in England typically have strong academic profiles. While less than 5 percent of all schools are registered as selective, roughly 50 percent of private schools select on academic ability. In general, private schools substantially outperform state schools in terms of achievement on tests taken at age 15/16 where, on average, private schools have about 75 percent of their pupils "doing well" (obtaining 5 or more A*-C grades in GCSE exams[19]), while this is only true, on average, for about 50 percent of pupils in state schools. Many charge fees that make them beyond the reach of the typical household. According to Graddy and Stevens (2003), the average annual fee for a child in a private secondary school is approximately 40% of median disposable income for UK households (20% at the 90th percentile).

About 30 percent of private schools are single-sex, with slightly more girls' than boys' schools, and 25 percent are boarding schools. As to their location, three quarters locate in areas which are designated as urban. In terms of

[18]By contrast, in Sweden, since a major reform in the early 1990s, private schools are funded by the state, cannot charge additional fees and cannot select pupils on any other basis than first-come-first-served. Denmark and the Netherlands each have more than a century a long history of subsidizing private schools while interfering very little in the way they are run. In France, many nominally private schools are Catholic, heavily subsidized by the government, while a large proportion of their English counterparts are counted as part of the state aided sector. In America privately run schools can increasingly get state finance through vouchers or by registering as charter schools, but there are constitutional barriers to state financing of religious schools.

[19]GCSE stands for General Certificate of Education and is normally taken in Year 11 (15/16 years). In addition, children sit National Curriculum tests at 7, 11 and 14, the so-called key stage 1, 2 and 3, as well as public examinations at 18, the A-levels. Only GCSE and A-level data is available for private schools.

school size, private schools on average have 285 pupils in 2005 (17 percent have less than 50 pupils). The average age range is from 5.5 to 14 years. While the numbers of private schools in operation are virtually constant over the past 11 years, there is a fair amount of turn over: Schools open less than 5 years constitute 11 percent of all private schools. In many respects, the characteristics of these "new" private schools are quite different from the older schools. New schools are more likely to be affiliated with religious minorities. They are smaller, much less likely to be boarding schools, and more likely to locate in urban areas. New schools perform much worse than older schools - on average, only a third as many pupils do well in new schools [20]. This suggests that the nature of schools entering the market might be changing over time, and that bad and unsuccessful schools exit, while good ones stay, but also that schools only gradually "mature" in terms of growing in size and improving their performance.

2.3.2 Religious Private Schools

I focus on Muslim and Jewish schools as examples of genuinely religious schools. There are several reasons for this: Although around 50 percent of private schools in England are nominally religious, in many cases, they are so primarily for historical reasons, generally do not pursue religious indoctrination of pupils

[20] In the the following, I report 2005 figures for schools open 5 years or less ("new schools") with equivalent figures for private schools open 5 years or more ("old schools") in parenthesis: 21 (31) percent single-sex, 4 (28) percent boarding schools, 84 (73) in urban areas, lowest age 9.2 (4.9), 5 or more A*-C GCSE grades 27 (77), 74 (9) percent "small" (<50 pupils), 9 (88) percent "big" (>100 pupils). The admission procedures of almost 55 percent of new schools is indicated as unknown, while this is not the case for any schools more than 5 years old. This may mask some differences in this respect as well.

A negative correlation between private school performance, on the one hand, and school age and size, on the other hand, is also present if one considers only schools in existence over longer time periods and compares their characteristics in the early period and in the later period. Controlling for various other characteristics, school age and size retain a significantly negative impact on school performance in OLS regressions.

and do not preclude pupils of other faiths attending if they wish[21]. Religious schools set up by minority groups, especially in recent years, are more likely to be genuinely religious. Aside from Christian sub-denominations, Muslims and Jews are the only minority groups with a non-negligible share of private schooling. Muslims and Jews accounting for 5.2 and 2.6 percent of all private schools, respectively. By contrast, Buddhist, Hindu and Sikh schools all together make up around 0.2 percent of private schools[22]. Second, to the extent that religious affiliation is not 100 percent reliably identified in the data, Muslim and Jewish schools are easier to spot, since almost 90% of these schools have uniquely "Muslim" or "Jewish" name components and can therefore be identified as being Muslim or Jewish simply from looking at their name (see Data Appendix, section), whereas many schools have "Christian"-sounding names without being religious, or Christian schools have names that do not clearly distinguish them from secular schools[23]. Third, Muslim and Jewish schools are special due the fact that the potential customers are fairly well identified. While it is common for individuals from other religions or without religious orientation to attend, for instance, Catholic schools, it appears unlikely that non-Muslims or non-Jews would attend Muslim and Jewish schools. Information on the specific characteristics of these potential customers, compared to the rest of the population, is available in the 2001 Census where, for the first time in England, data is provided split up according to religion. However, all Christians are lumped together as one group so that, say, separate

[21] It has been noted that religion is not as important an aspect in the majority of parents' decision to send their child to an independent school as it is in the United States, due to the requirement of state schools to timetable periods of Christian worship. (wikipedia)

[22] See further Appendix Table A1. According to the 2001 Census, Christians make up 73 percent of the population, while Muslims and Jews constitute 2.5 and 0.5 percent, respectively. (Buddhists, Hindus and Sikhs together make up 1.6 percent). See further Appendix Table A2.

[23] Moreover, there are around 350 private schools that are "Christian", but not affiliated with either the Church of England or the Roman Catholic Church, which may cover a wide and unspecified variety of Christian orientations which make it a less well defined group.

characteristics for Catholics, Methodists and Evangelical Christians cannot be identified. Finally, aside from Muslim religious education in particular being of topic of high policy relevance in recent years, the Muslim school sector is additionally interesting on account of displaying growth rates of the number of schools, pupil numbers, and school performance which are unparalleled by any other private school sector (see Figures 2.2 and 2.3).

In terms of how Muslims and Jews compare in socioeconomic terms to other religious groups, Muslims and Jews are generally better qualified than Christians, and the population at large. Jews are somewhat better qualified than Muslims. In terms of labour market activity, however, both Muslims and Jews are more likely to be economically inactive. Muslims, in particular, distinguish themselves by having more than 4 times as large a fraction of individuals who have never worked or who are unemployed as the general population (Table 2.4).

2.3.3 Income Distribution

In the following, I will make few observations on the distribution of income across postcode districts and socioeconomic differences between of members of different religious orientations in England of relevance in interpreting results. Income data is obtained from the New Earnings Survey, a one percent sample of the working population, for the years 2000-2004. Table 2.2 presents summary statistics at the level of postcode districts. The income distribution measures are computed based on a one percent sample of the working population with on average 110 observations per postcode district. On average, the postcode district level Gini coefficient is 0.4, ranging from 0.2 to 0.8. Individuals at the 75th income percentile earn roughly 3 times as much as those at the 25th percentile. The income share of the bottom 40 percent is 15 percent.

2.4 Empirical Analysis

In this section, I confront the predictions of the model with the estimated determinants of the demand for private education. I first study the demand for all private education, and then separately investigate the demand for Muslim and Jewish private education[24]. I make the assumption that the idiosyncratic preferences θ regarding non-academic aspects of education (religion) among Muslims and Jews are both stronger on average and more dispersed (lower γ) than the those of the population at large. I estimate the relationship between, on the one hand, the number of private schools[25] and, on the other hand, state school and population characteristics in postcode districts[26]. I assume that the supply of private education is perfectly elastic. As unit of analysis to measure "school markets", I use the postcode district. This is primarily for data reasons, since the relevant data is available at this geographical level. Previous work suggests that the choice of market definition has little influence on results. For instance, Downes and Greenstein (2002) find that characteristics of neighboring districts matter, but their influence is small. It appears that the supply of and demand for private education primarily responds to very localized conditions. Furthermore, it may be that area characteristics on average tend not to change much across geographic space. Finally, although English families are allowed to apply to schools outside their LEA of residence, only roughly 5 percent of pupils in the state sector attend schools outside their home school district (LEA)

[24] I have argued above in section (2.3.2) why I focus only on Muslim and Jewish schools as examples of genuinely religious schools.

[25] The number of pupil places might have been used instead of the number of private schools. The focus of the empirical analysis was initially on the location patterns of private schools and it was not apparent that reliable pupil numbers were availe for private schools. This is the reason that the number of schools were used. While school size is highly heterogeneous, there are no strong reasons for expecting the explanatory variables to be correlated with school size and the results to be biased in any particular direction. However, I will complement these results with analyses using pupil numbers instead in forthcoming work.

[26] Postcode districts contain on average 95,500 individuals, but there is a large variation in size with a standard deviation of 78,750.

(figure based on Gibbons, Machin and Silva, 2006). I exclude special schools but have not excluded private boarding schools from the analysis, although strictly speaking they should be left out since their pupils may come far away from their geographical location[27].

2.4.1 Empirical Method

Out of a total of 2035 postcode districts, less than half have private schools located in them. Of the latter postcode districts, more than half only contain one single private school, while a further third of postcode districts contain two or three private schools and a final 15 percent contain 4 or more private schools. Only 71 and 19 postcode districts contain any Muslim and Jewish private schools, respectively (see Table 2.2). Since the dependent variable occurs in non-negative integer amounts, OLS is thus inconsistent. One of the methods created to deal with such issues is count data models developed by, most notably, Hausman, Hall and Griliches (1984) and Cameron and Trivedi (1986)[28]. As argued by Hausman, Hall and Griliches (1984), the Poisson distribution is a natural first assumption for phenomena with non-negative integer outcomes[29]. For large enough integers, a continuous approximation often suffices. But for small integers, of which zero is a frequent outcome - as is the case in the present data set - a specification that models the counting properties of the data is preferred. As the probability of small counts is high, the discrete-

[27] Boarding schools comprise roughly 25 percent of private schools. They will be excluded in future work.

[28] Previously, the "zero value" problem has been tackled by choosing observations so as to minimise the number of observations with zero value, and by setting zeroes to one and adding a dummy variable to allow the equation to choose implicitly another value between zero and one (Hausman, Hall and Griliches; 1984).

[29] The Poisson distribution is the approximate distribution of the number of ones from a large number of Bernouilli trials, each with a small probability of one and it is often a reasonable description for events which occur both "randomly and independently" in time. Although the independence assumption may be challenged for school entry, I will assume that this does not fundamentally compromise the approach.

ness of the probability distribution is an important feature. Moreover, count data are distinct from general ordered discrete data in the sense that counts have cardinal meaning and their conditional mean holds interest[30]. Denote n_{it} as the observed event count for unit i during the time period t. Then the basic Poisson specification is $pr(n_{it}) = \frac{e^{-\lambda}\lambda_{it}^{n_{it}}}{n_{it}!}$. Given the Poisson parameter λ, we have $\log\lambda = X\beta$, where β is a parameter vector to be estimated and X is a vector of regressors which describe the characteristics of an observation unit in a given time period. Note that while the likelihood is constructed under the Poisson assumption, the resulting estimates are robust with respect to distributional mis-specification. The parameters β are consistently estimated provided that the conditional mean is correctly specified. However, the Poisson distribution does not in general fit the data well. In particular, most data are characterized by "overdispersion" (the variance to mean ratio increases in the Poisson parameter λ). The negative binomial, a generalization of the Poisson, is the leading alternative.

2.4.2 Baseline Specification

Based on the theoretical model, we expect private school location to be positively related to mean income levels and to the spread of the income distribution, holding mean income constant (Proposition 1). For religious schools, assuming lower γ, the model predicts that location is less strongly related to income inequality than is the case for secular schools (Corollary 1). The model further predicts that religious schools locate in poorer areas than secular schools (Corollary 2)[31]. Finally, the model predicts private school location to

[30] Authors usually motivate this probability mass function as a limit of the binomial probability mass function rather than from a latent regression model such as the ordered probability model (see Ruud, 2000: 761).

[31] That is, religious individuals consuming private education are relatively poorer than secular individuals consuming private education.

be negatively related to state school quality (per pupil spending).

To investigate the relationship between the number of private schools and school and population characteristics in postcode districts, I estimate the following count data model[32]:

$$N_{ij} = \beta X_i + \alpha_j + \epsilon_{ij} \tag{2.9}$$

where N_{ij} is the count of some type of private schools (secular or religious) in neighborhood (postcode district) i and region j. X is a vector of school and population characteristics in area i (averaged over the period for which I have data for each particular variable)[33].

In the baseline specification, X includes measures of mean income (the fraction of households with higher level qualifications[34]), the spread of the income distribution (the Gini coefficient), state school quality (per pupil spending), market size (log pupil numbers in postcode district). ϕ_j are regional fixed effects[35] and ϵ_{ij} is the error term. In regressions of Muslim and Jewish private schools, I also include controls for the fraction of population that belongs to the corresponding religion, and population characteristics for households belonging to that particular religious orientation rather than general population characteristics. The characteristics of the population not belonging to the religion in question should not matter since they are not potential customers[36]. I investigate the robustness of the reported results to the use of other available measures of these variables and the inclusion of additional variables in section

[32] Since I do not exploit time variation, I omit time subscripts.

[33] All variables are averaged at the postcode district level, except per pupil spending which is only available at the school district/LEA level. See further Data Appendix, section 6 on the data employed and construction of variables.

[34] This proxy turns out to dominate the direct measure of mean income as measured by the NES data (based on a 1 percent sample of the population) in regressions.

[35] Regions include: East Midlands (omitted), East of England, London, North East, North West, South East, South West, West Midlands, Yorkshire and The Humber.

[36] Unless differences in peer composition in the different sectors matters for parental choice.

(2.6).

2.5 Results

The results presented below are based on the negative binomial distributional regressions, but Poisson regressions give very similar results[37].

2.5.1 Location Determinants of all Private Schools versus Religious Private Schools

Table 2.5, column (1) presents results for all private schools. Consistent with the model, I find that, as a whole, private schools are significantly more likely to locate where mean income (as measured by the percentage of the population with higher level qualifications), and income inequality (as measured by the Gini coefficient), controlling for mean income, are relatively high, and where state school quality (as measured by spending per pupil) is relatively low. The coefficients on the income variables are highly significant [38]. The interpretation of the coefficient on per pupil spending is not entirely straightforward since spending is in part determined on the basis of the level of disadvantage of an area. As such the negative coefficient may also be reflecting that private schools tend to locate where there are few disadvantaged pupils, that is in more affluent areas.

Columns (2)-(3) display results for Muslim schools[39], (4)-(5) for Jewish

[37]The independence assumption inherent in count data approach might be problematic since the entry of a new school may not be independent of how many schools have already entered. I have tried a variety of other distributional assumptions than the negative binomial such as Poisson, ordered probit, simple logit/probit (whether schools in area or not). The results are largely unchanged.

[38]Spending is indeed positively correlated with the percentage of pupils in state schools with special educational needs (0.24), eligible for free school meals (0.48), who are non-white (0.56) and who have English as additional language (.65). At the same time, spending is also correlated with the percentage of individuals with high level qualifications (0.57).

[39]This includes both private and "voluntary aided" (VA) Muslim schools. There are only

schools. The location determinants of Muslim and Jewish private schools resemble each other quite closely and in addition differ markedly from those other private schools. Muslim and Jewish schools are *less* likely to locate where there is a relatively high fraction of highly qualified individuals belonging to the religion in question, i.e. of the type that are potential customers at these schools (columns (3) and (5)). This is true although the coefficients on the percent of the general population with higher qualifications is positive and significant (columns (2) and (4)). This underscores the importance of the availability of data specific to the religious group in question, which has not been available in other studies. The negative coefficient on mean income/qualifications is compatible with the extension to the basic version of the model, which suggests that the initial discrepancy in mean income levels in the religious and secular private school sector will deter the richest religious individuals from attending religious private education, thus further decreasing mean income levels in the private religious sector, possibly below mean income levels of the population at large[40]. In addition, as opposed to the results for all private schools, the coefficient on income inequality is insignificant. This is consistent with the model's prediction that the demand for religious private education is less sensitive to income inequality than private schools at large.

Finally, there is a significant, positive coefficient on per pupil spending. Again, this finding may reflect that Muslim and Jewish schools tend to locate where there are high levels of disadvantage which result in higher per pupil

4 VA Muslim schools, and these are all former private Muslim schools which have recently achieved VA status.

[40]This finding is consistent with Iannacone's (1998) argument that religious communities tend to have a stigma attached to prevent free-riding which make them attractive only to lower income individuals with poor outside options. This interpretation also reconciles these findings with those in Munk (2007b). Using survey data, I find that Muslims and Jews are more likely to use private education at higher income levels. However, I cannot distinguish between religious and secular private education. It appears quite plausible that Muslims and Jews' high demand for private education at the higher income levels is for secular, rather than Muslim or Jewish private education.

spending to compensate for this. Finally, the Muslim and Jewish shares, respectively, of the population are very important predictors of school location, confirming that such private target (or attract) a well defined segment of the population.

2.6 Robustness Checks

In this section I review the robustness of the above results to various concerns.

2.6.1 Employed Measures of Variables

Income Inequality

Table 2.6 presents results using a variety of different measures of income inequality: standard deviation of logs, the Gini coefficient and the ratio of the 75^{th} and 25^{th} income percentiles all calculated at postcode district level using NES data. While there concerns regarding the numbers of observations available to construct the income inequality measures[41], it is reassuring that they come out strongly significant in almost any specification[42]. Moreover, various other measures of income inequality, both using the same data, and using very different data to proxy income inequality (House price data, Nationwide, and data from a private consultancy, CACI based on sending out questionnaires and extrapolating from Census data), also come out strongly significant in a range of different specifications, except the measure based on the CACI data is not significant in all specifications.

I have also included log mean income or the percent of the population

[41] As mentioned above, on average there are 110 income observations per postcode district in the New Earnings Survey (standard deviation: 68). All postcode districts with less than 10 observations have been dropped.

[42] Due to lack of data (or sufficiently reliable data) in some postcode sectors, there are only 1955 postcode sectors in the regression, rather than the 2035 postcode sectors in which there are schools.

earning more than a specific earnings threshold (£40,000 which is above 10th income percentile overall), but these are highly correlated with the percentage of highly educated individuals (a correlation coefficient of.68 for both log pay and fraction earning above 40K).

To accommodate concerns regarding the reliability of the income measures, I have run the regression using only postcode districts in which there were more than 50 income observations from which to construct the inequality indices. This reduces the sample size from 1955 to 1555, but the results are largely unchanged.

School Quality

As mentioned above, there are qualifications regarding viewing per pupil spending as a measure of state school quality. Table 2.7 reports results using various alternative measures of state school quality.

In columns (3)-(5), I include measures of pupil performance in state schools at GCSE level (age 15). Column (3) reports results including a measure of the fraction of pupils achieving 5 or more good results in these exams, whereas columns (4)-(5) look at the fraction of pupils achieving no passes, in column (4) averaged over the period 1996-2004, and in column (5) only for the year 1996 to partially accommodate endogeneity concerns regarding these variables, namely the possibility that the presence of private schools (entering after that date) affect state school performance due to competitive pressure.

None of these variables have any significant effect[43], although the sign of the latter is consistent with the prediction of the model (private schools enter where more state school pupils achieve poorly, controlling for income and education characteristics). Columns (6)-(7) shows results using another commonly

[43]When both the fraction of high and low achieving pupils are included, the effect is significant owing to collinearity.

used measure of school quality, the pupil-teacher ratio, with and without controlling for spending (correlation with spending -.24). In both regressions, the coefficient on the pupil-teacher ratio comes out with the opposite sign to what would be predicted. That is, fewer pupils per teacher (normally seen as enhancing school quality, all else equal) is associated with a higher probability of private schools locating in an area. This may be because, in an attempt to compensate for disadvantage, low pupil-teacher ratios in England are associated with bad neighborhoods[44]. Nevertheless, this result is a bit puzzling. Finally, I add two measures of local area disadvantage, pupils with special educational needs and pupils eligible for free school meals, in addition to per pupil spending, in columns (8)-(9). These may be thought of as adversely affecting state school quality. Neither of these is significant, although the latter has the predicted sign[45].

Finally, I split up the data into postcode districts that are located in metropolitan areas (London, Birmingham, Manchester, Leeds, Bradford, Leicester and Liverpool) versus those that are not in (11)-(12). While all other coefficients barely change, the coefficients on the spending variable become insignificant. The fact that it becomes positive in non-metropolitan areas might suggest that private schools compete less on quality with state schools in areas with poorer infrastructure.

2.6.2 Tiebout Bias

A further concern in interpreting the results is the possibility of reverse causation. In particular, the results may not only reflect that private schools seek out particular population characteristics when making their location de-

[44]However, this does not obviously appear from the correlation table.

[45]Pupils eligible for free school meals is essentially another measure of mean income of an area and as such already captured by log mean income and the fraction of the population with high qualifications.

cisions, but also that households may move to locate near to particular private schools. In the case of secular private schools, this may be more likely to occur in non-metropolitan areas with a limited supply of private schools than in metropolitan areas with a larger supply of both public and private schooling within relatively short travel time. Table 2.6, columns (11) and (12), suggest that only the coefficient on per pupil spending differs between metropolitan and non-metropolitan areas. If Tiebout bias was a big issue, we might have expected bigger differences in these results. It might also be plausible that religious individuals move to particular areas in part to attend Muslim and Jewish schools. Table 2.2 indicates the geographically very concentrated nature of particularly Jewish private schooling. Almost half out of the 53 Jewish private schools are located in just two postcode districts. Unfortunately, there is no available data which would allow investigating whether population movements have occurred before after the entry of private schools[46]. However, while schools may be important features of religious communities, it appears more plausible that they follow, rather than precede, community formation.

2.7 Conclusion

This paper studies the relationship between the demand for private education, both secular and religious, and the distribution of income. I develop a simple theoretical model of private school demand, where I show that private school demand is positively related to mean-preserving increases in income inequality and that religious preferences for private schooling dampen the effect of mean-preserving spreads on demand. Furthermore, it follows from the model that mean income levels are lower in the religious relative to the secular private

[46]UK population censuses are released every ten years. This paper uses the 2001 Census which was the first to contain information on religion. The 1991 Census contains information on ethnicity, but not religion.

sector.

To test the predictions of the model, I estimate a count data model of the location of secular and religious (Muslim and Jewish) English private schools, based on a unique dataset composed of micro level school and income data, and of Census data. I obtain results that are consistent with the theoretical model. In particular, I find that private schools in general locate in areas with high income levels, high income inequality and low spending per pupil in state schools. This does not hold for religious schools. In particular, religious schools locate where the fraction of the relevant religious individuals is high and where the religious individuals are relatively poor. It thus seems that - as opposed to secular private schools - religious private schools tend to attract relatively poor members of their own religions while wealthier religious individuals prefer secular private schools. Possible policy implications of these finding include that relatively poor religious individuals are likely to benefit if such schools are subsidized by the state. However, subsidies may encourage even poorer religious individuals to attend them and further deter wealthier religious individuals. As such they may be likely to encourage segregation among poor and less educated members of religious minority groups. It remains for future research to study whether or not such schools improve the educational and socioeconomic outcomes of such religious minorities.

2.8 Appendix: Proofs

Proof of Proposition 1. The marginal impact on private school demand of *reducing* the dispersion of the income distribution (increasing γ) while holding mean income constant is given by

$$\frac{\partial}{\partial\gamma}D'(q_g,p;\delta)=\lambda^{-\gamma}\left[\frac{1}{\gamma-1}-\ln\lambda\right] \tag{2.10}$$

where $\lambda=\frac{\gamma}{(\gamma-1)}\frac{q_g p\psi^{\frac{1}{\alpha}}}{\bar{y}}=\frac{\hat{y}}{\kappa}>1$ (since the distribution is only defined for $y>\kappa$). The marginal effect of increasing γ is therefore zero at at level of private school demand given by all income levels greater than $y'=\left\{\hat{y}:\frac{\partial}{\partial\gamma}D'(q_g,p;\delta)=0\right\}=\kappa e^{\frac{1}{\gamma-1}}$ with $D'(y';\delta)=e^{-\frac{\gamma}{\gamma-1}}$. $\frac{\partial}{\partial\gamma}D'(q_g,p;\delta)<0$ follows from second-order stochastic dominance with single crossing[47]■

Proof of Proposition 2. Now consider the difference in impact on changing inequality depending on the income threshold:

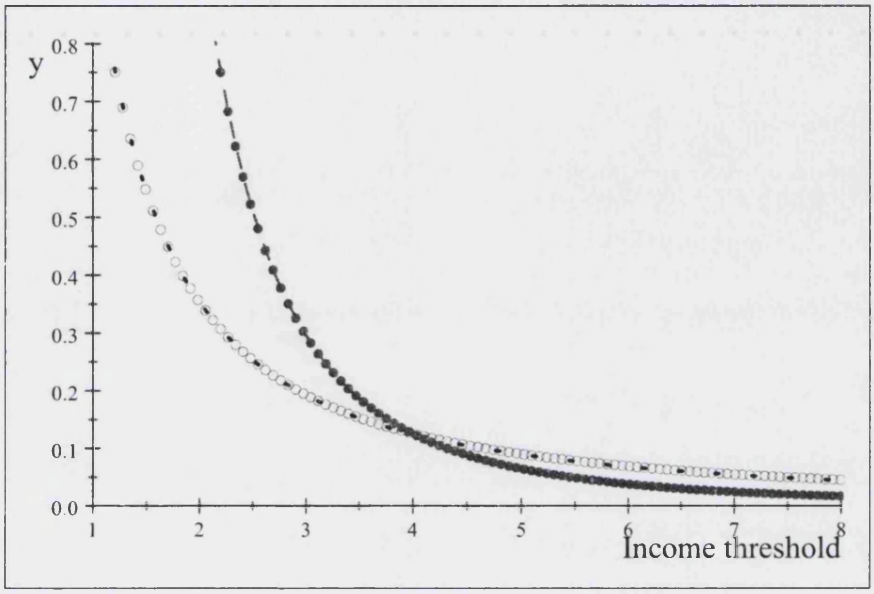
$$\frac{\partial^2}{\partial\gamma\partial\widehat{y}}D'(q_g,p;\delta)=\frac{1}{q_g p\psi^{\frac{1}{\alpha}}\lambda^{\gamma}}\left(1+\gamma\left(\frac{1}{\gamma-1}-\ln\lambda\right)\right)$$

For $\gamma>1$, $\frac{\partial^2}{\partial\gamma\partial\widehat{y}}D'(q_g,p;\delta)>0$ if $\lambda=\frac{\widehat{y}}{\kappa}<e^{\frac{1}{\gamma}+\frac{1}{\gamma-1}}$ and $\frac{\partial^2}{\partial\gamma\partial\widehat{y}}D'(q_g,p;\delta)\leq 0$ otherwise.■

[47]If $F(\cdot,r_1)$, or $F(\cdot,r_1)$ is a mean-preserving spread of $F(\cdot,r_2)$, $\forall r_1<r_2$ and the c.d.fs cross more than once, or are partly overlapping, there may be a number of intervals where $\frac{\partial}{\partial r}F|_{\overline{y}}<0$ and where $\frac{\partial}{\partial r}F|_{\overline{y}}>0$. $\frac{\partial}{\partial r}F|_{\overline{y}}\leq 0$ for all $y\in(0,y^*]$.

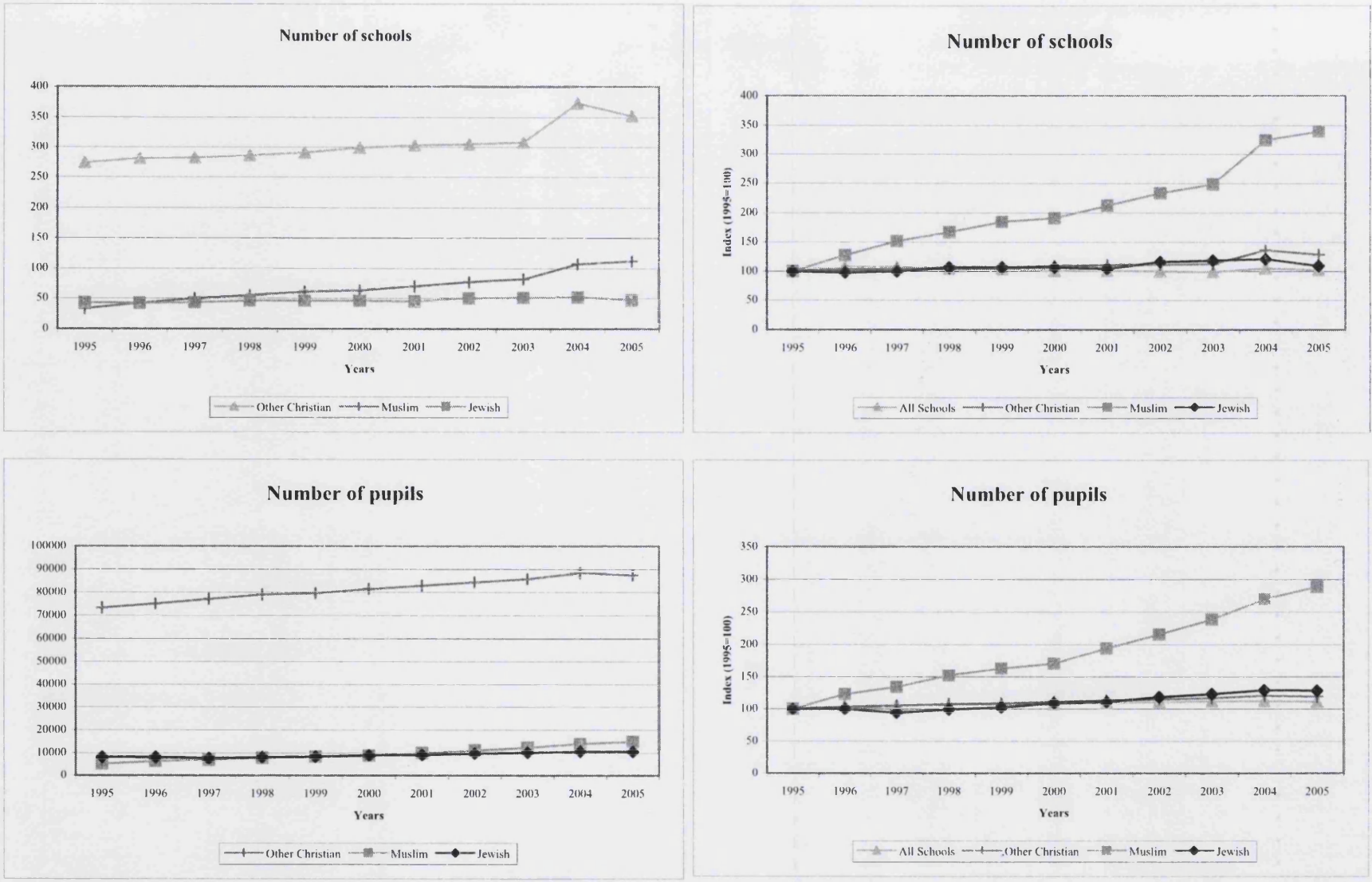
If there exists a unique $y^*=\left\{y:\frac{\partial}{\partial r}F|_{\overline{y}}=0\right\}$, then $\frac{\partial}{\partial r}F|_{\overline{y}}<0$ for all $y<y^*$ and $\frac{\partial}{\partial r}F|_{\overline{y}}\geq 0$ for all $y\geq y^*$

Figure 2.1: Demand for Private Education, γ=3, κ=1 versus γ=1.5, κ=2



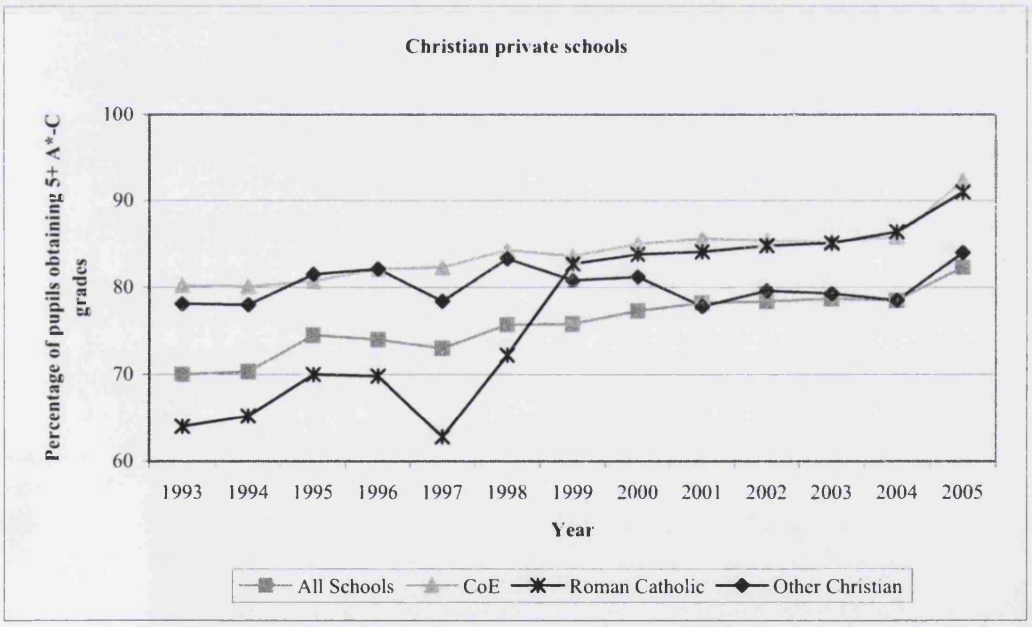
Note: Private school demand is given by $D(\widehat{y};\gamma,\overline{y}) = \left(\frac{\gamma\widehat{y}}{\overline{y}(\gamma-1)}\right)^{-\gamma}$. The light curve represents an income distribution with high inequality (low γ : $\gamma = 1.5$, $\kappa = 1$), while the dark curve represents lower inequality (high γ : $\gamma = 3$, $\kappa = 2$).

Figure 2.2: Evolution of Private School and Pupil Numbers, 1995-2005



Sources: ASC files 1995-2005 (pupil numbers) matched to Edubase 2005 (religious denominations) as well as authors own identification of Muslim and Jewish schools for websites and searching for Muslim/Jewish name components in school names.

Figure 2.3: Average GCSE Performance of Different Types of Private Schools, 1993-2005



Sources: Performance tables 1993-2005 (GCSE performance data) matched to Edubase 2005 (religious denominations) as well as authors own identification of Muslim and Jewish schools for websites and searching for Muslim/Jewish name components in school names.

Table 2.1: Summary Statistics by Postcode District

	mean	sd	min	max
Market size				
All schools in postcode district	11.5	6.7	1.0	50.0
Pupils in postcode district	3,915.3	2,618.0	58.2	18,948.3
Number of private schools in postcode district	0.9	1.5	0.0	23.0
Percentage of pupils in private schools	7.4	14.7	0.0	100.0
Percentage of pupils in private schools (in postcode districts with such schools)	13.6	17.7	0.0	100.0
State school characteristics				
Percent of pupils achieving more than 5 A*-C GCSEs	45.8	15.4	4.3	99.9
Percent of pupils achieving no GCSE passes	4.8	3.4	0.0	22.0
Pupil teacher ratio	21.7	1.6	13.3	36.3
Percentage of pupils with special needs without statements	16.6	4.3	5.0	38.0
Percentage of pupils known to be eligible for free school meals	16.5	12.1	0.2	73.8
Spending pr pupil LEA 1995-2003 (£1000)	3.4	0.5	3.0	10.4
Income variables				
Observations pr postcode district	109.9	67.8	10.0	574.0
Average annual gross pay (£1000)	18.5	7.4	9.7	127.0
Log of average annual gross pay	9.8	0.3	9.2	11.8
Relative mean deviation	0.3	0.1	0.1	0.7
Coefficient of variation	0.9	0.4	0.3	8.7
Standard deviation of logs	1.0	0.2	0.4	2.2
Gini coefficient	0.4	0.1	0.2	0.8
75th income percentile (£1000)	23.5	6.5	12.0	99.6
25th income percentile (£1000)	8.2	2.2	1.9	27.9
Income share of bottom 40 percent	15.3	2.9	3.6	30.1

Sources: ASC (1996-2004) and Edubase (2003 and 2004) files from Department of Education and Skills (DfES). Spending comes from separate files provided by the DfES. New Earnings Survey (NES) from Office of National statistics

Table 2.2: Geographical Dispersion of Different Types of Private Schools

Number of schools in postcode district	All private schools	Muslim*	Jewish
1	512	49	11
2	225	12	2
3	106	7	2
4	76		2
5	32	1	
6	15	1	
7	12	1	
8	5		
9	2		
10	2		
11	1		1
12	1		
13			1
14			
15			
16	1		
...			
23	1		
Presence in # of postcode districts (percent)	991 (48.7)	71 (3.5)	19 (0.9)
Percent of schools	100	5.2	2.6
Percent of pupils	100	2.5	1.9
Total schools	2058	112	53

Notes: The table includes counts per postcode district and reads: 512 postcode districts with one private school located in each of them, 225 with two, etc. Source Edubase 2004 files with corrections/additions to assigned denominations/types. Total postcode districts: 2035. There are 6 Voluntary Aided (state funded) Muslim schools which all started as private schools and are therefore included.

Table 2.3: Pupil Numbers of Different Types of Religious Schools

		All	Christian	Jewish	Muslim	Other Christian*	Buddhist, Hindu and Sikh
Population shares	Census		73	0.5	2.5		1.6
	BSAS†		55.5	0.5	1.3	15.4	0.9
	London (Census)		58	2.1	8.5		
2004 pupils	*Numbers*						
	Private	549,342	229,898	10,563	13,705	85,661	1,262
	Private + "aided"*	1,796,211	1,417,843	23,693	14,851	99,325	1,886
	Percent						
	Private		41.8	1.9	2.5	15.6	0.2
	Private + "aided"		78.9	1.3	0.8	5.5	0.1
Census	*Pupil:population share*						
	Private		57.3	384.6	99.8		14.4
	Private + "aided"		108.1	263.8	33.1		6.6
BSAS	*Pupil:population share*						
	Private		75.4	427.3	189.0	101.3	25.2
	Private + "aided"		142.3	293.1	62.6	35.9	11.5
1996 pupils	*Numbers*						
	Private	510,791	221,739	8,303	6,325	73,669	1,004
	Private + "aided"	1,699,475	1,363,710	18,097	6,510	85,628	1,066
	Percent						
	Private		43.4	1.6	1.2	14.4	0.2
	Private + "aided"		80.2	1.1	0.4	5.0	0.1
Census	*Pupil:population share*						
	Private		59.5	325.1	49.5		12.3
	Private + "aided"		109.9	213.0	15.3		3.9
BSAS	*Pupil:population share*						
	Private		78.3	361.2	93.8	93.7	21.6
	Private + "aided"		144.7	236.6	29.0	32.7	6.9

Sources: Department for Education and Skills Edubase 2004 and ASC files 1996-2004, Census 2001 and British Social Attitudes Survey. Notes: "Aided" schools includes Voluntary Aided, Voluntary Controlled and Foundation schools. Other Christian includes all non-Roman Catholic and non-Church of England respondents.
† BSAS figures averaged from 1992-2002.

Table 2.4: Religious Affiliation, Qualifications and Labour Market Activity

Variable	All	Christian	Muslim	Jewish	Hindu	Sikh	Buddist	Any other	No religion
Percentage of population	100	73	2.5	0.5	0.8	0.5	0.3	0.3	14.4
	0.0	(9.7)	(5.5)	(1.8)	(2.1)	(1.8)	(0.3)	(0.2)	(4.0)
Qualifications									
No qualifications	25.3	27.5	24.1	19.2	13.7	20	24	18.3	17.5
	(5.7)	(6.0)	(13.1)	(20.0)	(15.3)	(21.2)	(13.3)	(9.9)	(5.0)
Low qualifications	32.2	31.6	24.7	31.2	26.9	31.4	31.5	41.4	36.8
	(3.0)	(2.8)	(13.5)	(20.6)	(20.9)	(23.9)	(17.4)	(10.0)	(4.3)
High qualifications	15.1	13.9	22.3	28.7	40.3	25.9	33.4	29.3	20.7
	(7.0)	(6.7)	(17.5)	(22.9)	(24.8)	(28.9)	(15.1)	(12.3)	(10.1)
Labour market activity									
Economically active	48.4	47.5	42.9	50.9	55.2	52.1	58.5	59.5	56
	(4.4)	(4.5)	(25.5)	(30.9)	(25.1)	(32.7)	(21.3)	(14.4)	(5.9)
Economically inactive	24.1	25.5	28.5	29.4	24.8	23.7	30.9	29.1	19
	(3.8)	(4.1)	(13.9)	(25.2)	(21.0)	(21.6)	(19.5)	(12.1)	(4.8)
Never worked or unemployed	2.5	2	10.4	3	5	4.3	5.6	3.5	2.8
	(1.9)	(1.3)	(7.4)	(8.7)	(8.4)	(9.1)	(6.1)	(4.8)	(1.6)

Source: Census 2001. Standard errors in parentheses.

Table 2.5: Location Determinants of Private Schools
(Dependent variable: Count of private schools in postcode district)

	All	Religious schools			
		Muslim		Jewish	
	(1)	(2)	(3)	(4)	(5)
Percent of population with higher level qualifications	0.08***	0.11***		0.14**	
	[0.01]	[0.03]		[0.06]	
Percent of Muslims/Jews with higher level qualifications			-0.08***		-0.06***
			[0.02]		[0.02]
Percent of population Muslim/Jewish		0.12***	0.09***	0.57***	0.47***
		[0.02]	[0.01]	[0.12]	[0.07]
Gini coefficient	2.15***	-1.08	1.31	3.09	5.4
	[0.55]	[2.75]	[3.04]	[6.20]	[5.17]
Spending pr pupil LEA (£1000)	-0.16**	0.29	0.76**	3.37*	2.92**
	[0.08]	[0.28]	[0.32]	[1.98]	[1.31]
Observations (postcode districts)	1955	1955	1679	1955	1272
Number of schools	2058	112		53	
Pseudo R-squared	0.14	0.33	0.32	0.45	0.44

Notes: Negative binomial regression. Robust standard errors in brackets. All regressions include a control for market size (the log of all pupils in the postcode district) and regional fixed effects. Regions include: East Midlands, East of England, London, North East, North West, South East, South West, West Midlands, Yorkshire and The Humber. * significant at 10%; ** significant at 5%; *** significant at 1%. See Appendix B for details on data construction.

Table 2.6: Robustness Checks: Alternative Inequality Measures
Dependent variable: Number of private schools in postcode district

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
Standard deviation of logs	0.34*						
	[0.19]						
Gini coefficient		1.35***					
		[0.47]					
75/25 quantile ratio			0.09**				
			[0.04]				
Income share of top 40 percent				0.04***			
				[0.01]			
Income share of top 75 percent					0.02***		
					[0.01]		
House prices: 75/25 ratio						6.84***	
						[2.40]	
CACI: ratio of percent of households with income above 40K to below 10K							0.04
							[0.06]
Observations	1955	1955	1955	1955	1955	1883	1915
Pseudo R-squared	0.15	0.15	0.15	0.15	0.15	0.15	0.15

Notes: (1) Independent schools (excluding Muslim schools) that are still open; (2) All regressions include full set of controls (see Table 2.5) and regional fixed effects. The first 5 measures of income inequality are based on the New Earnings Survey data, while the two latter are based on Nationwide house price data and estimated neighborhood income from the CACI consultancy based on census data, respectively. Robust standard errors are reported in brackets. * means significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.7: Robustness Checks: Alternative School Quality Measures
(Dependent variable: Count of private schools in postcode sector)

										Metropolitan area	
										Yes	No
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*
Neighborhood characteristics												
Log mean income	0.78***	-0.31*	-0.43**	-0.39**	-0.36**	-0.23	-0.25	-0.33*	-0.21	-0.2	-0.51	-0.21
	[0.16]	[0.17]	[0.18]	[0.19]	[0.19]	[0.17]	[0.17]	[0.17]	[0.17]	[0.17]	[0.36]	[0.19]
Gini coefficient	2.41***	2.15***	2.60***	2.67***	2.69***	1.86***	1.95***	2.21***	2.19***	2.38***	3.51***	1.66***
	[0.64]	[0.55]	[0.65]	[0.65]	[0.66]	[0.58]	[0.58]	[0.57]	[0.57]	[0.56]	[1.25]	[0.62]
Percent of population with higher level qualifications		0.08***	0.08***	0.08***	0.08***	0.08***	0.08***	0.08***	0.08***	0.08***	0.08***	0.09***
		[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Local state school characteristics												
Percent of pupils achieving more than 5 A*-C GCSEs			0									
			[0.00]									
Percent of pupils achieving no GCSE passes				0								
				[0.01]								
Percent of pupils achieving no GCSE passes (1996)					0.01							
					[0.01]							
Pupil teacher ratio						-0.04*	-0.05**					
						[0.03]	[0.03]					
Percentage of pupils with special needs without statements								0				
								[0.01]				
Percentage of pupils known to be eligible for free school meals									0.01			
									[0.00]			
Metropolitan area (London, Birmingham, Manchester, Leeds, Bradford, Leicester, Liverpool)										-0.22**		
										[0.10]		
Spending pr pupil LEA 1995-2003 (£1000)	0.28***	-0.16**					-0.21**	-0.16	-0.33**	-0.16**	-0.03	0.16
	[0.09]	[0.08]					[0.10]	[0.10]	[0.14]	[0.08]	[0.11]	[0.24]
Observations	1966	1955	1607	1607	1596	1949	1949	1949	1949	1955	268	1690
Pseudo R-squared	0.1	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.13	0.19	0.12

Notes: Negative binomial regression. Robust standard errors in brackets. All regressions include a constant, regional fixed effects and controls for log pupil numbers. Pupil numbers are based on pupils enrolled in all state and private schools in the postcode district. State schools include all publicly run schools except nursery, special schools, pupil referral units. Regions include: East Midlands (omitted), East of England, London, North East, North West, South East, South West, West Midlands, Yorkshire and The Humber. * denotes significant at 10%, ** significant at 5% and *** significant at 1%

Chapter 3

The Quality of Public Education and the Demand for Private Education. Theory and Evidence from English Household Data

3.1 Introduction

Private sector alternatives to publicly provided education is a key policy issue. Proponents claim that private schooling frees up resources in the public sector and invigorates the public sector through increased competition. By contrast, critics worry that private schools attract the most able and wealthy pupils to the detriment of the viability of the state schools[1], which in turn increases the demand for private education. The focus of much applied research on the relationship between public and private education has been to study how private sector competition affects state school performance[2] and whether private

[1] In the UK, private schools are generally called "independent schools" because of their freedom to operate outside of government regulation. The term private schools will be used here. Private secondary schools are called public schools, though this term is primarily used of the older and more prestigious schools, like Eton. To avoid confusion with English public schools, I refer to schools operating in the public sector as "state schools".

[2] The literature on how private sector competition affects public school performance includes Couch et al. (1993), Newmark (1995), Hoxby (1994), Altonji, Taber and Ching-I (2004); Hsieh and Urquiloa (2006) and Chan (2006).

provision of education produces better outcomes than public provision[3]. However, very little is known about the association between state school quality and private school demand at the local level, and how this varies by household characteristics, such as the distribution of income or education levels. A major impediment is the paucity of high quality data which provides detailed information about households characteristics and local school quality. This paper contributes to filling this gap.

I develop a simple theoretical model to study the association of the demand for private education and local state school quality. There is one time period which covers the entire primary and secondary educational cycle of the children in the household. Households simultaneously choose residential location and educational quality. Education can be obtained from the public and private sectors, and public and private education are perfect substitutes. The quality of local public education is determined by residential location. It is possible to obtain a higher quality of education in the private sector, yet it is also more costly. Motivated by stylized facts I assume that households can flexibly choose to split their consumption of education between the public and private sector, but they cannot relocate.

I find that there is a non-monotonic relationship between the demand for local state school quality and household income. Up until an income threshold, it is optimal to consume as much educational quality as possible in the public sector and top up with private sector education of a higher quality, but also higher unit cost. However, the contribution of local public sector educational quality to overall educational quality obtained in the household declines in the proportion of education consumed in the private sector, while the price remains constant. As income rises, the proportion of educational consumption in the

[3]See, for example, Rouse (1998), Figlio and Stone (2001) and Altonji, Elder and Taber (2002).

private sector necessary to satisfy desired spending on education eventually becomes so large that the realized unit cost of education in the public sector exceeds that in the private sector. Beyond this threshold it is therefore optimal to consume in the private sector only and demand the minimal level of quality in the public sector.

The central empirical implication of the model is that, depending on the distribution of income, we may find either a positive or a negative correlation between private school demand and local state school quality in a cross-section of households. Compared with low income households, middle income households demand both more private education as well as a higher quality of local state school quality, relative to general neighborhood quality. Conversely, high income households don't consume in the public sector at all. High income households therefore demand more private education, but less local state school quality.

In the empirical section, I use a unique and rich micro data set constructed from 14 years of English nationally representative household-level survey data which includes information on whether respondents have ever sent a child to private school as well as detailed respondent/household controls, including information on household income. I match this data by detailed information on respondents' residential location to local school-level data on public and private schools as well as other neighborhood characteristics at the postcode district level. To measure state school quality, I focus on average public school test scores at age 15. In probit regressions using this data set, I find that state school quality is overall positively associated with household private schooling choices. However, consistent with theoretical priors, there is a strong and robust negative association between the *interaction* of household income and mean local state school test scores to private schooling choices such that a negative association is found at the top end of the income distribution. These

findings are robust to different ways of measuring state school performance. I also find evidence that public school quality and private school demand is less positively related in households where a parent has attended private school and for households living in better school districts. An overall negative association between state school quality and private school demand is obtained in regressions using different measures of private school demand based on pupil population data. However, I argue that, consistent with theoretical predictions, differences in the representation of different income groups in the alternative data sources provide the key to reconciling the empirical findings.

This paper contributes to a substantial body of empirical literature on household schooling choices. Closest in spirit to this paper is a study by Figlio and Stone (2001) which also uses detailed household-level data to look at the effect of community-level characteristics on enrollment patterns in public and private schools. However, the data set I use is superior. Most importantly, the information available to them on household location, and thus community-level characteristics, is much cruder. Through a careful matching procedure using a variety of geographical information, I am able to narrow down household location to an average population of 30,000, while their work is at a geographical level with an average population of 960,000. Consistent with the findings of this paper, they find that unattractive community features differentially leads to students from wealthier, better educated, and higher achieving families leaving the public sector. Other studies on parental preferences find that preferences attached to schools' mean test scores increases with student income and academic ability (Hastings, Kane and Staiger, 2005). Studies of the supply side of private schooling (Downes and Greenstein, 1996, 2002 and Munk 2007a), find some evidence that private schools tend to locate near relatively poorly funded and/or performing state schools. Finally, this paper contributes to the theoretical literature modeling the choice between public and private

education (e.g. Stiglitz, 1974; Besley and Coate, 1991; Epple and Romano, 1996, 1998 and Munk 2007a). The main difference of this paper from other theoretical contributions is that I here treat private education as a continuous, rather than a discrete, choice variable and explicitly tie residential and educational choices.

The remainder of the paper is organized as follows. Section 3.2 presents a simple theoretical model of residential and educational choices and illustrates possible relationships between local state school quality and private school demand at the household level. Section 3.3 describes the data and presents basic summary statistics. Section 3.4 describes the empirical approach, and presents results at the household and postcode district level. Section 3.5 reviews robustness and section 3.6 concludes.

3.2 The Model

In this section I develop a simple theoretical model to analyze the demand for educational quality. I use it to illustrate variation in the association between the demand for private education and local state school quality at the household level by income and preferences for education. The model is motivated by the following three empirical observations:

1. It is possible to obtain education of a higher quality in the private sector than in the public sector, yet it is also more costly[4].

2. A substantial fraction of households divide the consumption of education between the public and the private sectors over the course of their

[4]Private schools in England substantially outperform state schools (except Grammar schools) in terms of average achievement on standardized tests (See Figure 6.1). While public schools are nationally financed in England, private schools receive no state funding. The average annual fee for a child in a private secondary school is approximately 40% of median disposable income for UK households or 20% at the 90th percentile (Graddy and Stevens, 2003).

children's primary and secondary education[5].

3. Residential mobility for families with school-aged children is low[6].

Against this backdrop, consider the following approach to characterizing household choices.

3.2.1 Set-up

Households differ in disposable income and their preferences for educational quality, denoted λ. There are three households income levels y_i labelled $i \in \{L, M, H\}$ (low, middle and high). The economy has two goods, a numeraire good x and educational quality π. All households consume one unit of education which is available at different levels of quality and can be obtained in both the public and private sectors. For any given level of quality, public and private education are perfect substitutes. Local state school quality $q_g(j)$ is determined by residential location j. Residential location j should be thought of as a set of geographic coordinates in proximity of which there are a number of state schools[7]. There is exogenous variation in public school quality across a continuum of locations $j \in [0,1]$ such that $q_g(0) = \underline{q}_g$ and $q_g(1) = \overline{q}_g$. State schools are financed through national taxation. Yet on top of the costs of locating in a district of a certain general quality (not modeled), there are specific additional costs associated with locating near good quality state schools. The *additional* cost of residing in location j due to the quality of local state schools is given by $cq_g(j)$[8]. The highest level of educational quality

[5]Empirical support for this observation is discussed in section 3.4.

[6]The BSA survey includes a question on the number of years that respondents have lived in their neighorhood. This information is available for 30 percent of respondents in the baseline sample used in the empirical analysis. These have on average lived 20.1 years in their current neighborhood. The equivalent figure for the same sample restricted to respondents 55 years or older is 29.6 years.

[7]That is, j does not refer to a specific neighborhood or distict. j may vary within districts.

[8]Note that I do not model real estate markets. c might be conceived of as a house price premium that reflects the quality of local state schools, conditional on general neighborhood

available in the private sector is higher than the highest level available in the public sector $\overline{q_p} > \overline{q}_g$. However, educational quality is more expensive in the private sector. The unit cost of quality in the private sector is given by $p > c$. For simplicity, I assume that there are no restrictions on location choices and that c is exogenous[9]. Sorting into districts depends on a range of factors that are exogenous to the model. However, the choice of residential location *per se* is not the focus of the model. Residential location only matters to the extent that it is associated with the quality of local public education. In the following, for notational clarity, I therefore drop j and simply refer to $q_g(j)$ as q_g. However, it should be kept in mind that a choice of q_g is implicitly a choice of j.

Household decision-making: There is one time period which covers the entire primary and secondary educational cycle of the children in the household. Households simultaneously make residential location and educational choices for this time period. Households can split their consumption of education between the public and private sector, but they cannot relocate. Let $\mu \in [0,1]$ denote the fraction of household educational consumption which takes place in the private sector[10]. I refer to households which consume in both the private and public sectors as *mixed*, and households consume in only

quality. Several studies have found that the quality of public schools increase house prices, including Black (1999); Gibbons and Machin (2003); Fack and Grenet (2007); and Machin and Salvanes (2007). However, costs associated with locating near good state schools may also be construed more broadly to include compromises made on other aspects of residential location to obtain proximity to good public schools, or search costs to identify the best local public schools, conditional on neighborhoods quality.

[9]Assuming that c is constant and exogenously given is clearly unrealistic. However, relaxing this assumption would not qualitatively change the results of the model. As will become apparent below, the only outcomes that would be affected would be: (i) the income thresholds that separate different types of consumer behavior; (ii) the fraction of education that takes place in the public sector for middle income households and (iii) the level of state school quality demanded by low income households.

[10]While a child can only attend one type of education at any one time, children may switch between sectors during their childhood. Note that the assumption that private education is a *continuous* choice variable contrasts with the approach of Besley and Coate (1991) and Munk (2007a) in which education is modelled as a *discrete* choice between the public and the private sector.

in either the private and public sector as *pure* public and private users, respectively.

Preferences: Households' optimization problem over educational quality π and other goods x solves

$$\max_{\mu,q_g,q_p,x} u(\mu, q_g, q_p, x) = [h(\mu, q_g, q_p)]^{\lambda} x^{1-\lambda} \tag{3.1}$$

where *educational quality* is a weighted average of quality obtained in the public and private sectors:

$$\pi = h(\mu, q_g, q_p) = \mu q_p + (1-\mu) q_g \tag{3.2}$$

subject to:

(i) the budget constraint by which households pay a fixed price for residential location as a function of local state school quality, regardless of how much they consume in the public sector:

$$y \geq x + cq_g + \mu p q_p \tag{3.3}$$

(ii) constraints on the choice variables which stipulate that:

$$\mu \in [0,1]\,;\, q_k \in \left[\underline{q}_k, \overline{q}_k\right],\ k \in \{g,p\} \tag{3.4}$$

where $\overline{q}_g < \overline{q}_p$.

I make the following assumption on the three types of households.

Assumption 1: Household income levels $y_i \in \{y_L, y_M, y_H\}$, where $y_L < y_M < y_H$, satisfy the following conditions:

(i) $y_L < \frac{c\overline{q}_g}{\lambda}$

(ii) $y_M \in \left(\frac{c\overline{q}_g}{\lambda}, \frac{p\overline{q}_p}{\lambda} + \eta\right]$

(iii) $y_H > \frac{p\overline{q}_p}{\lambda} + \eta$

where $\eta \lesseqgtr 0$ but $\frac{c\overline{q}_g}{\lambda} < \frac{p\overline{q}_p}{\lambda} + \eta$, where η is given by $\left[(1+\lambda)\,\overline{q}_g - \overline{q}_p\right]\frac{c}{\lambda} + \frac{(1-\lambda)}{\lambda}\frac{p\overline{q}_p\overline{q}_g}{\overline{q}_p - \overline{q}_g}$.

3.2.2 Private School Demand

Assumption 1 assures that the income levels are well defined and that the three income types segregate into three types of educational consumption: Low and high income (*pure*) households consume education only in the public and private sector, respectively, while middle income (*mixed*) households consume in both the public and the private sector as demonstrated by Proposition 1:

Proposition 1: Suppose Assumption 1 holds. Then optimal household behavior $\left(\mu^*.\, q_g^*, q_p^*\right)_i$, $i \in \{L, M, H\}$ is characterized by:

$$\begin{pmatrix} \mu^* \\ q_g^* \\ q_p^* \end{pmatrix}' = \begin{cases} (0, & \frac{\lambda y_L}{c}, & 0 &) & \text{if } i = L \\ (\frac{\lambda\left(y_M - c\overline{q}_g\right)}{p\overline{q}_p} - \frac{\overline{q}_g(1-\lambda)}{\left(\overline{q}_p - \overline{q}_g\right)}, & \overline{q}_g, & \overline{q}_p &) & \text{if } i = M \\ (1 & \underline{q}_g, & \min\left\{\frac{\lambda y_H}{p}, \overline{q}_p\right\} &) & \text{if } i = H \end{cases}$$

Furthermore, note that the optimal fraction of private sector consumption in *mixed* households is below a threshold strictly smaller than 1:

$$\mu^* \in (0, \hat{\mu}) \quad \text{if } i = M$$

where $\widehat{\mu} \equiv 1 - \frac{c}{p}\frac{\left(\overline{q}_p - \overline{q}_g\right)}{\overline{q}_p} < 1$.

Proof: See Appendix.

The key implication of Proposition 1 is that there is a *non-monotonic re-*

lationship between the demand for state school quality and household income. To see why this is the case, recall that the nominal unit cost of educational quality is lower in the public than in the private sector: $c < p$. However, due to the restriction on residential mobility, a fixed price is paid for local public sector quality, regardless of how much is actually consumed in the public sector over the time period. The "de facto" unit cost of educational quality obtained in the public sector[11] thus increases in μ, and at some point $\widehat{\mu}$ overtakes the unit cost of quality in the private sector (p). In spite of lower unit costs in the public sector, rationing in the form of caps on maximal educational quality available lead middle income (*mixed*) households[12] to consume in both the public and private sector. Conversely, for rich (*pure* private sector) households (with $\mu^* > \widehat{\mu}$), it is optimal to avoid incurring costs related to locating near high quality local state schools so far as possible. Proposition 1 further implies that the fraction of education consumed in the private sector increases monotonically in household income. Households willing to spend more on education (by the Cobb-Douglas preferences, desired expenditure is equal to λy) than it costs to obtain the best quality of public education $\left(c\overline{q}_g\right)$, will consume some or all education in the private sector[13].

[11] The "de facto" unit cost of educational quality obtained in the public sector is given by $\frac{c\overline{q}_g+\mu p\overline{q}_p}{\mu\left(\overline{q}_p-\overline{q}_g\right)+\overline{q}_g}$.

[12] By construction of the income groups, $\mu^* \in (0, \widehat{\mu})$ for middle income households. For $\mu^* > \widehat{\mu}$ educational quality is cheaper in the private sector. Households with income levels that yield $\mu^* > \widehat{\mu}$ therefore only consume in the private sector.

[13] While it is not important for present purposes, note that the model furthermore may imply a non-monotonic relationship between the demand for private school quality and household income. This may arise if $\eta < 0$, or

$$\left(\overline{q}_p - \overline{q}_g\right)\left(\left(1+\lambda\right)\overline{q}_g - \overline{q}_p\right) > \left(1-\lambda\right)\frac{p}{c}\overline{q}_p\overline{q}_g \tag{3.5}$$

To see this, consider that the lower unit cost of educational quality in the public sector for $\mu^* < \widehat{\mu}$ further implies that it is optimal for *mixed* households to minimize the fraction of education consumed in the private sector, subject to realizing their desired overall level of expenditure educational quality. This expenditure level cannot be satisfied in the public sector alone for middle income households due to the constraint on the maximal quality levels available. (By the Cobb-Douglas preferences optimal expenditure on educational quality is equal to $\lambda y_M = cq_g^* + \mu^* pq_p^*$, where $q_g^* = \overline{q}_g$). Thus, it is optimal to consume

3.2.3 Private School Demand and the Demand for Local Public Educational Quality

Now consider the correlation of private school demand and the demand for local public educational quality in a cross-section of households, conditional on other local characteristics[14]. Proposition 1 implies that household location *within* districts will be characterized by the following pattern: (i) *pure private* sector high income households demand minimal public sector quality, (ii) *mixed* middle income households demand the highest possible quality of public education and (iii) *pure public* sector low income households demand a lower level of public sector educational quality than the middle income households, but a higher level than high income households. Let the overall fraction of households of each income type y_i be given by ρ_i, $i \in \{L, M, H\}$, with $\sum_i \rho_i = 1$. Furthermore, there is exogenous variation in the composition of income types across districts. Suppose there is some but not perfect sorting by income across districts[15]. For instance, there are rich districts characterized primarily by medium and high income types (H-M districts) and poor

the highest possible quality in both the public and private sectors. However, the income threshold that induces a switch to pure private consumption implies an optimal level of spending on educational quality that may be either greater or smaller than the cost of obtaining the highest level of quality attainable in the public sector. If $\lambda\eta < 0$, then we may have $q_p^* = \frac{\lambda y_R}{p} < \overline{q}_p$. This means that the demand for educational quality in the private sector may be lower for the very rich compared to that of the middle income households. To understand the conditions under which we may obtain this outcome, notice that $\lambda\eta < 0$ if (3.5) holds. For a given $\overline{q}_p$, the left hand side increases in the difference in maximal quality levels in the public and private sector, $\overline{q}_p - \overline{q}_g$. If there is a very large gap between the maximal quality levels attainable in the public and private sectors, the μ^* required to satisfy a given level optimal expenditure on educational quality increases and is therefore more likely to surpass $\widehat{\mu}$.

[14]In the empirical analysis in section 3.5, j is a set of geographic coordinates (estimated eastings and northings), and local public school quality is an average of the five closest state schools in a 15 km radius. Each location j is located in a smaller postcode district (neighborhood) as well as a larger school district (Local Education Authority). I include school district fixed effects as well as a series of postcode district level variables (including average house prices) to control for general neighborhood characteristics.

[15]In practice, we do not observe perfect sorting by income. The model thus departs from a classic Tiebout style models in which the equilibrium outcome involves perfect sorting by income into homogeneous neighborhoods. For other community-based models, see e.g. Fernandez and Rogerson (1996).

districts characterized primarily by medium and low income types (M-L districts)[16]. There may also be variation in the degree of income inequality such that, for the same mean income levels, the fraction of medium income types is high in some districts (M-district) but relatively low in others (H-L district). We then have that:

Corollary 1: *The (conditional) correlation between the demand for private education and local state school quality in a cross-section of households may be either positive or negative, depending on the distribution of income types across districts.*

The reason is as follows: The demand for private education increases monotonically in income. However, higher private school consumption is associated with higher demand for local state school quality for middle income households who also consume education in the public sector, but with lower demand for local state school quality for high income households who only consume in the private sector. The aggregate linear relationship found will therefore depend on the relative aggregate weight on the high and middle income groups. This point is illustrated in Figure 3.1. The graph on the left hand side in Panel A shows an example of a three-point income distribution with most weight on the middle income group (M-district). The graph on the right hand side shows a mean preserving spread[17] of this income distribution such that there is more weight on both the low and high income groups relative to the middle income group (H-L district). Panel B illustrates how the distribution of income distribution affects the aggregate linear relationship between the demand for private education and local state school quality. The values for the fraction of education consumed in the private sector μ for

[16]Note that as long as there are *any* medium type households in a district, there will be demand for the maximal level of state school quality.

[17]Given the following income levels for the three types: $y_L = 10$; $y_M = 30$; $y_H = 60$, the mean of the distribution equals 27 in both cases.

mixed households[18] and for quality levels demanded in the public sector by the three groups are fictive. The size of the bubbles is proportional to the size of each income group as shown in Panel A. The thick black curve shows the "true" hump-shaped relationship between the demand for private education (as a continuous choice variable in the $[0, 1]$ interval) and local state school quality predicted by the model. The straight lines show fitted values of actual linear regressions of μ on q_p given the different income distributions, based on the fictive values described above. In the example with low income inequality, and consequently relatively low weight on the high income group and high weight on the middle income group, the slope of the regression line is positive. However, in the example with higher income inequality with a greater weight on the high income group, this slope is negative.

The relationship of interest will furthermore be more negative in the rich (H-M) districts than in the poor (M-L) districts. As long as districts are not perfectly homogenous in income types, the aggregate relationship resulting from within district variation depends on the overall income distribution among all the households included in the analysis. Moving beyond these fictive illustrative examples, I now turn to investigate the empirical evidence for the predicted non-monotonic relationship between the demand for private education and local state school quality.

3.3 Data Description

To investigate the association between local state school quality and private school demand empirically, I use survey data on private schooling and other household characteristics matched by residential location to school, house price and census data.

[18] μ^* is always equal to 0 and 1 for pure public and private sector households, respectively.

3.3.1 Measuring Private School Demand and Other Household Characteristics

To form the basic household-level data set, I use variables on private education consumption, household income, geographic location, and other household/respondent characteristics from the nationally representative annual British Social Attitudes Survey (BSAS) data. There are 14 years of data in which these core variables are available, spanning the period 1986-2002. I extract all respondents living in England with school-aged or older children (aged 5+) who provide a yes/no answer to whether they have ever sent a child to private school. Out of the resulting 21,398 observations, a base sample of 16,206 observations satisfy all data requirements[19].

The BSAS survey data makes it possible to distinguish between *pure* public sector households and households which have ever consumed any private education. However, it is unfortunately not possible to tell apart *mixed* public-private users from *pure* private school users, since there are no direct measures of μ, the fraction of educational quality that is consumed in the private sector at the household level[20]. A measure of household income is constructed based on income bands defined in nominal terms. I take the mid-point of upper and lower values of these bands and adjust on a yearly basis by the UK retail prices index[21]. As a further (time-invariant) measure of household resources, I therefore also employ information on respondents' educational background

[19] See Data Appendix, section 6.3 for details.

[20] I try to address this limitation of the data in various ways which I describe in more detail below.

[21] The retail price index is the most widely used general purpose domestic measure of inflation in the UK. As a measure of household's financial resources in general, and at the time at which private schooling decisions were taken, this income variable suffers from some drawbacks. First, the highest income band is not bounded above and the accuracy of estimated income in this category is as such lower than that based on well defined bands. Second, low current household income in single parent families (roughly 25 percent of respondents with children) or in households headed by either very young or retired parents may not be indicative of low parental financial resources. For further details on income bands and the construction of the household income variable, see Data Appendix, Figure 6.6.

(including on whether the respondent is privately educated). Furthermore, I include age, marital status, and religious and political orientation. Finally, I use information on the residential location of the respondents at the time of the interview to link household schooling decisions to neighborhood characteristics.

Geographical information on residential location is available for all survey years. However, different geographical units are employed, and in different formats, sometimes with inconsistencies or errors that can in part be corrected to enable matching to other data files. The matching procedure is further complicated by numerous changes to names and codes of different geographical units over time. Using a variety of intermediate steps and geographic matching files, I am able to narrow down the residential location of all respondents in the base sample to geographical areas covering on average roughly 35,000 inhabitants. I derive estimated geographic coordinates as well as key pieces of administrative geographical information for each observation in the data which enables matching survey respondents to the 5 closest state schools as well as different relevant administrative units (postcode district and school districts (Local Education Authorities)) by which the survey data can be matched geographically to other data sources[22].

3.3.2 Matching Survey Data to Neighborhood Variables

Matching survey respondents' private schooling decisions to neighborhood variables poses a number of methodological problems. Even if ideal neighborhood data were available, it would not be obvious which years of neighborhood data it would be relevant to match survey year of interview to, or how to define the geographical scope of matching. Beyond the inability to establish the tim-

[22]For details, see Data Appendix, section 6.3.3 and online appendix.

ing of private schooling decisions in the survey data (private schooling choices may have taken place many years prior to the interview)[23], we do not know how households relate schooling decisions to neighborhood characteristics. If schooling decisions are made simultaneously with housing decisions, such decisions may be made years prior to actually sending children to private school. It is also not obvious how households factor information about neighborhood and school quality into those decisions. Households might observe quality over a number of years, say based on long-standing reputation of areas and the experiences of relatives and friends, or they might primarily focus on measurable outcomes, say mean test scores, at the time at which they are making decisions. There may be time lags in changing perceptions about neighborhood quality to objective changes in circumstances. The only thing we know for sure is that households cannot base their decisions on neighborhood outcomes occurring after the day of the interview. Furthermore, the older the respondent, and thus other things equal the older the households' children, the further back in time schooling decisions are likely to have been made. The further back in time schooling decisions have been made, the weaker is the likely relationship of those schooling choices to the state school quality and other neighborhood characteristics of respondents' residential location at the time of the interview. First, neighborhood characteristics may change over time. Moreover, the likelihood that households live in the same location as the one in which they made schooling decisions declines in the time elapsed between those schooling decisions and the time of the interview.

Mindful of these caveats, I proceed by matching survey data to contem-

[23]Only an upper limit (the year of the interview) on private school choice timing can be inferred from the data. There is no information in the data on the number or ages of children a household has sent to private school, or for how long. Only children living at home are reported and thus it is (mostly) impossible to know how many children older respondents have had. For 1995 and 1996 only, information is additionally provided on whether households currently have children in private education. However this is a very small sample of roughly 150 observations.

poraneous neighborhood variables where possible, and to the earliest possible year of data where it is not, to - so far as possible - approximate neighborhood characteristics likely to have affected schooling choices. By using the earlier survey data matched at the postcode district level to the more recent school performance and house price data the sample size is increased by almost 70 percent. I discuss the practical importance of these problems further when reviewing the robustness of the empirical results.

As regards the geographical aspect of matching, there are again no strong a priori guidelines on how to define the scope of educational markets. Moreover, clear limitations are imposed by the available data. I use different approaches for the different data sets as described below.

3.3.3 Measuring Pupil Performance

School quality has many dimensions. In this paper, I focus on pupil performance and use the school-level percentage of 15-16 year old pupils doing well in standardized GCSE[24] exams (obtaining 5 or more A*-C grades) as the baseline measure of state school quality. This measure of pupil performance has been directly observable to the public in the so-called league tables since 1992[25].

I construct a school-level panel spanning the years 1993-2002 based on yearly data from the Department of Education and Skills which covers all public and private English schools and includes information on GCSE performance, school type (public or private), enrollment numbers (in total and at different ages), as well as exact geographic coordinates (eastings and northings) that enables a precise localization of the schools[26]. Note that state schools refer

[24] GCSE stands for General Certificate of Education and is normally taken in grade 11 (15/16 years).

[25] Overall rankings are published in newspapers and on the internet, where it is possible to search for local information on particular areas, including a list of all the nearest schools and the performance on key standardized tests of the pupils of these schools.

[26] Constructing this data requires matching disparate files across years (ASC, SEC and

to schools operating in the public sector. I drop all special schools. I match the survey data to contemporaneous school data for the years 1993-2002, and to 1993 school data for pre-1993 survey data. In terms of geographical matching, the exact postcode, and hence precise geographical coordinates, is available for all schools. For each of the estimated geographic coordinates of the survey respondents, I identify all schools which lie within a 15 kilometer radius in that survey year, or in 1993 for pre-1993 survey data. I then select the 5 nearest schools (or largest number available) within the 15 kilometer radius[27] and construct a variable containing the mean value of their performance for each set of estimated BSAS coordinates. Furthermore, for robustness checks, I compute average performance of all schools by year and postcode district. In both cases, I weight by the number of 15-year old pupils when averaging across schools.

3.3.4 Measuring Neighborhood Quality

I include variables that proxy neighborhood quality more generally. First, I use English house price data from the Land Registry as an expression of the capitalization of general neighborhood quality. Second, I use Census data on the fraction of highly qualified individuals as a measure of overall neighborhood wealth and tastes for education. Geographically, both variables are matched to the survey data by postcode district. Temporally, the survey and house data is matched contemporaneously for 1995-2002 data, and pre-1995 survey

Edubase). This is complicated by the use of two different school identifiers (URN, unique reference numbers as well as the combination of local education authority (LEA) numbers and school establishment (estab) numbers. The latter are not consistent over time, and various intermediate files need to be used to match files containing the relevant information. However, by matching on a combination of old and new school identifiers as well as school postcodes only a small percentage of schools are left unmatched.

[27] On average, there are 50.3 schools within a 15km radius of the estimated geographic coordinates of respondents in the baseline sample. On average, the closest school is located 1.55km from the estimated household location.

is data is matched to 1995 house price data. The Census data is only available for 2001.

3.4 Preliminary Data Analysis

The first column of Table 3.1 provides sample means for all respondents in the base sample, while columns (2) and (3) respectively contain sample means for the 13.3 percent of respondents who have sent any children to private school and for the remainder who have not. Respondents who have ever sent a child to private school are on average wealthier, better educated, including more likely to have attended private school themselves, older, more likely to be married or cohabitating, more religious and more conservative than those respondents who have not sent children to private school. Furthermore, private education households tend to live in areas with better performing state schools, higher average house prices, with a greater percentage of the population with higher level qualifications.

In comparison to the 13.3 percent of survey respondents who have ever sent a child to private school, only roughly 7 percent of English pupils are enrolled in private education according to school-level enrollment data in all English public and private schools during the period considered[28]. It is worth exploring what might explain such a large discrepancy in the two measures of private school demand and to what extent the two data sources appear consistent. As shown in panel 1 of Figure 3.2, in spite of some fluctuations in the survey data, the overall trends in both data series are relatively flat over the period considered[29].

[28]Note, the pupil population figures are based on non-special public and private schools only.

[29]In addition to the baseline sample years of data, these figures also include data on private education for the 2003-05 BSA survey and 2003-06 pupil population data. These years are not included in the empiricial analysis because only relatively geographical information provided in the survey data for 2003 onwards which prevents adequate matching of the survey data to neighborhood variables.

This suggests that differences are not caused by time lags in the representation of private school demand in the survey data[30]. Moreover, panel 2 shows that the two measures of private school demand are highly correlated at the regional level with a correlation coefficient of 0.891 [31]. The most plausible explanation for why the percentage of households who have ever sent children to private school is higher than the percentage of pupils in private education therefore appears to be that *mixed* households which consume in both the private and the public sectors make up a substantial proportion of private school users, as suggested in the theoretical analysis. Households may send children to private school for only part of their children's primary and secondary education and may simultaneously consume in the public and private sectors by sending some of their children to private schools and some to state schools. Indeed, the fraction of pupils enrolled in private education increases markedly with the age of pupils, as demonstrated in panels 3-4[32].

Next, to explore the association of private school consumption with local state school performance and income, I divide the baseline sample into 8 equal sized groups according to the mean performance of the 5 nearest state schools and household income. The top group contains the 12.5 percent of households with the best local public schools or the highest household incomes; the next

[30]Since respondents are asked whether they have ever sent children to private school, the survey data represents private school demand that potentially goes decades back in time relative to the survey year.

[31]The figure also shows that regional variation in private education is very considerable in England: According to the pupil population numbers, only 3 percent of pupils in the North East attend private schools as opposed to 11 percent in the South East. Furthermore, there is much variation within regions, In some Local Education Authorities (schools districts) in London, 25-50 percent of pupils are educated in private schools, while the equivalent figure for other areas is 1-3 percent.

[32]In 2006, the percentage of pupils in private education was almost 50 percent higher among pupils aged 15 compared to pupils aged 6, a decline from 1996 where the equivalent figure was 76 percent. Furthermore, even given the high correlation of the two measures at the regional level, the ratio of age 15 to age 6 enrollement is correlated (.651) with the excess of the survey private school demand measure over the pupil population measure at the regional level. The excess, in region i, of private school demand as measured by the survey data (pctBSAi) over that measures by the pupil population data (pctDfES$_i$) is calculated as 100*(pctBSA$_i$/pctDfES$_i$-1).

group contains the next 12.5 percent, and so forth. Panels 5 and 6 show a clear, monotonic association between private school demand and, on the one hand, local state school performance and, on the other hand, household income. The drop in private school demand from the top household income group to the next is particularly striking and is suggestive of the extent to which private education predominates at the very top of the income distribution[33].

The positive correlation between private school demand and state school quality may be driven by the fact that high household income is positively correlated with both private education demand and local state school quality. Panel 7 considers the raw correlation of household income and local public school quality by whether respondents have ever sent a child to private schools. In each income group, the households which have ever sent children to private school also on average live in areas with better local state schools than those who have not. This difference is less marked at the top of the income distribution. On the whole, these raw empirical patterns suggest that a positive association between private school demand and local state school quality exists, even controlling for household income. Panel 8 further demonstrates that, at each income level, respondents who have themselves attended private education are far more likely to have ever sent children to private schools than those who have not.

To summarize, the key messages to take away from the comparison of the survey and pupil population data, and the preliminary look at the raw data are as follows: (i) Although the survey based measure of private school demand is higher than the pupil population based measure, the two measures of private school demand are highly correlated at the regional level with a correlation coefficient of 0.89. (ii) The discrepancy in the percentage of survey households

[33]The average annual fee for a child in a private secondary school is approximately 40% of median disposable income for UK households or 20% at the 90th percentile (Graddy and Stevens, 2003).

who have ever sent children to private school and the percentage of pupils in private education coupled with the increase in private school enrollment by pupil age (panels 3 and 4 of Figure 3.2 is most likely indicative of the prevalence of *mixed* households which consume in both the private and the public sectors. It appears that a sizeable proportion of households ever consuming private education only send their children to private school for part of their compulsory education. The increase in private school enrollment by pupil age suggests that the most common approach is to initially send children to state schools and then later switch to the private sector. Note that, by construction, this type of mixed consumption whereby children are only sent to private school for a short duration of time will be more heavily represented in the survey data than in the pupil population data. In a *snapshot* taken in any given year such mixed households will make up a smaller proportion of private school enrollment than they will make up of the *cumulative* pool of households who have *ever* sent children to private education. (iii) Consistent with the theoretical model, there appears to be a positive association between private school demand and local state school quality exists, but it is less pronounced at the highest income levels. This apparent inverted U-shape of plot of local school quality and house prices in Appendix Figure 6.4 consistent with panel B of Figure 3.1 and panel 7 of Figure 3.2). I now turn to more formal empirical investigation to see if this latter pattern holds up to further scrutiny.

3.5 Empirical Analysis

The theoretical model suggests a monotonic relationship between household income and private school demand, but a non-monotonic relationship between the demand for private education and local state school quality (illustrated in panel B of Figure 3.1). This implies that we may find either a positive

or a negative overall correlation between the demand for private education and local state school quality in a cross-section of households, depending on the distribution of income. However, as noted in section 3.3.1, the survey data makes it possible to distinguish between *pure* public sector households and households which have ever consumed any private education. On the other hand, *mixed* public-private users cannot be told apart from *pure* private school users. Although I have argued that the demand for private education should be considered a continuous choice, it is therefore only possible to study it directly as a discrete choice. The dependent private school variable is therefore an indicator variable which attains the value 1 if respondents have ever sent any child to private school and 0 if they have not. This introduces measurement error with a strictly positive mean in the private school demand for *mixed* households, but not for *pure* households. The model predicts that mixed users consume the maximal level of educational quality in the public sector, while pure private school users consume the minimal level of educational quality in the public sector, conditional on other neighborhood characteristics. To the extent that private education is indeed partly mixed, and a non-linear relationship exists as predicted by the theoretical model, this error therefore produces an upward bias in the estimated relationship between the demand for private education and local state school quality. This bias is illustrated by panels B and C of Figure 3.1[34]. Noting this source of expected upward bias, I will first estimate the aggregate relationship between household-level demand for private education and local state school quality and next explore how this relationship varies with income and other personal characteristics that we expect to be correlated with μ.

[34]In fact, in the example with high inequality, a negative aggregate relationship is obtained when μ is fully observable, but a positive relationship results when μ can only be observed as a discrete choice.

3.5.1 Baseline Specification

To study the aggregate relationship between household-level demand for private education and local state school quality, I estimate probit regressions of the form:

$$P^*_{ijklt} = \alpha Q_{jklt} + \beta X_{klt} + \delta Z_{ijklt} + \theta_t + \phi_l + \epsilon_{ijklt} \tag{3.6}$$

Let the variable P_{ijkt} take the value 1 if the ith household in residential location[35] j, postcode district k and school district l in year t has ever had any children enrolled in private education ($\mu > 0$) and 0 otherwise. Then $P_{ijkt} = 1\left(P^*_{ijkt} > 0\right)$ where $1(\cdot)$ is the indicator function taking the value 1 if the expression in parentheses is true and 0 otherwise.

Q_{jklt} denotes local state school quality (the average percentage of pupils achieving 5 or more A*-C grades at GCSE level in the 5 closest schools) in residential location j at time t[36].

X_{klt} is a vector of postcode district level covariates which include house prices and the fraction of the population with high level qualifications. As shown in Figure 6.4, local state school performance is positively correlated with proxies for general neighborhood quality and wealth such as house prices and the proportion of individuals with higher level qualifications. If households with a stronger taste for educational quality, and hence who are more likely to choose private education, also tend to care more about other neighborhood characteristics (safety, green areas, other public services and amenities and population composition), the coefficient on state school quality is upward biased in the absence of adequate controls for such neighborhood characteristics.

[35] Residential location refers to estimated geographic coordinates (easting and northing) as described in section 3.4.

[36] As described in section 3.4, the survey data is matched to contemporaneous variables where possible.

Z_{ijklt} includes the following household/respondent covariates: household income, the education of the respondent, respondent age and age-cohort, the respondent's marital status and religious and political orientation[37]. As shown in section (3.2), the model predicts that μ increases monotonically in income, while there is a non-monotonic relationship between q_g and income. In addition, for a given level of household income, respondent education levels may affect both μ and q_g, either directly through λ, or indirectly by capturing unobserved aspects of household income y. First, better educated individuals are likely to have higher λ, that is, stronger tastes for education[38]. Proposition 1 suggests that the optimal level of μ given *mixed* consumption increases in λ. Furthermore, the income thresholds which trigger a change from no private sector consumption to mixed private sector consumption, and from mixed private private sector consumption to pure private sector consumption[39] are decreasing in λ. Demand for public educational quality directly increases in λ for pure public users only, since either maximal or minimal public educational quality is demanded in the mixed and pure private regimes, respectively. Second, as discussed in section 3, the household income variable may be a noisy measure of (life time) household income. Education is a typically time invariant variable (for individuals with school aged or older children) which is correlated with life time earnings capacity. Respondent education levels, including whether the respondent has been privately education[40], therefore provide an

[37]I do not include number of children in the baseline regression. First, only information on number of children living at home is provided. Secondly, the number of children in the household is potentially endogenous to private schooling decisions. In an English context, parents may plausibly choose to have fewer children to be able to afford sending them to private school.

[38]For evidence that prerences for educational quality appear to increase in household education levels, see e.g. Kane, Hastings and Staiger (2005).

[39]We know that $\frac{\partial \eta}{\partial \lambda} < 0$ since since $\eta = \frac{1}{\lambda}\left((1+\lambda)\, c\overline{q}_g + (1-\lambda)\,\frac{p\overline{q}_p\overline{q}_g}{\overline{q}_p - \overline{q}_g}\right)\,\frac{c}{p} < \frac{\overline{q}_p\overline{q}_g}{\overline{q}_p - \overline{q}_g} > 1$

given that $c < p$ and $\overline{q}_p > \overline{q}_g$.

[40]As shown in Figure 1, private school demand is strongly correlated with household income levels and whether respondents have attended private school.

additional control for life time household income which is arguably a more important determinant of private schooling decisions than current household income. The descriptive statistics also show that private education predominates at the very top of the income distribution, as demonstrated in panels 6 and 8 of Figure 3.2 where the baseline sample is split into 8 equal sized income groups. Almost twice as a high a percentage (30 percent) of the top 12.5 percent richest households have ever sent a child to private school as the next 12.5 percent richest households (16 percent). This percentage further declines at each lower household income group, but at a much slower rate. Furthermore, in each household income group, there is a 20-30 percentage point gap in the percentage of households who have ever sent a child to private school between respondents who have themselves been privately educated and those who have not.

Finally, households' religious and political beliefs may capture variation in λ[41] which may drive both households' private school demand and the propensity to locate near high performing state schools. To control for household and neighborhood level λ, I therefore include households' religious affiliation[42] and political orientation[43] as well as the postcode district fraction of the population that is conservative in the set of control variables. Finally, ϕ_l and θ_t are school district (LEA) and year-of-interview fixed effects. Standard errors are assumed to be normally distributed and are adjusted for correlation of the errors within postcode districts.

[41] In Munk (2007c), I find that certain religious affiliations and professed allegiance to the Conservative party is associated with stronger private school demand, controlling for income and education.

[42] I construct indicator variables for 6 different types of religious affiliation: Church of England/Anglican, Roman Catholic, Other Christian, Non-Christian, Jewish and Muslim. For more details, see Munk (2007c).

[43] Respondents are categorized as Conservative partisan if they respond that they support the Convervative party and as sympathizers/identifiers if they respond that they feel a little closer or would vote for the Conservative party at the next election. Indicator variables for Labour partisans and sympathizers/identifiers are constructed using the same procedure.

Table 3.2 reports marginal effects estimates from probit analyses of whether a household has ever sent any children to private school with progressively more of the variables in (3.6) included. To facilitate interpretation, the state school quality measure is standardized to mean zero and standard deviation one in the baseline sample. Column (1) includes the state school quality measure, controlling for year and regional fixed effects[44]. The coefficient on state school quality is positive and statistically significant[45]. The second column controls for additional measures of neighborhood quality at the postcode district level: log house prices and the percentage of highly educated individuals. The school quality coefficient falls by almost one third, but remains positive and significant, as do the coefficients on both measures of neighborhood quality. As expected, these results indicate that state school quality is positively correlated with such other neighborhood characteristics and their omission consequently leads to upward bias of the school quality coefficient. Column (3) additionally controls for household income, respondent educational background (including whether respondent is privately educated) and other basic respondent/household demographic characteristics as described in the previous section. To control for household and neighborhood tastes for (private) education, column (4) further includes the religious and political variables. The school quality coefficient is more than halved in each step and falls in significance between column (3) and (4). These results again indicate elimination of upward bias of the school quality coefficient due to the respondent/household variables included in column (3) and (4) being positively correlated with the

[44]The 9 English regions (GORs) include: North East, North West, Yorkshire and The Humber, East Midlands, West Midlands, East of England, London, South East, South West. To avoid cluttering notation, the regional level subscripts and dummies are omitted in the description of the empirical method in the previous section.

[45]Note that the coefficient on state school quality is positive as opposed to that presented in Table 2.5 of Chapter 2. However, the measures are not identical. As discussed in section 2.5.1, the input-based measure (spending per pupil) is positively correlated with adverse neighborhood characteristics in an attempt to compensate for disadvantage. It's interpretation is therefore problematic.

school quality variable as well as private school demand. Furthermore, these results suggest that, for given socioeconomic neighborhood characteristics, state school quality is higher in areas where the population at large has a stronger taste for (private) education. Finally, to pick up remaining omitted factors at the school district level, columns (5) additionally adds school district (LEA) fixed effects. The school quality coefficient increases slightly while the coefficient on the proxy for general neighborhood quality, the percentage of highly educated individuals, falls in significance. On the whole, the results suggest that, in the aggregate, households consuming any private education tend to be located in areas with better state schools. A one standard deviation increase in state school quality is associated with a 0.9 percentage point increase in the propensity for private education which amounts to 6.8 percent of the sample mean (13.3 percent).

If private education were a discrete choice and there were only pure public and private sector users, the model would have predicted a negative relationship. This result therefore suggest that a fairly large proportion of private school users in the survey data are indeed *mixed* households which consume education in both the public and private school sectors. However, the presence of mixed households also raises the concern that the results are upwardly biased, as discussed above. To further explore the theoretical prior that results are driven by differences in the demand for state school quality among households with mixed and pure consumption of private education, I now turn explore heterogeneity in the estimated relationship with respect to households characteristics which we expect to affect μ (which cannot be directly observed with the given data).

3.5.2 "Mixed" versus "Pure" Educational Strategies

I first examine household income as a source of heterogeneity in the fraction of educational quality which is consumed in the private sector μ and thus in the association of private school demand and local public sector quality. The theoretical priors, as well as empirical evidence, suggest that μ is monotonically increasing in household income. To examine whether there is evidence of a non-monotonic relationship between the demand for private education and local state school quality, the final column of Table 3.2 ads an interaction term of local state school quality and household income, $\gamma y_{ijt} Q_{jt}$, to the baseline regression.

The coefficients on state school quality and household income (latter not reported) remain positive and significant. However, the interaction term between these variables is negative and significant. Consistent with the theoretical model, this result suggests that the association between state school quality and private school demand declines with income and thus with μ[46].

To get a sense of the income levels at which there is a negative, rather than a positive relationship between the two key variables of interest, consider the marginal effect of increasing state school quality for a household of a given level of income:

$$\frac{\partial P^*_{ijkt}}{\partial Q_{jt}} = \alpha + \gamma y_{ijt} \tag{3.7}$$

Since α is positive and γ is negative, $\frac{\partial P^*_{ijkt}}{\partial Q_{jt}}$ is thus positive for low levels of income but turns negative for higher levels of income. Let ω denote the income level at which the relationship between the propensity to consume private education and increased local state school quality is equal to zero. We have:

[46]Note that empirical second derivatives in the probit regressions may not be accurate. Thus, the change in the marginal effect of x1 w.r.t x2 is not the coefficient on the interaction of x1 and x2. I thank Steve Gibbons for pointing this out to me.

$$\omega = \left\{ y_{ijt} \quad : \quad \frac{\partial P^*_{ijkt}}{\partial Q_{jt}} = 0 \right\} = -\frac{\alpha}{\gamma} \tag{3.8}$$

With the caveat that this estimate is not likely to be accurate, according to the results reported in column (6) of Table 3.2, $\omega = 0.529$ which equals the 97^{th} income percentile in the sample. This corresponds to the relationship between state school quality and private school demand being positive for all but for the 3 percent wealthiest households[47]. One interpretation of this result, consistent with the theoretical framework, is that private education demand is only primarily *pure*, as opposed to *mixed*, among the very top of the income distribution. Pure households consequently have no motive to locate near the best state schools, conditional on other aspects of neighborhood quality. To put it differently, to ensure the best possible education, the wealthiest households will send their children to private schools if they choose not to locate near the best performing state schools. Conversely, less wealthy households are more often mixed households which do not send their children to private school throughout their education, or may only send some of their children to private school, and are therefore more sensitive to local state school quality.

To further examine whether the empirical evidence supports this conclusion, I now consider some additional possible sources of heterogeneity in μ. Columns (1)-(3) of Table 3.3 report the estimated relationship between state school quality and private school demand by parental private education background and the age and number of children in the households. First, column (1) interacts the school quality variable with dummies for whether the respondent is privately educated (12.3 percent of the baseline sample) or not. We expect parental private school background to be positively associated with μ

[47] In unreported regressions, I find the difference in the estimated coefficients on public school quality between the top 10 percent of households incomes and the bottom 90 percent to be significant at 5 percent level.

as a proxy for both preferences for educational quality and household income. I find that the coefficient on state school quality is positive and significant only for the non-privately educated respondents, while it is close to zero and insignificant for the privately educated respondents. The difference in the estimated coefficients on state school quality for the two groups is significant at the 2 percent level. This result lends further support to the theoretical prior that the association between private school demand and state school quality is at least less positive for households likely to have high μ and thus to be "purer" private school consumers.

Two further pieces of information that are likely to be correlated with μ are the age and number of children living in the household. As noted in section (3.4) and shown in panels 3 and 4 of Figure 3.2, the proportion of pupils enrolled in private education gradually increases with pupil age[48]. This empirical patterns thus suggest that the most common strategy for *mixed* households is to initially send their children to state school and later enroll them in private education. Hence, the younger the age at which a child is sent to private school, the greater is the likely proportion of that child's education spent in private education going to be and, other things equal, the greater is household μ. Finally, conditional on any private school consumption, a greater number children in a household increases the scope for a low μ as simultaneous consumption in the public and private sector is possible if the children are sent to different schools.

There is no information in the survey data on the number of children a household has sent to private school, at what age or for how long. However, the survey does contain information on the number and ages of children living in the household at the time of the interview. By separately considering house-

[48]During the period 1996-2006, the percentage of pupils in private education aged 15 has ranged from being 49-76 percent higher than among pupils aged 6, and 20-38 percent higher than among pupils aged 10.

holds where the eldest child living at home is less than 11 and the youngest child is 5 or above, it is possible distinguish between households which send children to private school at early ages from those which do not. I create three dummies for households where (i) the eldest child is less than 11 years old[49], (ii) the eldest child is 11 years old or older, but the youngest child living at home is below 18, and (iii) there are no children below 18 living at home. Column (2) of Table 3.3 reports results from interacting these three dummies with local state school performance measure. The state school quality coefficients are all positive and significant, and an F-test cannot reject the null hypothesis that there is no difference in the school quality coefficients. This finding might reflect that focusing on families which send children to private school at young ages does not yield a sufficient fraction of private school households with $\mu = 1$ to counteract the positive relationship between the two key variables of interest for households with $0 < \mu < 1$. To explore whether it is necessary to identify a group of households yet more likely to be "pure" private school consumers, I look at families with single children. To increase the likelihood that an only child living in a household in fact has no siblings and will get no siblings, I focus on households with 1 child aged between 6 and 14 years[50]. Column (2) includes a dummy for households with an only child aged 6-14 (6.1 percent of the sample) and interacts the school quality variable with this dummy and one for all other households in the base sample. Again an F-test cannot reject that there is no difference in the school quality coefficients. However, the difference in significance of the coefficients on the two interaction terms suggests that the positive association between school quality and private school demand might be weaker for households with young only children, although this could also

[49]The sample only includes households where the eldest child living at home is 5 or above.

[50]The younger the single child in the household is, the more likely it is to later be joined by more siblings, whereas it may be more likely to have older siblings which have left home the older it is.

just reflect the small sample size of this group.

3.5.3 Urban versus Rural

This section investigates whether there are differences in the association of state school quality and private school demand between urban and rural areas. Urban and rural areas are likely to differ in a number of ways, including in terms of income inequality. By a variety of measures, urban areas are characterized by a more unequal distribution of income and in particular by a greater concentration of very rich individuals compared to more rural areas[51]. As discussed in section 3.2.3, the theory predicts that a more positive association of state school quality and private school demand in areas where there is a relatively high concentration of high income households who consume only in the private sector[52].

Table 3.3, column (4) reports results obtained from interacting the state school quality variable with dummies for whether the respondent is located in Greater London or not. The state school quality coefficient is only positive and significant for respondents residing outside Greater London, but almost zero and insignificant respondents from London. In a similar spirit, I interact the state school quality variable with the degree of urbanicity in column (5). The state school quality coefficient is only positive and significant when interacted with Semi-urban areas, and again almost zero and insignificant when interacted with Urban[53].

Consistent with the theoretical prior, the positive association between state

[51]The mean as well as the standard deviation of household income in the survey data is almost 20 percent higher in London than outside London, although the difference in the mean is not statistically significant.

[52]A caveat regarding the mapping from the theory to the data is that the model only operates with a 3-point income distribution, while income is continuously distributed in the data.

[53]The insignificance of "Town, fringe, village and hamlet"-coefficient may be due to low sample size.

school quality and private school demand thus appears strongest in less urban, and less unequal areas, but insignificant in the most urban areas with the highest levels of income inequality (greater London and areas classified as urban).

3.5.4 Area School Quality

Finally, the association between state school quality and private school demand may depend on the "quality" of the area in which households reside, for examples as measured by mean income levels or mean state school performance. In this section I focus state school performance[54]. There are two reasons for this. First, to the extent households residing in LEAs with poorer performing state schools are also poorer, average μ, conditional on $\mu > 0$, is also likely to be lower. As with lower income inequality, the model predicts that a lower fraction of high income households (and thus a greater fraction of middle income households consuming private education) will result in a more positive coefficient on state school quality. Second, suppose there are diminishing returns to educational quality. Given household income levels, we should then expect households to value marginal improvements to educational quality more in relatively poorly performing areas[55]. We might expect mixed households to be more determined to seek out the best local schools in areas where schools are generally relatively poor[56].

[54]Mean public school performance is positively correlated with mean income levels. Similar results are obtained by dividing the sample into high and low income areas.

[55]Note that since the regressions include school district (LEA) fixed effects the results indicate the extent to which locating near the best public schools within an LEA affects households' inclination to use private education, or, alternatively, the extent to which choosing to consume education in the private sector is associated with households' propensity to locate near the best public schools within an LEA.

[56]If the marginal cost of obtaining improved educational quality within an LEA, conditional on neighborhood quality excluding education, declines in overall educational performance at the LEA level, this would work in the opposite direction. Note, the stylized prediction of the model is that mixed households always demand the highest level of state school quality. However, reality might be less clear cut.

I split the sample into households residing in the 50 percent best performing LEAs and the 50 percent worst performing LEAs and interact the school quality variable with indicator variables for each of these two groups. The positive association between state school quality is less than half as big in the 50 percent best performing LEAs than in the 50 percent worst. The difference in the estimated coefficients of state school quality between residents in the best and the worst LEAs is statistically significant at the 10 percent level. Households who the live in the worst LEAs and have ever sent children to private schools are thus more inclined to be located near the best state schools in their LEA than those who live in the best.

3.5.5 Summary and Alternative Interpretations

Taken together, the above results support the prediction of the theoretical model that a non-monotonic relationship exists between private school demand and state school quality. For households with a relatively low expected μ^*, given $\mu^* > 0$, this association is more positive than it is for households with relatively high expected μ. Thus, results are consistent with the theoretical model which predicts that *pure* private school users demand less state school quality than both *mixed* users and *pure* state school users.

In the following I discuss other possible interpretations of the results. The results may be driven by the difference in geographical precision of the state school quality and the other neighborhood variables. It may be that individuals with strong tastes for (private) education, who are more likely to choose private education, also care more strongly about other neighborhood attributes which the performance of the 5 closest schools variable may simply better and more precisely capture than the other neighborhood controls. Second, a potential confounding factor in interpreting the results is the existence of re-

verse causality in the relationship between aggregate private school enrollment and state school performance[57]. Local private school enrollment may either boost or depresses local state school performance. On the one hand, if private schools pupils are disproportionately attended by more able pupils, average pupil performance could be adversely affected by cream-skimming[58]. On the other hand, it may be that competition or knowledge spill-over effects from nearby private schools improve state school performance[59]. If there were a negative causal effect of local private school enrollment on local state school test scores (because the private sector attracts pupils who are on average placed higher in the ability distribution than those who remain in the state sector), this would result in downward bias of the estimated effect state school quality. This would go *against* finding the significant aggregate positive school quality coefficient.

Yet, reverse causality could be consistent with the negative effect found at the very top end of the income distribution. It might be that it is the withdrawal of children from by the very most affluent families from the private sector, or something unique about private education in the very most affluent areas, which most adversely affects tests scores in neighboring state schools. However, if such an effect were to drive results, it seems hard to explain why this negative effect would not be present for the slightly less affluent households (which are still in, say, the top quartile or quintile of the income distribution) who consume private education. This would appear to require that there is something extremely special about households in the very top percentiles of the income distribution, the areas they live in, or the private schools they

[57]The dependent variable is measured at the individual household level which in a theoretical, partial equilibrium sense does not affect aggregate outcomes. Statistically, however, using disaggregated data does not dispense with reverse causality.

[58]The effect of cream-skimming on public sector performance is studied for example by Altonji, Taber and Ching-I (2004) .

[59]The literature on how private sector competition affects public school performance includes Couch et al. (1993), Newmark (1995), Hoxby (1994), and Chan (2006).

attend, compared to those households only slightly further down the income distribution. Though various mechanisms though which state school tests scores might be affected by the presence of neighboring private schools can be envisaged[60], it would also seem to suggest very high correlation between household affluence and child ability, or at least child performance on test scores. Indeed, even if the withdrawal of the less affluent (but still well above average) households from the public sector for some reason do not exert quite as big an impact on state school performance as that of the very most fabulously affluent, it does appear hard to explain why the difference would be so great. Conversely, if salutary competitive pressures from the private sector, instead of having a negative effect, exerted a *positive* causal impact on local state school tests scores, the aggregate positive school quality coefficient might be purely attributable to reverse causality. However again, it seems difficult to explain why a causal effect from private school enrollment to state school quality would result in the observed heterogeneity across household income and educational backgrounds. This would appear to necessitate that such positive competitive effects are not caused by the private schools attended by the very most affluent households. It might be that these private schools are so exclusive, and so overwhelmingly different from state schools, that the two types of schools are effectively are not in competition with one other, either in terms of pupils or teachers.

To summarize, reverse causality might bias the results both positively and negatively. However, it is hard to come up with compelling explanations that do not rely on very ad hoc, unsubstantiated assumptions for why the non-monotonicity in the association between local public school quality and private school demand should be driven by reverse causality. While these concerns

[60]For instance, it could be driven by the best teachers being attracted to the private, rather than the public sector due to better salaries and resources.

might induce concern about the precision of the point estimates, the qualitative predictions of the theoretical model are consistent with all the empirical regularities found in the data as will be elaborated further below.

3.6 Robustness Checks

In this section, I examine the robustness of my results to a number of alternative specifications using alternative measures of private school demand and state school quality, and including potentially relevant omitted variables.

3.6.1 Alternative Measures of Local State School Quality

I first consider alternative measures of local school quality both in terms of the way the local market is defined and in terms of the school performance measures used. Table 3.4 repeats the baseline probit specification reported in Table 3.2 columns (5) and (6) using slightly different measures of local state school quality[61]. Columns (1)-(2) of Table 3.4 include the mean performance of the five closest state schools to the estimated household residential location. However, as opposed to the baseline measure of 5 or more A*-C GCSE grades, I here consider the percentage of pupils achieving one or more GCSE passes. This is a measure of the degree to which pupils are not doing very badly rather than a measure of how large a proportion of pupils are doing well.

The coefficient on state school quality in column (1) is statistically insignificant, though of positive sign and of comparable magnitude to that in column (5) of Table 3.2. Column (2) further includes the interaction term of household income and local state school quality. In this case, the coefficients on

[61] As previously, all the public school quality variables are transformed to have mean zero and standard deviation one in the baseline sample.

both state school quality and the interaction term, respectively of positive and negative sign, are statistically significant and are very similar to those obtained in column (6) of Table 3.2. Columns (3)-(4) use the same school-level performance measure of the fraction of pupils doing well (5 or more A*-C GCSE grades). However, I here employ a average at the postcode district in which households live, rather than an average over the five closest schools within a 15 kilometer radius of their estimated residential location. Again, the coefficient on state school quality is insignificant in column (3), but significant results consistent with the baseline regressions are obtained in column (4), where the interaction term of household income and local state school quality is added. However, the state school quality coefficient in column (4) is only half as large as that in the baseline regression and less significant. A possible interpretation of the results is that the percentage of pupils doing very well (5+ A*-C grades) just around where households live (5 closest schools) better captures aspects of local neighborhood quality that private school consuming households care about than either the percentage of pupils not doing very badly (1 or more passes) or in a broader geographical area (postcode district average).

I now turn to the interpretation of the negative coefficient on the interaction term of household income and local state school quality, given the positive coefficient on state school quality as indicative of the association between private school demand and local state school quality being positive at lower income levels and negative at higher income levels. The implied income cutoffs at which the association between private school demand and state school quality turns negative are lower than the in baseline regressions. The results in Table 3.4 suggest that a negative relationship exists for the wealthiest roughly 20-25 percent of the population as opposed to 3 percent as suggested by the baseline regression. This difference might reflect a different sensitivity to the different measures of state school quality. For instance, it may be that wealthier house-

holds are more likely to leave the public sector if there is a high proportion of very bad pupils as opposed to if there is a small proportion of very good pupils in their closest state schools. Similarly, the urge to leave the public sector may be greater if not only the 5 closest state schools are not very good (and good local public education can nevertheless be obtained), but all schools in the postcode district are bad.

3.6.2 Alternative Measures of Private School Demand

This section considers the sensitivity of results to using school level pupil population data as an alternative measure of private school demand to that obtained from the survey data.

Survey versus Pupil Population Data

School level pupil data offers an alternative method of measuring private school demand at the local level. The school level pupil data covers the entire population of pupils in England at all age levels and in both the public and private sector, while the survey data only includes a representative sample of the population. However, the school level data suffers from the drawback that it is not possible to control for any pupil or households level characteristics. In addition, an important difference between the two data sources is as follows: The survey data contains information about whether households have *ever* sent any children to private school while the school level pupil data yields information on the percentage of pupils enrolled in private education *in any given year*. If some households split educational consumption between the public and private sectors, this naturally implies that private education consumption measured by the survey data will be higher than that measured by the

pupil data[62]. Indeed, as noted in section 3.4, the survey measure of private school demand is almost twice as large as the pupil based measure, although the two measures are highly correlated at the regional level. By construction, "mixed" households with relatively low μ, given $\mu > 0$, will be overrepresented among private school users in the survey data compared to the school level data. Moreover, we there are reasons to expect households from the top end of the income distribution, with higher expected μ, to be slightly underrepresented in the survey data[63], which will further skew the representation of low μ households. In view of the previous discussion and results, we might therefore expect to find a more positive association between private school demand and local public sector quality in the survey data than in the pupil population data[64]. In addition, it may be that reverse causality is stronger for the pupil population data than for the survey data for structural reasons. It appears plausible that the impact on postcode district state school quality of the faction of pupils enrolled in private education in that postcode district is greater than the impact on the 5 closest state schools to a given residential location that a given fraction of those households has sent their children to private school at some point in time. A large catchment area for private schools (particularly boarding schools) might dilute the impact of households sending children to private school on overall state school performance in a the area in which they live. Finally, it is possible to focus on private school enrollment at

[62] If households who consume private education had more children than those who do not, this could counteract this relationship. However, there is no evidence that this is the case.

[63] 11.3 of survey respondents are dropped because no household income is available. Among the respondents who have answered the private education question but not the household income question, the percentage who have ever sent children to private school is 18.4 percent compared to 13.3 percent in the baseline sample. This suggests that the observations dropped due missing income information are drawn disporportionately from the top end of the income distribution.

[64] A second difference is that while the survey data provides information about the residential location of households and hence pupils, but none about school location, the school level data contains the geographical location of the school they attend, but none about their residential location. It is not obvious how this might affect results.

particular ages using the pupil population data. Since the state school quality measure is based on exams taken at age 15, a stronger association with private school enrollment at age 15 than at younger ages might be expected.

Postcode District Level Regressions

In order to produce as comparable regression results as possible using the different available measures of private school demand and state school quality aggregated at the postcode district level, I proceed as follows: Due to sample size limitations and the absence of any apparent time trend, I aggregate the survey based private school variable over all the years included in the survey at the postcode district level, while I construct yearly data at the postcode district level on private school enrollment and state school performance based on the school level data[65].

I estimate linear probability regressions of the form

$$P_{klt} = \alpha Q_{klt} + \eta X_{klt} + \theta_t + \phi_l + \epsilon_{klt}$$

Where P_{klt} denotes private school demand in postcode district in k and school district (LEA) l at time t. Q_{klt} and X_{klt} denote measures of state school quality and other neighborhood characteristics, respectively, in postcode district k at time t. In all regressions, as previously, X_{klt} includes house prices and the fraction of the population with higher level qualifications. θ_t and ϕ_l are time and school district fixed affects. Table 3.5 reports results obtained using the different measures in turn[66].

In column (1), I use the baseline measures of private school demand and

[65] For more details, see Data Appendix, section 6.3.4.

[66] Note that to make results as comparable to the results of the probit analyses reported in Table 2, the private school demand measure in all cases varies between zero and one and the public school quality variables are again standardized to have a mean of zero and a standard deviation of one.

local state school quality aggregated at the postcode district level. This regression thus constitutes an aggregated version of the probit regression reported in column (2) of Table 3.2[67]. The state school quality coefficient remains positive and significant, though it is somewhat smaller in magnitude than the equivalent coefficient in the baseline probit regression results. Similarly, column (2) provides an aggregated version of the results reported in column (3) of Table 3.4 . Mirroring the results obtained with the disaggregated survey data; the coefficient on the average performance of state schools in the postcode district is close to zero and insignificant. Next, in column (3), I regress the aggregated baseline measure of state school quality on the percentage of pupils enrolled in private education at the postcode district level. The state school quality coefficient is negative but statistically insignificant. Recall that this measure is based on the mean performance of the 5 closest schools within a 15 kilometer radius of the survey respondents' residential location. The geographical location of these schools may thus not overlap with the postcode district, or may not be representative of the overall postcode district performance. Column (4) therefore instead uses the postcode district average of school performance as local state school measure. The coefficient on this variable is negative and strongly significant. Columns (5) and (6) replicate columns (3) and (4), replacing the dependent variable with the percentage of 15-year old pupils in private education at the postcode district level, instead of the percentage of all pupils. The results are very similar though the negative state school quality coefficient is greater in absolute terms[68].

[67]The level of observation here is year-postcode sectors, rather than respondents. It is somewhat artificial to include year variation. Given the way the private school demand and public school quality variables are constructed, the only source of yearly variation is the house price data. This approach is taken for the purpose of comparability only. Very similar results are obtained using only one time period of data.

[68]Smaller and less significant coefficients are furthermore obtained in unreported regressions where private school demand is defined the fraction of 6 or 10-year old pupils in private education.

These results are striking in that statistically significant coefficients of opposite signs and non-trivial magnitudes are obtained on the local state school quality variables using different methods of measuring private school demand. However, the differences in results obtained with the two data sets may plausibly be explained by greater representation of more *mixed* private school users compared to "*purer*" private school users in the survey data compared to the pupil population data (lower average μ given that $\mu > 0$ in survey data). As argued previously, by construction of the respective data sets, mixed users will be more heavily represented in the survey data, and there will be non-negative measurement error of the private school consumption of the mixed users. This creates an upward bias in the estimated linear relationship (see also panels B and C of Figure 3.1). In addition, the very top end of the income distribution (with higher expected μ) is likely to be slightly underrepresented in the survey data (see section 3.6.2). As such the results are consistent with the theoretical prediction that the association between private school demand and state school quality is positive for households with mixed educational consumption while it is negative for pure private school households.

3.6.3 Further Empirical Issues

I finally address a number of additional issues relating to measurement error and potential omitted variable bias.

Measurement Error: Contemporaneous Variables, Timing and Location

As discussed in section 3, measurement error in the local state school quality variable stems, among other things, from the fact that the characteristics of households' residential location at the time of the interview may not re-

flect the neighborhood characteristics on the basis of which private schooling decisions have been made. The failure to match the survey data to neighborhood characteristics prevailing at the time schooling decisions are made, might bias the state school quality coefficient if the performance of state schools in neighborhoods with a greater prevalence of private schools tend to evolve differently from those without. Although both school performance and house prices have increased drastically over the period considered, the ranking of different postcode districts has not changed markedly overall over the period for which data is available. The correlation coefficient between 1995 and 2002 postcode district level average state school performance and house prices is 0.92 and 0.85, respectively[69]. These correlations suggest that the ranking of postcode districts in terms of school performance and house prices in the mid 1990s are fairly good proxies for their rank in the earlier period of the survey data, 1986-1992 (1994 in the case of house prices data).

As noted in section 3.2, the evidence suggests that residential mobility for families with children is relatively limited. Moreover, to the extent that circumstances and tastes tend to be relatively fixed before and after moving, and households tend to relocate to similar areas in terms of state school quality, the results would not be affected. Nevertheless, the possibility that households - at the time of the interview - no longer reside in the location where there made schooling decisions, might introduce bias if households change local state school quality once they move, and in particular if this change differs depending on households' degree of private sector consumption. Suppose, for example, that households tend move home after retirement, after all children have completed primary and secondary education and leave home. At this point, the quality of local state schools, relative to other neighborhood characteristics, is likely to

[69]The correlation coefficient between 1993 and 2006 public school performance at the postcode district level is 0.68.

be a lesser concern in determining residential location. Comparing households post-retirement would thus bias the state school coefficient towards zero, and would go against finding any significant relationship[70].

The first part of Table 4.6 explores the sensitivity of results to splitting the sample into groups which are likely to be differentially affected by problems relating to measurement error resulting from lack of contemporaneous matching of variables. I first limit the sample to households with children below the age of 18. This decreases the scope for the time gap between the contemporaneous neighborhood data and schooling decisions. Column (1) of Table 4.6 reports results when only households with children below 18 living at home are included. While the smaller sample size (reduced by more than a half) leads to larger standard errors and thus a slightly less precise point estimate, the school quality coefficient is almost identical to the baseline specification. There is thus no immediately obvious direction of bias resulting from this type of measurement error.

A further source of discrepancy in the timing of private schooling decisions and the neighborhood variables is present for the survey data dating from before 1995. Contemporaneous house price data is only available for 1995 onwards, and the school data begins in 1993. In addition, the association between state school quality and private school demand may have changed over time. The publication of league tables from 1992 onwards has made state school quality more observable to households. Increased observability of state school quality may have made households are more inclined to substitute public for private education when state schools are relatively poor and thus

[70] Another possibility is that residential relocation tends to follow income shocks resulting from job loss or divorce which may alter people's choice sets and preferences such that households locate in less attractive neighborhoods and perhaps also, given neighborhood quality, with lower quality state schools. This would introduce bias if consumption private education is correlated with the likelihood of households being subjected to such shocks. However, it seems implausible that this mechanism should affects results in any decisive way.

reducing the positive correlation. Columns (2)-(3) of Table 4.6 show that, by splitting the sample into 1986-1994 and 1995-2002 data, the coefficient on state school quality is indeed more than twice as large in regressions run on the early period of data as it is in regressions the later period of data[71]. Nevertheless, when interaction terms of dummies for the two time periods with the state school quality variable are included in column (4), the difference in coefficients shrinks, and an F-test cannot reject that they are identical.

To conclude, the results therefore suggest that increasing the sample size by including the earlier data does substantially increase the precision of the results without introducing any significant bias.

Private School Supply and Performance

Finally, I consider the robustness of the results to private school supply factors which may be correlated with both private school demand and state school quality. The use of boarding schools (about 25 percent of private enrollment) implies that private school quality may be decoupled from neighborhood characteristics of households' residential location. However, households may be motivated to choose private education by the relative difference in performance between the local state and private schools. Furthermore, the relationship between state school quality and private school demand could depend on the availability of local private schools which facilitate private school consumption. Column (5) of Table 4.6 restricts the sample to households living in postcode districts which contain private schools which offer GCSE exams. This reduces the sample size to 30 percent of the baseline sample. The coefficient on state school quality increases in size, but decreases in statistical significance. Col-

[71] Note that the samples sizes for the pre-1995 and 1995+ periods to not sum to the baseline sample size. This is because observations are lost due to the inclusion of LEA fixed effects. Lack of variation in private school demand at the LEA level results in failure to consume private education being predicted perfectly.

umn (6) reports coefficient estimates for the same sub-sample as in column (5) but including the mean performance of private schools in the postcode district. The coefficient on this variable is positive, as expected, but insignificant and the state school quality coefficient does not budge. As the catchment areas for private schools tends to be greater than for state schools, I also run regressions for the larger sample of households with a private school within a 15 kilometer radius (95 percent of the baseline sample). In these regressions I control for the mean performance of the 5 nearest private schools, rather than the mean postcode district performance of private schools. The results are reported in column (7). Relative to the baseline sample, the state school coefficient increases slightly, but remains highly statistically significant. The private school coefficient is once again positive and insignificant.

The results may also be driven by the characteristics of neighborhoods in which private schools locate. It might be that private schools only locate in areas with very good state schools because the households they primarily cater to live in such areas. Neglecting to control for this could result in upward bias on the school quality coefficient. To address this concern, columns (8)-(9) of Table 4.6 control for the distance to the closest private school[72]. In both sets of regressions, the state school quality coefficient is unchanged relative to the baseline results. The coefficient on distance in column (8) is negative and statistically significant, suggesting that a residential location in proximity to private schools is associated with greater private school attendance. To further investigate how distance to private schools affects private school demand, I split the sample into quarters by distance to the closest private school. The resulting indicator variables are included in the estimation results reported in column

[72]The distance is based on estimated geographic coordinates (easting and northing) of household location and the exact geographic coordinates of all private schools. The latter is available in the Department for Education and Skills Edubase data.

(9). It seems that distance only matters for those households living within 2 kilometers of the nearest private school. The state school quality coefficient remains unchanged. Overall, it thus appears that local private school demand is related local private school supply, as expected. Yet there is no evidence that local private school supply fundamentally alters the relationship between private school demand and state school quality.

3.7 Conclusion

The key finding emerging from this paper is that the connection between local private school demand and local state school quality depends upon underlying characteristics of the households consuming private education. The theoretical model suggests that household income and preferences for educational quality affect households' distribution of educational consumption between the public and private sectors which in turn drives the demand for local state school quality. Depending on the distribution of income, we may therefore find either a positive or a negative correlation between private school demand and local state school quality in a cross-section of households. Empirically I find an overall positive correlation between household private school demand and local state school quality exists. Yet, consistent with the model, this association declines in household income and is negative for households at the top end of the income distribution. The policy implications of these results are that the interaction of public and private education is likely to depend on whether private sector households consume education only in the private sector, or also in the public sector.

3.8 Appendix: Proofs/Derivations

Proof of Proposition 1: Substituting for x using the budget constraint, the household's optimization problem in section (3.2) can be rewritten as:

$$\max_{\mu,q_g,q_p} u = (\mu q_p + (1-\mu)\, q_g)^{\lambda} (y - cq_g - \mu p q_p)^{1-\lambda}$$

subject to:

$$0 \leq \mu \leq 1$$

$$0 \leq q_k \leq \overline{q}_k, \;\; k \in \{g, p\} \tag{3.9}$$

Form the Lagrangean function:

$$L(\mu, q_g, q_p) = u(\mu, q_g, q_p) + \eta_1 \mu + \eta_2 (1-\mu) + \eta_3 q_g + \eta_4 (\overline{q}_g - q_g) + \eta_5 q_p + \eta_6 (\overline{q}_p - q_p)$$

The first order conditions with respect to μ, q_g and q_p are as follows:

(Ai)

$$\frac{\partial L(\mu, q_g, q_p)}{\partial \mu} = u(\mu, q_g, q_p) \left[\lambda \frac{q_p - q_g}{\pi} - (1-\lambda) \frac{p q_p}{x} \right] + \eta_1 - \eta_2 = 0$$

(Aii)

$$\frac{\partial L(\mu, q_g, q_p)}{\partial q_g} = u(\mu, q_g, q_p) \left[\lambda \frac{(1-\mu)}{\pi} - (1-\lambda) \frac{c}{x} \right] + \eta_3 - \eta_4 = 0$$

(Aiii)

$$\frac{\partial L(\mu, q_g, q_p)}{\partial q_p} = u(\mu, q_g, q_p)\left[\lambda\frac{\mu}{\pi} - (1-\lambda)\frac{\mu p}{x}\right] + \eta_5 - \eta_6 = 0$$

For the following pairs, both constraints cannot be binding:

$$\eta_1\mu = 0 \text{ vs. } \eta_2(1-\mu) = 0$$

$$\eta_3 q_g = 0 \text{ vs. } \eta_4(\overline{q}_g - q_g) = 0$$

$$\eta_5 q_p = 0 \text{ vs. } \eta_6(\overline{q}_p - q_p) = 0$$

Note that if all multipliers are equal to 0, the above expressions simplify to:

(Bi)

$$\lambda\frac{q_p - q_g}{\pi} = (1-\lambda)\frac{pq_p}{x} \tag{3.10}$$

(Bii)

$$\lambda\frac{(1-\mu)}{\pi} = (1-\lambda)\frac{c}{x} \tag{3.11}$$

(Biii)

$$\frac{\lambda}{\pi} = (1-\lambda)\frac{p}{x} \tag{3.12}$$

There are three cases depending on the level of household income (for a given λ). I proceed by first considering three possible outcomes of the choice variable μ : $\mu^* = 0$; $\mu^* \in (0,1)$ and $\mu^* = 1$. From this I derive the associated optimal values of the choice variables q_g and q_p, subject to the constraints on the choice variables, as well as the levels of y that are compatible with the three outcomes. Based on these income levels, I define three income groups.

Case 1: Low income households; no consumption in the private sector

No consumption in the private sector, $\mu^* = 0$, implies that $\pi^* = q_g^*$, $x^* = y_L - cq_g^*$ and $\eta_2 = 0$, while q_p^* is indeterminate (households are indifferent about optimal q_g since they do not consume in the private sector). *(Aiii)* simplifies to $\eta_5 - \eta_6 = 0$. But since $\eta_5 > 0$ ($\Rightarrow q_p^* = 0$) is incompatible with $\eta_6 > 0$ ($\Rightarrow q_p^* = \overline{q}_p$), we must have that $\eta_5 = \eta_6 = 0$. That is, neither of the constraints on private school quality are binding. Hence, *(Aiii)* simplifies to *(Biii)* $\frac{\lambda}{\pi^*} = (1-\lambda)\frac{p}{x^*}$ or

$$\frac{\lambda}{q_g^*} = (1-\lambda)\frac{p}{y_L - cq_g^*}$$

Suppose the constraints on public sector quality are not binding: $q_g^* \in [0, \overline{q}_g]$ and thus $\eta_3 = \eta_4 = 0$, then *(Aii)* simplifies to *(Bii)* which yields

$$q_g^* = \frac{\lambda y_L}{c} \in [0, \overline{q}_g]$$

Now suppose the upper bound is binding $\eta_4 > 0$, which implies $q_g^* = \overline{q}_g$ and $\eta_3 = 0$. That is, in the absence of the upper bound on q_g, we would have optimal $q_g^* > \overline{q}_g$. Then *(Aii)* implies $\frac{\lambda}{\pi^*} - (1-\lambda)\frac{c}{x^*} > 0$ or

$$q_g^* = \overline{q}_g < \frac{\lambda y}{c}$$

which is a contradiction of $\mu^* = 0$. If desired expenditure on education (λy) exceeds the cost of obtaining the maximal level of quality attainable in the public sector $(c\overline{q}_g)$, then it is optimal to seek additional quality in the private sector, or $\mu^* > 0$.

Case 2: Middle income households; consumption in both public and private sectors

Consumption in both the public and private sectors, $1 > \mu^* > 0$, imply that $q_g^* > 0$ and $q_p^* > 0$ and that $\eta_1 = \eta_2 = \eta_3 = \eta_5 = 0$. Hence *(Ai)* simplifies to *(Bi)*. Suppose $\eta_4 = 0$. Then *(Aii)* simplifies to *(Bii)*. Dividing *(Bi)* by *(Bii)* yields $q_g^* = 0$ which is a contradiction of $q_g^* > 0$. Hence, we must have that the upper bound on state school quality is binding and $q_g^* = \overline{q}_g$. Next, suppose $\eta_6 = 0$. Then *(Aiii)* simplifies to *(Biii)*. Dividing *(Bii)* by *(Biii)* yields $(1 - \mu) = \frac{c}{p} > 1$ which is a contradiction of $1 > \mu^* > 0$. Hence, it must be that the upper bound on private school quality is binding and $q_p^* = \overline{q}_p$. Consequently we have

(EQ)

$$\pi^* = (1 - \mu^*)\,\overline{q}_g + \mu^* \overline{q}_p$$

(BC)

$$y_M = x^* + c\overline{q}_g + \mu^* p \overline{q}_p$$

(Ci)

$$\lambda \frac{q_p - q_g}{\pi^*} = (1 - \lambda)\,\frac{p q_p}{x^*}$$

(Cii)

$$\lambda \frac{(1 - \mu^*)}{\pi^*} > (1 - \lambda)\,\frac{c}{x^*}$$

(Ciii)

$$\frac{\lambda}{\pi^*} > (1-\lambda)\frac{p}{x^*}$$

Upper bound on y Dividing (Cii) by (Ci) and rearranging (BC) and (Ci) yields:

(i)

$$\mu^* < 1 - \frac{c\left(\overline{q}_p - \overline{q}_g\right)}{p\overline{q}_p}$$

(ii)

$$\mu^* = \frac{y - c\overline{q}_g - x^*}{p\overline{q}_p}$$

(iii)

$$x^* = (1-\lambda)\left(y - c\overline{q}_g + \frac{p\overline{q}_p\overline{q}_g}{\overline{q}_p - \overline{q}_g}\right)$$

By (i) and (ii):

$$\begin{aligned} y_M &< p\overline{q}_p - c\left(\overline{q}_p - \overline{q}_g\right) + c\overline{q}_g + x^* && \text{(Cii), (Ci) and (BC)} \\ &= (p-c)\,\overline{q}_p + 2c\overline{q}_g + (1-\lambda)\left(y_M - c\overline{q}_g + \tfrac{p\overline{q}_p\overline{q}_g}{\overline{q}_p - \overline{q}_g}\right) && x \text{ from (Ci)} \\ &= \tfrac{1}{\lambda}(p-c)\,\overline{q}_p + \tfrac{(1+\lambda)}{\lambda}c\overline{q}_g + \tfrac{(1-\lambda)}{\lambda}\tfrac{p\overline{q}_p\overline{q}_g}{\overline{q}_p - \overline{q}_g} \end{aligned}$$

Lower bound on y We have the following equations:

(BC):

$$y_M = x^* + c\overline{q}_g + \mu^* p\overline{q}_p$$

Rearranging (Ci), (Cii) and (Ciii) we obtain:

$$\mu^* = \frac{\lambda\left(y - c\overline{q}_g\right)}{p\overline{q}_p} - \frac{\overline{q}_g\left(1-\lambda\right)}{\left(\overline{q}_p - \overline{q}_g\right)}$$

$$x^* > \frac{1-\lambda}{\lambda}\frac{\pi^* c}{(1-\mu^*)}$$

$$x^* > \frac{1-\lambda}{\lambda}\pi^* p$$

We therefore have that $y_M > \frac{1-\lambda}{\lambda}\frac{c\pi^*}{(1-\mu^*)} + c\overline{q}_g + \mu^* p\overline{q}_p \geq \frac{c\overline{q}_g}{\lambda}$ and $y_M > \frac{1-\lambda}{\lambda}p\pi^* + c\overline{q}_g + \mu^* p\overline{q}_p \geq \frac{1-\lambda}{\lambda}\overline{q}_g p + c\overline{q}_g > \frac{c\overline{q}_g}{\lambda}$, since $\mu^* \in [0,1]$ and $\overline{q}_p - \overline{q}_g > 0$.[73] Hence

$$y_M > \frac{c\overline{q}_g}{\lambda}$$

Finally, plugging $q_g^* = \overline{q}_g$ and $q_p^* = \overline{q}_p$ into *(Bi)*, yields

$$\mu^* = \frac{\lambda\left(y - c\overline{q}_g\right)}{p\overline{q}_p} - \frac{\overline{q}_g\left(1-\lambda\right)}{\left(\overline{q}_p - \overline{q}_g\right)}$$

But we also know from (Aii) (because $\eta_3 = 0$ and $\eta_4 > 0$): $\lambda\frac{(1-\mu^*)}{\pi^*} > (1-\lambda)\frac{c}{x^*}$ while (Bi) entails that $\lambda\frac{\overline{q}_p - \overline{q}_g}{\pi^*} = (1-\lambda)\frac{p\overline{q}_p}{x^*}$. Dividing yields:

[73] The full derivation does not produce any intuitively meaningful results:

$$\begin{aligned}
y &> \tfrac{1-\lambda}{\lambda}\pi p + c\overline{q}_g + \mu p\overline{q}_p \\
&= \tfrac{1-\lambda}{\lambda}\left((1-\mu)\,\overline{q}_g + \mu\overline{q}_p\right)p + c\overline{q}_g + \mu p\overline{q}_p \\
&= \mu p\left[\left(\overline{q}_p - \tfrac{1-\lambda}{\lambda}\overline{q}_g\right)\right] + \left(\tfrac{1-\lambda}{\lambda}p + c\right)\overline{q}_g \\
&= \tfrac{y}{\overline{q}_p}\left[\left(\lambda\overline{q}_p - (1-\lambda)\,\overline{q}_g\right)\right] - \left[\left(\overline{q}_p - \tfrac{1-\lambda}{\lambda}\overline{q}_g\right)\right]\left(\tfrac{\lambda c}{\overline{q}_p} - \tfrac{p(1-\lambda)}{\left(\overline{q}_p - \overline{q}_g\right)}\right) + \left(\tfrac{1-\lambda}{\lambda}p + c\right)\overline{q}_g \\
&= \frac{\left(\frac{1-\lambda}{\lambda}p+c\right)\overline{q}_g - \left[\left(\overline{q}_p - \frac{1-\lambda}{\lambda}\overline{q}_g\right)\right]\left(\frac{\lambda c}{\overline{q}_p} - \frac{p(1-\lambda)}{\left(\overline{q}_p - \overline{q}_g\right)}\right)}{1 - \frac{1}{\overline{q}_p}\left[\left(\lambda\overline{q}_p - (1-\lambda)\overline{q}_g\right)\right]}
\end{aligned}$$

$$\mu^* < 1 - \frac{c\left(\overline{q}_p - \overline{q}_g\right)}{p\overline{q}_p}$$

Case 3: High income households; no consumption in the public sector

No consumption in the public sector, $\mu^* = 1$, implies that $q_g^* = 0$, $\pi^* = q_p^* > 0$, $x^* = y_R - pq_p^*$ and $\eta_1 = \eta_4 = \eta_5 = 0$.

Suppose $\eta_2 = 0$. Then (Ai) simplifies to $\lambda\frac{q_p}{\pi^*} = (1-\lambda)\frac{pq_p}{x^*}$ or

$$q_p^* = \frac{\lambda y_R}{p}$$

Plugging into (Aiii) implies $\eta_6 = 0$.

Next, suppose $\eta_2 > 0$. Then (Ai) implies $\lambda\frac{q_p - q_g}{\pi} - (1-\lambda)\frac{pq_p}{x^*} > 0$. Rearranging yields

$$q_p < \frac{\lambda y_R}{p}$$

And (Aiii) implies $\eta_6 > 0$ or $q_p^* = \overline{q}_p$.

Derivation of corollary 2

$$\begin{aligned} y_M &< p\overline{q}_p - c\left(\overline{q}_p - \overline{q}_g\right) + c\overline{q}_g + x \\ &= (p-c)\,\overline{q}_p + 2c\overline{q}_g + (1-\lambda)\left[y_M - c\overline{q}_g + \tfrac{p\overline{q}_p\overline{q}_g}{\overline{q}_p - \overline{q}_g}\right] \\ &= \tfrac{p-c}{\lambda}\overline{q}_p + \tfrac{1+\lambda}{\lambda}c\overline{q}_g + \tfrac{1-\lambda}{\lambda}\tfrac{p\overline{q}_p\overline{q}_g}{\overline{q}_p - \overline{q}_g} \equiv y_{M,\max} \end{aligned}$$

$\left\{q_p^*\right\}_{i=R} = \overline{q}_p$ if and only if $y_r > \frac{p\overline{q}_p}{\lambda}$. We therefore have that $\left\{q_p^*\right\}_{i=R} < \left\{q_p^*\right\}_{i=M}$ if

$$y_{M,\max} - \frac{p\overline{q}_p}{\lambda} < 0$$

or

$$\left[(1+\lambda)\,\overline{q}_g - \overline{q}_p\right]\frac{c}{\lambda} + \frac{1-\lambda}{\lambda}\frac{p\overline{q}_p\overline{q}_g}{\overline{q}_p - \overline{q}_g} < 0$$

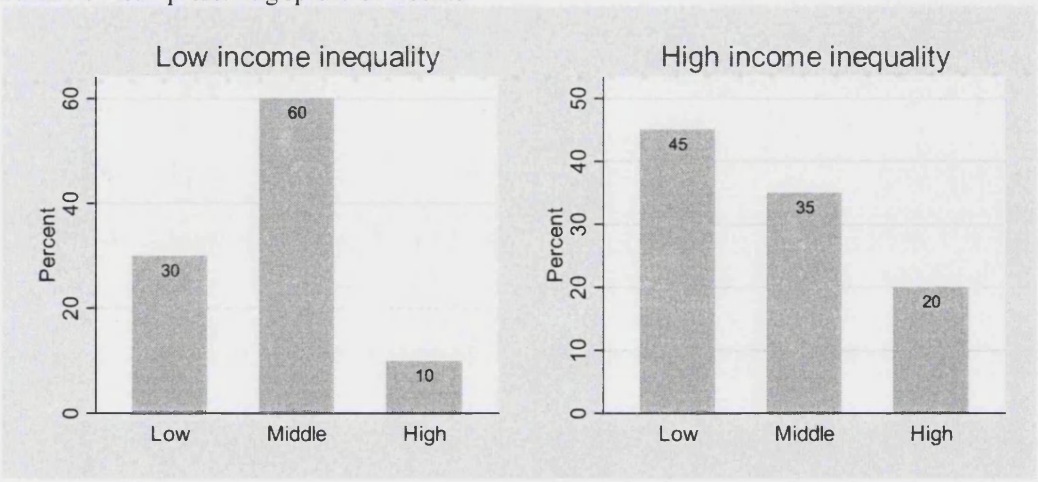
or

$$\left(\overline{q}_p - \overline{q}_g\right)\left((1+\lambda)\,\overline{q}_g - \overline{q}_p\right) > (1-\lambda)\,\frac{p}{c}\overline{q}_p\overline{q}_g$$

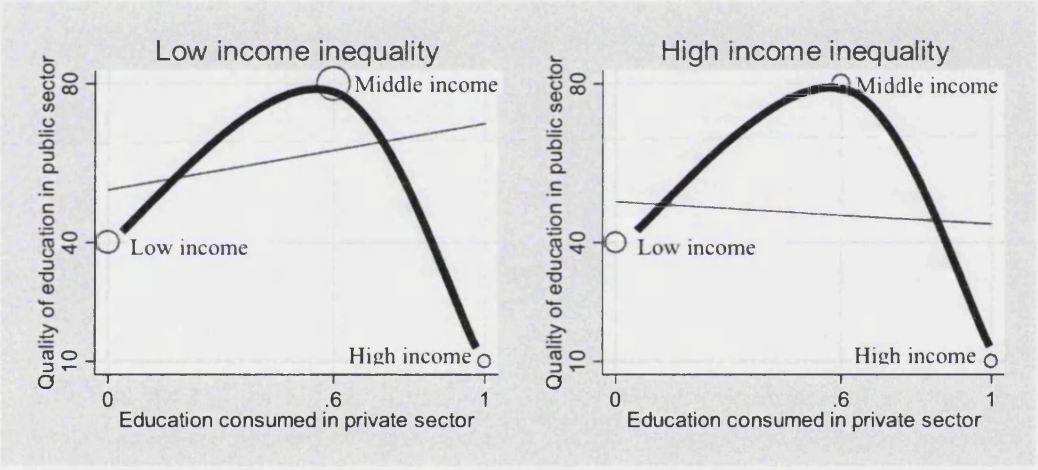
where the latter term is always positive, but goes to 0 as $\lambda \to 1$.

Figure 3.1: The Demand for Private Education and Local State School Quality given Different Income Distributions: Numerical Examples

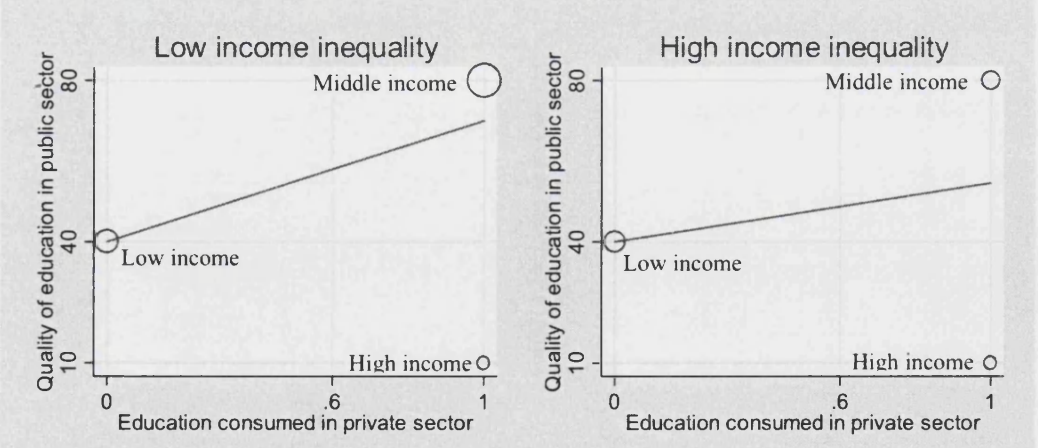
Panel A: Mean-preserving spread of income



Panel B: μ is fully observable



Panel C: Survey data: possible to distinguish $\mu = 0$ versus $\mu > 0$, but not $\mu = 1$ versus $0 < \mu < 1$



Note: The straight line represents the fitted values of a linear regression of private school demand on public school quality, given the fictive values of the variables and the size of the respective income groups shown in Panel A. The areas of the circles in Panels B and C are proportional to size of income groups shown in Panel A.

Figure 3.2: Demand for Private Education

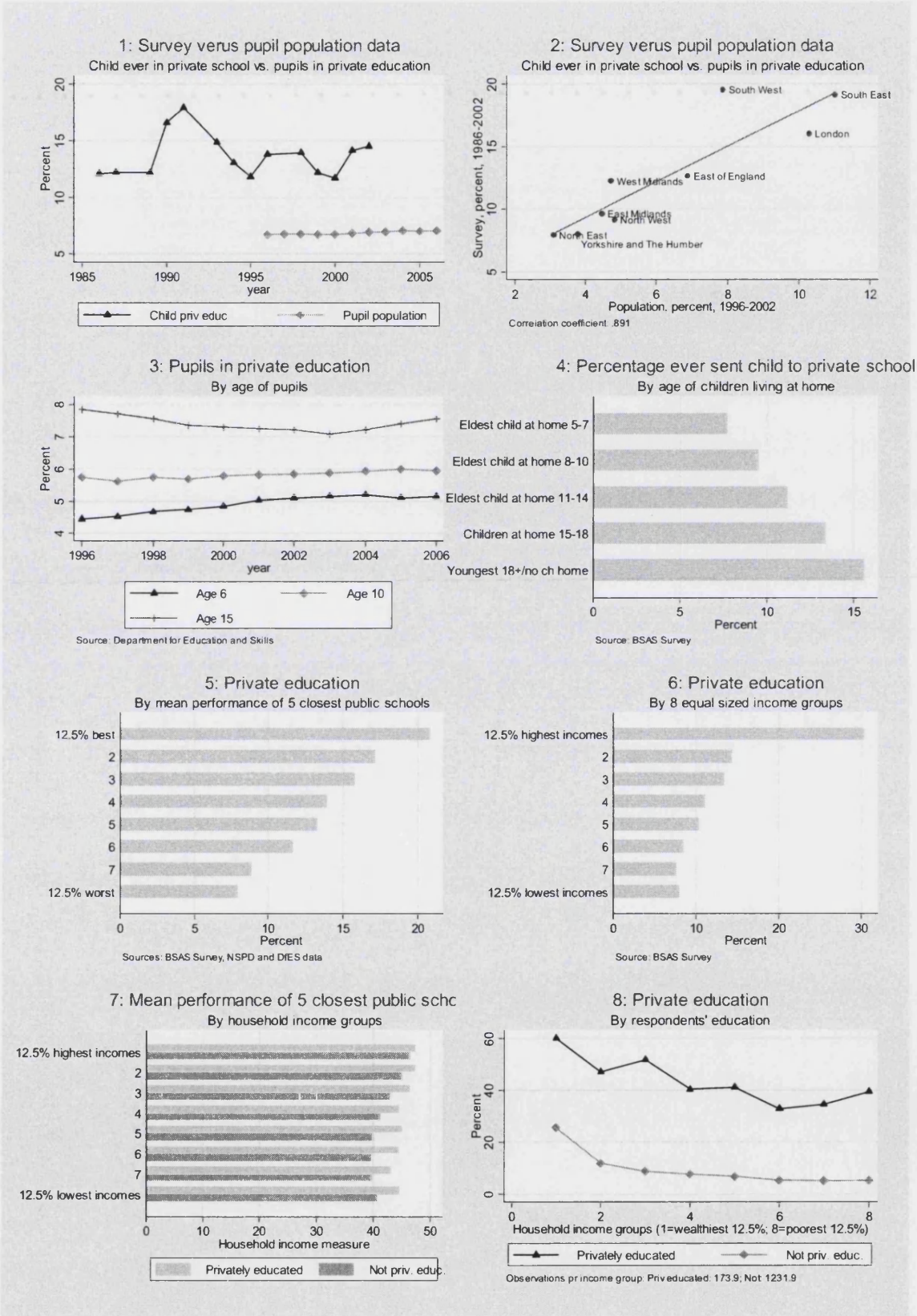


Table 3.1: Summary Statistics

	All	No child privately educated	Child privately educated
	(1)	(2)	(3)
Respondent characteristics [a]			
Household income (mid-point of bands, adjusted by retail price index)	196.7 [147]	185.2 [138.4]	273.7 [176.6]
Higher education below degree	14.4	13.1	22.9
A level or equivalent	8.6	8.2	11.5
O level or equivalent	18.5	18.9	15.9
No qualification	38.7	41.4	21
Respondent attended private education?	11.8	7.8	38.7
Age of respondent	50.7 [15.5]	50 [15.5]	55.8 [14.7]
Married or cohabitating	70	69.7	71.5
Religious	64	62.7	72.7
Conservative supporter*	19.7	16.5	40.6
Neighborhood characteristics			
Mean performance of 5 nearest public schools [b]			
5 or more A*-C GCSE grades (2006 school data)**	58.2 [9.4]	57.8 [9.4]	60.6 [9.3]
Postcode district level characteristics			
Average house prices (£1,000, 2006 prices)[c]	194.1 [96.3]	188.7 [91.8]	229.5 [115.2]
Percent of population with higher level qualifications[d]	14.1 [6.3]	13.7 [6.2]	16.6 [6.9]
N	16206	14049	2157
Percent	100	86.7	13.3

Sources:
a: British Social Attitudes Survey, 1986-2002
b: Department for Education and Skills, 1993-2006
c: Land Registry 1995-2002
d: UK 2001 Census

* Respondents are classiffed as political "supporters" if they respond yes and specify a particular political party in response to the question: generally speaking, do you see yourself as a supporter of any one political party?

**Weighted average by pupils aged 15 in each school

Table 3.2: Private Education and Public School Quality

(Dependent variable: Child attended private education?)	(1)	(2)	(3)	(4)	(5)	(6)
Mean performance of 5 nearest public schools	0.038*** [0.004]	0.026*** [0.004]	0.011*** [0.003]	0.006** [0.003]	0.009*** [0.003]	0.018*** [0.005]
Log house prices		0.063*** [0.018]	0.017 [0.013]	-0.002 [0.013]	0.004 [0.014]	0.002 [0.014]
Percent of population with higher level qualifications		0.003*** [0.001]	0.002** [0.001]	0.002*** [0.001]	0.001* [0.001]	0.001 [0.001]
Mean performance of 5 nearest public schools x Household income						-0.034** [0.015]
Income cutoff (=alpha/gamma)						0.529
Income percentile above which negative relationship between public school quality and private school demand						96.9
Household income, education, and demographic controls			y	y	y	y
Household taste controls				y	y	y
Neighborhood taste controls				y	y	y
School district (LEA) FE					y	y
Number of school districts (LEAs)	138	138	138	138	138	138
Number of postcode districts	1110	1110	1110	1110	1110	1110
Observations	16206	16206	16206	16206	16206	16206
Pseudo R-squared	0.04	0.15	0.19	0.22	0.24	0.24

Notes: Marginal effects of probit regression. All regressions include year and regional fixed effects. Robust standard errors clustered at the postcode district (e.g. WC2A) level are reported in brackets. Local public school quality is measured as the mean fraction of pupils achieving 5 or more A*-C GCSE grades in the 5 public schools located closest to the estimated household location, Additional household income controls include education, marital status and age, while the additional taste controls consist of religious affiliation and political allegiance. Neighborhood taste control consits of the fraction of survey individuals at the postcode district level who profess allegiance to the Conservative party, see Table 4.1 for details. * means significant at 10%; ** significant at 5% and *** significant at 1%

Table 3.3: Heterogeneity in Association between Private Education and Public School Quality

(Dependent variable: Child attended private education?)						
	(1)	(2)	(3)	(4)	(5)	(6)
l public school performance interacted with:						
Respondent privately educated	0.001					
	[0.005]					
Respondent not privately educated	0.014***					
	[0.003]					
Eldest child at home <11		0.014**				
		[0.007]				
Eldest child at home 11 or over		0.011***				
		[0.004]				
No children at home below 18		0.010***				
		[0.004]				
Only child 5-14			0.016			
			[0.010]			
Not only child 5-14			0.013***			
			[0.004]			
Greater London				0.003		
				[0.007]		
Not Greater London				0.012***		
				[0.003]		
Urban					0.008	
					[0.006]	
Semi-urban					0.014***	
					[0.004]	
Town, fringe, village and hamlet					0.006	
					[0.007]	
10 percent best performing LEAs						0.007*
						[0.004]
10 percent worst performing LEAs						0.018***
						[0.005]
t	5.54	0.26	0.06	1.23	1.5	3.53
ue	0.019	0.877	0.812	0.267	0.470	0.060
rvations	16206	16206	16206	16206	16206	16206
do R-squared	0.23	0.23	0.23	0.23	0.21	0.23

s: Marginal effects of probit regression. All regressions include the same respondent and neighborhood ols as the baseline regression reported in Table 3.2, column (5). Robust standard errors clustered at the ode district (e.g. WC2A) level are reported in brackets. The null for the F-tests are that the coefficients on nteraction terms are identical. * means significant at 10%; ** significant at 5% and *** significant at 1%

Table 3.4: Robustness Checks. Alternative Measures of Local Public School Quality

(Dependent variable: Child attended private education?)

easure of public school performance:	1 or more GCSE passes		More than 5 A*-C GCSE	
verage over:	5 closest schools		postcode district	
	(1)	(2)	(3)	(4)
ocal public school quality	0.005	0.016***	0	0.009*
	[0.004]	[0.005]	[0.003]	[0.005]
ousehold income (adj)	0.272***	0.282***	0.258***	0.265***
	[0.018]	[0.018]	[0.019]	[0.019]
ocal public school quality x Household income		-0.053***		-0.034**
		[0.014]		[0.015]
come cutoff (=alpha/gamma)		0.302		0.265
come percentile above which negative lationship between public school quality and ivate school demand		78.5		74.5
hool district (LEA) fixed effects	yes	yes	yes	yes
ighborhood "tastes" covariate	yes	yes	yes	yes
umber of school districts (LEAs)	138	138	138	138
umber of postcode districts	1084	1084	946	946
bservations	16206	16206	14476	14476
eudo R-squared	0.23	0.24	0.23	0.23

otes: Marginal effects of probit regression. Robust standard errors clustered at the postcode district (e.g. C2A) level are reported in brackets. All regressions include the same respondent and neighborhood ntrols as the baseline regression reported in Table 3.2, column (5). Futher details on the public school rformance measures are provided in the text. * means significant at 10%; ** significant at 5%; *** gnificant at 1%.

Table 3.5: Robustness Checks: Alternative Measures of Private School Demand

(Survey versus pupil population data postcode district level regressions)

Dependent variable	Pct. ever sent child to private school		Pct. of pupils in private schools		Pct. of 15- year olds in private schools	
Source	BSAS		DfES		DfES	
	(1)	(2)	(3)	(4)	(5)	(6)
Local public school performance						
5 closest schools to respondents in survey data,	0.018***		-0.006		-0.008	
averaged at postcode district level	[0.007]		[0.004]		[0.005]	
Postcode disctrict average		0		-0.012***		-0.019***
		[0.006]		[0.004]		[0.005]
Neighborhood controls						
Log average house prices	0.072***	0.082***	0.066***	0.070***	0.037*	0.044**
	[0.024]	[0.024]	[0.016]	[0.016]	[0.020]	[0.020]
Percent of population with higher level qualific	0.007***	0.008***	0.006***	0.006***	0.006***	0.007***
	[0.002]	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]
Number of school districts (LEAs)	139	139	139	139	139	139
Number of postcode districts	1007	1007	1007	1007	1007	1007
Observations	11032	11032	11032	11032	11032	11032
R-squared	0.35	0.35	0.37	0.38	0.25	0.27

Notes: Linear probability postcode district level regressions. The sample consists of all postcode sectors with both survey observations and public schools with GCSE data. All regressions include time and LEA fixed effects. Standard errors have been adjusted for serial correlation within postcode districts.

Table 3.6: Further Robustness Checks

(Dependent variable: Child attended private education?)

Sample	Children <18	1986-1994 data	1995-2002 data	All	Private school in postcode district	Private school in postcode district	Private school within 15 km	Private school within 15 km	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Mean performance (AC5) of 5 nearest public schools	0.010**	0.017***	0.007*		0.017*	0.017*	0.010***	0.009***	0.009***
	[0.005]	[0.006]	[0.004]		[0.010]	[0.010]	[0.003]	[0.003]	[0.003]
1986-1994 data x Mean performance of 5 nearest public schools				0.011**					
				[0.005]					
1995-2002 data x Mean performance of 5 nearest public schools				0.008**					
				[0.004]					
Postcode disctrict average private school performance						0.005			
						[0.006]			
Mean performance (AC5) of 5 nearest private schools							0.004		
							[0.003]		
Distance to closest private schools								-0.002**	
								[0.001]	
Less than 2km to nearest private school (1/4 of sample)									0.027*
									[0.015]
1.8-3.7km to nearest private school									0.013
									[0.014]
3.7-7.2km to nearest private school									0.007
									[0.013]
7.2+km to nearest private school									0.011
									[0.013]
Observations	6757	6397	9472	16206	4778	4778	15348	15348	16206
Pseudo R-squared	0.24	0.27	0.22	0.23	0.24	0.24	0.23	0.23	0.23

Notes: Marginal effects of probit regression. All regressions include the same respondent and neighborhood controls as the baseline regression reported in Table 3.2, column (5). Robust standard errors clustered at the postcode district (e.g. WC2A) level are reported in brackets. * means significant at 10%; ** significant at 5% and *** significant at 1%.

Chapter 4

Religion, Political Allegiance and Private Schooling Choices in England

4.1 Introduction

A large fraction of private schools are at least nominally religious, and views are divided as to whether private schools are desirable or not. While a growing body of literature investigates how culture, beliefs, values and norms shape individual behavior, very little is known about how such variables are linked to educational choices.

In this paper I explore the association between parents' religion and political allegiance and their private schooling choices, with primary focus on the relationship between religious beliefs and private school demand. I use household level data from 1986 to 2005 from the nationally representative British Social Attitudes Survey (BSAS). These surveys includes information on whether respondents have ever sent a child to private school as well as a range of respondent/household characteristics. The surveys include information about religious affiliation as well as about the intensity of beliefs (frequency of attending religious services, frequency of prayer, perceived strength of religious beliefs and degree of belief in God). Furthermore, respondents

are asked about their political allegiance and beliefs. To isolate the effect of religion and political allegiance from other confounding effects, I control for several individual and household characteristics: household income, education, including whether privately educated, marital status and age.

I find that self-reported religious beliefs and political allegiance are strongly and robustly correlated with private school demand. However, there is considerable variation in the relationship between religion and private education across religious denominations. The impact of religion on private school demand is strongest for minority religious denominations (Roman Catholic, Muslim, Hindu and Jewish), while no aggregate relationship exists for the 40 percent of respondents who belong to the largest religious denomination represented in the data, the Church of England. Further, the demand for private education increases in the intensity of religious beliefs and practices, suggesting that the religious effect is to a large extent driven by religious motives. However, the greater Muslim, Hindu and Jewish demand for private education appears to be primarily caused by a greater preference for education among these groups. As to political allegiance, stating support for the Conservative party, which views private education favorably, is associated with a significantly higher propensity to choose private education. The opposite is true for individuals who support the Labour party, which is critical of private education. Furthermore, I find evidence that the strength of the association between political allegiance and private schooling depends significantly on the extent of identification expressed with the political party in question. Overall, these results suggest that religious, ethnic and political factors play important roles in non-trivial economic decisions. The results are robust to the inclusion of additional controls for income, education and wealth, school district fixed effects and neighborhood controls including the performance of local state schools, house prices and the percentage of the population with higher level qualifi-

cations. Nonetheless, it should be emphasized that the observed correlations cannot readily be interpreted as causal effects. In particular, unobserved variables may cause people both to be more religious or shape their political party affiliations as well as affect their preferences towards education in general, and private education in particular. Moreover, reverse causality cannot be ruled out: The act of sending children to (religious) private school may affect parents' religious and political beliefs and behavior.

This paper contributes to a substantial body of literature on schooling choices. There is sizeable literature modelling individuals' choice between consuming publicly provided private goods, such as education, in the public or private sector. Examples include Stiglitz (1974), Besley and Coate (1991) and Epple and Romano (1996, 1998). With a few exceptions like Kremer and Sarychev (1998), Dixit (2002) and Besley and Ghatak (2005), the existing theoretical literature does not consider individuals' preferences for other attributes of education than pure academic quality or academic achievement. Empirical studies on the determinants of the supply and demand for private education include Downes and Greenstein (1996, 2002), Figlio and Stone (2001) and Munk (2007a, b). Downes and Greenstein (1996, 2002) and Munk (2007a) study religious schools separately from secular schools. A number papers have, primarily based on US data, studied whether (religious) private schools are more effective providers of education than the state sector. This literature includes Rouse (1998), Altonji, Elder and Taber (2000b), Figlio and Stone (2000), Neal (2007)[1]. Using UK data, Gibbons and Silva (2006) study whether state aided religious schools produce better educational outcomes than secular schools. None of these papers, however, use micro data to investigate the relationship between religion and political allegiance and the demand for (religious) private

[1]Focusing on the religious aspect Gibbons and Silva (2006) study whether state aided religious schools produce better educational outcomes than secular schools.

education at the household level. There are several micro level studies on the effects of religion on various other economic outcomes. Religion seems to affect wages (Chiswick, 1983), school attendance (Freeman, 1986), health (Ellison, 1991), criminal behavior (Evans et al., 1995) and economic attitudes conducive to higher per capita income and growth (Guiso, Sapienza and Zingales, 2003). More broadly, this paper is related to a growing empirical literature underscoring the importance of individual cultural background and beliefs in explaining attitudes and behavior[2].

The remainder of the paper is organized as follows. Section 4.2 provides some background information about religion and political beliefs in England. Section 4.3 describes the data and section 4.4 presents some preliminary data analysis. Section 4.5 describes the empirical approach and discusses the baseline results. Sections 4.6 and 4.7 further explore the relationship between private school demand and religion and political allegiance, respectively. Section 4.8 reviews the robustness of the results and section 4.9 concludes.

4.2 Background

This section briefly provides some background knowledge to motivate why religion and political beliefs may matter for private education choices.

4.2.1 Religious Private Education

Around 50 percent of private schools in England are nominally religious[3]. However, in many cases they are so primarily for historical reasons. Nominally

[2]For example, this literature finds that home country/region attributes are predictive of: immigrants' economic achievement (Borjas, 1999), fertility rates (Fernandez and Fogli, 2005) and corruption (Fisman and Miguel, 2006). Alesina and Fuchs-Schundeln (2005) find that exposure to Communism has made East Germans much more pro-state than West Germans.

[3]The sources of this information are the Edubase files released yearly from the Department of Education and Skillls.

religious private schools generally do not pursue religious indoctrination of pupils and generally do not preclude pupils of other faiths from attending if they wish. Furthermore, the requirement of state schools to timetable periods of Christian worship diminishes the need for mainstream religious households to have their religious taste satisfied in the private sector, but not necessarily for minority religious households. Religious schools set up by minority groups, especially those opened in recent years so that the religious label is not a historical relic, are more likely to be genuinely religious and to differ substantially from state schools. Accounting for 5.2 and 2.6 percent of all private schools, respectively, Muslims and Jews are the only non-Christian religious groups with a non-negligible and well defined religious school presence. The Muslim private school sector was virtually non-existent a few decades ago, but has grown rapidly in recent years. (For further details or religious private schools, see Munk 2007a).

4.2.2 Political Allegiance and Private Education

In England, private education is rendered politically sensitive by the highly unequal nature of the English educational system and the predominantly elitist character of private education. Most agree that private education is generally superior to public education for the individual pupil[4]. However, views are divided as to whether private schools are socially desirable. As such, households may experience a conflict between what they perceive to be in their personal interest and what they perceive to be in the collective interest, or in conformity with the norms and beliefs of the groups they belong to. As shown in

[4]The average annual fee for a child in a private secondary school is approximately 40% of median disposable income for UK households or 20% at the 90th percentile (Graddy and Stevens, 2003). It is widely believed that attending exclusive private schools improves future life chances. Naylor, Smith and McKnight (2002) find evidence that private school attendance confers a wage premium on former students of roughly 3 percent, which is increasing in the level of school fees.

Figure 4.4, attitudes towards private education expressed in survey data differ quite drastically between Conservative and Labour supporters. Conservative respondents tend to view private education favorably, while the opposite holds for Labour respondents. For instance, 38 percent of Labour supporters think there should be fewer or no private schools, while only 8 percent of Conservative supporters are of this opinion. It is interesting to note that although Conservatives are generally better educated and wealthier than Labour supporters (though more Labour supporters have higher education), their views on private education are the "least educated", in the sense that the attitudes towards private education of more educated individuals are closer to the views of Labour supporters. These differences in attitudes are also reflected in high profile political anecdotes[5].

4.3 Data

To form the basic household-level data set, I use variables on private education consumption, religious orientation, political allegiance, household income, and other basic household/respondent characteristics from the nationally representative annual British Social Attitudes Survey (BSAS) data. There are 17 years of data in which these core variables are available spanning the period 1986-2005[6].

I extract all respondents living in England with school aged or older children (aged 5+) who provide a yes/no answer to whether they have ever sent a

[5]In recent years, prominent British Labour MPs, including Jeremy Corbyn, "about as unreconstructed a beard-and-sandals leftwinger as New Labour endures" (Guardian, May 13, 1999), and Diane Abbot, Westminster's first black woman MP, have compromised their political credibility by opting to send their children to private schools rather than, as forcefully advocated by themselves and their party, to the local public school. Conversely, Oliver Letwin, Conservative shadow home secretary at the time, famously claimed that he would rather beg than send his children to a local comprehensive.

[6]The excluded years are 1988, 1992 and 1997.

child to private school. The resulting data set consists of 27,229 observations. I drop 11.5 percent of observations for which no household income information provided, reducing the sample size to 24,093. A further 1 percent of observations in this sample are in turn dropped because the religious or political variable or other covariates are missing or inconsistently coded. This yields the base sample of 23,862 observations.

The dependent variable of the analysis is an indicator variable which attains the value 1 if respondents have ever sent a child to private school and 0 if they have not[7]. 18 different religious denominations are represented in the data[8]. I focus on the seven largest religious groups (sorted by size): Church of England, Other Christian[9], Roman Catholic, Methodist, Muslim, Hindu, Jewish and group the remainder as non-Christian[10]. Furthermore, information is provided on the frequency with which respondents attend church aside from special occasions, pray, how religious they consider themselves and the extent of their belief in God[11]. I further classify respondents by political party identification. Following the terminology used in the survey data, I distinguish by *partisans*, *sympathizers* and *residual identifiers*[12]. I refer to respondents who are either

[7]Private education demand is coded based on whether respondents with children in the household answer yes or no to the following question: *"Have any of your children/ has your child ever attended a fee-paying, private primary or secondary school in the United Kingdom?"* 'Private' primary or secondary schools *include*: independent schools, scholarships and assisted places at fee-paying schools. They *exclude*: direct grant schools (unless fee-paying), voluntary-aided schools, grant-maintained ('opted out') schools and nursery schools.

Note that it is not possible to distinguish between whether households have sent their children to religious or secular schools.

[8]Religious denomination is coded based on the answers to the following question: *"Do you regard yourself as belonging to any particular religion? IF YES: Which?"*

[9]Other Christian includes: Christian - no denomination, Other Protestant, Baptist, Presbyterian, United Reform Church, free Presbyterian and Brethern. See Table 1 for details.

[10]Other non-Christians make up 0.85 percent of the baseline sample and include Sikhs and Buddhists. A fuller set of religious denominations in the data is shown in the notes to Table 4.1.

[11]I describe these variables in more detail when they are introduced in the empirical analysis.

[12]Party identification is coded is coded based on the question *"Generally speaking, do you think of yourself as a supporter of any one political party?"* (yes=*partisan*). If NO: *"Do you think of yourself as a little closer to one political party than to the others?"* (yes=*sympathizer*). If NO: *"If there were a general election tomorrow, which political party*

partisans, sympathizers or residual identifiers as party *supporters.*

To isolate the effect of religion and political allegiance from other confounding effects, I control for several individual characteristics. These characteristics include respondent educational background[13], sex, age and marital status[14] as well as a measure of household income constructed based on income bands defined in nominal terms[15].

4.4 Preliminary Data Analysis

The first column of Table 4.1 provides sample means for all respondents in the base sample, while columns (2) and (3) respectively contain sample means for the 13.1 percent of respondents who have sent any children to private school and for the remainder who have not. To compare groups of the same marital status and of similar age, column (4) restricts the sample to married or cohabitating respondents aged between 35 and 54. This sample will henceforth be referred to as the "restricted sample".

Almost 64 percent of respondents in the baseline sample are religious, of which almost 40 percent belong to the Church of England/Anglican Church. 40 percent of respondents go to church occasionally apart from special occasions. 31 and 40 percent of respondents support the Conservative and Labour party, respectively. Respondents who have ever sent a child to private school on aver-

do you think you would be most likely to support?"(if answer=*residual identifier*).

[13]Based on answers to questions about exams passed or qualifications obtained, respondents are classified by the BSAS survey into the following categories: 1 Degree; 2 Higher educ below degree; 3 A level or equiv; 4 O level or equiv; 5 CSE or equiv; 6 Foreign or other; 7 No qualification. Furthermore, respondents are asked *"Have you ever attended a fee-paying, private primary or secondary school in the United Kingdom?"* where private education is defined as in the question regarding whether the respondent has sent children to private school.

[14]Marital status is coded based on the question: " *Which of these applies to you at present?* 1 Married; 2 Living as married; 3 Separated (after being married); 4 Divorced; 5 Widowed; 6 Single (never married)".

[15]For details on the construction of the household income variable, see Data Appendix, section 6.3.

age more religious, go to church more often, are more Conservative, wealthier, better educated, including more likely to have attended private school themselves and older than those respondents who have not sent any children to private school.

Figures 4.1-4.2 provide graphical overviews of the religious and political composition of the survey respondents. Panels 1-2 of Figure 4.1 show that the age profiles differ considerably between the different religious denominations. Panels 3-4 show that household income is on average lower in religious households than in non-religious households. However, this difference almost disappears when only the restricted sample is considered, suggesting that differences stem mainly from religious households being older. There is also heterogeneity across denominations. Jewish respondents (of which there are only 43 in the restricted sample), on average have considerably higher household income than other religious denominations, while Muslim and other non-Christian respondents are relatively poor. Moreover, there is important variation in the degree of religious intensity, for instance as measured by the extent of church attendance. Almost 20 percent of respondents attend church once a week or more, while almost 40 percent never, or practically never, go to church. Church of England and Jewish respondents go to church the least, while the other minority religious denominations (Roman Catholic, Muslim, Hindus and other non-Christians) go to church most frequently.

Next, panels 1-2 of Figure 4.2 show that there are more Labour than Conservative supporters overall, but there are roughly equally many "partisans" (strong supporters) of each party. Panel 3 shows the correlation of religion and political allegiance. Being Conservative and being religious is positively correlated. The percentage of Conservative partisans is almost twice as high among religious as non-religious respondents. Panel 4 shows that there is no marked differences in age across political allegiance, although stronger supporters of

either party tend to be older. Average household income is considerably higher among Conservative supporters, and this is particularly true of the stronger Conservative supporters.

Figure 4.3 takes a preliminary look at the association of religion and political allegiance and private education, as well as how this varies by household income. To avoid confounding religious and political effects with age and marital status effects, all graphs in Figure 4.3 are based on the restricted sample. Panels 1-2 indicate the very considerable variation in private education background (whether respondent privately educated) and demand for private education (whether any children privately educated) across religious denominations and political allegiance. Nevertheless, the high percentage of Jewish, Hindu and Muslim households which have sent children to private school compared to the other religious groups is quite striking[16]. Note also how Hindus and Muslims are much more likely to have sent children to private school than to have attended them themselves. In addition, the low private school demand among Methodist respondents is conspicuous. It is furthermore remarkable that private education, both for the respondent and their children, increases almost monotonically when moving politically from left to right. The two residual identifier groups, which correspond to the lowest level of political identification out of the Conservative or Labour party supporters, constitute the only small deviation from this pattern. Finally, panels 3-8 demonstrate how the demand for private education varies with income interacted with religion and political allegiance. Demand for private education clearly increases in household income, and the patterns observed aggregated over income tend to hold at any income level. Private education generally appears to be closely correlated for parent and child across income groups. However, respondents

[16]It should, however, be noted that the sample size for the smallest minority religious groups in the restricted sample is relatively small (ranging from 43 to 140).

in the highest income groups tend to be more likely to send their children to private school than to have attended them themselves[17]. Having observed these suggestive patterns in the raw data, I now turn investigate whether they hold up to more rigorous empirical analysis.

4.5 Empirical Analysis

4.5.1 Empirical Method

To study the relationship between household-level demand for private education and religious and political allegiance, I estimate probit regressions of the form:

$$P^*_{ijkt} = \alpha Z_{ijkt} + \phi_k + \theta_t + \epsilon_{ijkt} \tag{4.1}$$

Let the variable P_{ijkt} take the value 1 if the ith respondent in postcode district j, region k and year t has ever had any children enrolled in private education and 0 otherwise. Then $P_{ijkt} = 1\left(P^*_{ijkt} > 0\right)$ where $1(\cdot)$ is the indicator function taking the value 1 if the expression in parentheses is true and 0 otherwise. Note that it is not possible to know which type of private school respondents have sent their children to. For example, secular and religious private education cannot be distinguished. Z_{ijkt} includes the following household/respondent covariates: religion, political allegiance, household income, the education of the respondent, age and age-cohort and the respondent's marital status as described in section 4.3. For a given level of household income, respondent education levels may affect the household's propensity for

[17]It is notable that demand for private education rises particularly rapidly in income for Muslim respondents (140 observations in restricted sample). This contrast with the results in Munk 2007a which suggest that it is the poorest religious minority households that opt for religious private education.

sending children to private school for at least two reasons. First, better educated individuals may have stronger tastes for education than less educated individuals, and private schools provide better education than state schools. Furthermore, education is a typically time invariant variable (for individuals with school aged or older children) which is correlated with earnings capacity. Respondent education levels, including whether the respondent has been privately education, therefore provide an additional control for household income at the time at which private schooling decisions are made as well as a possible proxy for taste for tastes for private education. As shown in section 4.4, religious beliefs, church attendance and political allegiance vary by age. Religious and political variables may thus be picking up age or cohort-related effects. Furthermore, a given household income may reflect different levels of household resources depending on respondent age and marital status. Finally, ϕ_k and θ_t are regional[18] and year-of-interview fixed effects. Standard errors are assumed to be normally distributed and are adjusted for correlation of the errors within postcode districts[19].

It should be noted that, in spite of the richness of the data, the results obtained with this empirical approach should not be viewed as necessarily identifying causal effects. In particular, the empirical strategy is vulnerable to the classic latent variable critique: an unobserved variable may cause people to be more religious or shape their political party affiliations as well as affect their

[18]The 9 English regions (GORs) include: North East, North West, Yorkshire and The Humber, East Midlands, West Midlands, East of England, London, South East, South West.

[19]Postcode district information is not available for the 2003-05 data. However, observations are sampled in small geographical units, which in previous years does not extend beyond a postcode district. The areas sampled are numbered and each observation is assigned such a number (spoint), preventing the identification of the specific geographic location, but making it possible to group respondents residing in the same area. The survey contains on average 15.7 observations in each sampled area. For the 2003-05 data, I therefore cluster by artificial postcode districts made up from the sampled areas. This means that clustering is effectively done by postcode district and year for the 2003-05. However, each postcode district only occurs 1.8 times in 1986-2002 data set. The difference from the rest of the data is therefore slight.

preferences towards education in general, and private education in particular. Moreover, reverse causality cannot be ruled out: The act of sending children to (religious) private school may affect parents' religious and political beliefs and behavior. However, after presenting the basic results, I report and discuss additional pieces of empirical evidence which consistently support the preferred interpretations put forward of the main results.

4.5.2 Baseline Specification

Table 4.2 reports marginal effects from probit analyses based on equation (4.1) of whether a respondent has ever sent any children to private school. Column (1) includes a dummy variable for whether the respondent belongs to any religion, controlling only for year and regional fixed effects and clustering at the postcode district level to account for correlation of the errors at the local level. The religious coefficient is positive and statistically significant. I additionally control for household income in column (2). The coefficient increases in magnitude, reflecting that religious households are on average poorer than non-religious households, and that income is positively associated with private school demand as shown in Figure 4.1. Column (3) further controls for whether the respondent is privately educated. The coefficient remains positive and statistically significant, but falls in magnitude by more than 20 percent. While this control may pick up household income and wealth not captured by the household income variable, this result may also suggest that the religious coefficient partly picks family traditions or intergenerationally transmitted preferences.

I next consider the association of political allegiance and private school demand. As discussed in section 4.2.2, the Conservative party views private education much more favorably than the Labour party. If party lines and be-

liefs guide the behavior of individual party supporters, we would, other things equal, expect Conservative supporters to more inclined to choose private education than Labour supporters. Column (4) includes a set of indicator variables for whether respondents support the Conservative or the Labour party, with those who support neither party as the omitted category. The Conservative and Labour coefficients are both highly significant with the expected signs. The political coefficients fall in absolute value following the introduction of the household income control in column (5), reflecting that Conservative respondents are on average richer, and Labour respondents poorer, than the omitted category. The absolute value of the political coefficients fall further after controlling for whether the respondent is privately educated in column (6). Again, this reflects that being privately educated is positively correlated with being Conservative supporter, and negatively correlated with being Labour supporter. In addition, the result is once again indicative of a possible role played by inter-generational preference transmission. Finally, column (7) includes both the religious and political indicator variables as well as a full set of household and respondent controls. The magnitude of the religious and Conservative coefficients falls further, reflecting the positive correlation of these two variables, while the Labour coefficient remains largely unchanged. However, all three coefficients retain their original signs and statistical significance.

4.6 Religion and Private Education

Well aware of the difficulty in interpreting the observed correlations as causal effects, I now further examine different interpretations which are consistent with the empirical patterns.

4.6.1 Main Hypotheses

The greater demand for private education by religious individuals may be driven the following three main factors: *(i)* Preferences for the religious content of education *(ii)* Differences in the price of educational quality faced by religious and non-religious households *(iii)* Differences in preferences for educational quality between religious and non-religious households.

First, there may be a component of private school demand which is driven by preferences for the religious content, or the *type* of education provided, rather than the *quality.* I will refer to this as a mission-driven component of demand[20]. Greater intensity of religious practice may lead to a heightened concern for the religious content or conformity with religious norms and prescriptions of one's children's education, and hence a greater demand for religious private education. If religious intensity has a significant effect on religious private school demand, we might expect to see differential effects of religion on private school demand by expressions of religious dedication, such as the frequency of church attendance or prayer, or the extent of belief in God.

On the other hand, to propagate a given religion, religious entities might sponsor religious education for religious households. Religious households may therefore have access to subsidized (high quality) private education not available to non-religious households, and thus face a lower cost of private education. If anyone registered as belonging to a particular religion can attend such schools, then a greater religious demand may be primarily driven by these price differences. In this case, if sending children to such schools furthermore does not change parents' religious behavior and beliefs, we should not expect households' religious intensity to matter significantly for (religious) private school demand. However, subsidized religious private education may only be

[20]This terminology is based on Besley and Ghatak (2004). A mission may, for instance, consist in a specific curriculum or a method of teaching.

available to households who have a proven religious record (e.g. church attendance). Households may thus have an incentive to attend church that is unrelated to the "true" intensity of their religious belief and is not genuinely a mission-drive component of demand. Suppose churchgoing reflects households responding to such incentives, and is only weakly correlated with actual religious beliefs or preferences[21]. If this were the case, we might expect more private and unobserved religious activities, e.g. prayer and belief in God, to be less strongly related to private school demand than comparatively observable religious activities such as church attendance.

Finally, tastes for educational quality may differ between religious and non-religious households. These differences may be culturally determined, or determined by socioeconomic stigma associated with belonging to a minority group, as much as determined by religion. In this case, we would again not expect the intensity of religious practice to play a major role, except perhaps as an expression of the degree to which households identify with their religious and cultural group.

To sum up, if there are no differential effects of religion by intensity of religious practice or beliefs, this would put into question the role of religion *per se* as a causal factor of private school demand. Such a finding might suggest (a) that the religious coefficient captures differences in preferences for education between different religious groups determined by cultural or socioeconomic factors or (b) - to the extent that no record of religious commitment is required to attend such religious private schools - differential access to subsidized religious private education. Differential effects by relatively observable religious practices but no differential effects by comparatively non-observable religious practices would suggest that the religious effect could be driven by access to

[21] Even it participation in religious activities is initially driven by economic incentives, it might of course also affect actual beliefs and preferences, as is no doubt intended by the religious entities which organise these activities.

religious private schools being conditional on observable religious participation. Finally, significant differences in the effect of being religious on private school demand by *both* observable and non-observable religious expressions of religious devotion, would suggest that there is an important mission-driven component of religious private education[22].

4.6.2 Heterogeneity by Religious Intensity

Table 4.3 investigates whether a greater intensity of religious practices and beliefs is associated with a greater positive effect on private school demand. I create dummies for whether religious individuals attend church "at least once a month", "less than once a month" or "never or practically never", which I interact with the religion variable. Column (1) shows that the religion coefficient increases in magnitude and significance in the frequency of church attendance[23]. The difference in the estimated coefficients on religion for individuals who "never or practically never" attend church versus the coefficients for individuals who do attend church are statistically significant at the 1 percent level[24]. The second column reports results from splitting religious respondents into those who pray weekly versus those who pray at least yearly, but not weekly[25]. The difference in the coefficients is again statistically significant at

[22]Another possibility is as follows: (i) It is primarily the availability of subsidized private religious education that entice religious households into sending their children to religious private schools in the first place. (ii) Yet having children in religious private education *also* affects the parents' non-observed religious intensity, e.g. prayer frequency and belief in God.

[23]The frequency of church attendance is coded based on the question: *"Apart from such special occasions as weddings, funerals and baptisms, how often nowadays do you attend services or meetings connected with your religion?"* (1=Never or practically never; 2=Less often than once a year; 3=Less often but at least once a year; 4=Less often but at least twice a year; 5=Less often but at least once a month; 6=Less often but at least once in two week; 7=Once a week or more).

[24]The religious coefficient is almost 50 percent greater for respondents who attend church at least once a month compared to repondents who attend church less than once a month, but an F-test cannot reject the null hypothesis that there is no difference in the coefficients.

[25]The frequency of prayer is coded based on the question: *"About how often do you pray?"* (1=Never; 2=Less than once a year; 3=1-2 times a year; 4=Several times a year; 5=About

the 1 percent level. Next, I split religious respondents into those who say that they "know God really exists" against those who doubt or only sometimes believe[26]. The results from including these dummy variables are shown in column (3). Again the coefficients are different at the 1 percent level.

Overall, the point estimates on the effects of religion thus increase considerably in different measures of religious intensity and these differences are highly statistically significant. Respondents who go to church at least monthly, pray weekly or more or "know God really exists" are respectively 2.7, 8.7 and 7 percent more likely to send children to private school than non-religious respondents[27]. In comparison, the aggregate estimated effect of religion on private school demand reported in Table 4.2 is only 1.6 percent. Particularly the large differential effects by more private and non-observable expressions of religious intensity are suggestive of a genuine mission-driven component of private school demand.

4.6.3 Heterogeneity by Religious Denomination and Ethnicity

The overall positive association of religion and private education may mask important differences across religious denominations. We might expect house-

once a month; 6=2-3 times a month; 7=Nearly weekly; 8=Every week; 9=Several times a week; 10=Once a day; 11=Several times a day).

Those who pray less than yearly are grouped together with non-religious individuals due to small sample size. The variable on how often respondents pray is only present in the 1991 and 1998 BSAS data.

[26]Belief in God is coded based on the question *"Please tick one box below to show which statement comes closest to expressing what you believe about God."* (1=Don't believe in God; 2=I don't know whether there is a God and I don't believe there is any way to find out; 3=I don't believe in a personal God, but I do believe in a Higher Power of some kind; 4=I find myself believing in God some of the time, but not at others; 5=While I have doubts, I feel that I do believe in God; 6=I know God really exists and I have no doubts about it).

The variable on belief in God is present in the 1991, 1993, 1995, 1998 and 2000 BSAS data.

[27]In column (2), non-religious respondents include those who identify themselves as religious but pray less than once a year.

holds belonging to minority, non-mainstream religious groups to have a stronger incentive to obtain religious education in the private sector since their religion and traditions will be less well represented in state schools as noted in section 4.2.1. Moreover, it may be that individuals electing to belong to minority religions - especially religious denominations associated with social stigma such as Islam - are on average more religiously dedicated than members of the majority religion[28]. We might expect a stronger mission-driven component of demand from the average religious individual belonging to more devout denominations. However, differences in private school demand across religious denominations may also result from culturally or ethnically determined preferences for particular traditions or types of education, or differences in preferences for education more generally, that are not necessarily religious in nature. Education may generally be considered more important in some cultures than in others. Another possibility is that ethnic and religious minorities in England differ from the white mainstream in their perception of the role of (private) education for their life chances, e.g. due to discrimination. For example, more than 40 percent of the baseline sample agree that there is prejudice against Asians. The religious coefficients do not immediately allow us to distinguish between these different interpretations.

In the raw data, religious denomination and ethnicity are closely correlated. This is particularly true for Muslims and Hindus: 95 percent of Pakistani and Bangladeshis in the BSAS data are Muslim, and they make up 57 percent of Muslims in the data. The rest are a relatively even mixture of blacks, other Asians and whites[29]. Indians make up 92 percent of Hindus, and bit less than half of Indians are Hindus. Whites makes up 99 and 95 percent of Church of

[28]This prediction would be in keeping with Iannacone's (1992) perspective on religion, whereby stigma and sacrifice strengthen religious dedication among members. See also Berman (2000).

[29]Respectively 13, 11, 10 and 9 percent. See appendix Table 6.4.

England and Roman Catholic respondents, respectively. By contrast, only 1.4 percent of Hindus are white.

In Table 4.4, I examine whether there are significant differences in the association of religion and private school demand across religious denominations and ethnic groups. I first construct indicator variables for the seven largest religious groups represented in the baseline sample (sorted by size): Church of England, Other Christian[30], Roman Catholic, Methodist, Muslim, Hindu, Jewish as well as for the remaining "Other non-Christian"[31] and no religion. I replicate column (7) of Table 4.2 in column (1) of Table 4.4, replacing the religion indicator variable with a set of eight religious indicator variables, again omitting the no religion category. Consistent with the aggregate result on religion, the majority of the religious coefficients are positive and significant. However, the coefficients on Church of England - the largest religious group covering almost 40 percent of the baseline sample - and Other non-Christian are positive but insignificant. Moreover, the coefficient on Methodists - at 3 percent of the sample the fourth largest religious group - is negative. The religious denominations are most positively associated with private education are Jewish, Muslim and Hindu.

To explore the extent to which private school demand is driven by ethnic origin, I create indicator variables for whether respondents are of (i) black, (ii) Indian, (iii) Pakistani or Bangladeshi, (iv) Chinese or other Asian or (v) white origin[32]. Respondents of white ethnic origin make up 95.4 percent of the base sample, while the four minority ethnic groups constitute 2.2, 1.2, .7 and .5 percent, respectively. Column (2) excludes the religious variables

[30] Other Christian includes: Christian - no denomination, Other Protestant, Baptist, Presbyterian, United Reform Church, Free Presbyterian and Brethern. See Table 4.1 for details.

[31] Other non-Christian includes: Sikh and Buddhist.

[32] Including variables on ethnic origin reduces the sample by 11 percent to 21,286 observations. Information on ethnic origin is only available from 1989 onwards. I further drop respondents of mixed origin from the sample.

and includes the set of ethnic indicator variables instead, omitting the white category. The coefficients on the minority ethnic groups are all positive and significant, except the Chinese or other Asian category. However, the coefficient on the latter category is positive but insignificant. The insignificance is likely due to the small sample size. The results suggest that Indian, Pakistani and Bangladeshi (IPB) Asians and blacks are respectively 10-11 percent and 5 percent more likely than the white majority to have sent children to private school. The IPB Asian coefficients are of roughly the same magnitude as the Muslim and Hindu coefficients in column (1). Column (3) includes both sets of religious and ethnic indicator variables. Except for the Muslim and Hindu coefficients, the religious coefficients are virtually unchanged as a result of the inclusion of ethnic dummies in the regression. However, reflecting the high degree of collinearity between the two variables, the Muslim and "Pakistani or Bangladeshi" coefficients decrease in size and are rendered insignificant. The magnitude and significance of the Hindu coefficient also falls, while the Black and Indian coefficients remain almost unchanged relative to column (2). In column (4) I omit the "Pakistani or Bangladeshi" group, whereby the Muslim coefficient retains its original significance, though it falls in magnitude by almost 25 percent.

These results thus suggest that ethnicity may be a separate driver of private school demand, distinct from religion. It is also worth noting that supply of religious private education constrain religious minorities' possibilities to obtain private education of their own religion. The share of Hindu and (until recently at least) Muslims private school pupils has been very low compared to their population share. Conversely, pupils in private Jewish religious schools make up a relatively large fraction of private school pupils, relative to the population share of Jews[33]. Thus, a substantial portion of Jewish private school demand

[33]For further details, see Munk (2007a).

is plausibly for Jewish religious education. However, the lack of Muslim and Hindu religious private schools in the time period in which the survey respondents in this data set have sent children to private schools puts into question that the positive Muslim and Hindu coefficients represent a mission-driven component of demand.

Finally, column (5) ((5a)-(5b)) explores the importance of dedication as expressed by church attendance by religious denomination. First, I interact the religious variables with dummies for whether respondents attend church at least yearly or "never or practically never"[34]. The results obtained by including these interaction terms again reveal a significant divergence in the association on religion and private school demand depending on church attendance. Most remarkably, the insignificant signs on the aggregate coefficients on Church of England and Other non-Christian change into significant coefficients of opposite signs when the church attending and the non-church attending religious respondents are separated: The coefficients of the interaction terms of belonging to these religious groups and attending church "at least once a year" are positive and significant, while the coefficients on the interaction terms with "never or practically never" attending church are negative and significant. F-tests show that these coefficients are different at the 1 and 5 percent levels, respectively. This is suggestive of the prior that members of the Church of England as the majority "default" religion in England, are overall less intensively religious than members of other religious denominations. As a consequence, the mission-driven component of demand is only significant for those members who are genuinely committed to their religion. For the other religious denominations, except Other Christian, the coefficient on religion is significant only

[34]Conditional on at least yearly church attendance, I do not distinguish between the frequency here. The aggregate results presented in Table 3 suggest that there is no significant difference between attending church at least once a month and less frequently. Moreover, the sample size of smaller religious denominations is quite low.

for the church going segment, but the coefficients are not significantly different.

All in all, the results suggest that religious beliefs are an important factor driving the association between religion and private education, and as such that there is a significant mission-driven component of demand. However, particularly for Muslims and Hindus or IPB Asians, it seems plausible that there is a culturally or ethnically driven component of private school demand related to a greater demand for *educational quality* in these groups that is unrelated to the demand for *religious* education.

4.6.4 Attitudes and Beliefs

The following section considers further empirical evidence that sheds light on whether the positive and significant religious and ethnic coefficients are likely to be driven by religious motives or preferences for educational quality more generally.

Religious Intensity

As suggested above, there may be heterogeneity in the average degree of devoutness across religious denominations. I estimate ordered probit regressions of different measures of the intensity of religious practices or beliefs regressed on the same set of covariates used in the private education regressions. These measures include the frequency of church attendance, prayer, how religious the respondent considers him/herself[35], and the respondent's stated degree of belief in God[36]. All variables are coded such that a higher number represents a higher degree of religious devotion. I restrict the sample to religious respondents and include the full set of religious denominations (omitting the majority

[35]Degree of religiosity is coded based on the question *"Would you describe yourself as .."* (1=Extremely non-religious; 2=Very non-religious; 3=Somewhat non-religious; 5=Somewhat religious; 6=Very religious; 7=Extremely religious).

[36]See variable descriptions of church attendance, prayer and belief in God in section 4.6.2.

religion, Church of England) as well as the full set of other covariates used in previous regressions.

Indeed, the results reported in Table 4.5 reveal considerable heterogeneity in the intensity of religious practices and beliefs across denominations. Respondents belonging to minority denominations are, other things equal, systematically more religious than Church of England respondents. Except Jews, they are significantly more likely to attend church and pray frequently, to consider themselves more religious and to be certain that God exists[37]. This is particularly true of Muslim and Hindu respondents. It is also worth noting that respondents who are privately educated are more likely to attend church frequently. This might be suggestive of possible endogeneity of the church attendance variable with respect to sending children to private school. Moreover, the frequency of church attendance and prayer increases in respondent education, but declines in household income. However, the strength of respondents' religious beliefs is unrelated to socioeconomic background.

In summary, as expected, on the whole members of minority religious denominations evince a stronger intensity of religious practices and beliefs than members of the majority religion, Church of England. I have shown in Table 4.3 that the association between religion and private school demand increases significantly in the available measures of religious intensity. As such it appears plausible that members of more religiously intense denominations may also on average be more inclined to be motivated by religious concerns to seek education in the private sector.

[37] A substantial part of this difference appears to stem from differences in ethnic background. In unreported regressions, the religious coefficients drop in magnitude, but remain positive and significant, once ethnicity is further controlled for along with religion.

Attitudes towards Education

I further look into the effect of religion on attitudes towards education, including religious education, to examine whether I find results consistent with the above interpretations of the results on private school demand. As in the previous section, I estimate ordered probit regressions for five different dependent variables regressed on the same set of covariates used in the baseline private education regressions. I consider preferences regarding the religious composition of schools, the importance of education as a priority for government spending, the priority that government spending should give to students at universities and two variables measuring respondents' opinions of private schooling.

Panel A of Table 4.6 employs the simple religion indicator variable used in the baseline regression, while panel B includes the full set of religious indicator variables described in section 4.3. The first column explores *preferences for own-religious education*[38]. The results show that, as we would expect, religious respondents are more inclined to prefer schools with only their own religion as opposed to schools mixed religions than non-religious respondents. To check whether the preference for own-religious education differs - as expected - by the intensity of religious beliefs, I separate religious respondents by the frequency of their church attendance. The results are reported in Column (4) of Table 4.3, along with the results on how the demand for private education differs by religious intensity. The magnitude of the religious coefficient is more than twice as large for religious respondents who attend church at least once a month, compared to those who do not. Furthermore, Panel B of Table 4.6 shows that the preference for own-religious schooling varies considerably by

[38]Respondents can choose between the following three answers to describe their prefererence regarding the religious composition of schools: own religion only; mixed - religion; no preference. It might appear illogical that non-religious respondents should prefer schools with only own religion, however, 21 percent of non-religious respondents express this preference. Presumably this should be interpreted as a disinclination to have mixed ethnic as well as religious education.

religious denomination. It is strongest for Roman Catholics, and of the same magnitude and significance, but of opposite sign, for Hindus. In other words, Roman Catholics significantly prefer schools of only their own religion, while Hindus prefer schools of mixed rather than of their own religion. Remarkably, no coefficients on any non-Christian religious denomination have positive and significant signs. On average, these minority religions thus do not appear to be attracted by segregating into their own religious schools. However, the lack of significance could also be an issue of low sample size.

As proxies for the *importance attached to (further) education* I use variables on whether education is regarded as a top priority for government spending[39] and on whether spending on university students is a priority for extra government spending on education[40]. Columns (2)-(3) reveal that, in the aggregate, being religious has no apparent effect on such preferences. However, Muslims are significantly more likely to prioritize spending on education in general, and both Muslim, Hindus and Jews are significantly more favorable towards spending on higher education than the other religious denominations. This result supports the conclusion that the non-Christian religious coefficients observed in Table 4.4 are driven by stronger preferences for education.

Finally, I consider *attitudes specifically towards private education.* I use opinions on whether there should be more or fewer private schools[41] and on how private schools affect the state sector[42]. Columns (4)-(5) show that re-

[39]Respondents are asked to state their *first and second priority for extra government spending* out of the following areas: Education; Defence; Health; Housing; Public Transport; Roads; Police and Prisons; Social Security Benefits; Help for Industry; Overseas Aid; (none of these).

[40]Respondents are asked to state their *first priority for extra spending on education* from the following list: Nursery or Pre-School Children; Primary School Children; Secondary School Children; Less Able Children with Special Needs and Students at Colleges or Universities.

[41]Attitudes towards private education are coded based on the question: *"Generally speaking, what is your opinion about private schools in Britain? Should there be ..."* (1=More private schools, 2=About the same number as now, 3= Fewer private schools, 4=No private schools at all).

[42]Attitudes towards the external effects of private education are coded based on the ques-

ligious respondents are slightly more in favor of having more private schools, particularly Jewish respondents, and to a lesser extent Church of England. Religion does not appear to have any strong effect on views regarding whether private schools are good or bad for the state school sector.

Overall, these results support the conclusion that the positive Muslim, Hindu and Jewish coefficients in the private education regressions reflect more than a religious component of demand. Rather it appears that, other things equal, these religious/ethnic groups put greater emphasis on education than the rest of the population. This could be for cultural/historical reasons unrelated to the English context. Alternatively, it could be that education is perceived as being more important to succeed by ethnic and religious minority groups than by the white mainstream, e.g. due to discrimination.

4.7 Political Allegiance and Private Education

I now turn to investigate the association of political allegiance and private school demand in more detail. Even more so than with the religious effects, the observed correlations cannot be immediately interpreted as causal effects. Bearing this in mind, I discuss different interpretations of the aggregate results below.

4.7.1 Main Hypotheses

The effect of political allegiance on the demand for private education may be driven the following three main factors: *(i)* People's behavior is shaped by their political views and allegiance; *(ii)* Consuming private education affects people's political views and allegiance; *(iii)* Political allegiance may capture

tion: *"If there were fewer private schools in Britain today do you think, on the whole, that state schools would ..."* (1= Benefit, 2=Suffer, 3=Would it make no difference).

unobserved individual characteristics which drive both political allegiance and preferences for (private) education.

First, it may be that people's behavior is affected by what they personally believe is "right" or "wrong", distinct from what they think is in their own personal interest, and regardless of what other people think. If people believe that private education has negative externalities for the state sector, they may feel less good about, and therefore be less inclined towards, consuming private education than if they do not hold this belief[43]. A stronger identification with a political party is likely to reflect a greater degree of support of the values and beliefs embodied by the political party. If there exists a causal impact of political allegiance on people's behavior through either of these channels, we should therefore expect the absolute magnitude of the effects of political allegiance to increase the degree of identification with a given political party.

Second, we may be concerned about reverse causation. The act of consuming private education may exert an independent effect on people's political preferences and beliefs. For example, individuals who pay for private education may be less supportive of government spending on education which does not benefit them directly, or may be exposed to different peer groups as a result of sending children to private schools which in turn affect their preferences and beliefs[44]. Moreover, it is conceivable that private sector consumption, or the lack of it, also affects beliefs in more subtle ways: People may incur a disutility from behavior which they perceive as anti-social in some way, even if it benefits themselves (for instance, if people believe that private education

[43]It might also be that people's behavior is in part driven to a desire to obtain approval from their social environment. Private education may in part be a status good whose value depends on what family, friends and neighbors think of it. If private education is viewed more favorably in some environments, then it will be more attractive for individuals part of those environments to consume private education.

[44]For instance, Table 4.1 shows that almost 55 percent of respondents in the baseline sample who have ever sent a child to private school supports the Conservative party. In contrast, this is only true of 28 percent of respondents who have never sent a child to private school.

harms the state sector) or tend to have a more negative opinion of types of behavior or consumption that they choose not to, or are not able to, take part in. To maximize utility, people may tailor their beliefs to rationalize or justify their behavior. Moreover, people's inclination to identify with a party may fall if they choose a course of action (for example, sending children to private school) which is condemned by that party.

Third, the presence of unobserved personal characteristics which cause people both to be attracted to certain political parties as well as affects their preference for (private) education cannot be ruled out. For instance, it might be that more intelligent and hard-working individuals are both more likely to be Conservative as well as have a stronger taste for (private) education. Furthermore, if spite of the available controls in the data, political allegiance may pick up unobserved aspects of income, education and wealth which increase the demand for private education. As shown in Figure 4.2, panel 5 (discussed in section 4.4), Conservative supporters on average have higher incomes than Labour supporters. If unobserved aspects of income and wealth follow the same pattern as observed income, then we might expect Conservative allegiance to be positively correlated with unobserved income, education and wealth and Labour allegiance to be negatively correlated with these unobserved characteristics. The political coefficients might reflect just this. However, it should be noted that the scope for relevant correlated omitted heterogeneity is limited due to the richness of the data. Characteristics such as income and education, and thus ability, wealth and preferences for (private) education, are arguably fairly precisely captured by observable variables in the BSAS data. In addition, there is a less obvious potential causal link between, say, unobserved ability and preferences for education and political allegiance than there is between, say, unobserved health status and preferences for private health insurance and

public spending on health which has been studied elsewhere[45].

Figure 4.2, panel 6 also shows that income is increasing in the strength of party identification for supporters of *both* parties. Suppose then that party identification is positively correlated with unobserved income and wealth for both Conservative and Labour supporters. In that case, if the results are driven entirely by unobserved income, education and wealth effects, we would expect the association between political allegiance and private school demand to increase in individuals' degree of party identification with either party (since increased party identification just picks up unobserved characteristics). However, if results are genuinely driven by political beliefs (including perhaps some degree of reverse causation), we would expect the absolute value of the political coefficients (positive or negative) to increase in individuals degree of party identification.

To summarize, we thus have two main competing hypotheses: *First*, that political allegiance and beliefs has a causal effect on, or at least a substantive connection with, private school demand. *Second*, that political allegiance and the degree of party identification merely pick up unobserved characteristics, such as income, education and wealth, which drive private school demand without there being a direct relationship between the political variables and private school demand. These two hypotheses yield opposite, and testable, predictions on the coefficients on Labour party supporters: In the data, Labour support is

[45]To deal with the problem of correlated common unobservables in the choice of private health insurance and support for public health spending, Hall and Preston (1998) assume a common correlation term in the error across different behaviors. However, the case for correlated common unobservables driving the relationship between private education status and political allegiance is considerably less compelling than in the case of insurance status and support for public health spending. There is a weaker case for relevant characteristics being unobserved than in the case of health insurance where relevant correlated omitted heterogeneity could consist in general preferences for health related goods, unobserved aspects of health status and hostility to the state. In addition, there is a much less obvious causal link between unobserved preferences for education and religion or broad political allegiance than there is between unobserved health preferences/status and preferences on public spending on health.

negatively correlated with the available measure of household income but the degree of party identification is positively correlated with the household income measure. If political identification merely picks up unobserved characteristics, such as income, that are positively correlated with private school demand, we should expect the negative Labour coefficients to be smaller in value for individuals who identify more with the Labour party. The converse holds if Labour party identification picks up genuine political beliefs which negatively affect the propensity for private education. The first hypothesis would thus lead us to expect the negative Labour coefficients to be greater in absolute value the more strongly an individual identifies with the Labour party. In contrast, the second hypothesis would predict the negative Labour coefficients to decrease in absolute value the more strongly an individual identifies with the Labour party.

4.7.2 Heterogeneity by Strength of Party Identification

To examine which of these hypotheses is most consistent with the data I proceed as follows. First, as a measure of party identification, I divide respondents into political *partisans*, *sympathizers* and *residual identifiers* as described in section 4.4[46]. I select the sub-sample of Conservative and Labour supporters and create a party identification variable constructed such that a greater degree of identification with either the Conservative or Labour party is coded with a higher number[47]. To ascertain that the degree of party identification is indeed, other things equal, positively correlated with observable measures of income, wealth and education (measured by reported household income,

[46] Party identification is coded is coded based on the question *"Generally speaking, do you think of yourself as a supporter of any one political party?"* (yes=partisan). If NO: *"Do you think of yourself as a little closer to one political party than to the others?"* (yes=sympathizer). If NO: *"If there were a general election tomorrow, which political party do you think you would be most likely to support?"* (if answer=residual identifier).

[47] The variable is coded such that 1=Residual identifier; 2=Sympathiser and 3=Partisan.

whether respondent or child privately educated, and whether respondent has obtained higher education) for supporters of both political parties, I run ordered probit regressions of the party identification variable controlling for the full set covariates used in the baseline sample, except for the political variables. The results are reported in Table 4.7. In the first column I use the sample of Conservative or Labour supporters in the baseline sample and next in columns (2) and (3) restrict the sample to Conservative and Labour supporters, respectively. The results show the strength of the degree of political identification increases in household income and education among both Conservative and Labour supporters.

I then construct indicator variables for the political party respondents support interacted with the degree of party identification. Table 4.8 replicates the baseline results of Table 2 replacing the Conservative and Labour dummies with this set of indicator variables, again omitting respondents who are not either Conservative or Labour supporters. The results and associated F-tests show that the political coefficients for both Conservative and Labour supporters differ at the one percent level[48].

The coefficients on political partisans as opposed to residual identifiers and sympathizers are greater in absolute value for both Conservative and Labour supporters, and the coefficients are different at the 1 percent level. These results are more consistent with the first than with the second hypothesis. They appear to suggest that, other things equal, the stronger respondents identify with the political party they support, the greater is the strength of the political effect. In other words, a stronger party identification makes Conservative supporters more likely to choose private education for their children, while the opposite is true for Labour supporters.

[48]The only exceptions are the Labour partisan and Labour residual identifier coefficients which differ at the 5 percent level.

To further substantiate the conclusion that the results using the political identity variable indeed appear to capture a real association of political beliefs and private school demand, I repeat the analysis using a different dependent variable as measure of political engagement: respondents' interest in politics[49]. The results are reported in Table 4.7, columns (4)-(6). Like the other measure of political engagement, the degree of party identification, this variable is positively correlated with household income and education. However, while the strength of party identification is arguably related to the degree to which an individual believes in the political views of a given party, the degree of interest in politics does not have to be correlated with unconditional support for a given party line. Indeed, columns (5) and (6) show a positive correlation between private school consumption and interest in politics for both Conservative and Labour supporters. This contrasts with the negative correlation of private school consumption and party identification for Labour supporters found in column (3). Equivalently, Table 4.8, column (2) ((2a)-(2e)) also does not show the ranking of the Labour coefficients according to political engagement found in column (1).

4.8 Robustness Checks

4.8.1 Additional Controls for Income, Education and Wealth

Omitted aspects of income, education and wealth are leading candidates for unobserved respondent or households characteristics that the political variables might pick up rather than political effects. In this section, I check the

[49]Interest in politics is coded based on the question "*How much interest do you generally have in what is going on in politics?*" (1=None at all; 2=Not very much; 3=Some; 4=Quite a lot; 5=A great deal).

robustness of the main results to the inclusion of additional controls for such variables. I create indicator variables based on respondent's social class[50], the economic activity of the respondent's spouse[51], respondent's degree of interest in politics[52] (which may pick up unobserved aspects of education or general interest in education), and whether the household owns or rents accommodation[53]. In Table 4.9 I drop observations which do not contain information on all these variables such that the sample size is more than halved from 23,862 observations in the baseline sample to 10,959 observations. The first column replicates the baseline regression on the restricted sample. In the following columns (2)-(6), I add the sets of dummy variables associated with each of the additional control variables[54]. The social class of respondents, interest in politics and home ownership are positively associated with private school demand and decrease the size of the coefficient on household income. As such these variables most likely pick up income, education and wealth effects. The magnitude of the Conservative coefficient also drops, but very slightly, while

[50]In Britain, for statistical purposes, class has been defined using the Registrar General's scale of social Class and Socio-economic groups. Respondents are divided into the following groups: 1: Class I: Professional ; 2: Class II: Managerial/Technical ; 3: Class III: Skilled ; 4: Class IV: Partly Skilled ; 5: Class V: Unskilled.

[51]The economic activity of the partners of respondents who are married or living as married is coded based on the following question. *"Which of these descriptions applied to what your partner was doing last week, that is the seven days ending last Sunday?"* (1=In full-time education (not paid for by employer, including on vacation); 2=On government training/ employment programme; 3=In paid work (or away temporarily) for at least 10 hours in week; 4=Waiting to take up paid work already accepted; 5=Unemployed and registered at a benefit office; 6=Unemployed, not registered, but actively looking for a job (of at least 10 hrs a week);7=Unemployed, wanting a job (of at least 10 hrs a week) but not actively looking for a job; 8=Permanently sick or disabled; 9=Wholly retired from work; 10=Looking after the home.)

[52]Interest in politics is coded based on the question *"How much interest do you generally have in what is going on in politics?"* (1=None at all; 2=Not very much; 3=Some; 4=Quite a lot; 5=A great deal)

[53]Whether the household owns or rents accommodation is coded based on the question *"Does your household own or rent this accommodation?"* I recode answers to this question such that respondents are divided into three groups(1=Own outright; 2=Buying on a mortgage; 3=Renting). See data appendix for full set of options given to respondents.

[54]The omitted categories for each variable are as follows: Social class (Class V: Unskilled) Spouse's economic activity (In paid work); Interest in politics (None at all); Home ownership (Renting).

the religious and Labour coefficients are virtually unchanged. These results suggest that the estimated effects are not very sensitive to unobserved aspects of income, education and wealth.

Finally, I split the sample up into males and females in columns (7) and (8). Since men on average have a higher earnings and a greater labour force attachment than women, the poorer controls for spouse's income, education and economic status than the respondent in the data may lead the political variables to pick up more information about the households income, education and wealth levels. Indeed, the Conservative coefficient for women is greater than for men, which would be consistent with this expectation. However, the Labour coefficient (which we expect to be negatively related to unobserved income, education and wealth) for women is smaller than that for men, which is not consistent with that prior. Moreover, the coefficient on higher education is larger for women than for men. These results show that, for given observed respondent and household characteristics, women are more likely to have sent children to private school. The likely explanation is that for a given set of respondent socioeconomic characteristics, having sent private education is associated with greater household income and wealth for women than for men[55]. Overall, these results suggest that, given the rich set of controls already included, the political coefficients do not pick up latent income, education or wealth effects to any great extent in the baseline regressions. Since these variables are the leading candidates for latent variables which might drive the results, this reinforces the conclusion that the political results reflect a substantive connection between political beliefs and private schooling choices.

[55]Since men generally earn more than women (who may stay at home or work part-time), household affluence will be more accurately captured by the man's education and socioeconomic status.

4.8.2 Neighborhood Controls and Fixed Effects

Finally, it might be that belonging to a particular religious or political group makes respondents more likely to locate in areas where private education is more prevalent. The religious and political effects might then pick up omitted area characteristics rather than capture a genuine causal effect. Table 4.10 investigates this possibility. I limit the sample to the sub-sample covering the years 1986-2002 for which neighborhood variables are available at the postcode district level (for details, see Munk, 2007b). This reduces the sample size from 23,862 to 16,206.

Column (1) repeats the regression reported in Column (1) of Table 4.3 for a slightly reduced number of religious denominations for expositional clarity. Column (2) includes log house prices, the percentage of highly qualified individuals and state school performance at the postcode district level. The coefficients change very slightly. Finally, to control for unobserved neighborhood characteristics, column (3) further introduces school district fixed effects. Once again, the coefficients are virtually unchanged. These results thus suggest that including neighborhood variables do not change results on religious and political allegiance significantly and robust results can be obtained using the much larger data set for which the geographical variables are not consistently available.

4.8.3 Summary

Taken together, the results are consistent with the hypothesis that religious and political identification and beliefs exert a significant effect on private school demand. The religious effects increase in different measures of intensity of religious beliefs and practices. Conversely, the evidence also suggests that the positive Muslim, Hindu and Jewish coefficients in the private education regres-

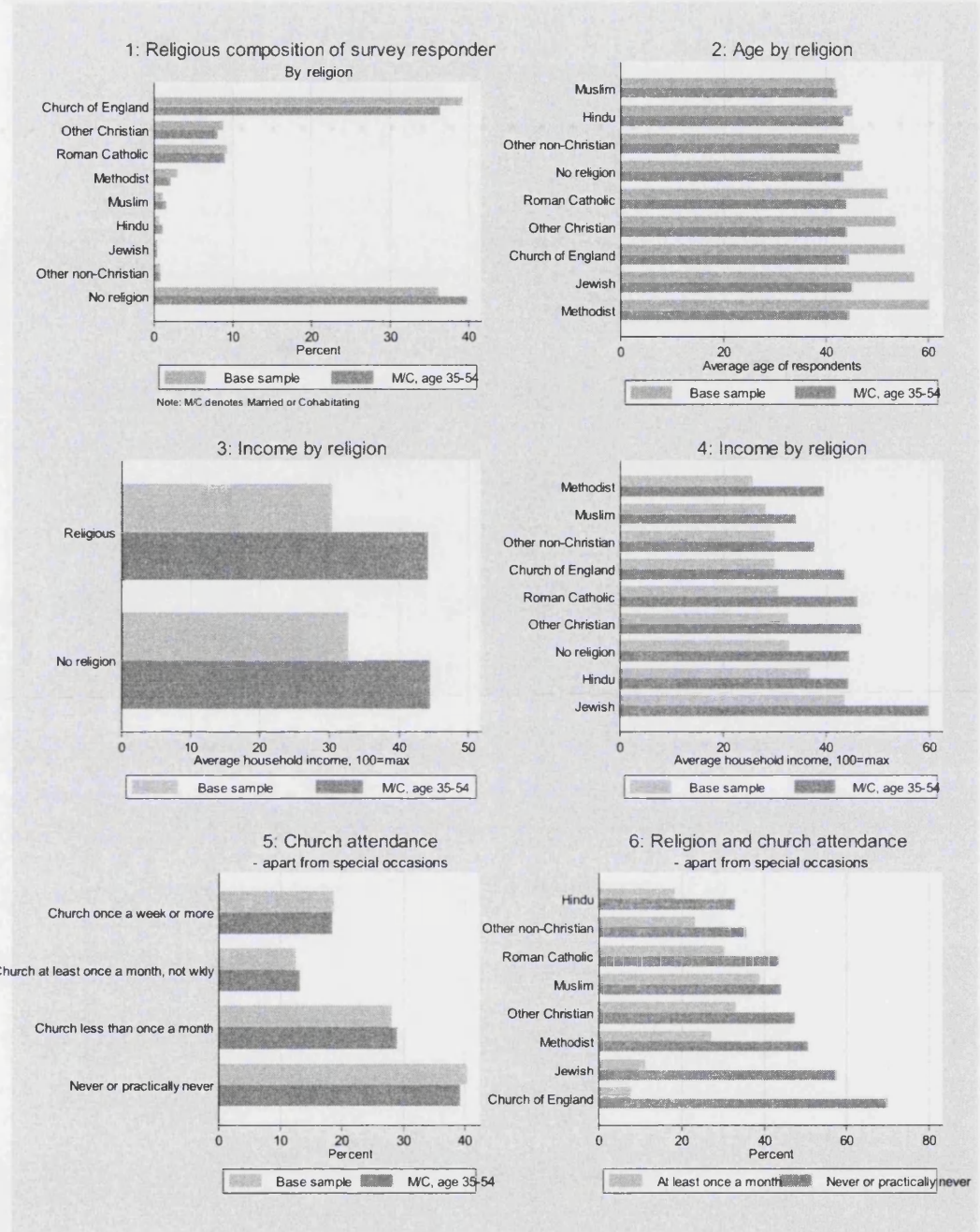
sions are to a large extent driven by cultural or ethnic, rather than religious, components of demand. As to the political effects in particular, some degree of reverse causality or omitted variable bias cannot be ruled out. However, it is notable that the political effects significantly increase in respondent's degree of identification with the political party that they support. Party identification increases in income and educational attainment for supporters of both the Conservative and the Labour party. However, support for the Labour party *decreases* in income and educational attainment, while support for the Conservative party *increases* in income and educational attainment. If the correlations of unobserved components of income, education and wealth with the variables of interest follow the same pattern as correlation with the observed component of income, education and wealth, then finding the absolute value of the political effects to be increasing in party identification for both Conservative (positive effect) and Labour (negative effect) supporters is inconsistent with results being driven by latent variables. On the other hand, this result is consistent with the prior that political beliefs matter. Moreover, both religious and political effects are strongly robust to the inclusion of a battery of individual, household and neighborhood level controls and as well as school district fixed effects. Nonetheless, further research is required to make a stronger case that the statistical relations observed are causal.

4.9 Conclusion

In this paper, I explore the association between parents' religion and political allegiance and their private schooling choices, with primary focus on the association of religion and private school demand. Controlling for detailed household covariates, I find strong and robust associations. The relationship between religion and private education varies considerably across religious groups, and is

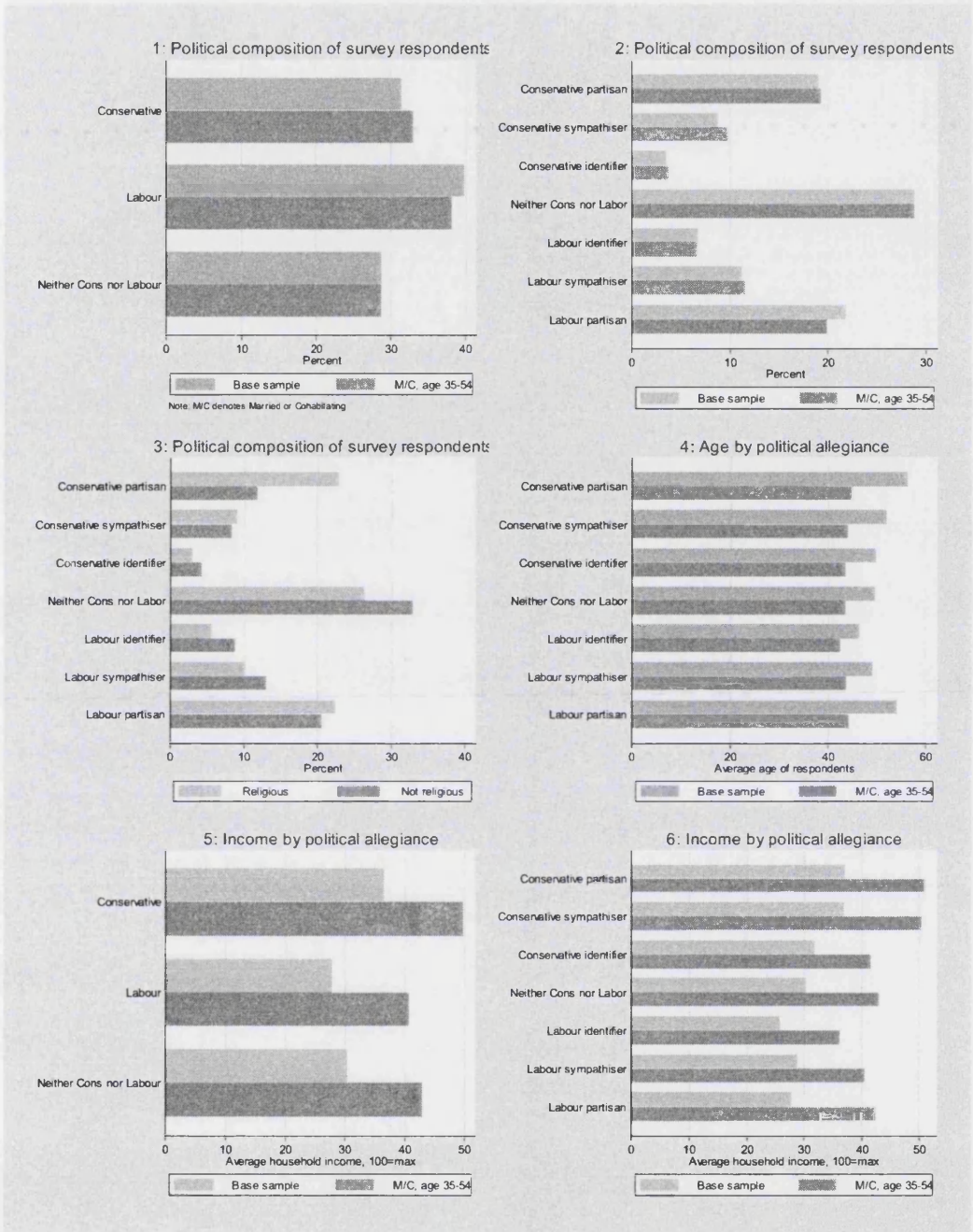
strongest for non-mainstream denominations (Roman Catholic, Muslim, Hindu and Jewish). Stating support for the Conservative party which views private education favorably is associated with a significantly higher propensity to choose private education. The converse holds for individuals who support the Labour party which takes a very critical stance towards private education. Furthermore, the association of private schooling with religion and political allegiance significantly strengthens in the intensity of religious beliefs (frequency of attending religious services, prayer, self-rated degree of religiosity or belief in God) and political allegiance (the degree of identification expressed with a political party), respectively. These results suggest that religion and political allegiance play important roles in non-trivial economic decisions.

Figure 4.1: Religion



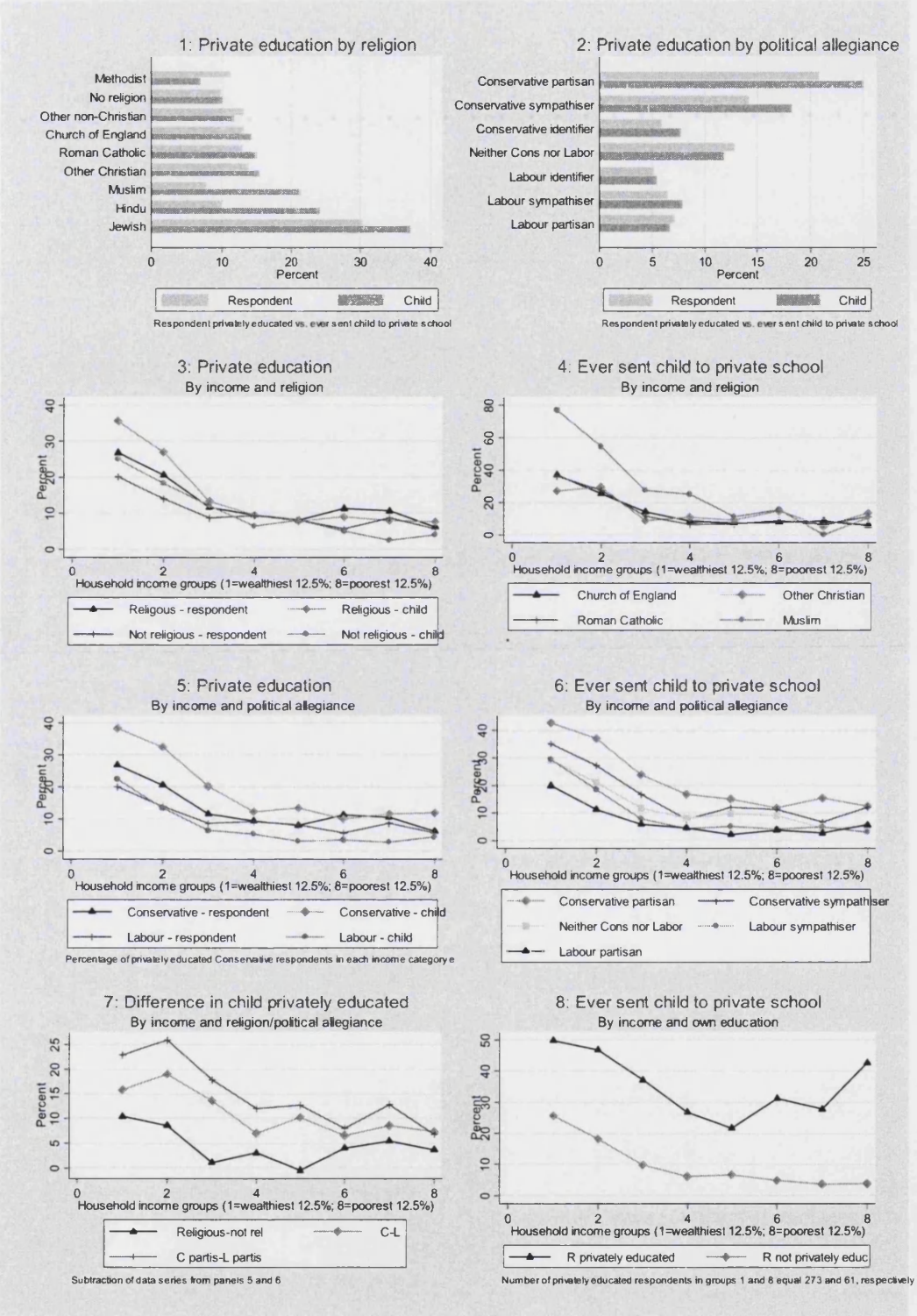
Source: British Social Attitudes Survey data 1986-2005. Graphs are based on the baseline sample (N=23862) described in the text and Table 1.

Figure 4.2: Political Allegiance



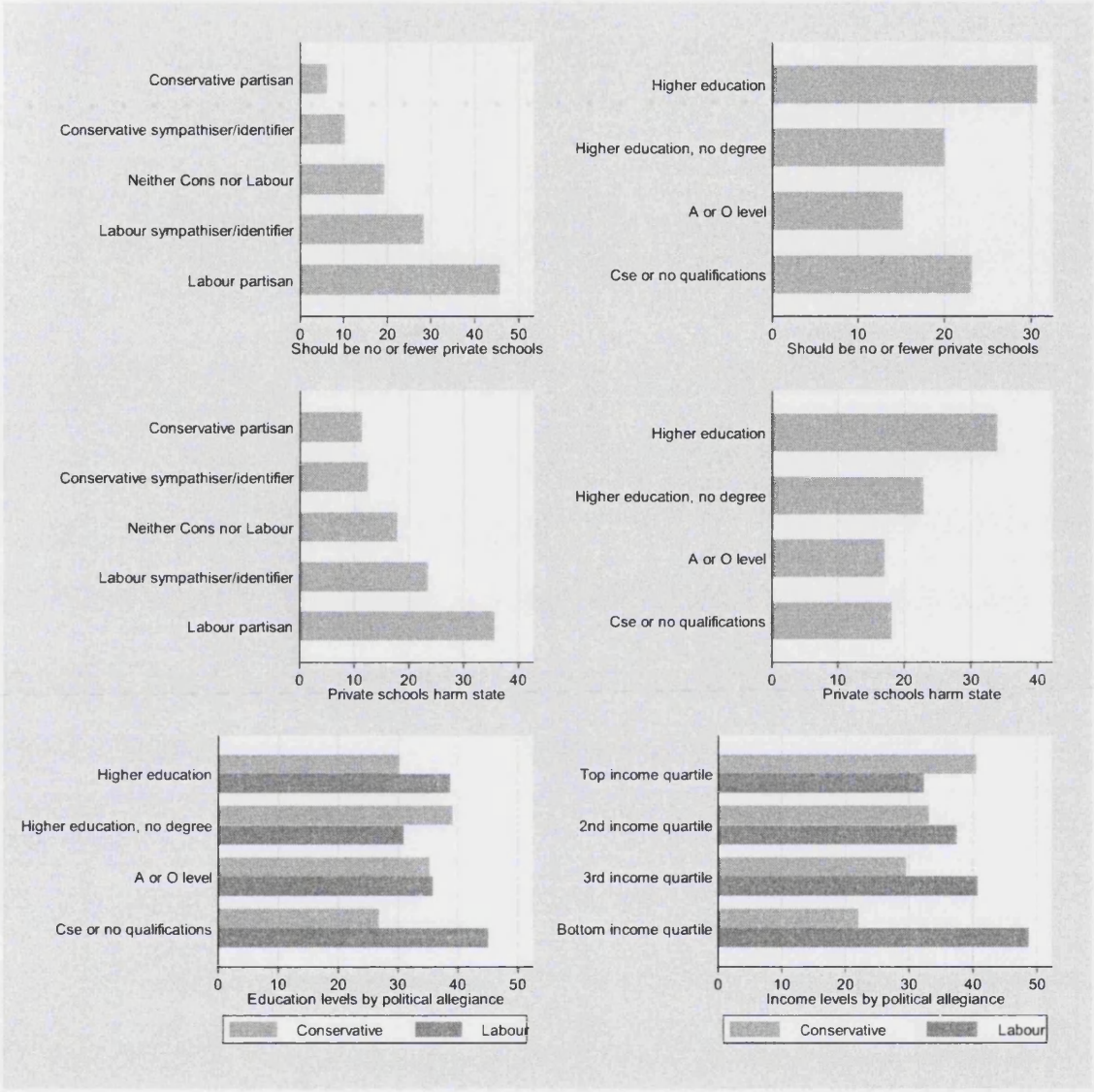
Source: British Social Attitudes Survey data 1986-2005. Graphs are based on the baseline sample (N=23,862) described in the text and Table 4.1.

Figure 4.3: Private Education, Religion and Political Allegiance



Source: British Social Attitudes Survey data 1986-2005. The graphs are based on the sub-sample (N=8,587) of the baseline sample (N=23,862) which consists of married or cohabitating survey respondents aged between 35 and 54. Income group 1 contains the 1/8th of observations in this sample with the highest household income and income group 8 the 1/8th with the lowest.

Figure 4.4: Attitudes towards Private Schools, Political Allegiance and Education



Source: British Social Attitudes Survey data 1986-2005. The graphs are based on the baseline sample.

Table 4.1: Summary Statistics

Sample	All		Child privately educated		No child privately educated		Married or cohabitating, aged 35-54	
	(1)		(2)		(3)		(4)	
	Pct	N	Pct	N	Pct	N	Pct	N
Religion								
Religious	63.8	15233	72.4	2266	62.5	12967	60.1	5161
No religion	36.2	8629	27.6	865	37.5	7764	39.9	3426
Church of England	39.3	9386	42.5	1330	38.9	8056	36.5	3136
Other Christian	8.8	2099	11.2	350	8.4	1749	8.2	704
Roman Catholic	9.4	2235	11.5	359	9	1876	9.1	778
Methodist	3.1	729	2.4	75	3.2	654	2.2	185
Muslim	1.2	288	1.4	44	1.2	244	1.6	140
Hindu	0.7	178	1	32	0.7	146	1.2	99
Jewish	0.5	116	1.6	50	0.3	66	0.5	43
Other non-Christian	0.8	202	0.8	26	0.8	176	0.9	76
Church aside from special occasions (religious respondents)								
Sometimes	39.6	8004	53.2	1466	37.4	6538	36.2	2474
Never or practically never	26.9	5440	20.4	562	27.9	4878	23.4	1601
Political allegiance								
Conservative	31.4	7485	54.5	1706	27.9	5779	33	2833
Labour	39.8	9504	20.4	638	42.8	8866	38.2	3277
Conservative partisan	19	4527	39.1	1225	15.9	3302	19.3	1654
Conservative sympathiser	8.8	2108	12.4	389	8.3	1719	9.9	847
Conservative residual identifier	3.6	850	2.9	92	3.7	758	3.9	332
Neither Cons nor Labor	28.8	6873	25.1	787	29.4	6086	28.8	2477
Labour residual identifier	6.8	1620	2.9	92	7.4	1528	6.7	575
Labour sympathiser	11.3	2694	6.4	199	12	2495	11.6	992
Labour partisan	21.8	5190	11.1	347	23.4	4843	19.9	1710
Income and education								
Household income (adj)	217.4 [161.6]		301.3 [191.6]		204.8 [152.7]		308.5 [167.7]	
Respondent privately educated	11.5		37.4		7.6		11.9	
Higher education, incl. foreign	10.4		22.9		8.5		14.3	
Higher educ, no degree	14.2		21.7		13.1		17	
A or O level	28.4		28.7		28.4		32.9	
Age, birth cohort and marital status								
Age of respondent	51.8 [15.5]		56.6 [14.7]		51.1 [15.5]		44.1 [5.6]	
Born: 1880-1910s	5.6		9		5.1		0	
Born: 1920s	12.5		15.8		12		0	
Born: 1930s	16.5		19.8		16		6	
Born: 1940s	22.4		25.9		21.8		33.3	
Born: 1950s	21.9		18.4		22.4		40.6	
Born: 1960-70s	21.1		11.1		22.6		20.1	
Married or cohabitating	67.7		70.3		67.3		100	
Separated or divorced	14.1		12.2		14.4		0	
Widowed	13		14.6		12.8		0	
N	100	23862	13.1	3131	86.9	20731	36	8587

Notes: see next page

Notes for Table 4.1

Source: British Social Attitudes data, 1986-2005. "All" denotes baseline sample described in text.

Detailed list of religious denominations represented in baseline sample*

Church of England	39.33	9386
Roman Catholic	9.37	2235
Christian, no denomination	4.83	1153
Methodist	3.06	729
Other Protestant	1.37	326
Muslim	1.21	288
Baptist	0.89	213
Presbyterian	0.76	181
Hindu	0.75	178
Jewish	0.49	116
United Reform Church	0.47	111
Other Christian	0.37	88
Other Non-Christian	0.38	90
Sikh	0.33	78
Buddhist	0.13	30
Other	0.13	31
No religion	36.16	8629
Total	100	23862

Definitions of political allegiance/identifiation:

Supporter	Partisan	Generally speaking, do you think of yourself as a supporter of any one political party?" If yes, which one.
	Sympathizer	[No to previous question] Do you think of yourself as a little closer to one political party than to the others? If yes, which one.
	Residual identifier	[No to previous question] If there were a general election tomorrow, which political party do you think you would be most likely to support?

Table 4.2: Private Education, Religion and Political Allegiance

	(Dependent variable: Child attended private education?)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Religious	0.048***	0.052***	0.041***				0.016***
	[0.004]	[0.004]	[0.004]				[0.004]
Conservative				0.098***	0.082***	0.069***	0.048***
				[0.006]	[0.006]	[0.006]	[0.005]
Labour				-0.050***	-0.045***	-0.034***	-0.032***
				[0.005]	[0.005]	[0.005]	[0.005]
Log household income		0.070***	0.056***		0.057***	0.046***	0.061***
		[0.003]	[0.003]		[0.003]	[0.003]	[0.003]
Respondent privately educated			0.277***			0.254***	0.189***
			[0.010]			[0.010]	[0.010]
Additional respondent controls							y
Observations	23862	23862	23862	23862	23862	23862	23862
Pseudo R-squared	0.03	0.07	0.14	0.07	0.1	0.16	0.2

Notes: Marginal effects of probit regression. All regressions include year and regional fixed effects. Robust standard errors clustered at the postcode district (e.g. WC2A) level are reported in brackets. Additional controls include education, marital status, age and birth cohorts. See Table 4.1 for details. * means significant at 10%; ** significant at 5% and *** significant at 1%.

Table 4.3: Heterogeneity by Intensity of Religious Practice and Beliefs

Dependent variable:	Child attended private education				Respondent prefers school only own religion	
	(1)	(2)	(3)	P-value*	(4)	P-value*
Frequency of church attendance						
Religious*Church at least once a month	0.027*** [0.006]				0.792*** [0.099]	
Religious*Church less than once a month	0.019*** [0.007]			0.2032	0.334*** [0.085]	0.0000
Religious*Never or practically never attend church	-0.008 [0.006]			0.0000	0.347*** [0.089]	0.0005
Frequency of prayer						
Religious*Pray weekly or more		0.087*** [0.022]				
Religious*Pray at least yearly, not weekly		0.025 [0.016]		0.0003		
Belief in God						
Religious*Know God really exists			0.070*** [0.019]			
Religious*Doubt, but believe/sometimes			0.016 [0.013]	0.0019		
Observations	20385	979	2339		2765	
Pseudo R-squared	0.21	0.33	0.24		0.06	

Notes: Marginal effects of probit regression. All regressions include year and regional fixed effects and full set of controls included in Table 4.2. Robust standard errors clustered at the postcode district (e.g. WC2A) level are reported in brackets. P-values stem from F-tests of the null hypotheses that most religious coefficient (the top row for each set of results using one of the three variables uest to measure religious intensity) is identical to the coefficient reported in the same row as the p-value. Thus the coefficient on being religious and attending church at least once a month is different at the 1 percent level from the coefficient on being religious and not attending church, but not significantly diferent from the coefficient on being religious and attending church less than once a month. * means significant at 10%; ** significant at 5% and *** significant at 1%.

Table 4.4: Heterogeneity in Private School Demand by Religious Denomination and Church Attendance

(Dependent variable: Child attended private education)

					Church attendance		
					Sometimes	Never or practically never	
	(1)	(2)	(3)	(4)	(5)		P-value
					(5a)	(5b)	
rch of England	0.006		0.007	0.007	0.015**	-0.018***	0.000
	[0.004]		[0.005]	[0.005]	[0.006]	[0.006]	
er Christian	0.019***		0.015**	0.015**	0.012	0.025*	0.369
	[0.007]		[0.008]	[0.008]	[0.009]	[0.013]	
nan Catholic	0.047***		0.045***	0.045***	0.051***	0.026	0.186
	[0.009]		[0.009]	[0.009]	[0.011]	[0.017]	
hodist	-0.016*		-0.016*	-0.016*	-0.013	-0.030*	0.427
	[0.009]		[0.010]	[0.010]	[0.013]	[0.016]	
slim	0.116***		0.041	0.085***	0.109***	0.097*	0.861
	[0.027]		[0.037]	[0.030]	[0.038]	[0.055]	
du	0.089**		0.02	0.027	0.125***	0.091	0.794
	[0.035]		[0.037]	[0.038]	[0.043]	[0.120]	
ish	0.157***		0.174***	0.174***	0.170***	0.094	0.449
	[0.049]		[0.054]	[0.054]	[0.059]	[0.073]	
er non-Christian	0.04		-0.003	-0.001	0.075**	-0.079***	0.033
	[0.026]		[0.024]	[0.024]	[0.037]	[0.019]	
ck		0.048**	0.047**	0.045**			
		[0.019]	[0.019]	[0.019]			
an		0.111***	0.103**	0.093**			
		[0.029]	[0.044]	[0.044]			
stani or Bangladeshi		0.102***	0.064				
		[0.039]	[0.052]				
ese or other Asian		0.056	0.05	0.04			
		[0.035]	[0.035]	[0.033]			
eline respondent controls	y	y	y	y	y		
ervations	23862	21286	21286	21286	23862		
do R-squared	0.21	0.2	0.2	0.2	0.2		

s: Marginal effects of probit regression. All regressions include year and regional fixed effects and full set of controls included able 4.2. P-values stem from F-tests of the null hypotheses that coefficients in each row of columns (5a) and (5b) are identical. ust standard errors clustered at the postcode district (e.g. WC2A) level are reported in brackets. * means significant at 10%; ** ficant at 5% and *** significant at 1%.

Table 4.5: Intensity of Religious Practice across Denominations

Dependent variables:	Frequency of:		How religious is respondent?	Respondent's belief about god?
	Church attendance	Prayer		
Other Christian	0.601***	0.683***	0.845***	0.705***
	[0.028]	[0.123]	[0.192]	[0.084]
Roman Catholic	0.737***	0.562***	0.597***	0.590***
	[0.024]	[0.054]	[0.097]	[0.062]
Methodist	0.590***	0.248***	0.759***	0.339***
	[0.040]	[0.080]	[0.115]	[0.088]
Muslim	1.036***	1.509***	1.914***	1.552***
	[0.071]	[0.187]	[0.500]	[0.299]
Hindu	0.770***	1.313***	1.123***	0.744***
	[0.058]	[0.098]	[0.141]	[0.246]
Jewish	0.267***	-0.565	-1.031**	-0.212
	[0.079]	[0.599]	[0.444]	[0.259]
Other non-Christian	0.781***	0.568	0.648	0.718***
	[0.083]	[0.393]	[0.714]	[0.278]
Conservative	-0.023	-0.099	0.133	-0.077
	[0.019]	[0.061]	[0.122]	[0.063]
Labour	-0.127***	0.013	0.168	-0.039
	[0.021]	[0.055]	[0.130]	[0.051]
Household income	-0.110*	-0.670***	-0.317	-0.214
	[0.062]	[0.226]	[0.232]	[0.180]
Respondent privately educated	0.202***	0.019	-0.082	0.146*
	[0.022]	[0.069]	[0.063]	[0.079]
Higher education	0.594***	0.486***	0.027	-0.028
	[0.028]	[0.076]	[0.173]	[0.085]
Observations	19744	918	627	2301
Pseudo R-squared	0.05	0.05	0.09	0.04

Notes: Ordered probit regressions where all variables are constructed such that a greater degree of religious participation or belief is coded with a higher number. The sample consists of all religious respondents in the baseline sample. All regressions include year and regional fixed effects and full set of controls included in Table 4.2. Robust standard errors clustered at the postcode district (e.g. WC2A) level are reported in brackets. The Church of England is the omitted religious denomination. The frequency of church attendance is coded based on the question: "*Apart from such special occasions as weddings, funerals and baptisms, how often nowadays do you attend services or meetings connected with your religion?* " (1=Never or practically never; 2=Less often than once a year; 3=Less often but at least once a year; 4=Less often but at least twice a year; 5=Less often but at least once a month; 6=Less often but at least once in two week; 7=Once a week or more).

The frequency of prayer is coded based on the question: "About how often do you pray?" (1=Never; 2=Less than once a year; 3=1-2 times a year; 4=Several times a year; 5=About once a month; 6=2-3 times a month; 7=Nearly weekly; 8=Every week; 9=Several times a week; 10=Once a day; 11=Several times a day). Degree of religiosity is coded based on the question *"Would you describe yourself as ..*" (1=Extremely non-religious; 2=Very non-religious; 3=Somewhat non-religious; 5=Somewhat religious; 6=Very religious; 7=Extremely religious). Belief in God is coded based on the question *"Please tick one box below to show which statement comes closest to expressing what you believe about God .*" (1=Don't believe in God; 2=I don't know whether there is a God and I don't believe there is any way to find out; 3=I don't believe in a personal God, but I do believe in a Higher Power of some kind; 4=I find myself believing in God some of the time, but not at others; 5=While I have doubts, I feel that I do believe in God; 6=I know God really exists and I have no doubts about it).

Table 4.6: Educational Preferences, Religion and Political Allegiance

Dependent variable:	Respondent prefers school only own religion	Education is 1st or 2nd priority for government spending	Students at universities is 1st or 2nd priority for extra gvt spending on education	Respondent's opinion of private schooling	More private schools benefit state?
Panel A					
	(1)	(2)	(3)	(4)	(5)
Religious	0.365***	0.007	0.052	0.047	-0.034
	[0.069]	[0.018]	[0.033]	[0.068]	[0.037]
Conservative	0.105	-0.033	0.031	0.328***	0.208**
	[0.069]	[0.022]	[0.039]	[0.039]	[0.082]
Labour	-0.048	-0.019	-0.057	-0.455***	-0.330***
	[0.069]	[0.023]	[0.036]	[0.071]	[0.039]
Household income	-0.125	0.317***	0.123	0.306***	-0.206
	[0.204]	[0.059]	[0.131]	[0.116]	[0.187]
Respondent privately educated	0.042	0.008	-0.001	0.257***	-0.022
	[0.113]	[0.024]	[0.051]	[0.061]	[0.112]
Child attended private school	0.201*	0.024	0.066	0.363***	0.252***
	[0.121]	[0.029]	[0.042]	[0.079]	[0.068]
Higher education	-0.394***	0.303***	0.189***	-0.393***	-0.403***
	[0.105]	[0.035]	[0.054]	[0.073]	[0.077]
Observations	1952	18984	8510	2259	2247
Pseudo R-squared	0.05	0.04	0.01	0.08	0.03
Panel B					
	(1)	(2)	(3)	(4)	(5)
Church of England	0.252***	-0.006	-0.001	0.052**	0.023
	[0.087]	[0.018]	[0.024]	[0.022]	[0.038]
Other Christian	0.503***	0.026	0.05	-0.082**	0.025
	[0.095]	[0.024]	[0.039]	[0.041]	[0.067]
Roman Catholic	0.841***	0.033	0.037	0.069	-0.07
	[0.071]	[0.027]	[0.039]	[0.052]	[0.047]
Methodist	0.105	0.054	0.065	-0.032	-0.147
	[0.087]	[0.037]	[0.069]	[0.094]	[0.095]
Muslim	0.369	0.218***	0.477***	0.257	-0.032
	[0.227]	[0.064]	[0.096]	[0.164]	[0.171]
Hindu	-8.425***	0.047	0.410***	0.081	0.331*
	[0.141]	[0.074]	[0.110]	[0.090]	[0.179]
Jewish	0.611	-0.015	0.401***	0.567***	0.214
	[0.438]	[0.111]	[0.139]	[0.181]	[0.266]
Other non-Christian	-0.295	0.027	0.133	0.18	0.158*
	[0.564]	[0.069]	[0.153]	[0.117]	[0.091]
Observations	3981	33282	15361	6394	6326
Pseudo R-squared	0.07	0.03	0.01	0.07	0.03

Notes: Ordered probit regressions. All regressions include year and regional fixed effects and full set of controls included in Table 4.2. Robust standard errors clustered at the postcode district level are reported in brackets. The dependent variables of columns (4) and (5) are coded such that a higher number represents a more favorable view of private education. For details of dependent variables, see text and data appendix.

Table 4.7: Determinants of Party Identification and Interest in Politics

Dependent variable	Party identification			Interest in politics		
Sample	Baseline, Conservative or Labour supporters	Conservative supporters	Labour supporters	Baseline	Conservative supporters	Labour supporters
	(1)	(2)	(3)	(4)	(5)	(6)
Household income	0.664***	0.782***	0.514***	0.818***	0.702***	0.881***
	[0.075]	[0.093]	[0.111]	[0.071]	[0.110]	[0.109]
Respondent privately educated	0.136***	0.223***	-0.053	0.178***	0.090**	0.223***
	[0.032]	[0.040]	[0.052]	[0.027]	[0.038]	[0.052]
Child attended private school	0.072**	0.173***	-0.131***	0.124***	0.134***	0.158***
	[0.029]	[0.038]	[0.049]	[0.024]	[0.038]	[0.047]
Higher education	0.231***	0.076	0.394***	0.854***	0.668***	0.931***
	[0.035]	[0.050]	[0.051]	[0.031]	[0.056]	[0.050]
Higher education, no degree	0.170***	0.225***	0.122***	0.572***	0.442***	0.590***
	[0.028]	[0.039]	[0.038]	[0.026]	[0.046]	[0.042]
A or O level	0.111***	0.156***	0.079***	0.446***	0.344***	0.449***
	[0.022]	[0.033]	[0.030]	[0.020]	[0.036]	[0.033]
Religious	0.215***	0.312***	0.153***	0.035**	0.052	0.016
	[0.022]	[0.029]	[0.027]	[0.017]	[0.037]	[0.026]
Observations	17253	7575	9678	18724	5592	7686
Pseudo R-squared	0.05	0.06	0.04	0.07	0.04	0.06

Ordered probit regressions. All regressions include year and regional fixed effects and full set of controls included in Table 4.2. Robust standard errors clustered at the postcode district (e.g. WC2A) level are reported in brackets. Party identification is coded based on the question "*Generally speaking, do you think of yourself as a supporter of any one political party?* " (yes=*partisan*). If NO: "*Do you think of yourself as a little closer to one political party than to the others?* " (yes=*sympathizer)* . If NO: *"If there were a general election tomorrow, which political party do you think you would be most likely to support?* "(if answer=*residual identifier*). (1=Residual identifier; 2=Sympathizer; 3=Partisan). Interest in politics is coded based on the question "How much interest do you generally have in what is going on in politics?" (1=None at all; 2=Not very much; 3=Some; 4=Quite a lot; 5=A great deal). Robust standard errors clustered at the postcode district level are reported in brackets. * means significant at 10%; ** significant at 5% and *** significant at 1%.

Table 4.8: Private School Demand, Party Identification and Interest in Politics

(Dependent variable: Child attended private education?)

Heterogeneous effects by:	Party identification			Interest in politics				
	Partisan	Sympathizer	Residual identifier	A great deal	Quite a lot	Some	Not very much	None at all
	(1)			(2)				
	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)	(2d)	(2e)
Conservative	0.064***	0.036***	0.007	0.099***	0.058***	0.044***	0.036***	0.01
	[0.006]	[0.007]	[0.012]	[0.015]	[0.010]	[0.008]	[0.011]	[0.023]
Labour	-0.039***	-0.020***	-0.020**	-0.018*	-0.025***	-0.030***	-0.042***	-0.048***
	[0.005]	[0.006]	[0.008]	[0.009]	[0.007]	[0.006]	[0.007]	[0.011]
Observations		23862				18375		
Pseudo R-squared		0.21				0.2		
P-values								
Conservative		0.0001	0.0000		0.0080	0.0000	0.0000	0.0030
Labour		0.0073	0.0436		0.4670	0.2490	0.0170	0.0400

Notes: Marginal effects of probit regression. All regressions include year and regional fixed effects and full set of controls included in Table 4.2. Robust standard errors clustered at the postcode district level are reported in brackets. * means significant at 10%; ** significant at 5% and *** significant at 1%. Note that the coefficients reported in columns (1a)-(1c) all stem from one regression, as do the coefficients reported in columns (2a)-(2e). For variable definitions, see Table 7. P-values derive from F-tests of the null hypotheses that the Conservative (Labour) coefficients reported for in the given column are identical to the Conservative (Labour) coefficient reported in columns (1a) in the case of party identification and (2a) in the case of interest in politics. Thus, the P-values reported in the Conservative row show that the Conservative Partisan coefficient reported in column (1a) is different at the 1 percent level from the Conservative Sympathiser coefficient reported in column (1b) as well as from the Conservative residual identifier coefficient reported in column (1c).

Table 4.9: Robustness Checks: Additional Income, Education and Wealth Controls

(Dependent variable: Child attended private education?)

	(1)	(2)	(3)	(4)	(5)	(6)	Male (7)	Female (8)
ligious	0.021***	0.020***	0.020***	0.020***	0.020***	0.020***	0.018**	0.021***
	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]	[0.008]	[0.008]
nservative	0.035***	0.034***	0.034***	0.032***	0.031***	0.031***	0.025**	0.034***
	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.010]	[0.010]
bour	-0.035***	-0.034***	-0.034***	-0.036***	-0.035***	-0.035***	-0.043***	-0.029***
	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.010]	[0.008]
g household income	0.075***	0.066***	0.066***	0.064***	0.064***	0.063***	0.060***	0.066***
	[0.005]	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]	[0.009]	[0.008]
spondent privately	0.180***	0.174***	0.174***	0.171***	0.169***	0.170***	0.190***	0.147***
ucated	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.022]	[0.019]
gher education, incl.	0.135***	0.094***	0.093***	0.086***	0.085***	0.085***	0.072***	0.104***
eign	[0.016]	[0.015]	[0.015]	[0.014]	[0.014]	[0.014]	[0.019]	[0.023]
ional income and wealth controls								
l class of respondent								
ass I: Professional		0.078***	0.077***	0.072***	0.068**	0.068**	0.136*	0.016
		[0.028]	[0.028]	[0.027]	[0.027]	[0.027]	[0.071]	[0.032]
ass II:		0.059***	0.058***	0.054***	0.050***	0.050***	0.099*	0.023
anagerial/Technical		[0.020]	[0.019]	[0.019]	[0.019]	[0.019]	[0.051]	[0.021]
ass III: Skilled		0.01	0.01	0.008	0.005	0.005	0.037	-0.006
		[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.042]	[0.018]
ass IV: Partly Skilled		0.007	0.007	0.006	0.006	0.006	0.04	-0.004
		[0.017]	[0.017]	[0.017]	[0.017]	[0.017]	[0.052]	[0.017]
e's economic activity								
employed, permanently			-0.007			-0.009	-0.056***	0.032
k or disabled			[0.014]			[0.013]	[0.014]	[0.022]
tired			0.006			-0.001	-0.011	0.005
			[0.010]			[0.009]	[0.013]	[0.014]
oking after the home			-0.001			-0.004	-0.009	-0.015
			[0.008]			[0.008]	[0.009]	[0.038]
st in politics								
great deal				0.049**	0.047**	0.047**	0.064*	0.033
				[0.022]	[0.021]	[0.021]	[0.037]	[0.026]
ite a lot				0.033*	0.032*	0.032*	0.04	0.029
				[0.018]	[0.018]	[0.018]	[0.031]	[0.021]
ne				0.026	0.025	0.025	0.041	0.014
				[0.016]	[0.016]	[0.016]	[0.031]	[0.017]
t very much				0.016	0.015	0.015	0.035	0.002
				[0.017]	[0.017]	[0.017]	[0.033]	[0.018]
ousehold own or rent accommodation								
ns outright					0.032***	0.031***	0.049***	0.018
					[0.010]	[0.010]	[0.017]	[0.014]
ving on mortgage					0.002	0.001	0.02	-0.013
					[0.010]	[0.010]	[0.015]	[0.012]
nale	0.007	0.013**	0.012**	0.015***	0.014**	0.013**		
	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]		
ervations	10959	10959	10959	10959	10959	10959	5557	5402
udo R-squared	0.21	0.21	0.21	0.22	0.22	0.22	0.23	0.21

Marginal effects of probit regressions. All regressions include year and regional fixed effects and full set of controls included in 1.2. Robust standard errors clustered at the postcode district level are reported in brackets. * means significant at 10%; ** ant at 5% and *** significant at 1%.

Table 4.10: Robustness Checks: Neighborhood Controls and School District Fixed Effects

(Dependent variable: Child attended private education?)

	(1)	(2)	(3)
Church of England/Anglican	0.004	0.004	0.004
	[0.006]	[0.006]	[0.006]
Roman Catholic	0.049***	0.048***	0.045***
	[0.011]	[0.011]	[0.011]
Other Christian	0.012	0.012	0.012
	[0.008]	[0.008]	[0.008]
Non-Christian	0.039	0.039	0.038
	[0.026]	[0.026]	[0.027]
Jewish	0.141***	0.133***	0.140***
	[0.049]	[0.048]	[0.051]
Muslim	0.144***	0.147***	0.150***
	[0.040]	[0.041]	[0.042]
Conservative partisan	0.069***	0.067***	0.066***
	[0.008]	[0.008]	[0.008]
Conservative sympathiser/identifier	0.026***	0.027***	0.026***
	[0.009]	[0.009]	[0.008]
Labour sympathiser/identifier	-0.019***	-0.017**	-0.015**
	[0.007]	[0.007]	[0.007]
Labour partisan	-0.040***	-0.038***	-0.036***
	[0.006]	[0.006]	[0.006]
Respondent privately educated	0.191***	0.185***	0.182***
	[0.012]	[0.012]	[0.012]
Respondent controls	y	y	y
Neighborhood controls		y	y
LEA fixed effects			y
Observations	16206	16206	16206
Pseudo R-squared	0.21	0.21	0.23

Notes: Marginal effects of probit regression. All regressions include year and regional fixed effects and full set of controls included in Table 4.2. Neighborhood controls include the performance of local public schools, house prices and the percentage of the population with higher level qualifications. See text for details. Robust standard errors clustered at the postcode district level are reported in brackets.* means significant at 10%; ** significant at 5% and *** significant at 1%.

Chapter 5

Concluding Chapter

This thesis examines, theoretically and empirically, how the demand for secular and religious private education relates to the distribution of income, the quality of public education, and religion and political allegiance. In Chapter 2 I find that while private education is most prevalent in the most affluent neighborhoods, (minority) religious schools locate where the religious individuals are relatively poor. Furthermore, holding mean income levels constant, local income inequality is positively related to the demand for private schooling, but less so for religious private education. Chapter 3 suggests that a non-monotonic relationship exists between the quality of public education and the demand for private education, where the demand for private education is defined as the fraction of compulsory education that is consumed in the private sector. A key premise is that residential mobility is limited during the years in which children attend compulsory education, yet children may switch between the private and the public sectors during this period. In this context, the importance attached to the quality of local public schools by families consuming any private education will depend on the extent to which they also use state schools for some periods of time. It thus matters whether private education is viewed as a continuous or discrete choice.

Finally, Chapter 4 studies the role of religion and political allegiance for the propensity to send children to private schools. The relationship between religion and private education varies considerably across religious groups, and is strongest for non-mainstream denominations (Roman Catholic, Muslim, Hindu and Jewish). However, the greater demand for private education among Muslims, Hindus and Jews does not appear to be driven primarily by religious motives but rather by stronger preferences for education. Coupled to the findings of Chapter 2, it appears that members of minority non-Christian religious denominations are segmented into low income members who are attracted by own-religious private education, while richer members are attracted to secular private education. I also find evidence that political beliefs and allegiance affects private schooling decisions. Stating support for the Conservative party which views private education favorably is associated with a significantly higher propensity to choose private education. The converse holds for individuals who support the Labour party which takes a very critical stance towards private education. Furthermore, the association of private schooling with religion and political allegiance significantly strengthens in the intensity of religious beliefs and political allegiance, respectively

There are some limitations to the results found in this thesis. First and foremost, additional work is required to corroborate that the statistical relationships found reflect genuine causal relationships. A battery of tests and robustness checks performed in the thesis all yield results that reassuringly support the overall conclusions. Yet, the data sources used have clear limitations, and have not permitted an empirical strategy, for instance instrumental variables, which would more unambiguously identify precise causal effects. Several of the key variables used in the empirical analysis are inherently flawed. Most importantly, there is no fully adequate measure of the demand for private education at the household level. The survey data does not provide information

on the extent to which families use private education over time (exclusively or only for a short duration of time such that public sector alternatives are also used to some degree). I have argued that it matters crucially for how families locate relative to state schools that private education is viewed as a continuous choice, rather than a discrete choice, over the course of a child's compulsory education. Furthermore, pupil numbers only provide a snapshot of demand in any given year, and also don't provide information on the extent of families switching between the private and public sectors. Additionally, there is no information available on family background characteristics in the school data. Furthermore, it is not quite clear if the available pupil numbers for private schools (especially small schools) can be fully trusted across the board. Moreover, adequately measuring the quality of public education is difficult. Public school quality as determined by per pupil spending (the measure used in Chapter 2) may be indicative of underlying characteristics of pupil population (additional resources are allocated to compensate for disadvantage). High per pupil spending therefore does not necessarily correlate with schools being more attractive. Moreover, there generally appears to be a tenuous relationship between school inputs and pupil outcomes. Another key available measure, mean pupil performance (the measure used in Chapter 3), is primarily determined by underlying pupil characteristics rather than school inputs. Pupil performance on standardized tests thus does not indicate how good schools are at conferring value added, yet parents appear to value mean test scores, in part because they are indicative of good peers. Thus mean test scores are probably a better indicator of parents' perception of school quality than spending per pupil. The fact that these two measures capture different things is also highlighted by the coefficients obtained using the respective measures in Chapters 2 and 3 being of opposite signs. Finally, the survey data does not offer any information on the type of private education attended, for

instance whether boarding schools or not, the level of fees, or whether religious or not.

As regards directions for future work, it would overall appear desirable with a better and more nuanced understanding of, first, how different kinds of private schools operate and, second, what motivates parents to send their children to them (academics, school resources, peer groups, pedagogical approach, religious instruction etc.), and what factors amenable to public policy interventions may sway their choices. At the school level, it would be very useful with additional data on fees, pupil characteristics, admission practices (in terms of academics and religious credentials) and religious practices. Previous literature has focused a great deal of finding appropriate instrumental variable approaches, regression discontinuity designs or - if possible - using natural or controlled experiments to pin down causal effects. However, fully convincing instruments or discontinuities are very hard to find, and relying on experimental data alone would greatly reduce the contexts and topics that can be studied. Yet it seems that less ambitious endeavors are nonetheless worthwhile, given the wealth of data that is increasingly (potentially) available, and that our knowledge of rather basic properties of private education remains limited. It particularly seems relevant to study more carefully the heterogeneity among different types of private education, and how this heterogeneity matters for private education affect the state sector in different regards. For instance, it would be interesting to look into how elite private schools differ from other types of private schools, perhaps differentiating by school fees, or mean household income levels of the enrolled pupils. In this context, it appears important to understand the wider impact of peer effects. How are state schools affected if the pupils from the most affluent families opt out and choose private education instead? Are there heterogeneous effects by the characteristics of these pupils? Does it matter if these pupils spend some years in state schools,

rather than being exclusively privately educated? How is the availability of good teachers affected? To what extent is support for public education affected by whether households consume private education, and whether they do so exclusively, or only in part? It also appears of interest to gain a better understanding of the differences between secular and (truly) religious private education, as well as the heterogeneity *within* the religious sector. There may, for instance, be great differences in the impact on academic achievement of attending, and in the types of households attracted to, moderately religious as opposed to fervently religious schools etc. If such differences exist, it would be of great interest to gain a greater understanding of *how* religious aspects of school instruction affects educational outcomes. Another topic which apears pertinent to explore further is *why* members of religious and ethnic minorities appear to be drawn to private education to a greater extent than members of the white, Christian majority, other things constant. Is it simply that they value education more in general, or is it because the payoff to (private) education is greater for them, because they are otherwise generally subject to discrimination and stigma, and/or less well served by the public sector?

The policy implications that may be drawn depend crucially on whether private education is, on the whole, considered desirable or not in terms of overall pupil performance, distributional concerns and social segregation, which is not the subject of this thesis. It also depends on whether different types of private education, or ways of consuming private education (exclusively, or merely for a limited duration of children's compulsory education), are considered more or less desirable from a societal perspective. However, at the very least the results of this thesis make clear that policies aiming at increasing the role of non-public educational alternatives, for example subsidies to private schools or school vouchers, must take into account differences among different types of private schools, and different motives for and different ways of consuming

private education.

In conclusion, in spite of the difficult challenges in terms of identifying precise and unambiguous causal effects, private education remains an important and highly topical issue which deserves further study, including the collection of superior data.

Chapter 6

Data Appendix

All variables are aggregated at the level of the postcode district, except per pupil spending. Postcode districts on average contain almost 95,000 inhabitants (with a substantial amount of variability: standard deviation of 81,500) and are taken to approximate local school markets.

6.1 School Data

6.1.1 Edubase Files

Every year since 2003, a file covering (normally) time-invariant data on all schools in England, including those which have closed in the past 15 years, is published. This contains information on, among other things:

- type (private or public - with various subcategories of state schools. Special schools are dropped)
- religious denomination
- opening and closing dates
- gender

- admission procedures
- address

6.1.2 ASC Files and Performance Tables

For the period 1993-2005, year-on-year school level information for both public and private schools is provided on

- Pupil numbers
- Performance on standardised tests
- Percentage of pupils eligible for free school meals
- Percentage of pupils with special educational needs (with and without statements)

6.1.3 Spending per Pupil

In addition, the Department for Education and Skills have provided separate files with information on spending at the Local Education Authority (equivalent of school district) level data from 1995-2003. This is a higher level of aggregation than that of the postcode district, and is as such a less precise indication of localised conditions than the other variables.

6.1.4 Constructing School Counts

I construct counts of, on the one hand, all private schools, and, on the other hand Muslim and Jewish private schools at the postcode district level. I only include those schools which have positive pupil numbers in 2005. Since there is a substantial amount of turnover of schools, and the degree of turnover

may vary across areas, looking only at schools that still exist appears a better measure of net entry.

6.1.5 Identification of Religious Schools

Differentiating public from private schools is unproblematic. However, properly identifying religious schools is a little more tricky. Data on religious denomination has improved substantially with the release of 2004 Edubase data in 2005, with a few further improvements to the 2005 data release. However, there remain a substantial number of schools in the data for which the correct denomination does not appear to have been assigned (this applies in particular to schools that are no longer open). For Muslim and Jewish schools, I have supplemented the schools identified as such with about 30 percent additional schools based on cross-checking with Muslim and Jewish websites and searching for 86 and 67 uniquely Muslim and Jewish name components (see below), respectively in school names in 17 separate data files covering the period 1993-2005. This leaves me with a large degree of confidence that I have identified and matched up virtually all Muslim and Jewish schools that have existed since 1993. To identify additional Muslim and Jewish schools, I searched for whether the following words entered the names of schools:

- **Muslim:** Al-Islamia, Arabic, Arabiya, Islam, Islameah, Islamia, Islamic, Islamiyah, Muslim, Abu, Afifah, Al, Al-Ansaar, Al-Aqsa, Al-Asr, Al-Bilal, Al-Burhan, Al-Furqan, Al-Hijrah, Al-Hira, Al-Muntada, Al-Noor, An-Nur, Arqam, Azhar, Bakr, Darul, Darul, Dawatul, Farooq, Furqan, Ghausia, Hanifah, Huda, Hudaa, Imam, Imaam, Imaan, Jamahiriy, Jamea, Jameah, Jameah, Jamia, Jamiah, Jamiatul, Jamiatul, Jamiatul-Ilm, Jaamiatul, Karam, Karam, Kassim, Kauthar, Madaniyah, Madni, Madrasah, Madrasatul, Madrassa, Markazul, Mazahirul, Muham-

mad, Mumin, Qurania, Quwwatt, Rabia, Rabia, Rawdhatul, Salafi, Shaksiyah, Shifa, Suffah, Taqwa, Tarbiyah, Tawhid, Tawhid, Tayyibah, Uloom, Ummah, Ummah, Zakaria, Zakariya

- **Jewish:** Aharon, Akiva, Avigdor, Beis, Bnois, Bnos, Bobov, Brodetsky, Chaim, Chinuch, Clore, Etz, Hadass, Hamedrash, Hasmonean, Hatorah, , Kerem, Lebonos, Liyeshivah, Lubavitch, Machzikei, Malka, Meirim, Menorah, Mesifta, Mesivta, Moriah, Moshe, Naima, Noam, Norim, Oholei, Pardes, Rochel, Schlomoh, Sinai, Sobell, Solomon, Soroh, Talmud, Talmudical, Tashbar, Tiferes, Torah, Trana, Vodaas, Yeshivah, Yesodey, Yetev, Yisroel, Yitzchok, Yosef, Yaakov, Zichron and Talmud-, Yetev-.

In this way, a total of 42 additional Muslim and Jewish schools were thus identified on top of those designated as such in the official statistics. This mainly affects schools that are now closed and reflects that accurate descriptions of religious affiliation were only made in the past few years.

6.2 Income and Census Data

The employed income data comes from the New Earnings Survey (NES) which is a one percent sample of the working population. Home postcodes are provided for the years 2000 onwards. On average there are 110 income observations per postcode district (standard deviation 68). The minimum is 10 observations - all postcode districts with less than that have been dropped. From the raw data, I have constructed measures of mean income and a variety of measures of income dispersion: the relative mean deviation, coefficient of variation, standard deviation of logs, the Gini coefficient and the ratio of 75^{th} and 25^{th} income percentiles. I focus on the Gini coefficient in the empirical analysis. In addition, to check robustness, I have used data from CACI (a private firm based on questionnaires coupled with Census data) and house price data from Nationwide.

The Census data stems from the 2001 census which includes a range of socioeconomic and ethnicity information. I focus on general population characteristics in terms of qualifications and labour market attachment, overall as well as split up according to religion (Muslim and Jewish).

6.3 British Social Attitudes Survey Data

6.3.1 Years of Data Included

The Survery data covers the years 1986-2002. During this period, the years 1988, 1992 and 1997 are excluded. The survey was not carried out in 1988 and 1992, and no private education question was included in 1997. Furthermore, although the private education variable is present, I drop the years 1983-1986 because of inconsistencies in the way the private education question was defined relative to the later period, and 2003-05 because the geographical information

is much less precise than in other years.

6.3.2 Sample Construction (Chapter 3)

I extract all respondents living in England with school aged or older children (aged 5+) who provide a yes/no answer to whether they have ever sent a child to private school. Out of the resulting 21,398 observations, I drop 11.3 percent of observations for which no household income information provided, reducing the sample to 18,989. Out of this sample, I have been able to geographically match 92.2 percent of observations by the available geographic variables in any given year to the postcode data base with geographic coordinates[1]. 0.9 percent of observations in this sample are in turn dropped because no state schools are located with 15 kilometers of the estimated household location, as are a further 6.7 percent because other covariates are missing or inconsistently coded or due to collinearity. This yields a base sample of 16,206 observations.

6.3.3 Geographical Matching of Survey data (Chapter 3)

The geographical units present in various years of the BSAS data include wards (names or codes), local authorities (names or codes), postcode districts, postcode sectors and parliamentary constituencies. For details, see further Data Appendix Table A2-A3.

Using a variety of intermediate steps and geographic matching files, I am able match the geographical units available in each year to the National Sta-

[1]This has involved a great deal of inferring information based on different kinds of information, correcting mistakes or names or codes than have changed over time. In some instances, it has involved guessing. For example: ward and postcode district can be matched to the data base, but not parliamentary constituency. A set of postcodes that belong to any given combination of ward and postcode district, may distributed on two or three parliamentary constituencies. In such cases of ambiguity, I have picked the option with the greatest number of address counts.

tistics Postcode Directory (NSPD) database which assigns 1.4 million English postcodes to the different relevant geographical units. Each postcode very precisely captures geographic location, containing on average 17.8 postal address points (standard deviation of 14.7). Each year of survey data provides two to three pieces of information on partly overlapping different geographical units. Combining the available pieces of geographical information and matching them to the postcode directory allows me to identify the postcodes belonging to the intersection of these geographical units. On this basis I derive three separate pieces of geographical information for each observation in the data: *(i) Estimated geographical coordinates.* Using the described method, I am able to narrow down the residential location of all respondents in the base sample to an average of 4,200 possible address points covering on average roughly 35,000 inhabitants[2]. All postcodes are uniquely identified by a set of geographical coordinates (easting and northing) which describe their geographical location. To estimate the geographic coordinates of households' residential location as precisely as possible, I take the average value, weighted by number of address points, of the geographic coordinates of the postcodes that lie in the intersection of the different geographical units provided for each household in each survey year[3]; *(ii) Postcode districts.* Information about the postcode district in which respondents reside can be directly inferred from the BSAS survey for all observations in the period 1993-2002[4] and can be obtained indirectly via

[2]Due to the availability of different geographical information, precision in terms of average address points pr geographical unit is greater in some survey years than others, ranging from 2,558 in 2001 to 13, 818 in 1999. See further Data Appendix Table A2.

[3]For instance, a postcode district covers on average 10,688 (sd: 7,359) address points. Each postcode district contains on average 2.1 (sd: 1.1) parliamentary constituencies. Hence the combination of postcode district and parliamentary constituency increases precision by more than half (each combination containing average of 4,893 (sd: 5,971) address points). Adding information on ward codes further reduces the average number of address points contained in each combination to 1,379 (sd: 1,599).

[4]In 1993-1995 postcode sector information is provided. The postcode district is defined by the first half of the complete postcode. Examples include G2, SP5, PA15 and WC2A. Postcode sectors are further defined by the number in the second part of the postcode, such as WC2A 2.

the above procedure for the survey years prior to 1993[5]. There are a total of 2321 postcode districts in England, containing on average 90.000 inhabitants[6], of which 1110 are represented in the baseline sample. Postcode districts information is of interest as this allows geographical matching all to the other data sources on neighborhood characteristics used for this paper; *(iii) School districts (Local Education Authorities or LEAs):* LEA information is not provided in the Survey data, but may be obtained with the above matching procedure to the NSPD database. There are a total of 150 LEAs in England[7] which each cover on average roughly 200 schools. I use LEA information to include LEA fixed effects in the empirical analysis[8].

6.3.4 Aggregating Survey and School Level Data at the Postcode District Level (Chapter 3)

There are on average only 15.1 observations per postcode district for the entire time 14 years of survey data (covering the period 1986-2002), and on average each postcode district only appears in the survey 1.8 times in total over that 14 year period[9]. Since there are so few observations per year and there is no strong time trend in private school demand over the period considered, as shown in Figure 3.2, I disregard the time variation and aggregate the private school

[5]In some cases a set of postcodes that belong to a given combination of other geographical units are spread over more than one postcode district. In such cases of ambiguity, I select the option with the greatest number of address points. The possible error deriving from this procedures is thus maximally that a contiguous postcode district is erroneously selected.

[6]The former figure is derived from the National Statistics Postcode Directory while the latter is based on Census 2001 data.

[7]12 LEAs are dropped from the baseline sample due to lack of variation in the dependent variable in the survey data.

[8]For further details on the geographical information provided in the BSAS survey and how this is matched to other data sources to produce estimates of household location, see Appendix Tables 6.1-6.3 and online Appendix.

[9]There are in total 2321 postcode districts in England of which 1110 are represented in the BSAS base sample.

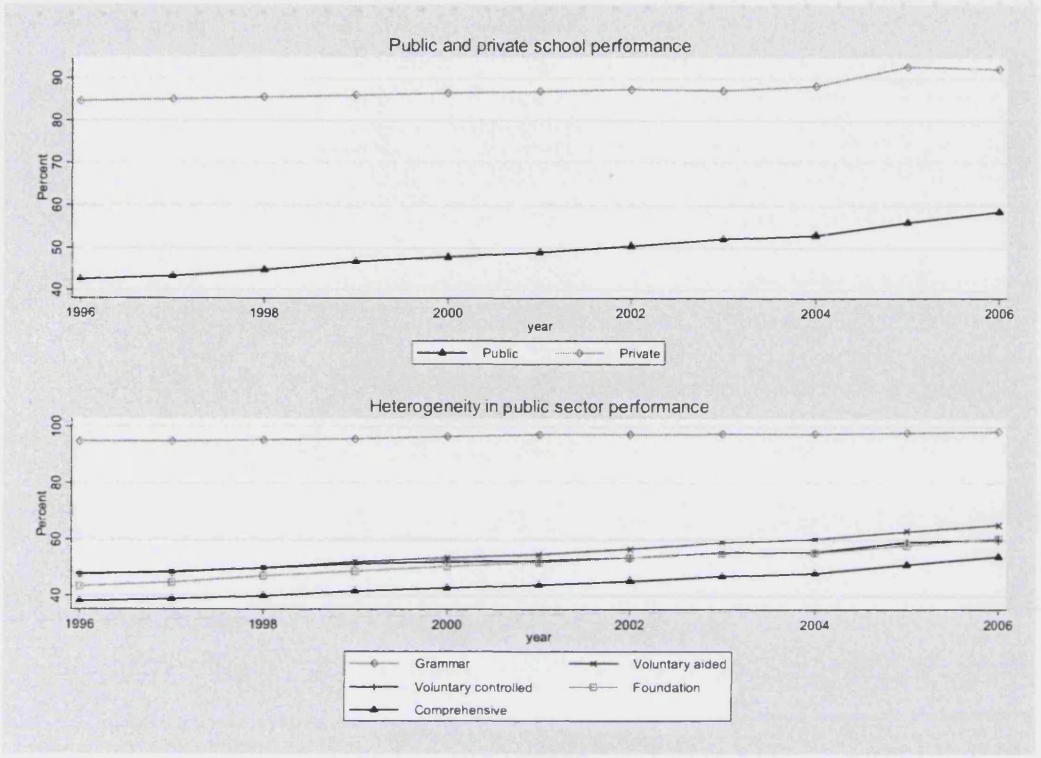
variable over all the years included in the survey at the postcode district level[10]. However, there is a marked upward time trend in school performance over the period considered with average state school performance increasing almost 40 percent between 1996-2006 (see Appendix Figure 6.1) – a growth that is generally attributed to grade inflation. Averaging the average performance of the 5 closest schools (the benchmark measure of local state school quality) over time in an unbalanced panel is more problematic. Instead, I match all the estimated respondent locations appearing in the survey over the 1986-2002 time period to the 1993-2002 average performance of the 5 closest schools[11]. I then calculate the mean of this variable at the postcode district level. Next, with the 11 years of pupil population data ranging from 1996-2006, I construct yearly data at the postcode district level on private school enrollment and state school performance.

[10]In any case, we do not have information on private school demand in any given year since we do not know which year respondents have sent their children to private school. On average 142 postcode districts are represented in any given year, whereas 1110 postcode district in total are covered in the 1986-2002 data used in the baseline regressions. To the extent that there were large fluctuations in private school demand over time, aggregating over time could therefore potentially lead to private school demand being recorded as such as artificially high (low) in postcode districts included in years where private school was higher (lower) than average. However, this concern is alleviated by the absence of a strong time trend.

[11]This approach may be problematic to the extent that public schools open and close over this period, leading to certain years possibly carrying undue weight in some cases. An alternative approach is to just use one year of data to avoid such concerns. Results are virtually identical either way.

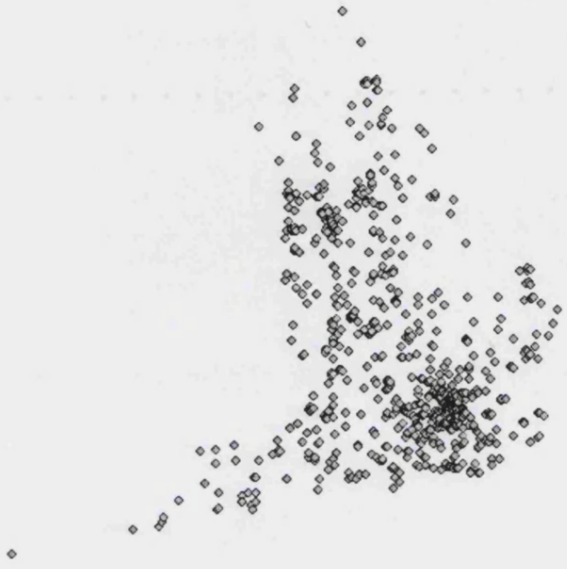
DATA APPENDIX

Figure 5.1: Pupil Performance in Public and Private Sectors



Notes: Performance is measures as average school-level percentage of pupils achieving 5 or more A*-C grades on GCSE exams, weighted by 15-year old pupil enrollment. Source: Department for Education and Skills.

Figure 5.2: Geographical Dispersion of Secondary Private Schools in England



1993

2006

Note: All private schools with GCSE performance data.
Source: Secondary school performance tables 1993 and 1996 and Edubase 2006.

Figure 5.3: Correlation of Public School Performance and Private School Enrollment

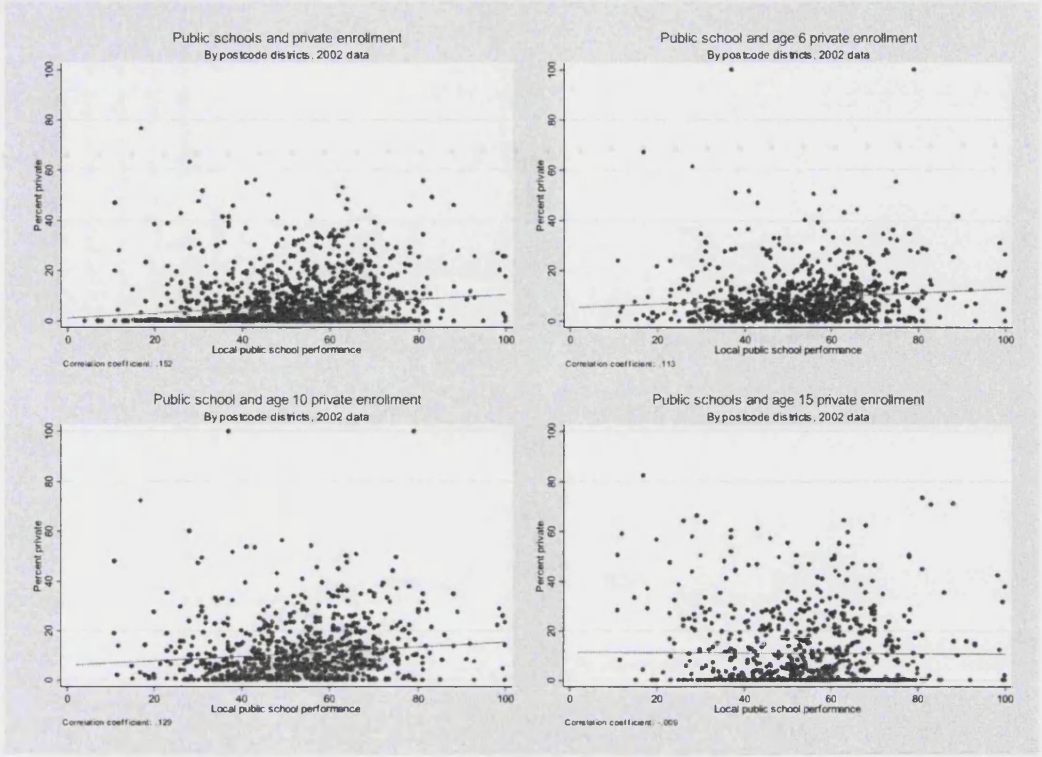


Figure 5.4: Correlation of Public School Performance and Neighborhood Characteristics

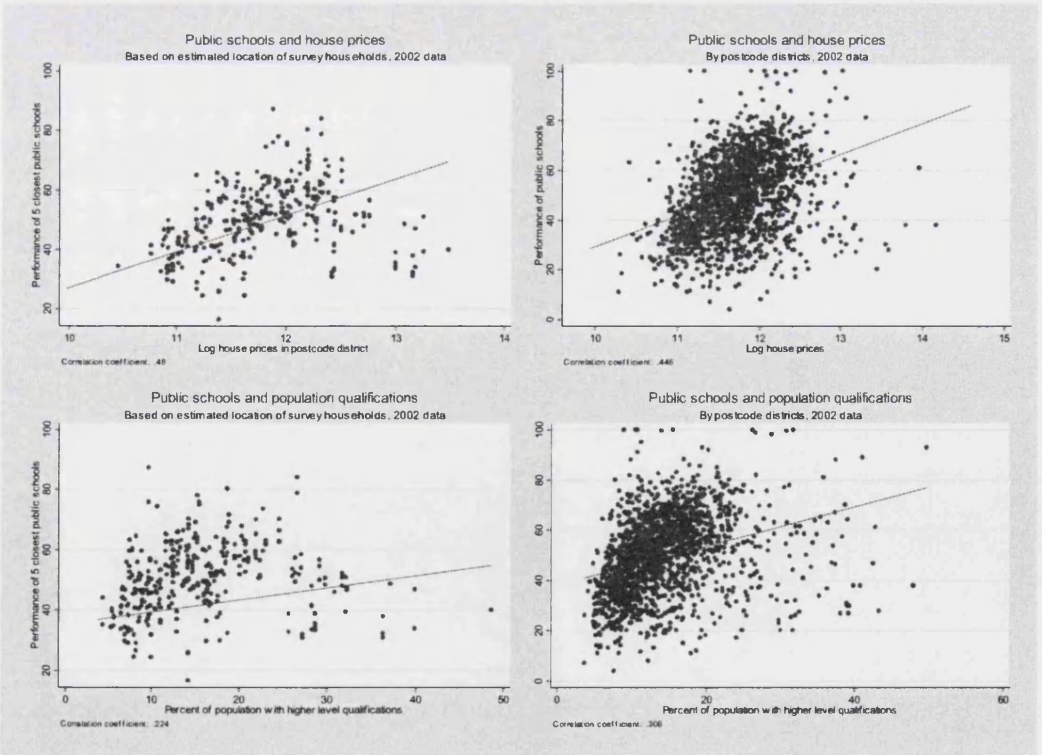


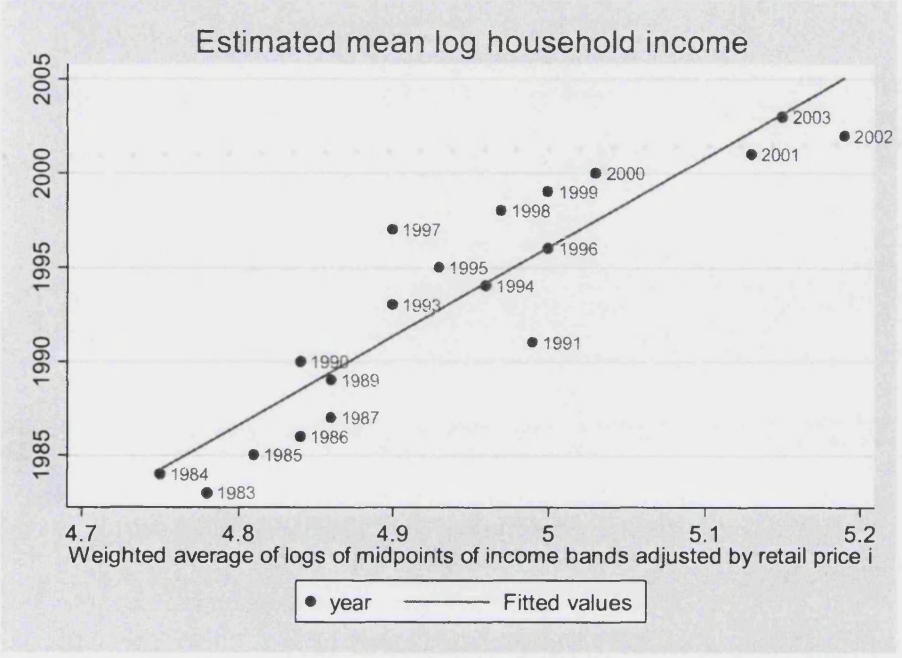
Figure 5.5: Geographical Dispersion of BSA Survey Households and Schools

Estimated geographic coordinates for all BSA years 1983-2002.

State schools 1993

State schools 2001

Figure 5.6: Construction of BSAS Household Income Variable



Note: Average is weighted by number of observations in each income band.

Examples of survey income bands and responses

	1986	Pct		2002	Pct
1	< 2000 p	0.4	1	< than 3999	2.2
2	2000-299	2.5	2	4000-5999	9.1
3	3000-399	3.7	3	6000-7999	8
4	4000-499	5	4	8000-9999	6.5
5	5000-599	4.8	5	10000-11999	5.9
6	6000-699	5.8	6	12000-14999	6.6
7	7000-799	5.9	7	15000-17999	5.3
8	8000-999	12.6	8	18000-19999	4.5
9	10000-11	11.6	9	20000-22999	3.5
10	12000-14	10.7	10	23000-25999	4.8
11	15000-17	9.2	11	26000-28999	4.5
12	18000-19	5.4	12	29000-31999	4
13	20000+ p	11.9	13	32000-37999	5.7
98	don't know	6.5	14	38000-43999	4.5
99	na	4	15	44000-49999	3.2
			16	50000-55999	2.6
			17	56000 or more	8.6
			97	refused information	6
			98	don't know	4.5

Table 5.1: Sample Size and Geographical Variables per Year for Base Sample

										In BSAS sample		In NSPD database		Pct matched	
	Observa		Postcode	Parl.	Ward		Local authority		Areas	address points		address points			
Year	tions	LEAs	districts	constit.	Code	Name	Code	Name	matched	mean	median	mean	median	Areas	Obs.
1986	834	80	116**	*		*			129	4,224.2	3,562	2,558	2,038	92.2	92.1
1987	771	80	118**	*		*			129	4,072.4	3,450	2,558	2,038	93	92.2
1989	798	75	112**	*		*			130	3,998.0	3,207	2,558	2,038	90.8	91.2
1990	1111	85	137**	*		*			152	4,224.9	3,686	2,558	2,038	96.7	97.3
1991	1216	91	142**	*		*			151	4,190.6	3,488	2,558	2,038	96	100
1993	831	81	127					*	171	3,690.4	3,797	2,153	1,973	98.8	99
1994	1405	97	155	151			x		204	2,864.9	2,980			99.5	99.3
1995	1563	80	151	136			**		214	3,067.8	3,309			90.2	95.2
1996	1509	79	142	128	298***				393	3,252.4	2,808	1,379	776	96.7	97.7
1998	1334	76	127	128	255***				390	3,086.1	2,725	1,379	776	82.3	86.9
1999	1438	84	146				121		181	13,818.0	12,423	5,775	2,782	91.2	91.5
2000	1547	83	151	152	293				375	3,458.8	2,917	1,379	776	89.9	90.9
2001	1382	88	154**	152	288				418	2,558.1	2,351	1,379	776	83	82.1
2002	1702	105	164	181	389				446	2,650.5	2,404	1,379	776	100	100
Avg.	1197.5	83.3	135.5	146.9	306.3	298.0	121.0	121.0							
Not used															
1983				*		*			97	4317	4116			77.3	77.1
1984				*		*			97	4540	4177.5			82.5	80.9
1985	522	65	91**	*		*			98	3,894.4	3,477	2,558	2,038	95.9	96.2
2003					x			x							
2004					x			x							
2005					x			x							

x Available, but I have not included variables in final data file and will update this.

* Information not in BSAS data, but names provided in technical appendix (scanned pdf documents) and can be typed in manually. These names can be matched to codes using intermediate files. I will update overview to include info for these years.

** Inferred using other information (1985-1991: roughly A72001 postcode district is available, but it is entirely wrong as postcodes districts indicated to not exist in the regions observations belong to)

*** Codes are not entirely correct, can mostly infer correct information

Table 5.2: Different Geographical Variables Available in Each Year

	postcode		Parl.	Local		address points		
	district	sector	constit.	authority	Ward	mean	median	SD
1996-98; 2000-02	x		x		x	1.379	776	1,599
1983-91			x		x	2.558	2038	
1994-95		x	x	x				
1993		x		x		2.153	1973	
1999	x			x		5.775	2782	
2003-05			x	x		30.551	34162	
					x	2.649	2119	
		x				9.322	8350	
	x					10.688	9697	

Notes:
Examples of:
Postcode disctricts: B2, SP5, PE10 and WC2A
Postcode sectors: B2 4, SP5 5, PE10 0, WC2A 2

Ward codes, for example 26UGFA, are subject to ongoing change. New sets of codes are provided for 1991, 1998 and 2005 in the NSPD database. However, ward codes from, say, 1996 will match some 1991 and some 1998 codes. There are also ward names which can be found in the BSAS data technical appendices (to type in) 1983-1990 which are relative stable over time and for which a matching file exists to 1995 ward codes. There are some further complications due to errors/inconsistencies in ward codes in the BSAS data as detailed in the web Appendix.

year	const	pcd	pcs	ward	wa	co	lacode	locauth
1983-1991								
1993			sector					
1994	censparl		sector					censusdc
1995	censparl		sector				locauth	
1996	censparl	sector			ward			censuscc
1998	pano	postcode						
1999		postcode					lacode	
2000	concode	postcode		ward			lacode	
2001	conname	postcode		ward			lacode	
2002	conname	postcode		ward			lacode	
2003	concode						lacode	
2004	conname1						lacode	
2005	conname1						lacode	

rename geographic variables to consistent names

vars
const wardname
pcs locauth
pcs const locauth
pcs const locauth
pcd wardname const
pcd const wa
pcd lacode
pcd const ward
ward const pcd
ward const pcd
const lacode
const lacode
const lacode

key variables to merge to postcode data (NSPD)

Variables typed in from technical appendix

For early years, no geographical information is available in the actual BSAS data, only a numbering of the different geographical areas (spoint) for which the names of the parliamentary constituency and ward can be found in the technical appendices. However, many parliamentary constituencies have changed names and boundaries in the intervening years.

year	vars0	vars1	vars2	vars3	vars4	step1	step2	step3	step4	merge_data1	merge_data2	merge_data3	merge_data4
1993													
1994													
1995	pcs cons	pcs locat	pcs locat	pcs	locauth c	drop con	drop con	drop con	drop const	const_lacode_pcs_1	const_laco	const_laco	const_lacodc_pcs_199
1996	pcd ward	pcd ward	pcd ward	pcd ward	pcd ward	drop con	drop con	replace c	drop const	const_wardname_pc	const_war	const_war	const_wardname_pcd_
1998	co wa pc	co wa pc	co wa pc	co wa pc	co wa pcd		drop con	replace c	drop const	const_ward_pcd_20	const_war	const_war	const_ward_pcd_2000
1999		pcd lacode											
2000		pcd const wa											
2001		ward cor	ward	pcd const ward									
2002		pcd ward const											
2003		const lac	const2 lacode							C:\data\const_lacod	C:\data\cor	C:\data\cor	C:\data\const_lacode_0
2004	const lac	const2 lacode							C:\data\co	C:\data\const_lacod	C:\data\cor	C:\data\const_lacode_05a.dta	
2005	const lac	const2 lacode							C:\data\co	C:\data\const_lacod	C:\data\cor	C:\data\const_lacode_05a.dta	

Table 5.4: Religion and Ethnicity in BSA Survey Data

Panel A

	Black	Indian	Pakistani or Bangladeshi	Chinese or other Asian	White	Total pct	N
Church of England	16.6	1.8	0.6	3.1	36.3	34.9	14348
Other Christian	34.2	2.6	0.6	6.2	8.9	9.3	3826
Roman Catholic	11.6	5.5	0	12.5	9.4	9.3	3828
Methodist	5.2	0	0.3	1.4	2.9	2.9	1193
Muslim	6	9.3	95.1	21.5	0.2	1.3	553
Hindu	0.1	46.4	0.3	5.5	0	0.7	277
Jewish	0.1	0.5	0	0.7	0.6	0.6	231
Other non-Christian	1.1	22.6	0.3	12.1	0.5	0.9	356
No religion	25.2	11.3	2.7	37	41.2	40.1	16507
Total pct	2.3	1.3	0.8	0.7	94.9	100	
N	941	549	329	289	39011		41119

Panel B

	Black	Indian	Pakistani or Bangladeshi	Chinese or other Asian	White	Total pct	N
Church of England	1.1	0.1	0	0.1	98.8	34.9	14348
Other Christian	8.4	0.4	0.1	0.5	90.7	9.3	3826
Roman Catholic	2.8	0.8	0	0.9	95.4	9.3	3828
Methodist	4.1	0	0.1	0.3	95.5	2.9	1193
Muslim	10.1	9.2	56.6	11.2	12.8	1.3	553
Hindu	0.4	92.1	0.4	5.8	1.4	0.7	277
Jewish	0.4	1.3	0	0.9	97.4	0.6	231
Other non-Christian	2.8	34.8	0.3	9.8	52.2	0.9	356
No religion	1.4	0.4	0.1	0.6	97.5	40.1	16507
Total pct	2.3	1.3	0.8	0.7	94.9	100	
N	941	549	329	289	39011		41119

Note: BSA Survey data 1986-2005. Panel A reports the percentage of each ethnic group that belong to the different religious denominations, whereas Panel B shows the percentage of each religious denomination that is made up of the different ethnic groups. Thus Panel A shows that 16.6 percent of Blacks belong to the Church of England as opposed to 36.3 percent of Whiltes. Conversely Panel B shows that 98.8 percent of Church of England adherents are White and only 1.1 percent are Black.

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