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What parents want: school preferences and school choice

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Abstract. Parental demand for academic performance is a key element in the view that strengthening school choice will drive up school performance. In this paper we analyse what parents look for in choosing schools. We assemble a unique dataset combining survey information on parents choices plus a rich set of socio-economic characteristics; administrative data on school characteristics, admissions criteria and allocation rules; and spatial data attached to a pupil census to define the de facto set of schools available to each family in the survey. To achieve identification, we focus on cities where the school place allocation system is truth-revealing (equal preferences). We take great care in trying to capture the set of schools that each family could realistically choose from. We also look at a large subset of parents who continued living in the same house as before the child was born, to avoid endogenous house/school moves. We then model the choices made in terms of the characteristics of schools and families and the distances involved. School characteristics include measures of academic performance, school socio-economic and ethnic composition, and its faith school status. Initial results showed strong differences in the set of choices available to parents in different socio-economic positions. Our central analysis uses multinomial logistic regression to show that families do indeed value academic performance in schools. They also value school composition preferring schools with low fractions of children from poor families. We compute trade-offs between these characteristics as well as between these and distance travelled. We are able to compare these trade-offs for different families. Our results suggest that preferences do not vary greatly between different socio-economic groups once constraints are fully accounted for.

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1. Introduction

Strong parental demand for academic performance is a key element in the view that strengthening school choice will drive up school performance. Since school choice is a widely endorsed school improvement policy, this assumption is an important policy issue too, and the academic and policy debates on “school choice” are both controversial and unresolved. In this paper, we contribute to this debate by offering new evidence on the nature and heterogeneity of school preferences. We address two key questions. First, what characteristics are families actually looking for in a school? Is the school’s academic attainment record important, or do other factors out-weigh it? Second, do preferences differ between families in important ways, for example by socio-economic status? The former question is important for the idea that strengthening choice will raise standards. The latter question is potentially part of the answer to an important fact about schooling in England. In England, children from poor families are much more likely to go to academically low-scoring schools¹. This allocation could arise through differences in preferences or in constraints. It is sometimes argued that poorer families care most about proximity of home to school, whilst middle class families care most about school quality². If so, this might be a substantial contributing factor to the quality differential. The difficulty of disentangling constraints from preferences makes this a difficult question to address, however.

In this paper we assemble a unique dataset that allows us to address these questions. We use survey information on parents’ school choices plus a rich set of socio-economic and neighbourhood characteristics. We have administrative data on school characteristics, admissions criteria and allocation rules. Finally, and crucially for identification, we have the national pupil census, with embedded spatial information which allows us to model *de facto* catchment areas around schools. The model set-up involves parents nominating a school as their first choice on the appropriate form. The ingredients of this process are: a set of schools that the parents choose from; information on the characteristics of those schools; parents’ preferences over those characteristics; and an allocation mechanism that maps from the parents’ nomination to actual school attended. There are two central identification challenges

¹ See Burgess and Briggs (2009).

² Hastings et al (2005); Hastings et al (2006). Also see our companion paper Burgess et al (2009) with descriptive evidence of the difference in stated preferences from high and low socio-economic status parents.

in this: defining the *de facto* set of schools that a family can actually choose from; and determining how the school nominated by the family relates to their true preferences as a function of the allocation mechanism. These two inter-relate in that getting the first right is helpful in addressing the second. The first question is a major data exercise and is dealt with in detail in the Data section. Combining the pupil census and the spatial information, we define for each child in the survey dataset a minimal set of schools for which they have almost-sure access. The second issue relies on the mechanism design literature that has analysed agents' optimal responses to assignment mechanisms. Parents' nominations for school choice will be affected by the admission criteria (or the mechanism design) used by schools. At the relevant date for our survey, about two-thirds of Local Authorities in England used a mechanism likely to elicit truthful preferences among almost-sure schools (Coldron et al, 2006). We implement a conditional logit model to estimate families' revealed preferences. Given these empirical feasible choice sets, the truth-revealing assignment mechanism and the widespread availability of school information in England, we make inferences about parental preferences from the observed choice of school.

Our results show that the three main factors that families care about are academic attainment, school socio-economic composition and travel distance. We estimate average trade-offs between these to be as follows: for a school that is about 400m further away³, families would on average need an increase of 11 percentage points in the academic attainment measure to be indifferent, about 1 standard deviation. Similarly, again for a school about 400m further away, families would be indifferent to nominating that school if its fraction of poor students was 7 percentage points lower, about half a standard deviation. We can also compute the preference trade-off directly between academic attainment and school composition. A 1 percentage point increase in the proportion of poor students at a school is off-set by a 1.722 percentage point increase in the attainment measure. So a school with a high intake of poor children can still be attractive to parents if it performs very well academically. Given that on average poor children tend to under-perform relative to their better-off peers, however, the school's educational quality has to be considerably higher to more than offset this initial detriment.

Turning to the second question, our econometric model produces potentially different trade-off values for each respondent, and indeed we would not expect families to have exactly the

³ This is about two-thirds of the mean distance between home to nearest primary school in England.

same preferences. We show that the distribution of trade-off values mostly overlap for the highest socio-economic quintile and the lowest, however. That is, we find no evidence of importantly different preferences among rich and poor. This suggests that inequality in access to good schools is primarily due to constraints.

These results add to the live academic debate around school choice. Recent reviews of the evidence include Howell and Peterson (2002), Hoxby (2003a) and Ladd (2003). Whilst there has been a great deal of work on the impact of school choice, investigating preferences directly is less common. Closest to this paper, Hastings, Kane and Staiger (2005) estimate a mixed-logit demand model for schools using school choice data from North Carolina. They find that parents value proximity highly and that the preference attached to a school's mean test score increases with student's income and own academic ability. Hastings et al use their model to estimate the elasticity of demand for each school with respect to mean test scores in the school. They find that demand at high-performing schools is more responsive to increases in mean test scores than demand at low performing schools. Jacob and Lefgren (2007) analyse families' revealed preference for teachers within schools by looking at transfer requests made to the school. They find that for those in low-income schools where academic inputs are presumably scarce, motivated parents choose teachers based on their perceived ability to improve academic achievement. In contrast, in higher-income schools "parents seem to respond to the relative abundance of academic inputs by seeking out teachers who also increase student satisfaction". Rothstein (2006) adopts a more indirect approach to evaluate the relative weight parents place on school effectiveness and peer group attributes. He finds little evidence that parents focus strongly on school effectiveness. Other authors have focussed on the availability or intelligibility of the information given to parents, which may influence the choices of parents from different social groups (Hastings, Weeldon, Weinstein (2007); Ball, Bowe and Gewitz (1996)). A number of educational and sociological studies have explored the process of parental choice in detail, often focusing on parents' stated preferences for schools (see our companion paper, Burgess et al (2009)).

In the next section we present our modelling framework and describe the systems by which children are allocated to schools in England. We also set out the econometric model we adopt. Section 3 details the data, focussing in particular on the definition and estimation of the feasible choice sets. Section 4 presents the results, first describing the properties of these choice sets, then the central preference model, robustness checks and the interpretation of the

results. Finally, we offer some conclusions for school choice and for educational inequality in section 5.

2. Model

We set out the broad economic approach, the identification issue and our econometric model.

a. Economic model

Our variable of interest is the school that parents nominate as their first choice on the appropriate application form. This nomination process involves: a set of schools that the parents choose from; information on the characteristics of those schools; parents' preferences over those characteristics; and an allocation mechanism that maps from the parents' nomination to actual school attended. Our approach is to make assumptions about the information parents have; to precisely and carefully define the set of schools that parents can choose from, and then given that and the known allocation mechanism, to make inferences about parents' preferences from the choice of school we observe. We will discuss these assumptions in turn.

We assume that parents prefer the school that maximises their utility. We follow an additive random utility framework in which we assume the classical model of the rational, utility maximising consumer (McFadden, 1977). The parent faces a choice of schools indexed $s = 1, \dots, n$. Each parent i derives utility U_{is} from each school s , which may in general depend on characteristics of the parent, pupil and school. This is standard, and for each individual i is written $U_{is} = V_{is} + \varepsilon_{is}$, where s is the number of schools ranging from $s = 1, \dots, n$. V_{is} denotes the deterministic component of utility and ε_{is} denotes the random component. Deterministic components include parent and school characteristics, and may be written as follows:

$$U_{is} = X_{is} + W_i + \varepsilon_{is} \quad s = 1, \dots, n \quad (1)$$

Where X_{is} represents the characteristics of the schools (varying by alternative school) and W_i represent the invariant characteristics of the parent and child. Random components ε_{is} include idiosyncratic tastes of the parent and unobserved characteristics of the choices, such as school ethos or leadership. Probabilistic statements about the distribution of choices can be made, where parent i nominates the school that maximises her utility. The probability that school s is parent i 's most preferred school is:

$$P_{is} = \Pr(U_{is} > U_{it}) \quad \forall t \neq s \quad (2)$$

This favourite school will not necessarily be the one that parents actually nominate as the first choice on the form however, as the optimal nomination decision also depends on the assignment mechanism. We therefore describe the school assignment system in England before we examine identification of parents' preferences.

b. The school admissions system in England

In the UK, the term 'school choice' describes parents' right to express a preference for the school they would most like their child to attend. Parents must complete a common application form to their Local Authority (LA), on which they may nominate at least three schools⁴. The LA then assigns pupils to schools based on these nominations, school admission criteria and the availability of places; parents' preferences may not necessarily translate into a place at their desired school, and school admission criteria play an important role.

Within an LA, there are various types of school, some of which follow the admission criteria set by the LA, some of which set their own admissions criteria subject to legislatively binding restrictions on the types of criteria that may be applied by schools. Admissions to community schools are decided by the LA according to a set of rules and an assignment mechanism, which will be discussed shortly. Community schools make up the significant majority of primary schools in most areas (62% over England as a whole), but there are other types of school which are semi-autonomous for which the governing body sets the admissions criteria. These are Voluntary Aided (VA) schools (mainly faith schools which make up 21% of primary schools in England), and Foundation schools, which make up 2% of primary schools in England.

Voluntary Controlled (VC) schools (which make up 14.5% of primary schools in England) are essentially Community schools that may have a faith orientation. Admission criteria for VC schools are determined by the LA. Parents apply to VA, VC and Foundation schools through the common application form also used for regular Community schools. Pupils wishing to apply to a VA school may complete a separate form for the school in addition to the LA form. The Schools Admission Code of 2007 set strict guidelines for what may be included as additional admissions criteria by schools, ensuring "fair" access for all. The code applies to all types of school, whether the admissions authority is the LA or the governing

⁴ Not all parents will give three preferences for school choice. Some LAs invite up to six preferences for school choice, although the mode is 3.

body. In 2004, however, when our cohort made their application covert selection by schools was still possible, for example requiring photographs or personal statements from applicants. In a survey of admissions criteria, West et al (2003) find that 27% of voluntary-aided schools interviewed parents as part of the admissions process. This allows “cream skimming” of pupils by schools, which affects the mechanism under which parents make their choices. In the majority of cases, VA schools require proof of religiosity and priestly support, again potentially subjective criteria that may be used to cream skim particular types of students.

For non-autonomous schools (the majority), first priority in admission is given to a series of special groups: children with a statement of special educational need; children who are looked-after by the local authority; and children with siblings who already attend the school. After these pupils, those living closest to the school are generally given priority. The system is rather different to the US in that it is less discrete. Admission is generally not based on within-district vs outside-district criteria, but based more on continuous measures such as degree of proximity and straight line distance⁵.

Approximately 95%⁶ of all primary school age pupils in England attend state funded primary schools, so we focus only on these pupils; we discuss the empirical aspects of this further in the Data section.

c. Identification

There are two central identification issues. The first is defining the set of schools that a family can actually choose from. The second is determining how the school nominated by the family relates to their true preferences. The first issue is a major data exercise and is dealt with in detail in the Data section.

The mechanism design literature that has analysed agents’ optimal responses to assignment mechanisms informs the second issue. Parents’ nominations for school choice will be affected by the admission criteria (or the mechanism design) used by schools and LAs in their area. Recent literature has analysed agents’ optimal responses to assignment mechanisms in many contexts where agents on two sides of a market need to be paired up⁷. In the school choice context Abdulkadiroğlu and Sömnez (2003) set out the mechanism design approach to

⁵ In some rural areas there are sometimes *de facto* catchment areas i.e. a village. Village A would be linked to a particular primary school located in a neighbouring village or town. So children living in village A would have priority over other potential applicants who lived nearer but not in the catchment area.

⁶ From the authors own calculations, based on the Independent Schools Council Census 2009 http://www.isc.co.uk/publication_8_0_0_11_561.htm, and the Annual Schools Census for Spring 2008.

⁷ For example, labour markets as in Roth (1991).

school assignment, Abdulkadiroğlu et al (2005a, b) apply this approach to the Boston and NYC school districts, and Pathak and Sömez (2008) and Abdulkadiroğlu et al (2008) subsequently update the design. These papers determine the properties of particular assignment mechanisms and whether they elicit true preferences from the participants.

Revealing true preferences is a weakly dominant strategy in two common mechanisms known as “Student Optimal Stable Matching” (or “Student Proposing Deferred Acceptance”) and “Top Trading Cycles”. These mechanisms have other properties, not of issue here.

In the year that our sample made their decision, (Autumn 2004 for entry in September 2005) there were two different assignment mechanisms in use in England. LAs could either operate a ‘first preference first’ system in which schools give priority to those that named the school as their first choice on the application form, or an ‘equal preference’ system in which the rank assigned to the school is not taken into account. The equal preference (EP) system is broadly equivalent to the student proposing deferred acceptance algorithm, first proposed by Gale and Shapley (1962). In both, pupils rank schools; the admissions authority or school decides which pupils to admit without reference to the parents’ rank of the school. Details of the EP system are given in Pennell, West and Hind (2006). Thus we argue that the EP mechanism encourages families to reveal their true preferences.

The difference between the EP and student proposing deferred acceptance algorithm is that under EP parents can rank only a limited number of schools. Coldron et al (2006) report that “most LAs (95, 64%) invited 3 preferences, some invited 4 or 5 preferences (12, 8%) whilst a notable number invited 6 or 7 preferences (41, 28%).” It is therefore possible that a pupil will not be admitted to any of these schools, encouraging at least one “safe” choice and perhaps strategic nominations. Haeringer and Klijn (2008) and Calsamiglia et al (2009) show that when parents can make only limited nominations, truth-telling is not optimal in some circumstances and for some players. We believe our definition of a feasible set of schools avoids this problem, however. Calsamiglia et al (2009) show that in a game with k choices on the form, playing truthfully up to and including the “safe” school is weakly dominant for those families with a school with certain entry in the top k (Calsamiglia et al 2009, pp. 9 – 10). See also Abdulkadiroğlu et al (2008), discussed below. As our preferred definition of each family’s feasible choice set only includes schools to which entry is almost certain we overcome the problem of limited choices.

In contrast to the EP system, the first preference first system (FPF) encourages expression of ‘safe’ choices; parents whose true preference is a very over-subscribed school are unlikely to name it as their first nominated school as they risk losing entry to the schools nominated as their second or third choice as well. Through a survey of LAs’ admissions criteria for the entry year 2006/2007, Coldron et al (2006) find that in 2006 68% of LAs used an EP system, the remainder using FPF⁸.

In order to ensure that our results provide informative and valid evidence for families’ true school preferences we employ three main identification strategies. We also provide brief evidence on the extent of strategic preferences made on application forms. First, we restrict our analysis to LAs which used the EP (student proposing deferred acceptance) mechanism at the time of our parents’ application, as parents’ nominations in these LAs should be truth-revealing.

Second, we define a truly feasible choice set of schools for all families; schools at which the family is almost certain to be offered a place because their very-close-neighbours already attend the school⁹. A highly desirable school that is unfeasible for some reason (perhaps oversubscription and a small catchment area) will therefore be excluded from the feasible choice set. This is detailed fully in the Data section. This addresses the problem of a constrained number of choices. In the student proposing deferred acceptance mechanism, even if parents can only rank a subset of schools, if all schools are “safe” choices then they can do no better than ranking those schools in the correct order. This is a result in the appendix of Abdulkadiroglu et al (2008)¹⁰.

Third, there are two subsidiary pieces of information that strengthen the case that the nominations are truly revealing preferences. First, parents are specifically asked if they made their choice strategically¹¹; only 10% confirmed that they had. Second, parents are also asked if there was another school that they truly preferred to their top nominated school but that they did not put down on the form. Only 7% said that they had done this. In these cases we substitute “truly preferred” school for the nominated school.

⁸ These relate to secondary schools, but LAs will use the same system for each.

⁹ All these schools are therefore essentially equivalent to the characterisation of “district” schools in the US system in the mechanism design literature.

¹⁰ The result does not necessarily imply that families will rank their top choice first, but it does mean that the nominations will be ordered correctly; that is, the rank order will be preserved. This is still informative about the weights families place on their choices.

¹¹ Parents were asked to give the reasons they choose to nominate their first choice school. We assume that parents acted strategically in their nominations if they give “how likely it was that [their child] would get a place” or that the “school is a feeder school” as an important reason for their choice.

Finally, we offer evidence to corroborate our claims on the different strategies that families employ by comparing first and second choices made under the two allocation mechanisms. For the sub-sample who report two or more choices we compare different dimensions of the quality of the schools by family characteristics. It is not possible to make precise claims about families nominating “better” or “worse” schools under the different systems. We can offer some informal evidence on the nature of first and second nominations under the two systems, however. We might typically expect a “safer” first choice under the FPF mechanism than under the EP mechanism. Figure 1 provides suggestive evidence to support this. In both LA types, the richest families, in the 4th and 5th socio-economic status quintiles, nominate a higher scoring first school than second. But for the lower socio-economic quintiles (which are typically the ones who may need to consider strategic behaviour), the pattern reverses between EP and FPF, with the first nomination being lower scoring on average than the second in FPF LAs.

d. Econometric model

We estimate a multinomial model to model parents’ choice of schools. Such models enable us to allow simultaneously for both the characteristics of pupils and their families, and the characteristics of schools on the schooling decision. Following McFadden’s classic approach, the nature of the multinomial model generated depends on the assumption about the joint distribution of the error terms. The conditional logit model is obtained by assuming that the error terms are iid type 1 extreme value, with density:

$$f(\varepsilon_s) = e^{-\varepsilon_s} \exp(-e^{-\varepsilon_s}) \quad (3)$$

We use the conditional or ‘mixed’ logit, which is given by:

$$P_{is} = \frac{e^{X_{is}\beta + W_i\gamma_s}}{\sum_{l=1}^n e^{X_{il}\beta + W_i\gamma_l}} \quad s = 1, \dots, n \quad (4)$$

where X_{is} represents a vector of school characteristics that will vary across the choices (and between families). Variables for the characteristics of the choices have a common coefficient β . W_i represents a vector of characteristics of the families that are constant across choices, such as the respondent’s highest level of education or the ability level of the child. The value of the variable is constant across school groups, but may have a different impact on

the probability of choosing each school group. Variables that are characteristics of the choosers therefore have school-specific coefficients γ_g . Relative to a multinomial logit, this approach allows both respondent-specific and option-specific characteristics to be included. In the present context, this is a crucial feature of the model.

In the traditional applications of the McFadden model, the options that respondents face are generic; in transport studies the choice may be between travelling by “car”, “train”, or “bus” for example; in the occupational literature it may be the choice of profession (Schmidt et al, 1975). In our context choices are not generic, as respondents are geographically spread and do not choose between the same specific schools. The underlying choice object is a named, specific school, and since respondents live in different areas no respondents will face a choice over the same specific schools. Even within the same town two respondents may have different feasible schools to choose from. To implement the model, we therefore group the schools together into generic categories based on their attainment scores, composition and faith status. These school groups are common between all families. This approach has been used in the residential choice literature, where choices are grouped into housing “bundles” (Quigley, 1976). Demand for health-care provision focuses on choice of provider type, rather than a specific choice (Thomson et al, 2008). Categorizing schools into school groups is necessary for the model to allow the choice-invariant characteristics, W_i . The grouping has further practical advantages as it reduces the dimensionality; some respondents in dense urban areas had up to 100 feasible schools within a 3km radius. Finally, grouping similar schools also helps avoid the problem of independence of irrelevant alternatives often found in conditional and multinomial logit models; the models should only be used in cases where the choices are assumed to be “distinct and weighed independently in the eyes of each decision maker”(McFadden, 1973). Details of this grouping process are provided in the Data section below.

3. Data

We have assembled a dataset combining survey information on parents' choices plus a rich set of socio-economic characteristics; administrative data on school characteristics, admissions criteria and allocation rules; and spatial data attached to a pupil census to define the *de facto* set of schools available to each family in the survey. Our data sources and construction are described below.

a. The Millennium Cohort Study

Our longitudinal survey dataset is the Millennium Cohort Study (MCS). This was sampled from all live births in the UK, over the period from 1 September 2000 to 31 August 2001. This period coincides with the school academic year, so the children in the study in England form an academic cohort. We focus only on England in order to exploit the pupil census data only available for England; also there are differences in the education systems in the other countries of the UK. For England, the sample was selected from a random sample of electoral wards, disproportionately stratified to ensure adequate representation of deprived areas, defined as the poorest 25% of wards based on the Child Poverty Index (CPI)¹², and also areas with high concentrations of Black and Asian families¹³.

The MCS provides rich information on parents' characteristics and their relationship with the child. Our paper mainly uses the third survey of the MCS, taken in 2006 when children in the study were 5 years old, although we draw on earlier waves for some parental characteristics. The timing of the third survey was deliberate; the children were beginning primary school and a main objective of the MCS was "to record the child's transition to primary school, from the point of view of their parents and their school".

Details of the parent and pupil characteristics we use can be found in Appendix 1. These are fairly standard controls. We summarise a number of measures of income, occupation and so on in a single socio-economic status measure; Appendix 2 gives details of the principal component analysis used to construct this. As noted above, the weighted sample is representative of the UK at the time it was drawn, though the stratification means that our sample lives in disproportionately deprived areas. Note that we take the "parental faith" indicator from wave 1. This ensures we have a measure of parents' faith prior to any strategic decisions they make about their choice of primary school (which may include decisions about whether they want their child to attend a faith school)¹⁴.

¹² The CPI is defined as the percentage of children under 16 in an electoral ward living in families that were, in 1998, receiving at least one of the following benefits: Income Support; Jobseekers Allowance; Family Credit; Disability Working Allowance, and is therefore a proxy for neighbourhood deprivation.

¹³ 'High' is defined as above 30% of the ward. Proportions are based on the 1991 national census.

¹⁴ In wave 1 22% of our sample are Church of England, 8.5% are Roman Catholic and 10.3% are another Christian denomination. Of those in our final sample, 5.69% change faith between wave 1 and wave 3 of the

Parents were asked to give details of all schools they nominated on the LA form, and any other schools they applied to. The survey also asks the parent to name any schools that they would have liked their child to attend “but chose not to apply to”. We take the parents’ most preferred school as the choice they ranked highest on their LA application form. Around 7% of parents say they would have preferred their child to attend a different school but they chose not to apply¹⁵. For these parents we replace their most preferred school on the LA form with this hidden preference. The dataset also provides extensive information on the reasons that parents gave for their choice of school; we analyse this in a companion paper (Burgess et al 2009).

There are two potential problems with this data. First, it is clear from the chronology that parents are asked the survey questions retrospectively, on average about 12 months after they would have made their choices. There is therefore a possibility that parents do not recall their nominations accurately. Parents that do not get their first choice may forget that they initially made a different choice, or may have rationalised their actual school as a good choice. If this were the case, we would expect a higher fraction of parents in our data stating that their actual school is their first choice school. We believe our data is broadly comparable to the national picture, however¹⁶. Also, any bias would be enhanced if it was more likely to happen for a particular parent type. In fact, in our companion paper we find that on average parents of different social class are equally likely to be admitted to their first choice school. We therefore believe that recall bias is not a serious problem.

Secondly, there is a discrepancy between the percentage of parents saying that they gave a preference on the LA form, and the national picture. 28% of our sample report that they made no application through the LA application form. LAs that we contacted reported that at least 95% of parents did express a preference in this way however, as application forms were compulsory. The difference between the survey and actual response rate could be because parents have forgotten what they did, did not recognise the questionnaire wording as a description of what they did, were confused by the system of application, or simply did not want to answer the question in full. The questionnaire routing and wording is given in

survey. Around half of the people that change faith now have an affinity with the Church of England, which could be related to the high performance of these religious schools. Strategic changes of faith by parents are often reported in the media. Also see Allen and West (forthcoming).

¹⁵ The most common reasons parents gave for not applying to this ‘hidden preference’ or most preferred school was because it was too far away or they were doubtful their child would get in. Other reasons given by a minority of parents are school expenses and religious grounds.

¹⁶ Our data shows that 94.2% of parents got their first choice school. There is no national data for primary schools on the percentage of families getting first choice. We contacted a small number of LAs and all reported at least 90%. There is national data for secondary schools, in which 83.2% of applicants get their first choice school, but we expect this number to be below that for primary school places.

Appendix 3. There is a mild socio-economic gradient in answers to this point: 31.90% of parents in the lowest SES quintile say that they made no application, compared to 26.43% of those in the highest SES quintile.

We use data from the MCS for England only in order to match to the National Pupil Database (NPD), see below, yielding some 9000 families. The biggest source of missing data is the families not reporting their first choice of school, reducing the sample size by some 2000 families. We drop 12 pupils who attend special schools, as it is likely that parents' preferences might be non-standard in this case¹⁷. For practical purposes, we retain pupils with more than two feasible schools. This yields a sample of 6,756; once we take into account further missing data for the regressions, we end up with 4218 in the estimation.

b. Schools data

Detailed information on schools is essential to compare characteristics of the chosen school with others that were feasible choices. We create the dataset for this purpose by combining variables from two administrative data sources: EduBase and the NPD.

EduBase holds administrative information for all educational establishments (state and independent) in England and Wales, maintained by the Department for Children, Schools and Families (DCSF). Administrative information includes the type of school (whether voluntary aided, voluntary controlled etc.), phase of education (primary, middle or secondary) and its exact location (postcode). We keep all non-special schools in England: this means that special schools do not appear in a pupil's feasible choice set. We drop all primary schools which do not admit pupils at 4 or 5 years old, as these schools are unavailable to our sample of parents.

The NPD is an administrative dataset owned by DCSF which contains information on pupils' attainment throughout their school careers, and also information from the pupil level census such as each pupil's eligibility for free school meals, recognition of any special educational need and whether they have English as an additional language. Providing this information for the census (previously known as PLASC, now the Annual Schools Census) is a statutory requirement for all maintained schools in England; data should therefore be accurate and reliable. We collapse the pupil level data to school level, yielding the percentage of pupils in the school that are eligible for free school meals and so on. From the attainment data, we construct a measure of each school's average exam¹⁸ points score (averaged over 3 years;

¹⁷ Note that we do not drop all pupils who have some level of emotional or behavioural difficulty.

¹⁸ These are the Key stage 2 exams, compulsory for all pupils in state schools in English, maths and science. These exams are nationally set and remotely marked. They are (because of their publication) high-stakes for the schools but not for the students (they do not affect school assignment).

2003, 2004 and 2005), and the percentage of high-achieving pupils¹⁹. This indicator is taken from pupils taking the tests in 2003, which were published in school performance tables²⁰ in 2004 when parents were making their school choices. We adopt this measure as it is readily observable to parents – these performance tables are widely published and reported in the national and local media. However, it is clearly not a measure of school effectiveness as it incorporates the effect of school composition as well as teaching quality. An alternative would be to for us to compute an estimate of value-added as the school quality attribute; this would better represent school effectiveness but would be very difficult for parents to observe and use to make their choices.

There are two issues we must account for in the schools data. First, we must impute academic information for schools in 5,344 out of 22,324 cases²¹. Second, independent schools raise a number of problems. Choosing a fee-paying school is another branch of decision-making. In terms of data, most of the school-level information for independent schools is not available, excluding them from the model. Independent schools are not covered by the schools census, and many do not sit the Key stage 2 exams that our attainment data are based on. Our survey results show that 4.54% of pupils in our sample attend an independent school, compared to around 5% nationally²². We find that only 89 parents (under 1% of the sample) applied to the LA for state education if they currently attend a fee-paying school. We drop families where the child attends an independent school from our sample, and we do not include such schools in the choice set for parents. We report more on this issue in Appendix 4.

c. Spatial data: Generating feasible school choice sets

The final key element in our data is to link the families to the schools that they could have chosen; that is, to define their feasible choice set (FCS) of schools. The choice set that a family considers cannot be known, so we have to attempt to recreate it. There are no legal

¹⁹ Level 5 is above the expected level of attainment at KS2. This indicator therefore represents the proportion of pupils that achieve highly at the end of primary school in all subjects.

²⁰ School performance tables are available online each year from the Department of Children Schools and Families (DCSF), for example see: http://www.dcsf.gov.uk/performance/tables/primary_08.shtml, where a variety of statistics on school performance are published.

²¹ Many schools in the 4 – 11 age range are administratively split into infant schools (ages 4 – 7) and junior schools (up to age 11). These split schools are typically closely linked (for example, on the same site), but this is not noted in the administrative data and so has to be recreated statistically. This is necessary to attach the appropriate age 11 attainment data to the age 4 or 5 entry choice. We impute KS2 scores for each infant school based on the schools' characteristics. We also impute KS2 scores for schools missing academic information for other reasons. We impute KS2 mean scores for 3,846 out of 22,324 primary schools and the proportion with level 5 in all KS2 tests in 2003 for 5,344. Another feasible method, however, would use scores from the junior school that most pupils in an infant school attend. Following recent work at CMPO, we explore this method by matching infant schools with their modal junior school. We compare attainment in both method and find a high degree of correlation.

²² From the authors own calculations, based on the Independent Schools Council Census 2009 http://www.isc.co.uk/publication_8_0_0_11_561.htm, and the Annual Schools Census for Spring 2008.

restrictions on the schools that a family can apply to, as noted in the previous section. In principle, therefore, the feasible set of schools could be very large indeed. In the year our cohort applied for school places parents could apply to any school inside or outside their LA, though making an application to a school outside their own LA was more difficult²³. We take two approaches to define a FCS, one based on distance alone, and one based on consideration of each school's "catchment area".

FCS-T represents the choice set of schools that is feasible in terms of distance to travel. We calculate the straight line distance between each pupil in our sample and every school in England. We assign all schools that are within 3km of the pupil's home and in the same LA to their feasible choice set. The FCS-T simply defines what is available within reasonable travel distance of the family's home; it captures nothing about whether the family might reasonably be expected to be offered a place there. Our preferred feasible choice set which accounts for restrictions that parents may face is detailed below.

As noted in the previous section, proximity to the school is often the key tie-breaker in determining admission to over-subscribed schools. The English system has historically used proximity as a determinant of whether a pupil can be admitted to a school. The expansion of school choice limited the importance of proximity to some extent, but distance remains a prominent over-subscription criterion in the School Admissions Code, and proximity is very widely included in admissions procedures.²⁴

We define a narrower, constrained FCS to capture this likelihood of not being offered a place, FCS-C. To implement this, we use the census data to construct a measure of each school's *de facto* catchment area, the area within which prospective pupils are very likely to be admitted to the school²⁵. The process is as follows:

- 1) We calculate the straight-line distance between the home address and school attended for all pupils in England in the reception year group in 2004²⁶. This is some half million pupils. This tells us how far pupils travel to attend each school.
- 2) We then collate that by school and calculate the 80th percentile of the distribution of distances for each school. We take 80% to exclude outliers. Thus 80% of pupils

²³ In most cases parents must contact the relevant local authority (LA) and submit a separate application form. Pupils in London submitted a common application form for all LAs, however. The Pan-London co-ordinated admissions system was introduced from 2005 (the year after our cohort applied to primary school). The aim of this scheme was to co-ordinated admissions between all LAs in London and some surrounding LAs to reduce the number of parents receiving multiple offers, and those receiving none. Nominated schools were all on the same application form regardless of their LA, which also made the process easier for parents.

²⁴ See Annex A of West et. al. (2009).

²⁵ Some local authorities may have official catchment areas for some schools which are non-linear. Official catchment areas in rural areas may exclude one village and include another for example. Our approach does not take account of this, but we believe it to be a good approximation.

²⁶ This is the entry cohort in the year before the MCS cohort entered primary school.

attending school S live no further away from the school than that distance. We assume that any family contemplating choosing school S and living no further away than that distance, would feel almost certain of being offered a place at that school on proximity grounds. That school choice could be considered a “safe” option.

The calculation is based on the previous year’s entry as this is the year that is most relevant to prospective parents in our sample²⁷.

This sort of information is very likely to be known by parents. Most LAs provide information on the number of applications for entry and the number of places possible to be allocated in the previous year, which gives an indication of relative supply and demand. This is presented alongside other school information in the LA application booklet and so is easily accessible. Some LAs also give further information on oversubscribed schools, for example how far away the furthest pupil lived from the school in the previous year.

Under this second approach, each family’s FCS-C consists of schools for which they live within the 80th percentile of the distance distribution, which are in the LA they live in and are within 20km of the family home²⁸. Since the *de facto* catchment area approach is meant to identify a minimal set of almost-sure schools, it is to be expected that many families will succeed in an application outside this set. In our sample 27.5% make a choice outside the schools whose *de facto* catchment areas they are in. So to complete the FCS-C, we add to this set all schools named on the LA application form and any other schools applied to.

Distance is likely to be an important variable in parents’ decision making. We therefore need a measure of distance between each family and each school in its FCS-T and FCS-C. Calculating the distance per se is part of the procedure outlined above, but confidentiality requirements mean that we cannot retain actual distances for the analysis. We therefore transform the distance variable to the distance rank of schools: whether each school in the feasible choice set is the closest, second closest, third closest and so on.

Finally we map the information regarding each LA’s assignment mechanism (either EP or PPF) on to the survey data²⁹.

²⁷ In fact the correlation between years is quite strong. The same calculation in the previous year group has a correlation with the current year group of 0.76.

²⁸ This final restriction is simply to ensure that schools with very large catchment areas, such as boarding schools, are excluded from the feasible choice set.

²⁹ Having done this, we anonymise the local authority variable so we cannot identify pupils’ region of the country.

d. Defining groups of schools

To implement the econometric model we need to group schools. Our criteria are as follows: the within group variance in school characteristics should be smaller than the between group variance; schools in the same groups should be seen by the parent as similar, while schools in different groups should have quite different characteristics. The process ensures school groups are “distinct in the eyes of the decision maker” (McFadden, 1973).

All groups are defined relative to each family’s feasible choice set. This means that although actual schools are different for each family, each family will have a group of “relatively highly performing” schools and a group of not so highly performing schools. We define a “high-scoring” school as a school with average KS2 exam performance over 3 years that is greater than the median level within the FCS. A “low scoring” school is therefore a school with an average KS2 score below the median. When schools are equal to the median value we randomly assign them either above or below. We define a “relatively poor” school as a school where the proportion of pupils eligible for free school meals (FSM) is above the median level within the FCS and a “relatively rich” school as a school where the proportion is below the median. Again, in cases where the school equals the median it is randomly assigned. We also distinguish between faith and non-faith schools. We group schools based on relative levels of KS2 and FSM within each FCS and on their faith status. This provides the groups given in table 5, for example “rich, low scoring non-faith” schools, “rich, high scoring non-faith” schools, and “rich, high scoring faith” schools. Table 5 shows that 79.08% of parents have a poor, low scoring non-faith school in their feasible choice set, and that 75.47% have a rich, high scoring faith school. Only 56.86% have a rich, high scoring non-faith school, however, and 35.69% have a poor, low scoring non-faith school. Faith schools are most likely to be above average in terms of KS2 score and below average in their proportion of pupils with FSM; only 45.19% have a poor, low scoring faith school, and 27.78% have a poor, high scoring faith school.

School characteristics are averaged to the group level, with the exception of distance rank. For this variable we take the minimum rank of the group; all else equal we expect a closer school to be preferred. All school characteristics (before they are collapsed to group level) are presented in table 3.

4. Results

We first characterise the feasible choice sets that we have constructed, and the school groups. We then set out the main estimation results, followed by a series of robustness checks. We finally carry out a number of exercises to quantify the effects in interpretable ways.

a. Characterising the feasible choice sets

All pupils with at least two schools available in their FCS-C are included in the model. Table 1 shows the considerable variation in the number of schools available in the population of pupils that have at least two schools in their FCS-C: 8.38% of pupils have two schools available, and 17.03% have 5, and 3.33% have more than 11. The number of schools available depends on population density as there are more schools in urban areas. Given our definition of catchment areas for schools it also depends on the relative popularity of some schools in your area as these may be excluded from your feasible choice set. The comparison of the number of schools available between FCS-C and FSC-T in Table 1 shows that catchment areas for schools greatly restrict the numbers of schools available to parents. By ignoring this constraint we would overestimate the ‘choice’ available to parents. When we focus on school groups, we see that less than one percent of pupils have all school groups in their feasible choice set, while the modal number is 4. Pupils are more likely to have less than 4 school groups available than they are to have more than 4.

Table 3 shows that there are clear differences in the quality of schools available for different types of parent. On average schools available to parents have 16% of pupils with FSM. This is 22% for parents in the lowest SES quintile however, and only 11% for parents in the highest SES quintile. Schools available to the population as a whole have 19% of pupils achieving a high standard in their KS2 tests, compared to 17% in schools available to parents in the lowest SES quintile and 23% for parents in the highest SES quintile. Similar variations in the characteristics of schools exist between those with no education and those with at least a degree. While schools in metropolitan and non-metropolitan areas have different proportions of pupils with FSM, EAL, and that are white, academic performance is the same on average, as is the level of SEN. These are important differences to account for in our

model, and this is the motivation for defining school groups relative to the specific feasible choice set.

Despite large differences in absolute levels of school characteristics, table 4 shows that on average all types of parents have a large degree of choice in their feasible choice set. The standard deviation for the proportion of pupils with FSM is 0.08 (or 8 percentage points) for the whole population. Those in the lowest socio-economic quintile have a larger variance in school characteristics than those in the highest SES quintile; 0.11 compared to 0.06 in FSM for example. The same is true for those with no education compared to those with at least a degree, and for those in metropolitan areas compared with those in non-metropolitan areas. This suggests that within their feasible set of schools, parents have some degree of choice in the characteristics of the school they apply to. Parents could feasibly apply to a high scoring school with a low proportion of pupils with FSM or a low scoring school with a high proportion of pupils with FSM (defined relative to their local area). We argue that the availability of this choice to most parents can enable us to genuinely elicit parents' revealed preferences.

b. Estimation results

Having described the different choice sets available to different families, we now turn to the main task of modelling the choices made. We first discuss the results of the regression estimating the conditional logit model from (4) for all LAs, presented in Table 8. Second, we discuss the preferred results focussing on LAs using the 'Equal Preferences' assignment mechanism, presented in Table 9.

The top panel of Table 8 displays the school group-specific variables which are school-group invariant. The middle panel presents the family-specific variables in rows. As family-specific variables vary across school-groups, the school-group-specific coefficients for each school-group are presented in the columns. We present only a subset of the coefficients in the table; other variables included in the model are listed in the footnote to the table and the full results are available from the authors. The final panel presents some diagnostic statistics for the model.

The top panel shows that the school characteristics that parents most care about are: distance rank, negatively valued; academic achievement, positively valued; and school socio-economic composition (the fraction of children from poor families), negatively valued. We postpone discussion of the quantitative significance of these coefficients. The results show that families do not value a school by its proportion of pupils with English as an additional language, or the proportion of pupils with special needs. The ethnic composition is also insignificant.

Each column represents a school-group. In each column, the coefficients in the middle panel are interpreted as the impact of a variable on the likelihood of choosing a school in the given school-group relative to a school in the omitted group (the “poor, low-scoring, non-faith” school-group). The pattern of the socio-economic status coefficients suggests little difference in choosing faith and non-faith school-groups. It also suggests that richer families are more likely to choose a school in the higher-scoring school-group over the omitted group than the poorest fifth of families. The overall pattern is summarised in Figure 2: high socio-economic status families are more likely to choose schools in the “rich, high-scoring, non-faith” group and less likely to choose schools in the “poor, low-scoring, non-faith” group and, in the top two quintiles, marginally less likely to choose “poor, high-scoring, non-faith” schools. Statistically, the strongest effects are for the 2nd and 3rd quintiles being much more likely to choose “poor, high-scoring” schools over “poor, low-scoring” schools than the lowest quintile. Overall, the p-value for the joint significance of socio-economic status is 2.88%.

Parents with at least a degree or ‘A’ level³⁰ qualification are more likely to choose the “rich, high-scoring, non-faith” school-group compared to the reference school-group, although these are the only significant coefficients for parental education variables. Neighbourhood deprivation also has a small impact, which suggests we are successfully controlling for neighbourhood constraints parents may face in their school choice³¹. Self-reported faith has the strongest effect of the other included parental variables included in the model. Recall that this is taken from the first wave of the survey, possibly before any incentive for ‘strategic’ motives for a change in faith. Self-reported faith has a significant impact on the probability of

³⁰ ‘A level’ exams are generally taken after two years study after the end of compulsory schooling at age 16. There is a minimum requirement of 5 GCSE grades at A*-C for progression onto A level courses.

³¹ This is strengthened by the fact that IMD variables remain largely insignificant in the model even when distance rank is not controlled for. This shows that the catchment area restrictions we account for are effective. When the same test is tried for the FCS-T IMD coefficients are highly significant, which suggests that in a broader definition of FCS location has a significant impact on parents’ choice of school.

choosing a faith school-group relative to the reference school-group. There is a much greater likelihood of choosing a school in the richer faith school-groups rather than the poorer schools, however, suggesting that parents also value composition of the school as well as its denomination.

School group	1	2	4	5	6	7	8
Faith?	N	N	N	Y	Y	Y	Y
Composition?	Non-poor	Non-poor	Poor	Non-poor	Non-poor	Poor	Poor
Attainment?	L	H	H	L	H	L	H
Church of England	-0.178	0.295*	0.111	0.671*	0.589***	0.375	0.387
	0.89	2.1	0.59	2.4	3.78	1.72	1.3
Roman Catholic	-0.68	-0.064	-0.057	1.539***	2.289***	1.372***	1.775***
	1.86	0.26	0.18	4.3	11.65	4.87	4.82

Note: Coefficients from the analysis in Table 8.

Other variables included in the model are ethnicity of the main parent, measures of parental interaction with the child (frequency of reading and visits away from home), availability of a car, demographics (birth order and number of siblings, gender and season of birth), and measures of the emotional and cognitive development of the child. There are few significant differences between White parents and parents of other ethnic groups, although families of Black African heritage are more likely to choose high-scoring and faith school-groups. Families reporting a high frequency of reading and many visits away from the home, variables that also measure socio-economic background, are more likely to choose the rich, high-scoring non-faith school group. There are no strong, systematic patterns in the effect of the other variables.

The model includes a binary variable for whether the parent expressed a preference for a school that was further than 3km from their home. This captures a willingness to travel with the child. The model shows that parents who applied to a school far from their home are more likely to apply to almost all types of school-group (except the rich, low-scoring non-faith school-group). This suggests that parents are willing to travel for high academic standards and a religious affiliation of the school, and in part is picking up the larger catchment areas of faith schools more generally.

The final panel of the table gives McFadden's R^2 of 0.224. We also calculate that the number of correct predictions of group choice from the model is 72%. This seems a reasonably creditable performance and suggests that the model is capturing a good deal of the underlying behaviour. We report a number of tests of joint significance including socio-economic status (p-value of 2.88%), self-reported faith (0%), other parental characteristics (0.42%), child characteristics (4.66%) and neighbourhood deprivation (0.11%). It is reassuring to note that both the school-specific variables and the family-specific variables are significant: both parts of the model are important explanators. Unsurprisingly given the strong similarity of our defined school groups, the Hausman test for the IIA property fails. One standard response to the failure of the IIA is to consider a nested logit approach. For some families this would make sense: they may first want a faith school of any type, followed by high test scores. Other families may want high test scores above all else, and so on. But because there is no natural order for the nesting, we cannot implement this and stick with the conditional logit approach.

In Table 9 we repeat the analysis including only LAs using the EP pupil assignment mechanism in the sample. As noted in the methodology the EP assignment rule is expected to elicit parents' true preferences in their school nominations. The number of observations falls from 4218 to 2479; these LAs account for 58.8% of the sample. Comparing these results to those for all LAs in the previous table we see that the school-specific coefficients change a little: the school composition variable is a little less negative and the academic attainment a little more positive, perhaps suggesting that under the EP system parents are more likely to nominate a desirable, "most truly preferred" school, i.e. a higher achieving school. The distance rank coefficient is almost identical, suggesting it is more likely to be schools' catchment areas rather than distance which constrain choice. The pattern of coefficients on the family-specific variables changes only marginally; the socio-economic status and parental education coefficients that were remain significant and become a little larger in magnitude.

It is unsurprising that results are similar to our main results as almost two thirds of the samples are the same. We would like to compare coefficients between samples in EP with FPF LAs but the smaller size of the latter sample coupled with a quite demanding estimation prohibits this.

c. Robustness results

We illustrate the importance of using FCS-C as the feasible choice set in our main regression by comparing the results with those under FCS-T. This also serves to underline the value of our data which includes the spatial element of the *de facto* catchment areas. Table 10 presents the same model as Table 8, but in this case using FCS-T.

There are a number of striking changes. First, note that this model does a much worse job of explaining the data – 62% correct predictions as opposed to 72%; McFadden’s R^2 is about 20% lower. Second, the school group-specific variables are different: the coefficient on academic attainment has halved in value and become insignificant, while the coefficient on composition has increased substantially. Our interpretation of this is that FCS-T does not accurately capture the true choice set, particularly for poorer families. Although high-scoring schools are feasible in terms of distance they may not necessarily be feasible after consideration of the schools’ catchment area, so schools in FCS-T are likely to be higher scoring on average. In this case the model will compare the school chosen to these high scoring schools, even when in practice they are an unrealistic choice. This may also explain why the coefficient for FSM increases; schools in FCS-T are likely to have a larger variance in composition than those in FCS-C. If FCS-C excludes more deprived schools, then it will seem as though parents more actively avoid these types of school. Third, differences in preferences between socio-economic groups appear much stronger when constraints are not appropriately accounted for: the p-value for socio-economic status falls to 0.01% from 2.88%. The neighbourhood-specific variables are also more important: the p-value on local deprivation is 0.04% versus 0.11% above. Distance rank still plays an important role in controlling for the choices actually available to parents. In fact, neighbourhood characteristics are strongly significant if we exclude distance rank from the model. This is not the case in FCS-C, suggesting that this definition of FCS is appropriate.

We perform a number of other robustness checks on the model: we rerun the model using only those children whose parents that have not moved house since the child in the survey was born; those children without an older sibling of primary school age; and those in metropolitan areas. These subsequent analyses use FCS-C and we do not restrict the sample to LAs operating under EP in 2004/5 (the latter is simply to maintain the sample size).

We run the first robustness check as residential location at the date we observe is not exogenous. This is particularly true given the importance attached to location for school access, though this is more often emphasised for secondary schools than the primary stage studied here. To address this problem we exploit the rich longitudinal nature of the MCS which asks parents in each wave of the survey whether they have moved address since the previous survey. We restrict the sample to include only those families who did not report moving house since the birth of the cohort child, which leaves 2230 observations. The results are in Table 11. Note that to ensure convergence of the model we re-group all faith schools into two groups: a rich, high-scoring faith school-group (as before) and an “other faith” school-group. Relative to the original results in table 8, the school composition variable increases in absolute value by 8.3%, the academic attainment variable by 73%, and distance rank by 15.8%. Socio-economic status is less important (joint significance p-value of 29.6% and very few individually significant coefficients) as are parental characteristics (p-value of 13.8%) and neighbourhood controls (3.6%). Note that this may be partly due to the lower sample size. This suggests that when we focus on a sample where location is much more likely to be exogenous, we find that school characteristics have a stronger impact on parents’ preferences for school but socio-economic differences are less prominent. This suggests that high socio-economic status families who move house drive some of the differences in preferences for school.

We run the second robustness check as most admissions authorities give preference to prospective pupils with siblings already at the school. By restricting the sample to those children with no older sibling of primary school age we focus only on families where the preference given on the LA form has no relation to other siblings. The results are in Table 12, with a sample of 1851 families. Again, socio-economic characteristics are less important than the base case (p-value of 8.90%), parental characteristics (41.60%) and neighbourhoods (5.23%) likewise. The school group-specific coefficients are less changed than under the non-movers: the coefficient on school composition is absolutely larger by 37.3 %, distance rank increases by 5.5%, but academic attainment falls in magnitude by 10.4%.

Overall, we argue that the main points of our estimation results are strengthened by considering these sub-samples in which endogeneity is less likely to be a problem. Whilst it would be useful to cut to the sample to those in households with no older sibling of primary

school age and that have not moved house in the period we observe, unfortunately this leaves too few observations for the model to converge.

We next consider restricting the sample to only families living in metropolitan areas, which leaves a sample of 1661. We expect school choice to be more practical in metropolitan areas; it is possible to travel to a larger number of schools, and there is a larger variation in schools' characteristics. Again, note that to ensure convergence of the model we re-group all faith schools into two groups: a rich, high-scoring faith school-group (as before) and an "other faith" school-group. Results show, as might be expected, that distance rank is less important in metropolitan areas³². School academic attainment becomes substantially more important, increasing by 88.9% and becoming very well determined; school composition falls in absolute terms by 24.8% and is less well estimated. Focusing on parental variables, socio-economic status and other parental variables are less statistically important compared to the main results, but self-reported faith remains as important.

Another issue to address is whether our FCS definitions capture the true choices open to families. If not, then our estimated 'preferences' will still contain elements of their constraints. The obvious main concern here is the extent to which poor families have a preference for local high-poverty schools, or in fact only have access to such schools. That is, whether it reflects an area effect, or a true preference. This question is partly answered by our discussion of the nature of the FCS-C sets above, and partly by these results in table 10.

d. Quantifying the effects

We address the question of quantifying parental preferences more directly by estimating the trade-offs between school characteristics. For example, how much higher would academic performance need to be to make the family indifferent to an increase of one in the distance rank? How much closer would a school have to be to compensate for a one standard deviation increase in its proportion of 'poor' students? We also allow these trade-offs to differ by

³² Separate calculations show that the mean distance between the first and second closest school is 154m in Tower Hamlets for example, compared with almost 2km in North Yorkshire.

family characteristic, thus directly addressing whether different families have different preferences. We set this up as follows.

A family is indifferent between two schools in groups 2 and 1 if the probability of choosing each school group is the same, that is $P(Y_{i2} = 1) = P(Y_{i3} = 1)$. Expanding this with the conditional logit model given in (4) gives:

$$\frac{e^{X_{i2}\beta + con_2 + W_i\gamma_2}}{\sum_{l=1}^n e^{X_{il}\beta + con_l + W_i\gamma_l}} = \frac{e^{X_{i1}\beta + con_1 + W_i\gamma_1}}{\sum_{l=1}^n e^{X_{il}\beta + con_l + W_i\gamma_l}} \quad (5)$$

In this case we explicitly focus on the probability of choosing a school in school-group 2 and school-group 1 and have used subscripts accordingly. We have also explicitly noted the group-specific coefficients (γ_2 and γ_1) on the family-specific variables (W_i), and noted the group-specific constants. This is important because our groups are defined on school characteristics. Therefore a change in a school characteristic may switch its group. Manipulating this equation, it is straightforward to reach:

$$\beta(X_{i2} - X_{i1}) = con_1 - con_2 + W_i(\gamma_1 - \gamma_2) \quad (6)$$

As X_{ig} and W_i are vectors of characteristics we expand this as:

$$\left[\beta^1(x_{i2}^1 - x_{i1}^1) + \beta^2(x_{i2}^2 - x_{i1}^2) + \dots + \beta^k(x_{i2}^k - x_{i1}^k) \right] = con_2 - con_1 \\ + \left[w_i^1(\gamma_1^1 - \gamma_2^1) + w_i^2(\gamma_1^2 - \gamma_2^2) + \dots + w_i^j(\gamma_1^j - \gamma_2^j) \right]$$

Where there are k school characteristics and j family level characteristics. The first term is the difference of all school-group characteristics between group 2 and 1 for each family. The second term is the difference in the constant terms between school-group 2 and school-group 1. The third term is the difference in coefficients between group 2 and group 1 for each family level characteristic, for each family.

Suppose we are interested in two school group characteristics x_{ig}^1 and x_{ig}^k , whose values push schools into groups 2 and 1. Define:

$$\Delta x^k = x_{i2}^k - x_{i1}^k,$$

$$\Delta \gamma w_i = \left[w_i^1(\gamma_1^1 - \gamma_2^1) + w_i^2(\gamma_1^2 - \gamma_2^2) + \dots + w_i^j(\gamma_1^j - \gamma_2^j) \right], \text{ and}$$

$$\Delta con = con_1 - con_2.$$

If we are interested in school characteristics l and k , the trade-off is given as follows:

$$\beta^1 \Delta x^1 + \beta^k \Delta x^k = \Delta con + \Delta \gamma w_i$$

$$so \Delta x^k = \frac{\Delta con + \Delta \gamma w_i}{\beta^k} - \frac{\beta^1 \Delta x^1}{\beta^k}$$

The calculation for the trade-off between school characteristics x_l and x_k between the two school-groups is:

$$\frac{\Delta x^k}{\Delta x^1} = \frac{\Delta con + \Delta \gamma w_i}{\beta^k \Delta x^1} - \frac{\beta^1}{\beta^k} \quad (7)$$

This has two parts. The second component $-\beta^1/\beta^k$ comes from the part of the school-specific variables part of the model. This is common across all families. It is also the value of the trade-off if the comparison is within a group rather than between groups. The first component allows this trade-off to vary by family, depending on the γ coefficients and the constants.

Note that if the change in x^1 and x^k do not push the schools into different groups then $\Delta con = 0$ and $\Delta \gamma w_i = 0$, leaving only the trade-off $-\beta^1/\beta^k$. In this case the trade-off does not vary by w_i , and becomes the standard way of describing the trade-offs (see Davies et al (2001)).

The table below shows the core trade-off term $-\beta^1/\beta^k$ in column one, where all coefficients used in the calculation are taken from the main results in Table 8 (all LAs). The trade-off between non-poor non-faith school-groups are given in column two, and the trade-off between poor non-faith school-groups in column three. Columns 1 and 2 use equation (7) to construct the trade-off between academic standards and distance rank (row 1) and school composition and distance rank (row 2).

Trade-off between:	Core	Non-poor schools	Poor schools
Academic attainment and distance rank	0.23	0.24	0.24
Trade-off between:	Core	High-scoring schools	Low-scoring schools
School composition (% FSM) and	-0.13	-0.13	-0.16

distance rank

The interpretation is as follows. Using the core measure, if a school is now one school (distance rank) further away, families would on average need an increase of 23 percentage points in the academic attainment measure at this school to remain indifferent between choosing this school and another. This is equivalent to about 2 standard deviations of the academic attainment measure; a substantial effect. Turning to the second row, again for a school one rank further away, families would be indifferent between nominating that school if its fraction of poor students was 13 percentage points lower, using the core measure. The standard deviation of the FSM percentage is 0.15. These seem sensible orders of magnitude. These numbers represent the answers to the questions we began with, attempting to identify the preferences of families for school characteristics.

We are forced to use distance rank rather than actual distance because of confidentiality issues in the MCS. We can use the administrative data in the NPD to get a sense of the average scale of one distance rank in terms of kilometres, however. To do this we use all pupils in the NPD that began primary school (around half a million) in the year before our cohort. Using a similar process to that defined in the data section to create FCS-T we identify each pupil's nearest school, second nearest school and so on. We then compute the average distance between first and second ranked school, second and third, and so on. The details of this exercise are available from the authors. It shows that on average³³, one distance rank is about 800m. Thus, a typical family trades off an extra 400 metres to school for a rise in standards of one standard deviation, 11 percentage points.

We can use the methodology to compute the preference trade-off directly between academic attainment and school composition. A one percentage point increase in the proportion of low income students at a school is off-set by a 1.722 percentage point increase in the attainment measure. A school with a high intake of low income children can attract other families if it performs very well academically. And given that on average such children tend to under-

³³ The mean difference between first nearest and second is 812.5m; between second and third closest schools is 667.9m. The average difference between the four closest schools for each pupil is 611m. This varies substantially across the country however; pupils in Cornwall travel an extra 1977m to their second closest school, while pupils in Camden travel only an extra 89m on average.

perform relative to their better-off peers, the school's educational effort has to more than offset this factor to be as equally attractive.

Another goal of the paper is to investigate whether different families have different preferences. Table 14 presents the trade-offs made between academic standards and distance rank between rich, high scoring non-faith schools and rich, low scoring non-faith schools for families of varying levels of SES. Table 15 presents trade-offs made between the same school characteristics between high and low scoring poor schools. Both tables show that on average those in the lowest SES quintile have a stronger trade-off between academic standards and distance rank than those in the highest SES quintile. Between rich schools for example, those in the lowest SES quintile require a 24 percentage point increase in academic standards to compensate for an increase of one distance rank. Those in the highest SES quintile require a 20 percentage point increase, however, which is marginally smaller. These calculations were computed for each member of the sample, and the distribution of the calculation is therefore informative of its precision. The standard deviation and inter-quartile range of the trade-off calculation is large in each case, suggesting that differences between trade-offs between parents of high and low SES are not significantly different. In theory it would be possible to calculate the standard error of these estimates which would provide definitive evidence on whether differences are significant. This computation would involve all coefficients in the model, however, many of which are not significant.

5. Conclusions

We have combined survey, administrative, census and spatial data to study parental preferences for schools in England. One of the central challenges has been to distinguish between constraints, that is, what is available to be chosen from, and preferences. We have used the census and spatial data to define and construct empirical feasible choice sets for each survey member. These illustrate stark differences in the options available to families at different ends of the socio-economic spectrum.

Our results add to the literature in a number of ways. We show that the main characteristics that parents care about in a school are academic attainment, school socio-economic composition and travel distance. This is probably not a surprise³⁴. However, we are able to quantify this and also be reasonably confident that we have identified preferences not constraints. Using the results, we estimate the trade-offs parents are willing to make between distance and attainment, and between distance and composition. We also show that on average, families do not appear to care so much about ethnic composition³⁵, or proportions of children with special educational needs.

Preferences are heterogeneous between families; those in the lowest SES quintile require a 24 percentage point increase in academic standards to compensate for an increase of one distance rank, while those in the highest SES quintile require a 20 percentage point increase. However, we show that the distribution of preferences does not vary greatly between different socio-economic groups; in fact, the distribution of preferences of the rich and poor almost completely overlap. It may be that what families want is for their child to go to a school with other children “like” their own. This could mean many things, but it might mean “like” in terms of socio-economic status. If that were true then we might expect low socio-economic status families to prefer schools with high percentages of poor children and higher status families to prefer schools with lower such percentages. This would obviously encourage greater social stratification in schools. There are small hints of this: the mean trade-off of distance and composition is slightly lower for the poor, and at the very lower end the trade-off switches sign. But inspecting the results in tables 14 to 17, it is clear that the first order message is that preferences are very similar across parent type.

Of course, there are caveats and potential reasons for concern. The main challenge in the analysis is the specification of the constraints in order to identify the preferences. Our constrained feasible choice sets are intended to capture a minimal set of schools that families can truly access. Potential objections to our findings include that we have got these wrong, and that they either still include actually infeasible schools (in a way correlated with socio-economic status) or they exclude many feasible schools. Another central issue is the “Equal

³⁴ They may also care about other features, unmeasured here: sports or music facilities, uniform, and so on.

³⁵ The sample is not big enough to make any very strong statements about ethnic composition, and this is not the main focus of this study.

Preferences” assignment mechanism. It may be that families did not truly understand it, or did not respond optimally to its truth-revealing characteristic. It is interesting and perhaps helpful that as we compare all LAs to EP-using LAs, and as we move from all families to non-house-moving families, that the academic attainment characteristic of schools strengthens in the analysis.

We conclude with a brief discussion of the implications of our findings for educational inequality and for school choice policies more broadly. On educational inequality, we have shown big differences in the choice sets of different families. We have shown less important differences in their preferences. The big driver of differential access to better schools is the quality of schools nearby to where the families live, and the use of proximity as a tie-breaking device. This relates immediately to practical issues about the operation of the current system.

The broader implications of our results for choice in education are mixed. Parents, almost universally in our data, have a strong preference for schools with high academic attainment. This supports the idea that competition to meet those preferences should help to raise standards. Of course, the measure of academic attainment we have used is the raw output measure, as this is what parents observe, not an estimate of school effectiveness. Which measures schools use to increase their attainment measure is another question in the chain between parental preferences and school effectiveness, and it is likely that schools will both aim to raise effectiveness and to manipulate their intake peer group. However, the hugely different feasible choice sets are an illustration of the problems involved in reducing access inequalities. Also, confirming the importance of preferences for peer groups means that there is also pressure for socio-economic sorting. The challenge for education policy is to accept the former whilst minimising the potential for the latter.

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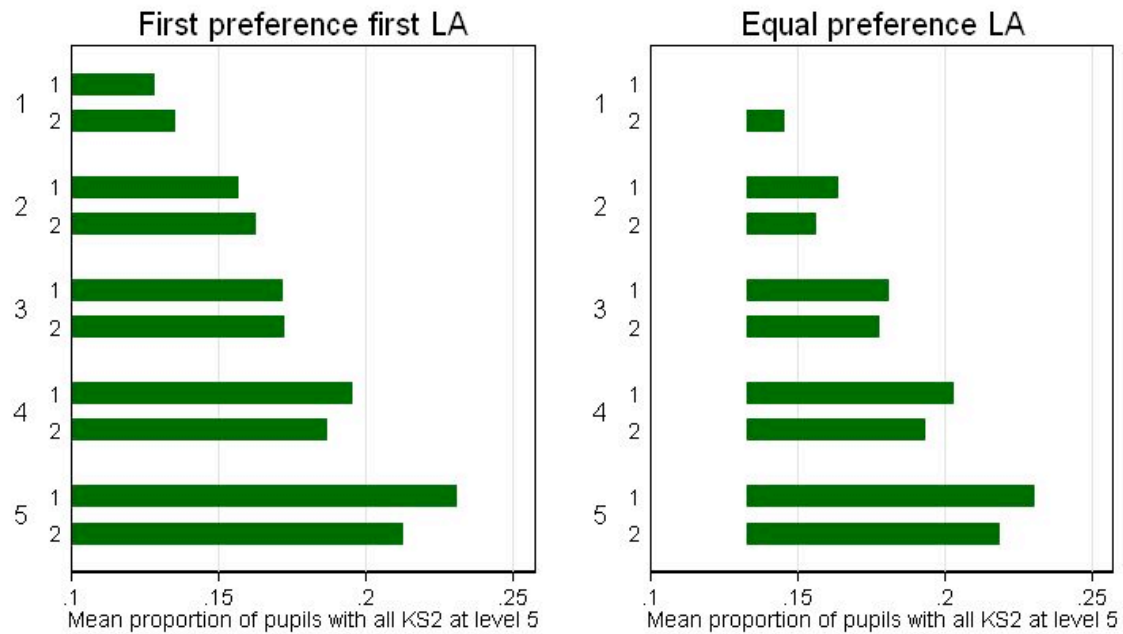
Pan-London Co-ordinated admissions system:

<http://www.londoncouncils.gov.uk/children/briefings/PanLondoncoordinatedadmissionssystem.htm>

Tables and Figures

Figure 1: Comparison of schools nominated on the LA form as 1st and 2nd

Comparison of 1st and 2nd choice schools Evidence of strategic naming in FPF and EP?

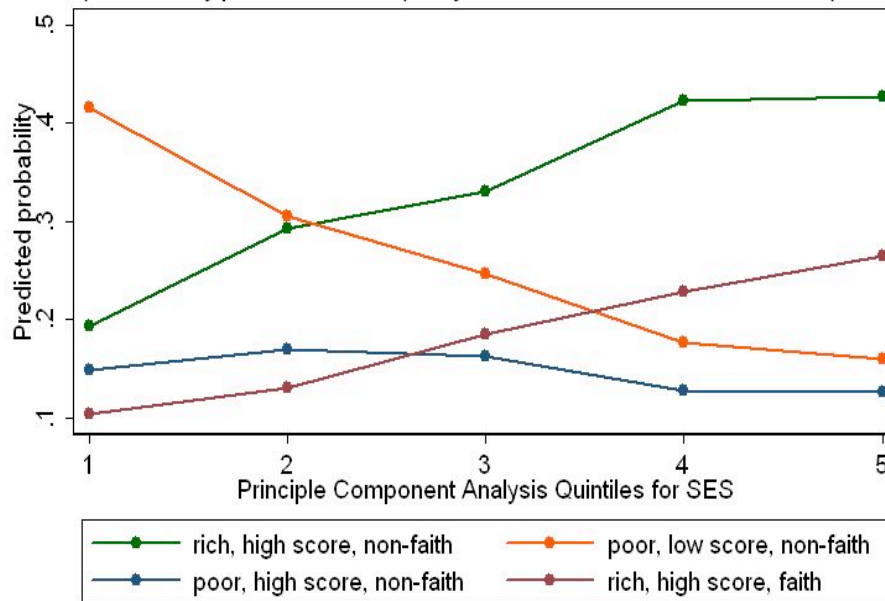


Note: '1' refers to the school named as 1st choice on LA form, '2' refers to the 2nd choice
The sample is all parents that made at least two choices

Note 1, 2, ... 5 refer to quintiles of the socioeconomic status variable

Figure 2: Predicted probability of choosing the four most common types of school, by socio-economic status of the main respondent

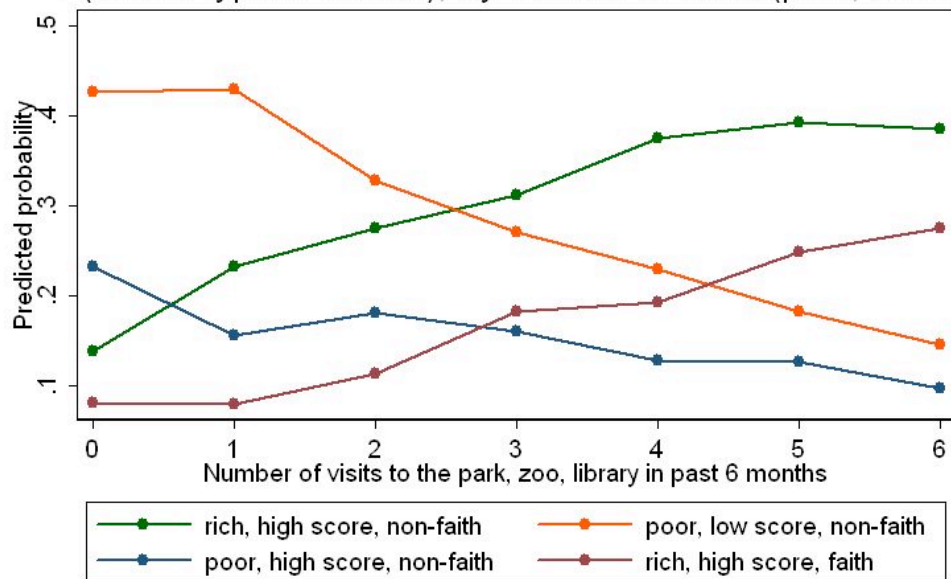
P(attend type of school), by socio-economic status (SES)



Low PCA = low SES; High PCA = high SES
 Predicted probabilities only drawn for the 4 most common types of school

Figure 3: Predicted probability of choosing the four most common types of school, by the number of visits to the library, park, zoo etc. that the child has been taken on in the past 12 months

P(attend type of school), by number of visits (park, zoo...)



Predicted probabilities only drawn for the 4 most common types of school
 6 represents to at least 6 visits

Table 1: Number of schools in FCS-T and FCS-C, the feasible choice set based on travel distance alone (FCS-T) and the more constrained feasible choice set (FCS-C)

Number of schools	FCS-T		FCS-C	
	Percentage	Cumulative percentage	Percentage	Cumulative percentage
2	4.8	4.8	8.38	8.38
3	5.64	10.44	16.64	25.02
4	6.2	16.64	16.86	41.88
5	4.91	21.55	17.03	58.91
6	6.31	27.86	13.17	72.08
7	5.01	32.87	10.74	82.82
8	4.6	37.47	7.71	90.53
9	4.66	42.13	4.06	94.59
10	4.57	46.7	2.08	96.67
11+	53.3	100	3.33	100

Note: The table shows weighted percentages. The number of schools in FCS-C is the number of schools for which the pupil lives within the schools' catchment area. Catchment areas are defined by the straight line distance in which 80% of pupils in the previous cohort lived. The number of schools in FCS-T is the number of schools within a 3km straight line radius of the pupil's home.

Table 2: Number of school-groups in FCS-T and FCS-C, the feasible choice set based on travel distance alone (FCS-T) and the more constrained feasible choice set (FCS-C)

Number of school-groups	FCS-T		FCS-C	
	Percentage	Cumulative percentage	Percentage	Cumulative percentage
2	7.42	7.42	14.92	14.92
3	10.99	18.41	25.95	40.87
4	14.4	32.81	28.38	69.25
5	25.72	58.53	19.06	88.31
6	23.79	82.32	9.68	97.99
7	10.89	93.21	1.82	99.81
8	6.79	100	0.19	100

Note: The table shows weighted percentages. The number of school-groups in FCS-C is the number of school-groups which are constructed from each school for which the pupil lives within the schools' catchment area. Catchment areas are defined by the straight line distance in which 80% of pupils in the previous cohort lived. The number of school-groups in FCS-T is the number of school-groups constructed from all schools within a 3km straight line radius of the pupil's home.