On the Way Down: The Unintended Consequences of School Transport Subsidies

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Abstract

This paper provides evidence of the potentially unintended consequences of policies aiming at increasing school choice. I examine a policy reform that occurred in England in 2008, which provided monetary incentives to low SES students to attend further away schools. In particular, the policy supplied free transport to any of the three closest schools at a distance of at least two miles from home. A simple model shows that while this policy should create incentives for low SES students to attend further away schools, its effect on the quality of the school attended is ambiguous, as constrained parents might be induced to enrol children into more distant but lower quality schools in order to benefit from the subsidy. Moreover, over-subscription of best schools, along with distance-based admission criteria, may de facto limit parents' choice to less popular institutions. Using confidential panel school micro data, providing information on the postcode of both schools and students' residence, I identify the effect of the policy on school choice through a difference-in-difference approach. Consistent with the intended objectives of the policy, I find strong evidence of an increase in enrolment into more distant schools. Interestingly, though, there is a deterioration in the quality of the school attended.

Keywords: Schools Choice, Education Expenditures, Busing

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1 Introduction

According to the National Transport Survey (NTS)[1], in 2009 more than 50% of British households in the bottom quintile of the income distribution did not own a car or van, compared with only 10% in the top income group. Low rates of car ownership imply that families will need to rely on public transports if their children are enrolled in schools beyond walking distance, with a significant impact on both the time and monetary cost of attending school.[2] The high cost of travelling, together with distance-based admission criteria, mean that low income students residing in isolated neighbourhoods *de facto* do not have access to the best institutions.[3]

Improving access to good schools seems to be a promising tool to decrease segregation and promote social mobility. Indeed, though pupils' innate ability and parental background explain a large share of academic achievement, the quality of the school attended is believed to be crucial in determining academic success and future labour market outcomes (Card, 1992; Chetty et al., 2011; Dearden et al., 2002; Kramarz et al., 2009).[4]

[1]The NTS is the primary source of data on personal travel patterns in Great Britain. It is designed to monitor long-term trends in personal travel and to inform the development of policy. The survey collects information on how, why, when and where people travel as well as factors affecting travel (e.g. car availability and drivers' holding). `https://www.gov.uk/government/collections/national-travel-survey-statistics`.

[2] On average, tickets fares for children aged under 16 are £1 for a single short journey, £1.20 for a medium length journey and £1.40 for a long journey.

[3]In principle, school admission policies are not based on geographic zoning, implying that students could potentially apply to and attend any secondary school in the country. Nonetheless, low income students usually attend the school nearby, which is typically of lower quality compared to the national average. Gibbons et al. (2012) provide compelling evidence of how house prices are correlated with school quality: using a regression discontinuity approach, they show that a one standard deviation increase in the school's value added or raw test scores increases house prices by 3%. For additional evidence on the link between housing market prices and school quality see also Black (1999), Hoxby (2000), Rothstein (2006), Fack and Grenet (2010) and Machin and Salvanes (2010).

[4]Compelling evidence comes from the newly introduced academy schools in England, which are showed to improve the share of pupils achieving at least five grades in range A*-C in their GCSE/GNVQ (Machin and Vernoit, 2010; Machin and Wilson, 2009). More recent literature focuses on the impact of the newly introduced charter schools in the US. These schools aim at promoting teaching quality emphasizing traditional reading and math skills, extended instruction time and selective teachers hiring. Abdulkadiroglu et al. (2011) show that oversubscribed charter schools in Boston increase the test scores of low income students by a third of a standard deviation per year -enough to eliminate the black-white test score gap in a few years of attendance. In a follow-up of this paper, Abdulkadiroglu et al. (2014) show that Boston charter attendance boosted SAT scores sharply, along with the probability of taking an Advanced Placement examination. Similar effects have been found in New York City (Dobbie and Fryer, 2011). For additional evidence on the benefits on charter schools see also Hoxby and Murarka (2009), Dobbie and Roland G. Fryer (2011) and Abdulkadiroglu et al. (2011). However, the literature on charter schools is not completely unanimous. Both Ravitch (2010) and Rothstein (2004) criticize the external validity of studies on charter schools, pointing out that those schools are more likely to select students from the top of the ability distribution those children with innate intelligence and well motivated parents. Other studies using as a proxy of school quality by various observable indicators, such as teacher/pupil ratio,

One way to achieve this goal is to decrease the cost of transport to school. The focus of this paper is a unique policy innovation which occurred in England in the academic year 2007/2008, providing monetary incentives to low income students to attend schools beyond walking distance. Although transport subsides have always existed in the UK, in 2007/2008 they became particularly generous for low socio-economic status (SES) students -i.e. those eligible for free school meals (FSME) or whose parents are in receipt of benefits.[5] In particular, it extended the right to free transport to any of the three closest schools at a distance of at least 2 miles and no more than 6 miles from home. The rationales of this policy (Free Transport policy), though with important differences, resemble two kind of programmes adopted in the past: the US desegregation policies, aiming at reducing school segregation of racial minorities, and school choice programmes, having the objective of increasing families' choice set.

Concerning the former, past literature generally connected the implementation of school desegregation programmes with a number of positive outcomes (Billings and Rockoff, 2014; Guryan, 2004; Reber, 2010).[6] Nonetheless, there are important exceptions: the Moving to Opportunity relocation of low SES families across the US, for instance, did not seem to be effective in improving children's academic achievement. (De Luca and Rosenblatt, 2010; Katz et al., 2001; Ludwig et al., 2013). Though the Free Transport policy shares with these policies the ultimate goal of improving access for low SES families to high quality education , it differs from the majority of school desegregation programmes

teachers' educations and per-pupil expenditures, find mixed results on the link with students' achievement (Chetty et al., 2014; Hanushek, 1986, 2003; Krueger, 1999, 2003).

[5]Benefits include: income-based Job-seekers Allowance, Income-related Employment and Support Allowance, Support under Part VI of the Immigration and Asylum Act 1999, Child Tax Credit (provided one is not also entitled to Working Tax Credit and has an annual gross income of no more than £16,190) and the guaranteed element of State Pension Credit.

[6]Guryan (2004) finds a 3 percentage points reduction in drop out rates for black students, while no effect is found for white students. Similarly, Reber (2010) shows that schools desegregation increased graduation rates among black students by 15 %. Ashenfelter et al. (2005) report a positive effect of desegregation on long term outcomes of black students, finding that blacks who finished their schooling just before effective desegregation occurred fared poorly compared to blacks who followed just a few years behind them at school. Finally, Billings and Rockoff (2014) show that the rezoning following the end of busing sensibly widened racial inequality despite the effort of local schools to mitigate the impacts of increased segregation through an increase in the resources invested in education. Students reassigned to high minority schools displayed persistently lower grades at graduation, lower college attendance and higher crime rates. Concerning studies outside the US, Lavy (2010) studies the effect of the end of inter-district busing in Tel-Aviv public schools. Similarly to the US, before 1994 students' assignment to secondary schools was motivated by social and ethnic integration and included busing of some pupils across the city's schooling districts. The 1994 programme terminated the previous system and granted families access to all secondary schools, both within and outside the district. He finds that affected students displayed lower drop out rates and significantly higher cognitive achievement than unaffected children. Moreover, non-academic outcomes, such as students' satisfaction and social acclimation, improved as a result of the better match between students and schools.

as it is not conditional on attendance of a pre-assigned school.

With respect to school choice interventions, there is plenty of evidence showing how English pupils from disadvantaged families are disproportionally sorted in poorly performing institutions (Allen, 2007; Allen and Vignoles, 2006; Burgess et al., 2008, 2004, 2010; Fitz et al., 2003; Gibbons and Telhaj, 2007), though little is known on whether improved school choice would help promoting access to best schools. Past literature exploring parents' preferences revealed that, on average, families do value academic attainment as one of the most important school characteristics (Burgess et al., 2009; Gibbons and Silva, 2011; Hastings et al., 2005), suggesting that expanding families' choice set should translate into a higher fraction of students attending high quality institutions.[7] Empirical evidence on this, however, is mostly limited to the US context. Among others, Cullen et al. (2005) explore the impact of introducing open enrolment within the Chicago Public Schools (CPS). Roughly half of the students opt out of their assigned high school to attend career academies and other high-achieving schools, and these students are much more likely to graduate than those who remain in their assigned schools.[8] Similarly, Deming et al. (2014) explore the effect of winning an admissions lottery to attend a public high school in Charlotte-Mecklenburg (CMS), showing that lottery winners are more likely than lottery losers to graduate from high school and to attend college, and that the positive impacts of choice are strongly predicted by gains on several measures of school quality.[9] [10] With respect to the UK, Gibbons et al. (2008) show that pupils who have a wider choice of schools at their place of residence perform no better than those with more limited choice.

[7]Families also value pupils' composition and distance, the latter being generally more relevant for students with lower socio-economic backgrounds.

[8]Cullen and Jacob (2007) examine whether expanded access to sought-after schools in the CPS can improve academic achievement. Using lottery data, they find that winners attend on average higher quality schools than lottery losers. However, they do not find that winning the lottery systematically confers any evident academic benefit.

[9]For additional evidence on the effects of CMS open enrolment see, among the others, Hastings et al. (2006) and Hastings et al. (2007).

[10]A different strand of the literature examines the impact on school choice of school vouchers, which decrease the cost of attending private schools. In 1990 Wisconsin began providing a small number of low income families with vouchers to attend non sectarian private schools. Greene et al. (1997, 1996) and compare the test scores of students who won the lottery with those who lost, finding significant gains in both math and reading scores. Rouse (1998) compares the test scores of students selected to attend a private school with those of all other students from Milwaukee public schools. She finds that the program had a positive impact on math score gains of selected students. Other studies on the effects of the Milwaukee Voucher Program include: Witte (1992), Witte et al. (1995), Witte and Thorn (1996), Witte (1997). Finally, Angrist et al. (2002) explore the effects of a voucher programme in Columbia, offering vouchers which partially covered the cost of private secondary school for students who maintained satisfactory academic progress. Three years after the lotteries, winners were about 10 percentage points more likely to have finished 8th grade, primarily because they were less likely to repeat grades, and scored 0.2 standard deviations higher on achievement tests.

Though closely related to school choice programmes, however, the Free Transport policy differs from these policies in being the first intervention of this kind conditioning choice on distance to school.

A simple model shows that, while this policy should create incentives for low SES student to attend schools further away, its effect on the quality of the school attended is ambiguous and it might even reduce it. This follows from the fact that some students might be induced to trade school quality with savings in the cost of transport. The mechanism is further enhanced by school over-subscription and distance-based admission criteria that could *de facto* limit choice to lower quality, less popular schools.[11]

Using a unique dataset on the universe of England's students providing information on both pupils' postcode of residence and school history, I identify the effect of the policy on school choices through a differences-in-differences approach, comparing low SES students living in postcodes eligible for free transport (i.e. with at least one of the 3 closest schools over 2 miles and below 6 miles) in the post reform period with those ineligible (i.e. those for whom the three closest schools are all below 2 miles). As eligibility for the programme is based on walking distances, I computed the shortest route between pupils' postcodes and schools' postcodes using the Geographic Information System (GIS). Furthermore, I use students' postcodes measured prior to the entrance into secondary school (i.e. in their last year of primary school), to alleviate the concern stemming from families' endogenous mobility.

Consistent with the intended objectives of the policy, I find strong evidence of an increase in the probability of FSME students enrolling at more distant schools, in the order of 2 percentage points. This, however, does not result in an improve in quality, with eligible students enrolling at schools between 0.02 and 0.03 standard deviations lower in quality than ineligible ones. Exploring the potential mechanisms, my results show that a crucial role is played by school over-subscription which limits the access to more distant, high quality schools. Overall, these findings suggest that the introduction of free transport did not yield the desired effect of improving the quality of the school attended by low SES students.

This paper unfolds as follows: in sections 2 and 3 I briefly discuss the institutional background and present basic descriptive evidence. Section 4 introduces a simple model of school choice with free transport to school. Sections 5 and 6 present the identification strategy and show results of the effect of the programme on the outcome variables of

[11] Compelling evidence on the relevance of the proximity criterion is provided by Burgess et al. (2010), showing that it accounts for up to two thirds of the overall observed difference in the quality of the school attended.

interest. The last section summarizes and concludes.

2 Background

This paper focuses on public school students in their transition from primary to secondary school. Compulsory primary education in England covers ages 5 to 16.[12] The National Curriculum is divided into four Key Stages: Key Stage 1 (ages 5 to 7), Key Stage 2 (ages 7 to 11), Key Stage 3 (ages 11 to 14) and Key Stage 4 (ages 14 to 16).[13]

In the Spring at the end of each Key Stage (KS) students are assessed in three compulsory subjects, mathematics, English and science, either by teacher assessment (in Key Stage 1 and Key Stage 3) or by standard national tests (SATS, in Key Stage 2).[14] At the end of KS4, though not mandatory, most students take the General Certificate of Secondary Education (GCSE),[15] the minimum requirement being to sit national examinations in mathematics, English and science.[16]

School admission to both primary and secondary schools is based on the principle of free parental choice: parents can apply to any school, regardless of their Local Authority (LA) of residence (roughly comparable to New York City's Boroughs).

The only limit to parents' free choice is over-subscription of the most popular schools. In this case admissions are determined on the basis of the schools' own criteria, which must be non-discriminatory according to the Department for Education's guidelines. Generally, schools give priority to: (1) pupils with special education needs (SEN), (2) students who have siblings already at the school and (3) students who live close by.[17] Some schools, namely grammar schools, may select students on the basis of their ability. However, the share of these schools is negligible.

Every year LAs' websites publish an up-to-date list of the schools available within

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[12] There is no grade retention in England, so age corresponds to school grade.

[13] A second route available to students consists of a three tier track with students enrolling in primary school at age 6-9, in middle school at age 9-13 and in secondary school from then on. However, even if very popular in the 80's, the number of middle schools started declining already in the early 90's and nowadays only a negligible fraction of students follows this path (roughly 5% of the whole population).

[14] Evaluation of Key Stage 3 became teacher-assessed in the academic year 2008/2009.

[15] Roughly 95% of students in Key Stage 4 take the final examinations. This is also an essential requirement to access higher education. Moreover, virtually all universities set requirements on additional subjects to be taken at GCSE level, as well as on minimum grades.

[16] To pass the GCSE all students are required to take the examination in first level (*core*) science (Single Award). Students can also choose to pursue a Double Award (*core* and *additional*) or a Triple Award (biology, chemistry and physics).

[17] Distance for the purpose of admission is the <u>linear</u> (crow flies) distance between the pupil's house and the school.

their boundaries, along with all the steps needed to complete the application process.[18] Parents are provided with very rich information on the characteristics of available schools. In particular, every school is required to publish on its website detailed information on past performances ("performance tables"), typically Key Stage 2 and Key Stage 4 attainment measures, and additional statistics, such as the pupil/teacher ratio and pupils' ethnic composition. Even if the criteria to complete the performance tables have been reviewed almost every year, measures of pupils' achievement in both mathematics and English have always been included. Additional to performance tables, schools' websites must include a link to Ofsted's website, an independent body producing detailed reports on perceived schools' quality on the basis of students' and parents' satisfaction.[19]

This study focuses on the unique policy change, which aimed at increasing school choice among low income families through the provision of free transport to school. Since 1996 a duty exists for Local Authorities to provide free transport to all students aged 11-16 years old attending their nearest available school, provided this is more than 3 miles (and less than 6 miles) walking distance from their home.[20] Free transport can take different forms: school buses ("yellow buses"), free tickets for public transport, private cars and taxis or car mileage bonuses for parents. The provision of free transport only covers the travels to and from schools for the whole duration of the academic year and it is up to the LA to determine case by case the most suitable transport arrangement.[21] [22] [23]

In academic year 2007/ 2008 the Free Transport policy extended the benefit for low income students aged 11-16 to any of their *three* nearest schools over 2 (and below 6) miles walking distance from their homes. In practice, this means that starting from 2007/2008, FSME students with the first closest school below 2 miles but the second or third closest school between 2 and 6 miles can access free transport to any of the more distant two schools. If the second or third nearest school is over-subscribed and the pupil is not granted

[18] Applications open the Fall before the student is due to start school. Families need to submit their completed application (on-line or on paper) by the 15th of January for primary schools and 31th of October for secondary schools, including at least three and a maximum of five options. Results of the application will be confirmed by the 16th of April for primary schools and by the 1st of March for secondary schools.

[19] All past reports can be consulted at www.ofsted.gov.uk.

[20] To the best of my knowledge, the vast majority of Local Authorities employ the Geographic Information System (GIS) to compute the walking distance. Usually Local Authorities also provide a free of charge service through which parents can compute the home to school distance in a similar way.

[21] Local Authorities have the discretionary power to provide travel arrangements to ineligible students, usually charging a fee, but priority is to be given to eligible children.

[22] The Education Act 1996 states "As a general guide, transport arrangements should not require a child to make several changes on public transport resulting in an unreasonably long journey time. Best practice suggests that the maximum each way length of journey for a child of primary school age to be 45 minutes and for secondary school age 75 minutes".

[23] Unfortunately, to the best of my knowledge, there are not official data on what form of free transport LAs provided to families.

admission, the right to free transport extends to the next available school. In order to be eligible for the programme, parents need to be in receipt of benefits- the same criterion required for free school meal status. Families can apply to their Local Authority at any time during the academic year and need to provide initial evidence of their receipt status. The Local Authority would then be in charge of verifying the existence of the eligibility status on a yearly basis.[24] The policy change did not affect non-FSME students, with the exception that starting from 2007/2008 children living between 2 and 3 miles from the nearest school became eligible for free transport to that school.[25]

3 Data

To assess the effects of the Free Transport policy, I employ a differences-in-differences identification strategy, comparing FSME students eligible for free transport (defined on the basis of distance) with those ineligible before and after the policy. The empirical analysis covers academic years 2004/2005-2010/2011 and only considers students who do not reside in London. This decision follows from the fact that first, since August 2005, all students living or attending a secondary school in London have been entitled to free of charge transport or reduced fares on public transports with no distance or income constraints. As such, London Local Authorities are not subject to the duties of the Free Transport policy. Second, London secondary schools display different trends in terms of performance compared to the rest of English schools. Table 1 shows how the eligible and ineligible groups are constructed. The first two columns report the distance to the nearest and second nearest school respectively, the third and fourth columns report the eligibility for free transport before and after 2007/2008 and the last column reports the percentage of the total sample. For simplicity, and without great loss of generality, I restrict the analysis to students who leave less than 2 miles from the nearest school and assume that families can only choose between the 2 nearest schools. The ineligible group is then defined as pupils who leave less than 2 miles from the second nearest school, while

[24] Local Authorities are asked to publish detailed information on how the eligibility for free transports would be assessed and what kind of assistance they would be providing.

[25] The fact that non-FSME students are now eligible for free transport to the nearest school (between 2 and 3 miles) from home may potentially have an impact on FSME students as well, through an increase in competition for schools between 2 and 3 miles. To rule this out, table 1.A1 in the Appendix reports results for a regression on non-FSME students of the form

$$y_{ipt} = \gamma_0 + \gamma_1 T_{pt} + \eta_p + \eta_t + \omega_{ipt}$$

where T_{pt} is equal to 1 if the nearest school is between 2 and 3 miles from home in the post reform period, η_p are postcode fixed effects and η_t are year fixed effects. Estimates show that the changes in the requirements for free transport for non-FSME students did not have a significant impact on their choices.

the eligible group is formed by pupils whose second nearest school is over 2 (and below 6) miles from home. As shown in the last column of the table, overall these two groups count for 91% of the total number of English students.

The core dataset used in the analysis is the Pupil Level Annual Census (PLASC), carried out every year at the end of January. This is a Census of English state school pupils, covering roughly 95% of the whole population.[26] It includes information on student demographics such as gender, ethnicity, language spoken at home, special education need status (SEN), eligibility for free school meal, the unique identifier of the school attended and pupils' postcode of residence. There are 900,609 postcodes in my data. A postcode includes roughly 20 households (a block) located on the same side of a street and identifies on average less than 2 students per year in the data. I focus on students due to start secondary school in academic years 2004/2005 to 2010/2011.[27]

A minor concern relates to the time at which the eligibility for free transport is determined. As mentioned above, parents can apply for free transport at any time during the academic year . Hence, one may worry that families may move (or avoid to move) in order to gain eligibility for free transport to their preferred school. To temper this concern, I consider students' postcode measured during the last year of primary school, that is, before the eligibility for the programme is assessed.

I use administrative data on schools, which report the exact address of every establishment, to match each pupil to his two nearest secondary schools determined on the basis of linear distance ("crow flies", which determines admission) from the student's postcode of residence. I exclude from the sample of schools institutes for SEN students (special schools). I do so because these schools may follow a different curriculum from the national one and pupils studying below GCSE level may take a different qualification altogether in one or more subjects.

To determine eligibility for free transport, I measure walking distance from the pupil's postcode to each school using the Geographic Information System (GIS), which computes the shortest route available excluding motorways and major roads. Figure 1 provides an example of how walking distances to school are computed: the straight line reports the linear distance to the second nearest school, while the blue-dotted line reports the shortest walking distance. In the example the student would not be eligible for free transport if we were to consider the linear distance; however, he falls into the eligible group when considering walking distance to the school.[28]

[26] About 5% of English students are enrolled in private schools.

[27] As I am interested in the transition between primary and secondary education, I exclude from the analysis the small fraction of students (roughly 5%) enrolled in middle schools.

[28] As school have some discretionary power in determining the walking route to the school, there is

Finally, I use data on students' test scores at KS4 (Year 11) from the National Pupil Database (NPD) to obtain a measure of the quality of school attended. The data include information on individual GCSE test scores in all subjects for the academic years 2004/2005-2010/2011. One may worry that schools based in different neighbourhoods may experience different trends in performance (for instance because Local Authorities invest more resources in schools based in more deprived areas). If this process differs between the eligible and ineligible group, the estimates of the effect of the programme on the quality of the school attended may be biased. In order to alleviate this concern, I define a time invariant measure of school quality computed as the average of English and mathematics test scores over the whole period of analysis and standardize it at the school level to have a mean of zero and a unit standard deviation, such that the average school quality in the period is zero. It is worth mentioning that this measure is constructed based on the test scores of students who enrolled before the policy was implemented (2007/2008) and is hence pre-determined.

Figure 1.A1 in the Appendix summarises the timing of the data building. In October, at the beginning of the last year of primary school (Year 6), families fill the application form to enrol at secondary school. In January of the following year, at the time of the Census, I observe the residential address of the student and measure the walking distance to each of the two nearest schools. In September the student starts secondary school (Year 7) and, finally, in January I observe the unique identifier for the school attended and assign the corresponding measure of school quality to each student.

3.1 School characteristics

There are 3,323 secondary schools in England in the period of analysis.[29] Panel A of table 2 reports schools' basic characteristics. Among them 50.23% are community schools, which are run and financed directly by the local government.[30] On average each school enrols roughly 147 new students every year, going from a minimum of 2 in the bottom

still some risk of measurement error in determining the eligibility for the programme. Specifically, schools consider the "safe" shortest route from the pupil's house to the school, implying that they are allowed to discard some routes when they do not find them appropriate for the pupil. As the policy does not provide schools with objective criteria to define safety, I am not able to control for this.

[29]This number does not account for secondary schools based in London and schools dedicated to special education needs students ("special schools"), which have been excluded from the analysis. Moreover, schools changing denomination are counted as separate schools.

[30]There are several types of secondary schools in England, which differ regarding the degree of freedom in setting their own curriculum. The most common are: community schools, controlled by the local council; foundation schools, with slightly more freedom than community schools; voluntary controlled and voluntary aided school, run by a foundation or a trust and academies, comparable to US charter schools.

decile of the distribution to almost 275 in the top decile.

The last row of Panel A reports statistics on school quality. The top 10% of schools perform 1.4 standard deviations better than the average and 2.4 standard deviations above the bottom decile.

Panel B displays schools pupils' composition. In the average establishment almost 80% of first year students are white British, more than 88% speak English as a first language and roughly 20% of them are eligible for free school meals. As for the number of new enrolments, students' characteristics differ widely among schools, suggesting that there is significant sorting of pupils based on ethnicity and parental income. The fraction of white British students goes from 16% in the bottom decile to a maximum of over 98% in the most "white" schools. Very similar patterns emerge with respect to English speakers: in 10% of schools the proportion of students speaking English as a first language is in the order of 36%, while in the top 10% of the distribution it is virtually 100%.

Lastly, there is significant variation also with respect to students' family income. In the most wealthy schools, the percentage of FSME pupils is less than 2%. This is well below the national average of 20%. On the other hand, FSME pupils account for 57% of students in the most disadvantaged schools.

Overall, these figures show that there is large variation in both the quality and students' body composition of schools, including ethnic and income composition.

3.2 FSME students' characteristics

There are 416,366 FSME students starting secondary school between academic years 2004/2005 and 2010/2011. Panel A of table 3 reports the basic characteristics of the sample. The first column reports statistics for the whole sample, the second for students eligible for free transport (on the basis of distance) and the last for ineligible students.

Eligible students are more likely to be white British and to speak English as a first language compared to the rest of the population: 87.5% of them report to be of white British ethnicity and 95% are native English, compared to 74% and 84% respectively among the ineligible.

Figure 2 shows the distribution of students by distance to the two nearest school from home. The majority of FSME students have at least two schools within 2 miles, with less than 10% of them having to travel more than 2 miles to reach the closest school. However, more than 15% of FSME students have the second nearest school above 2 miles from home, meaning that, starting from 2007/2008, they would be eligible for free transport. Panel B of table 3 shows the statistics relative to school availability and choice of school separately for eligible and ineligible students. The average distance among all children to the nearest school is 0.9 miles while the distance to the second nearest is 1.8 miles, increasing to 1 and 2.9 miles respectively for the sample of eligible students.[31]

Most students attend either the nearest or the second nearest school from home: more than 70% of eligible pupils attend one of these two schools, compared to roughly 63% of other pupils. Interestingly, eligible students attend schools that are, on average, of higher quality than the ineligible group (of the order of 0.11 standard deviations).

Figure 3 shows the distribution of the quality of the nearest and the second nearest schools by distance to the second nearest school for FSME students (i.e. the programme eligibility variable). Strikingly, on average, the second nearest school is always of higher quality than the nearest one, the gap increasing with distance. Even more interestingly, the quality of both schools decreases with distance as long as pupils live within 2 miles from the school and it increases sharply above the 2 miles threshold. The average standardized test scores of the nearest school are in the order of -0.04 for both eligible and ineligible students, while the same figures for the second nearest school are in the order of 0.14 for eligible students and 0.07 for ineligible ones. This suggest two margins of residential segregation. First, FSME students are generally segregated into neighbourhoods served by low quality schools surrounded by affluent neighbourhoods with high quality schools. Second, among FSME students, those who are more isolated are surrounded by neighbourhoods served by higher quality schools than other disadvantaged students (possibly wealthy residential areas).[32] Overall, these figures suggest that, by pushing students to enrol at more distant schools, the Free Transport policy could in principle have beneficial effects on the quality of the school attended by eligible students.

4 Theoretical framework

For the sake of simplicity, consider a world with only two schools. Note, however, that the implications do not change if the model is extended to more than two schools. A family decides whether to enrol their children at the nearest school (S_1) or at the more distant school (S_2). The utility of enrolling at S_1 and S_2 is given, respectively, by

[31] 3 miles is the "statutory walking distance" for ineligible students and 2 miles the "statutory distance" for low income students, i.e. the maximum distance students are expected to walk to school according to the DfE.

[32] Figures 1.A2 and 1.A3 provide a visual representation of these two stylized facts for the city of Manchester. Figure 1.A2 maps the difference in quality between the second nearest and the nearest school (on the left) and the proportion of FSME students on the territory (on the right). Figure 1.A3 shows the difference in quality between the second nearest and the nearest school (on the left) and the proportion of FSME students living between 2 and 6 miles from the second nearest school (on the right).

$$U_1 = Q_1 - \beta_1 dist_1 + e_1$$

and

$$U_2 = Q_2 - \beta_1 dist_2 + e_2$$

where Q_1 and Q_2 are school quality measured as test scores, $dist_1$ and $dist_2$ are the distance costs of attending the further away school and e_1 and e_2 are idiosyncratic error terms. The parameter β_1 captures the utility cost per mile of travelling to school, embodying both the monetary cost of transport and the leisure loss. The family will choose to enrol their children at the school delivering the highest utility. Hence, the probability of attending S_2 will be given by

$$P(S_2 = 1) = P(U(S_2) > U(S_1)) = F(\Delta Q + \beta_1(dist_1 - dist_2))$$

Where F is the cumulative distribution of $e_2 - e_1$ and $\Delta Q = Q_2 - Q_1$. Note that students may enrol at the more distant school even if this is of lower quality compared to the nearest one (i.e. $P(S_2 = 1) \neq 0$ even if $\Delta Q \leq 0$). This captures preference heterogeneity across families.[33] In particular, as test scores are *de facto* only a proxy of true quality, a family utility function may take into account other characteristics, for instance peer composition, the quality of the neighbourhood or more targeted programmes for disadvantaged pupils.

The Free Transport subsidy *de facto* reduces the cost $dist_2$ of attending the distant school. All else equal, the main implications of the programme on the choice of school can be summarized as follows:

1) A positive impact on the probability of enrolling at S_2;

2) A larger effect the higher the distance to S_1;

3) A smaller effect the higher the distance to S_2.

The second relevant question concerns the effects on the average quality of the school attended. The expected quality can be written as

$$E(Q) = Q_1 P(S_1 = 1) + Q_2 P(S_2 = 1)$$

This is equivalent to

[33]Though I do not report statistics here, the data at hand confirm that a non negligible fraction of students attend a more distant school even if it is of lower measured quality compared to the nearest one.

$$E(Q) = Q_1 + \Delta Q F(\Delta Q + \beta_1(dist_1 - dist_2))$$

The effect is ambiguous and depends effectively on the distribution of school quality (ΔQ) among those who took up the policy. In particular, given the design of the programme, marginal students may be pushed to enrol at more distant schools even if there is no gain in terms of quality. This follows from the fact that, as mentioned, families have different preferences and take into account school characteristics other than test scores. This implies that some families would prefer to enrol their children at S_2 even if $\Delta Q \leq 0$, but are constrained by the distance cost. The decline in $dist_2$ may hence move these students away from S_1 towards S_2. Second, the subsidy may imply that now for some families $dist_2 < dist_1$. In, particular, the free transport subsidy provides monetary savings for students whose nearest school is beyond walking distance and would have to pay public transport out of their own pocket if attending the closest school. Hence, in the post reform period these students may decide to enrol to the more distant school even if $\Delta Q \leq 0$, in order to save on transport costs.

The overall potential effect on $E(Q)$ is shown in figure 4. The y-axis reports the expected quality of the school attended $E(Q)$ and the x-axis the difference in the quality of the two schools ΔQ. The solid line plots the distribution of $E(Q)$ for a given $P(S_2 = 1)$ before the policy change: the larger ΔQ, the higher $E(Q)$. The effect of the policy $E(Q)$ is shown by the dashed line. Free transport has the effect of boosting the distribution of $E(Q)$ for values of ΔQ greater than 0 and pushing it down for values lower than zero.

Indeed, although ex-ante $\Delta Q > 0$ (see table 3), meaning that FSME children could potentially gain from the policy, I show that, due to school over-subscription, students responding to the programme are disproportionally those for whom $\Delta Q \leq 0$, so that $E(Q)$ declines as an effect of the policy.

5 Empirical strategy

In order to identify the effect of the policy on FSME students' choice, I use a differences-in-differences strategy based on the eligibility for free transport as shown in table 1. In practice, I compare the choice of eligible students (i.e. FSME pupils with the first school below 2 miles and the second nearest school above 2 miles) and ineligible students (i.e. FSME students with both schools below 2 miles) before (up to 2008) and after the implementation of the policy (2007/2008 onwords).

Ignoring other covariates, I estimate the model in reduced form

$$y_{ipt} = \beta_0 + \beta_1 D_{pt} + \eta_p + \eta_t + \epsilon_{ipt} \tag{1}$$

where D_{pt} is a variable that takes the value of 1 if the second nearest school to student i's postcode is between 2 and 6 miles walking distance in the post reform period, η_p is a postcode fixed effect, η_t are time fixed effects and the β_1 parameter captures the effect of the programme. The outcome variable y_{ipt} is either the probability of attending a given school or the quality of the school attended.[34]

Equation 1 leads consistent estimate of the intent to treat parameter under the assumption that, in the absence of the programme, the changes in the outcome variables would have been the same for eligible and ineligible postcodes. In other words, the eligibility for the programme should be "as good as random", implying that $Cov(D_{pt}, \epsilon_{ipt}|\eta_p, \eta_t) = 0$.

One violation of this assumption may occur if distance to the second nearest school (the treatment variable) is correlated with other unobservable characteristics of the pupils. This might arise from endogenous mobility or, in general, from the non random allocation of households across neighbourhoods. As the identification strategy is a differences-in-differences (across postcodes over time), the real concern is whether such selection is correlated with the policy reform, as in practice the diff-in-diff is able to control for non random location as long as it is time invariant. One might indeed think of circumstances where households respond strategically to the policy. Consider, for instance, a household with very strong preferences for a (good) far away school, say school A. In the pre policy period this household would have moved near to the school in order to maximize the probability of admission and minimize the cost of travel. If that school is centrally located (better schools tend to be close to each other), then this household would have been classified as ineligible in the pre policy period, as the second nearest school would also have been within 2 miles from home. However, this household might decide not to move in the post reform period in order to take advantage of the subsidy. It would now be classified as eligible while still attending school A. Under this set of circumstances one would find that households further away from the second nearest school are more likely to attend school A in the programme vs the pre programme period, but this would be a pure compositional effect, rather than a genuine effect of the policy. There are three arguments that suggest that this selection should not be a major source of concern. First, as discussed in section 3, all distances to schools are predetermined and, as such, do not depend on residential choices in response to the policy. Second, low income households are typically immobile, especially considering that house prices are highly correlated with proximity to good

[34] Though the analysis relies on a linear probability model, results are consistent and comparable when estimating a conditional logit model.

schools. Third, this can be empirically tested. Though, for simplicity, I do not report this here, a regression of the number of household by postcode on the treatment variable shows no significant correlation between the policy change and students' residential choices, suggesting that endogenous mobility is not a major source of concern.

Aside from endogenous mobility in response to the policy, another potential source of bias in the estimates might result from latent time trends in school attendance among children in populated vs isolated areas. If those living in more populated areas are increasingly more likely to attend closer and possibly better schools compared to those in isolated areas, this might confound the effect of the policy. In theory this seems to be unlikely. Also, if this were the case one could expect a smooth trend across treatment and control areas over time. Figures 5 and 7 report the treatment effect at different leads and lags from the implementation of the policy.[35] Overall, there is no evidence of the presence of pre policy trends in the outcome variables. Moreover, there is a change in the gradient precisely at the time of the policy change, reassuring on the validity of the identification strategy.

6 Results

This section begins by showing the overall effect of the program on the choice of school (subsection 6.1). Second, it looks at the effects on the quality of the school attended (subsection 6.2). Third, it checks the identifying assumptions and whether the main findings are robust to the alternative specifications (subsections 6.3 and 6.4). Finally, it analyses heterogeneous effects in the impact of the programme (subsections 6.5 and 6.6).

6.1 The effect of the policy on the choice of school

Figure **??** shows the probability of attending the nearest school before and after 2008 by distance to the second nearest school. Data only refer to FSME students. Observations on the left of the vertical line (i.e. with distance to the second nearest school less than 2 miles) identify the ineligible group, those on the right (i.e. with distance to the second nearest school greater than 2 miles) the eligible group. The dashed line reports data

[35] The figures plot the coefficients ψ_{1t} from the following regression (where η_s=1 if $t = s$):

$$y_{ipt} = \psi_0 + \sum_{s=2005/2006}^{2010/2011} \psi_{1s}(D_p * \eta_s) + \eta_p + \eta_t + u_{ipt}$$

where D_p is a variable that takes the value of 1 if the second nearest school to student i's postcode is between 2 and 6 miles walking distance.

for the pre policy period, while the solid line reports data for the policy period. The difference between the outcome of the eligible and ineligible groups before and after the policy identifies the effect of the programme. As it is clear, the proportion of eligible students attending the nearest school falls significantly after the implementation of the policy, while it is virtually unchanged for the ineligible group. This suggests that free transport had the effect of decrease the fraction of low income students attending the closest school.

Table 4 shows the corresponding estimates of the effect of the programme on the probability of attending each of the two nearest schools (row 1 and row 2) or any other school (row 3). The first column controls only for Local Authority fixed effects, time fixed effects and students' background characteristics. These include: gender, student's first language and a dummy for whether the student identifies himself as "white British". Standard errors are clustered at the Local Authority level. Results show a clear negative, though small, effect of the programme on the probability of attending the nearest school from home, with a coefficient of -0.027 (significant at the 1% level). These results imply that being eligible for the programme decreases the probability of attending the nearest school by 2.7 p.p. in the post reform period, corresponding to a 5.6% decrease over the mean of 48%. The decrease in the probability of attending the nearest school is counterbalanced by a 1.2 p.p. increase in the probability of attending the second nearest school and a 1.6 p.p. increase in the probability of attending other schools.[36] These represent, respectively, an increase of 6.8% and 4.6% over the corresponding means of 17.6% and 34.6%.

The specification in columns 2 and 3 further controls for potential time varying endogenous sorting within Local Authority. Specifically, families can endogenously choose their location with respect to schools on the basis of unobserved characteristics which affect both the probability of being eligible for free transport and the choice of the school. If this process is not time invariant, estimates would be biased. In an attempt to control for this, I include in the regression a polynomial of the second order for the distance to the second nearest school (column 2) and to the nearest school (column 3). The coefficients are slightly smaller than the ones presented in column 1 but still statistically significant.

Finally, the specification in column 4 controls for postcode fixed effects. This regression compares eligible and ineligible students in the pre and post reform periods absorbing all time invariant unobservable characteristics of the student's postcode of residence. Though the specification is highly demanding, the estimates on the probability of attending the nearest and the second nearest school remain significant and similar in magnitude, im-

[36] Note that, by construction, the three rows add up to zero.

plying a 1.8 p.p. decrease in the attendance of the nearest school and a 1 p.p. increase in the attendance of the second nearest school, corresponding to a 3.8% decrease and a 5.7% increase over the mean, respectively. Interestingly, the coefficient on the probability of attending other schools remains positive, but is not significant at standard confidence levels, confirming the intuition that the choice of school among disadvantaged students is largely between the nearest and the second nearest schools.

6.2 The effect of the programme on the quality of the school attended

The crucial question of the paper is whether the shift in school choice had any effect on the average quality of the school attended by eligible students.

Table 5 shows the estimates of equation 1 where the dependent variable is the quality of the school attended, using the same specifications as in table 4.[37] As mentioned, quality is standardize over the whole period to have a mean of zero and a standard deviation of one.[38] It is worth reminding that this measure is constructed based on GCSE test scores of students who were not affected by the policy (as they enrolled before 2007/2008) and is hence pre-determined.

Estimates show that eligible students choose *lower* quality schools with respect to the pre-policy period than ineligible ones. On average, the quality of the school attended is between 0.021 and 0.022 standard deviations below the pre-policy period. Families whose children are eligible for FSM typically follow in the bottom 20% of the income distribution, implying that a household composed of two working parents will have post taxes earnings of roughly £16,000 (at year 2008)[39] . Estimates shown in table 5 suggest that, on average, families are willing to trade 2.2% of a standard deviation of quality in exchange for the subsidy. As the average transport cost to school for a child aged 11-16 is between £330 and £440 per academic year, the subsidy corresponds to approximately 2-3% of the family annual income.[40] This implies that a household would be willing to enrol their children at a school nearly 70% of a standard deviations worse if the subsidy was 100% of their initial annual income (corresponding to approximately £32,000, enough

[37]This measure is based on the average quality for the school's existence period. Since the panel is unbalanced due to school openings and closures, different spans of time may be considered for schools with different existence periods.

[38]Results do not change if quality is defined as the average test scores at baseline year, i.e. at 2004/2005.

[39]Statistics from the HM Revenue and Customs, available at https://www.gov.uk/government/statistics/percentile-points-from-1-to-99-for-total-income-before-and-after-tax.

[40]The average cost of a monthly ticket is between £30 and £40 and the academic year goes from September to the end of July.

to move from the bottom 20% to the median of the income distribution).

Overall, these results suggest that the policy did not have the desired effect of improving the quality of the school attended among FSME students. First, as discussed in section 4, as a result of the programme some FSME students may decide to enrol to more distant schools, even when there is no gain in measured quality. Second, as families' access to high quality schools is rationed, eligible students are *de facto* able to attend distant schools only as long as they are not very popular (and presumably high quality). The two effects combined may explain why the policy did not improve the average quality of the school attended.

So far I have assumed that the only measure of school quality considered by parents is given by students' standardized test scores. Nonetheless, as discussed in section 4 other characteristics may also be relevant in the choice of school. Rows 2 to 4 of table 5 report the estimates of equation 1 for schools' student composition, measured as the percentage of white British students, the percentage of FSME and the percentage of native English speakers. Similarly to school's quality, all the three variables are constructed as a mean for the whole period of Year 11 students' characteristics and hence are pre-determined. Row 2 and row 4 report the estimates of the percentage of white British students and English speakers in the school. Overall, all estimates are very close to zero and not statistically significant. Interestingly, a significant and positive, though rather small, effect emerges with respect to the percentage of students eligible for free school meals in the school (row 3): students eligible for free transport enrol at schools with between 0.4 and 0.6 percentage point higher fraction of pupils with a similar background.

6.3 Robustness checks

As stated in section 5, the identification strategy relies on the assumption that the assignment to the eligible and ineligible group is as good as random. I attempt to prove the validity of this assumption showing the presence of pre policy parallel trends and probing the robustness of the estimates to the inclusion of (observable) students' characteristics. Nonetheless, one may still be concerned about the presence of latent trends. One way to deal with this is to make the treatment and control groups the more closely comparable as possible. I do so by restricting the sample to families who live closer to the 2 miles threshold. Specifically, I redefine the eligible group as students with the first nearest school between 1 and 2 miles from home and the second nearest school between 2 and 3 miles from home. Similarly, the control group is defined as pupils with both the first and the second nearest school between 1 and 2 miles from home.

The first panel of table 6 reports the corresponding estimates of equation 1. Results are very close in magnitude, however, they are not statistically significant. This should not be surprising, as the sample is reduced by two thirds and, once including postcode fixed effects, there is little variation left.

There are two concerns remaining. First, a (small) number of school opening and closures which might be correlated with the treatment variable.[41] Second, school conversions, which are *de facto* treated as two separate schools (i.e. when school A converts to school B I treat these as two separate schools). As in the case of school openings and closures, this may generate bias if it is correlated with the treatment variable. In an attempt to rule this out, the second panel of table 6 shows estimates for the sub-sample including only postcodes which are not subject to school openings/closures or school conversions, i.e. for which the school identifier of the two nearest schools is the same for the whole period of analysis. Reassuringly, estimates are robust and very close to the ones presented above, suggesting that these concerns are of second order.

6.4 Falsification tests

As an additional way of checking the validity of the identification strategy, in the remainder of this section I present a number of falsification tests.

The top panel of table 7 reports regressions of the probability of attending the nearest, the second nearest or any other school and of the quality of the school attended for the city of London. As mentioned, London is not subject to the duties imposed by the Free Transport policy, as all students are provided with discounted fares on any public transport since 2005. Hence, if the identification strategy is valid, one should not observe any change in the choice of school following the implementation of the programme. Columns 1 to 3 show estimates for the choice of the school attended. Reassuringly, I find no evidence of an effect of the Free Transport programme on the choice of school among students living in London: estimates are virtually zero and not significant across all specifications. Columns 4 reports estimates on the quality of the school attended as defined in table 5. Again, estimates are not significant at the standard levels.

The second panel of table 7 reports estimates for non-FSME students. As higher income students are not entitled to free transport, there should be no effect of the programme on their choice of school. All estimates are close to zero and non significant at the standard levels, with the exception of the one on school quality. Note, however, that the

[41] The case of new school openings should not be an issue as I restrict the sample to years previous to academic year 2011/2012, i.e. before the mass academy conversion took place.

coefficient is substantially smaller than the one found for FSME students and statistical significance may simply follow from the considerably larger number of observations.

Overall, these falsification tests lend reassuring support to the findings the previous sections.

6.5 Non-linear effects

As in figure **??**, figure 8 reports the attendance of the nearest school before and after the reform separately for students for whom the first school is close and far away. The left graph focuses on pupils whose nearest school is located between 1 and 2 miles from home, the right graph on students whose first nearest school is within 1 mile. According to the predictions of the theoretical model, the effect of the programme should be larger the higher the distance to the nearest school and the lower the distance to the more distant school. Consistently, the effect of the policy is significant only for the sub-sample of students whose nearest school is above 1 mile from home. Moreover, results seem to be driven by pupils whose second nearest school is located closer to the 2 miles threshold.

Table 8 reports the corresponding estimates of equation 1. The top panel shows the results of two separate regressions by distance to the nearest school (i.e below 1 mile or between 1 and 2 miles). Column 1 reports the estimates for the probability of attending the nearest school. Estimates are very close to zero and not significant for students living below 1 mile from the nearest school, but in the order of 2.5 p.p. and significant for those living more than 1 mile from the nearest school. The second column reports the coefficients for the probability of attending the second nearest school: estimates are small and not significant for students living closer than 1 mile to the nearest school, while a positive and significant effect in the order of 1.5 p.p. is found for those whose nearest school is above 1 mile from home.

The second panel shows the estimates on two separate regressions by distance to the second nearest school. Specifically, I divide the eligible group in 1) students whose distance to the second nearest school is above 2 but below 3 miles; 2) students whose distance to the second nearest school is above 3 miles. Results are significant only for students whose second nearest school is located closer to the 2 miles threshold, i.e. between 2 and 3 miles from home, while no effect emerges for students with the second nearest school above 3 miles.

6.6 Heterogeneous effects

The first six columns of table 9 report estimates of the probability of attending each of the nearest schools by quality of the two available schools, by region of residence and LAs Income Deprivation Affecting Children Index (IDACI).[42] [43]

Columns 1 and 2 investigate heterogeneities based on the region of residence. I define "urban" and "rural" areas according to the 2011 UK Census classification. Rural areas are more likely to be characterized by a lower coverage of public transport, meaning that, compared to urban areas, the time cost of travelling to school would be generally higher. Most Local Authorities conformed to the Free Transport policy introducing a school bus service collecting pupils directly from their homes. This substantially reduces not only the monetary cost of travelling to school by public transport, but also the time cost, especially for families living in less populated areas. Unsurprisingly, the larger effect of the policy is found in less dense regions: pupils living in rural areas are 2.2 p.p. less likely to attend their nearest school and 1.9 p.p. more likely to enrol at the second nearest, while virtually no effect is found for students living in urban areas.

Columns 3 and 4 report results for two separate regressions for Local Authorities with a IDACI score below (less deprived) or above the median (more deprived). Though coefficients are negative for both sub-samples, the effect is significant only for students living in more deprived areas and in the order of 2.6 p.p. Estimates of the probability of attending the second nearest school are also larger and significant only for IDACI scores above the median. Overall, this suggests that the programme has a larger effect in those areas where children are more likely to have a deprived background. This is consistent with the intuition that only constrained families respond to the monetary incentives of the subsidy, while wealthier ones will be more likely to enrol their children at the best school regardless of free transport.

Finally, columns 5 and 6 of table 9 show the estimates for the sub-sample of students whose second nearest school is of higher quality than the nearest and the sub-sample of students whose second nearest school is of lower quality than the nearest. Interestingly, the coefficient on pupils whose second nearest school is of lower quality is considerably larger and statistically significant at standard levels. Similarly, the probability of attending the

[42]The Index measures locally the proportion of children living in low income households.

[43]Figure 1.A4 in the Appendix provides graphical evidence of the heterogeneity of results across different sub-groups of the population. All sub-figures report the probability of attending the nearest school from home as a function of the distance to the second nearest school (i.e. the eligibility variable) before and after the reform. Sub-figures a) and b) show the the effect separately for a) students whose second nearest school is of higher quality compared to the nearest one and b) students whose second nearest school is of lower quality compared to the nearest. Sub-figures c) and d) show the same exercise for the sub-samples of urban and rural areas and sub-figures e) and f) for less and more deprived areas.

second nearest school increases significantly only for those students whose second nearest school is of lower quality. These findings support the argument that over-subscription of good schools may *de facto* prevent families to enrol their children at more popular institutions.[44] This mechanism is further enhanced by distance-based admission criteria, implying that more isolated students (i.e. those eligible for free transport) will have lower chances to be accepted.

To prove this point, I use data on school capacity in year 2005/2006 to construct a proxy for schools' over-subscription. Note that the decision to use school capacity at baseline follows from the fact that changes in school choice induced by the programme may have an independent impact on schools over-subscription. I define a school as "over-subscribed" if the total count of students enrolled in the school in equal or exceeds the number of places available (i.e. school capacity).[45]

Columns 7 and 8 of table 9 show separate estimates for the sample of students who have the second nearest school not oversubscribed and over-subscribed, respectively. As predicted, results are larger and significant only for students whose further away school is not full or over capacity. Specifically, students who are eligible for free transport are 2.7 p.p. less likely to attend the nearest school after 2008 and 1.8 p.p. more likely t o attend the second nearest. In contrast, estimates are virtually zero and not significant at the standard levels for students whose second nearest school is oversubscribed.

7 Summary and conclusions

This paper investigates how the provision of free transport to attend schools further away affects the school choices of low income families. I explore a unique policy change that occurred in England in academic year 2007/2008, which expanded the right to free transport for low SES students to any of the three nearest school to home, subject to distance thresholds. While a simple theoretical model shows that monetary incentives should push families to enrol their children in more distant schools, the effect on school quality is ambiguous, as constrained parents may be induced to choose schools further away even without a gain in terms of quality. Moreover, over-subscription of high quality schools may *de facto* limit parents' choice to less popular schools.

Using confidential administrative data for the period 2004/2005-2010/2011 on the universe of English students, I identify the effect of the programme through a differences-

[44] Though I do not provide evidence here, over-subscription is strongly correlated with school test scores. Estimates are available on request.

[45] In academic year 2005/2006, 36% of English secondary schools were oversubscribed.

in-differences approach, comparing low SES students living in eligible postcodes in the pre and post reform period with those who are ineligible. As the Free Transport policy is based on walking distances, I compute the shortest available route for each pupil using the Geographic Information System (GIS).

Results show that, consistently, students eligible for free transport enrol at more distant schools; the effect being larger the more distant the nearest school and the more deprived the region of residence. However, the programme does not seem to lead to the intended outcome of improving the quality of the school attended by low SES students: the effect on the quality of the school attended is negative and robust to alternative specifications.

Though the direct objective of the Free Transport policy was to improve the quality of the school attended by low income families, it may still be possible that the programme succeeded under different dimensions. Specifically, though I do not address this question here, low income pupils may gain from higher choice, despite attending lower quality schools. Students may take advantage of the subsidy to escape the poor environment where they are living, benefiting from having peers with less disadvantaged backgrounds. The policy may hence result in higher average achievement, even if there is no improvement in the quality of the school attended.

References

Abdulkadiroglu, A., Angrist, J. D., Dynarski, S. M., Kane, T. J., and Pathak, P. A. (2011). Accountability and Flexibility in Public Schools: Evidence from Boston's Charters And Pilots. *The Quarterly Journal of Economics*, 126(2):699–748.

Abdulkadiroglu, A., Angrist, J. D., Hull, P. D., and Pathak, P. A. (2014). Charters Without Lotteries: Tasting Takeovers in New Orleans and Boston. NBER Working Papers 20792, National Bureau of Economic Research, Inc.

Allen, R. (2007). Allocating Pupils to Their Nearest Secondary School: The Consequences for Social and Ability Stratification. *Urban Studies*, 44(4):751–770.

Allen, R. and Vignoles, A. (2006). What Should an Index of School Segregation Measure? Cee discussion papers, Centre for the Economics of Education, LSE.

Angrist, J., Bettinger, E., Bloom, E., King, E., and Kremer, M. (2002). Vouchers for Private Schooling in Colombia: Evidence from a Randomized Natural Experiment. *American Economic Review*, 92(5):1535–1558.

Ashenfelter, O., Collins, W. J., and Yoon, A. (2005). Evaluating the Role of Brown vs. Board of Education in School Equalization, Desegregation, and the Income of African Americans. NBER Working Papers 11394, National Bureau of Economic Research, Inc.

Billings, S. B. and Rockoff, J. (2014). School Segregation, Educational Attainment, and Crime: Evidence from the End of Busing in Charlotte-Mecklenburg. *The Quarterly Journal of Economics*, 129(1):435–476.

Black, S. E. (1999). Do Better Schools Matter? Parental Valuation Of Elementary Education. *The Quarterly Journal of Economics*, 114(2):577–599.

Burgess, S., Greaves, E., Vignoles, A., and Wilson, D. (2009). What Parents Want: School preferences and school choice. The Centre for Market and Public Organisation 09/222, Department of Economics, University of Bristol, UK.

Burgess, S., Johnston, Ron, K. T. P. C., and Wilson, D. (2008). The transition of pupils from primary to secondary school in England . *Transactions of the Institute of British Geographers*, 33(3):388–403.

Burgess, S., McConnell, B., Propper, C., and Wilson, D. (2004). Sorting and Choice in English Secondary Schools. The Centre for Market and Public Organisation 04/111, Department of Economics, University of Bristol, UK.

Burgess, S., Wilson, D., and Worth, J. (2010). A Natural Experiment in School Accountability: the Impact of School Performance Information on Pupil Progress and Sorting. The Centre for Market and Public Organisation 10/246, Department of Economics, University of Bristol, UK.

Card, D. (1992). Using regional variation in wages to measure the effects of the federal minimum wage. *Industrial and Labor Relations Review*, 46(1):22–37.

Chetty, R., Friedman, J. N., Hilger, N., Saez, E., Schanzenbach, D. W., and Yagan, D. (2011). How Does Your Kindergarten Classroom Affect Your Earnings? Evidence from Project Star. *The Quarterly Journal of Economics*, 126(4):1593–1660.

Chetty, R., Friedman, J. N., and Rockoff, J. E. (2014). Measuring the Impacts of Teachers II: Teacher Value-Added and Student Outcomes in Adulthood. *American Economic Review*, 104(9):2633–79.

Cullen, J. B. and Jacob, B. A. (2007). Is Gaining Access to Selective Elementary Schools Gaining Ground? Evidence from Randomized Lotteries. In *The Problems of Disadvantaged Youth: An Economic Perspective*, NBER Chapters. National Bureau of Economic Research, Inc.

Cullen, J. B., Jacob, B. A., and Levitt, S. D. (2005). The Impact of School Choice on Student Outcomes: an Analysis of the Chicago Public Schools. *Journal of Public Economics*, 89(5-6):729–760.

De Luca, S. and Rosenblatt, P. (2010). Does Moving To Better Neighborhoods Lead to Better Schooling Opportunities? Parental Choice in an Experimental Housing Voucher Program . *Teachers College Record*, 112(5):1441–1489.

Dearden, L., Ferri, J., and Meghir, C. (2002). The Effect Of School Quality On Educational Attainment And Wages. *The Review of Economics and Statistics*, 84(1):1–20.

Deming, D. J., Hastings, J. S., Kane, T. J., and Staiger, D. O. (2014). School Choice, School Quality, and Postsecondary Attainment. *American Economic Review*, 104(3):991–1013.

Dobbie, W. and Fryer, R. G. (2011). Are High-Quality Schools Enough to Increase Achievement among the Poor? Evidence from the Harlem Children's Zone. *American Economic Journal: Applied Economics*, 3(3):158–87.

Dobbie, W. and Roland G. Fryer, J. (2011). Getting Beneath the Veil of Effective Schools: Evidence from New York City. *American Economic Journal: Applied Economics*.

Fack, G. and Grenet, J. (2010). When do Better Schools Raise Housing Prices? Evidence from Paris Public and Private Schools. CEE Discussion Papers 0119, Centre for the Economics of Education, LSE.

Fitz, J., Gorard, S., and Taylor, C. (2003). *Schools, markets and choice policies*. RoutledgeFalmer, London.

Gibbons, S., Machin, S., and Silva, O. (2008). Choice, Competition, and Pupil Achievement. *Journal of the European Economic Association*, 6(4):912–947.

Gibbons, S., Machin, S., and Silva, O. (2012). Valuing School Quality Using Boundary Discontinuities. CEE Discussion Papers 0132, Centre for the Economics of Education, LSE.

Gibbons, S. and Silva, O. (2011). School quality, child wellbeing and parents' satisfaction. *Economics of Education Review*, 30(2):312–331.

Gibbons, S. and Telhaj, S. (2007). Are Schools Drifting Apart? Intake Stratification in English Secondary Schools. *Urban Studies*, 44(7):1281–1305.

Greene, J. P., Peterson, P. E., and Du, J. (1997). The Effectiveness of School Choice: The Milwaukee Experiment. Harvard university education policy and governance occaional paper 97-1.

Greene, J. P., Peterson, P. E., Du, J., Boeger, L., and Franzier, C. L. (1996). The Effectiveness of School Choice in Milwaukee: A Secondary Analysis of Data from the Program's Evaluation. University of houston mimeo.

Guryan, J. (2004). Desegregation and Black Dropout Rates. *American Economic Review*, 94(4):919–943.

Hanushek, E. A. (1986). The Economics of Schooling: Production and Efficiency in Public Schools. *Journal of Economic Literature*, 24(3):1141–77.

Hanushek, E. A. (2003). The Failure of Input-Based Schooling Policies. *Economic Journal*, 113(485):F64–F98.

Hastings, J. S., Kane, T. J., and Staiger, D. O. (2005). Parental Preferences and School Competition: Evidence from a Public School Choice Program. Working Papers 10, Yale University, Department of Economics.

Hastings, J. S., Kane, T. J., and Staiger, D. O. (2006). Gender and Performance: Evidence from School Assignment by Randomized Lottery. *American Economic Review*, 96(2):232–236.

Hastings, J. S., Weelden, R. V., and Weinstein, J. (2007). Preferences, Information, and Parental Choice Behavior in Public School Choice. NBER Working Papers 12995, National Bureau of Economic Research, Inc.

Hoxby, C. (2000). Does Competition among Public Schools Benefit Students and Taxpayers? *American Economic Review*, 90(5):1209–1238.

Hoxby, C. M. and Murarka, S. (2009). Charter Schools in New York City: Who Enrolls and How They Affect Their Students' Achievement. NBER Working Papers 14852, National Bureau of Economic Research, Inc.

Katz, L. F., Kling, J. R., and Liebman, J. B. (2001). Moving to Opportunity in Boston: Early Results of a Randomized Mobility Experiment. *The Quarterly Journal of Economics*, 116(2):607–654.

Kramarz, F., Machin, S., and Ouazad, A. (2009). What Makes a Test Score? The Respective Contributions of Pupils, Schools and Peers in Achievement in English Primary Education. CEE Discussion Papers 0102, Centre for the Economics of Education, LSE.

Krueger, A. B. (1999). Experimental Estimates Of Education Production Function. *The Quarterly Journal of Economics*, 114(2).

Krueger, A. B. (2003). Economic Considerations and Class Size. *Economic Journal*, 113(485):F34–F63.

Lavy, V. (2010). Effects of Free Choice Among Public Schools. *Review of Economic Studies*, 77(3):1164–1191.

Ludwig, J., Duncan, G. J., Gennetian, L. A., Katz, L. F., Kessler, R. C., Kling, J. R., and Sanbonmatsu, L. (2013). Long-Term Neighborhood Effects on Low-Income Families: Evidence from Moving to Opportunity. *American Economic Review*, 103(3):226–31.

Machin, S. and Salvanes, K. G. (2010). Valuing School Quality via a School Choice Reform. IZA Discussion Papers 4719, Institute for the Study of Labor (IZA).

Machin, S. and Vernoit, J. (2010). Academy Schools: Who Benefits? CentrePiece - The Magazine for Economic Performance 325, Centre for Economic Performance, LSE.

Machin, S. and Wilson, J. (2009). Academy Schools and Pupil Performance. CentrePiece - The Magazine for Economic Performance 280, Centre for Economic Performance, LSE.

Ravitch, D. (2010). *The Death and Life of the Great American School System: How Testing and Choice Are Undermining Education*. Basic Books, New York.

Reber, S. (2010). School Desegregation and Educational Attainment for Blacks. *Journal of Human Resources*, 45(4):893–914.

Rothstein, J. M. (2006). Good Principals or Good Peers? Parental Valuation of School Characteristics, Tiebout Equilibrium, and the Incentive Effects of Competition among Jurisdictions. *American Economic Review*, 96(4):1333–1350.

Rothstein, R. (2004). *Class and Schools: Using Social, Economic, and Educational Reform to Close the Black-White Achievement Gap*. New York:Teachers College Press.

Rouse, C. E. (1998). Private School Vouchers and Student Achievement: An Evaluation of the Milwaukee Parental Choice Program. *Quarterly Journal of Economics*, 113(2):553–602.

Witte, J. F. (1992). Private School vs. Public School Achievement: Are There Findings That Should Affects the Educational Choice Debate? *Economics of Education Review*, XI:371–394.

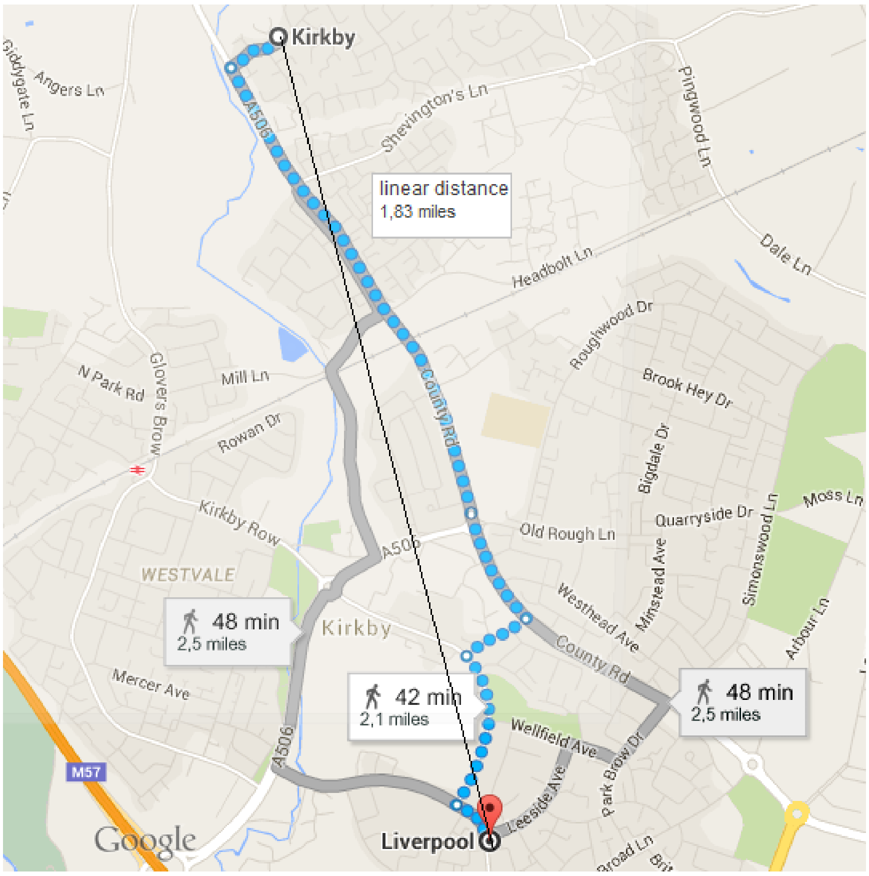
Witte, J. F. (1997). Achievement Effects of the Milwaukee Voucher Program. University of Winsconsin and Madison mimeo.

Witte, J. F., Sterr, T. D., and Thorn, C. A. (1995). Fifth-Year Report: Milwaukee Parental Choice Program. University of Winsconsin mimeo.

Witte, J. F. and Thorn, C. A. (1996). Who Chooses? Voucher and Interdistrict Choice Programs in Milwaukee. *American Journal of Education*, CIV:186–217.

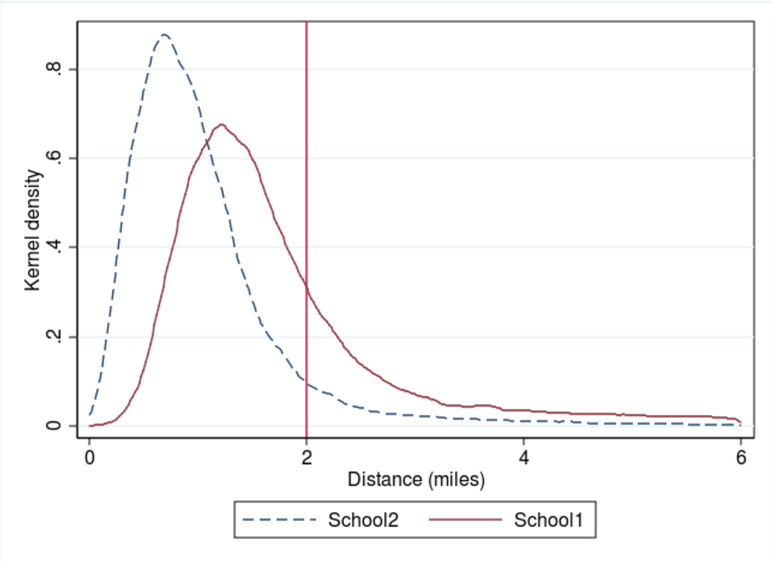
Tables and figures

Figure 1: Linear and walking distance to the second nearest school



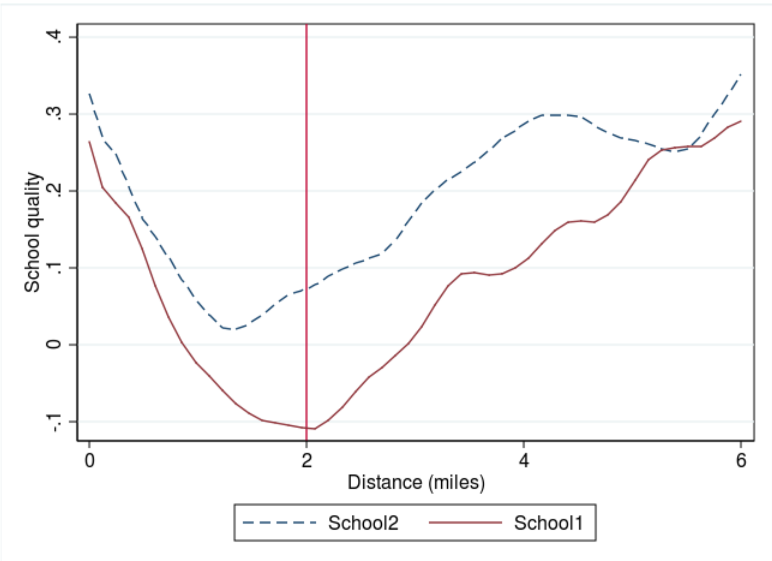
Notes: Author's calculations on PLASC data. The map reports the linear (black line) and walking distance (blue and grey lines) between the pupil house and the second nearest school from home.

Figure 2: FSME students' distribution by distance to the first and second nearest schools



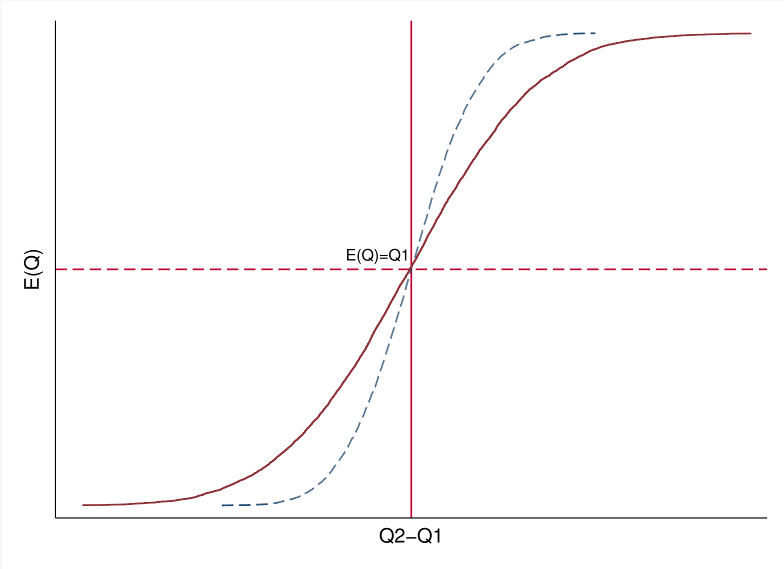
Notes: Author's calculations on PLASC data for the period 2004/2005-2010/2011.

Figure 3: Average school quality by distance to the second nearest school- FSME students



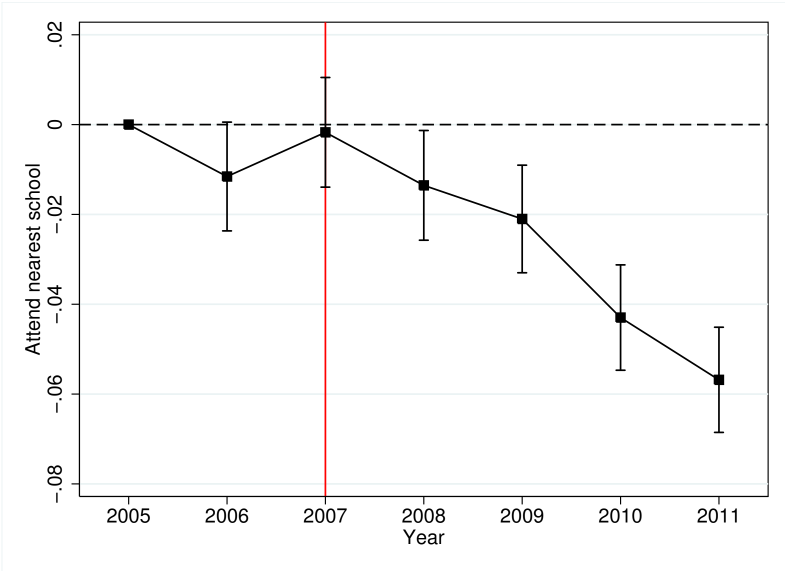
Notes: Author's calculations on PLASC data for the period 2004/2005-2010/2011. Local mean smoothing.

Figure 4: Predicted effect of the policy on the quality of the school attended



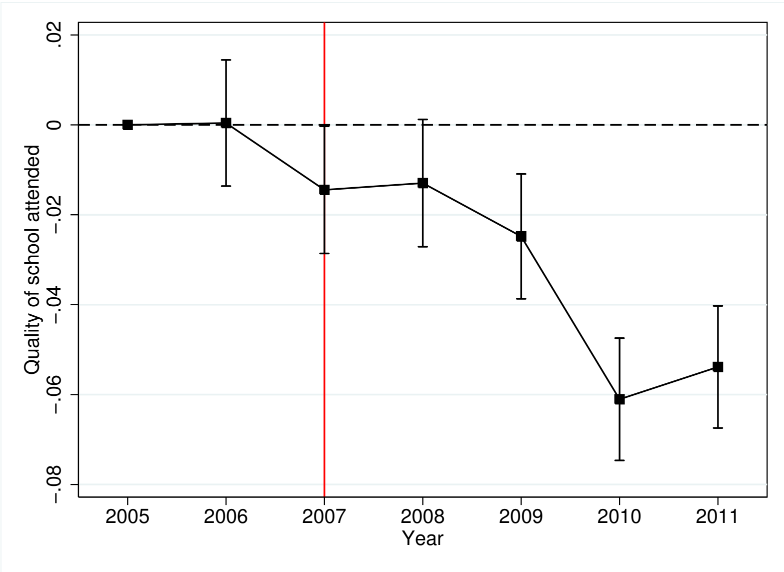
Notes: The figure plots the expected quality of the school attended on the y-axis and the difference in the quality of the two nearest school on the x-axis. The solid line represents the distribution of school quality before the policy change, the dashed line after the policy change. See also text for details.

Figure 5: Treatment effect at different leads and lags from the implementation of the policy: school attended



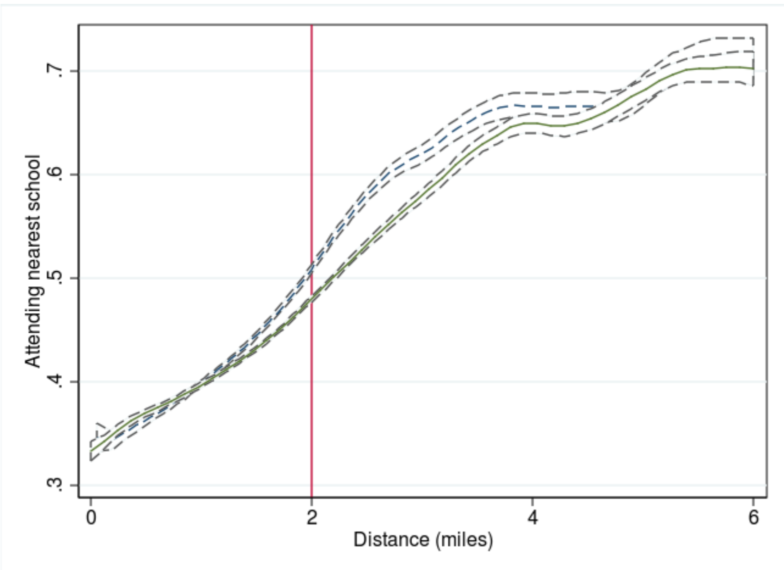
Notes: The solid line displays the coefficients of a regression of a dummy for attending the nearest school on the interaction between the year dummies and the eligibility dummy. 90% confidence intervals. Omitted category: year 2004/2005.

Figure 6: Treatment effect at different leads and lags from the implementation of the policy: quality of the school attended



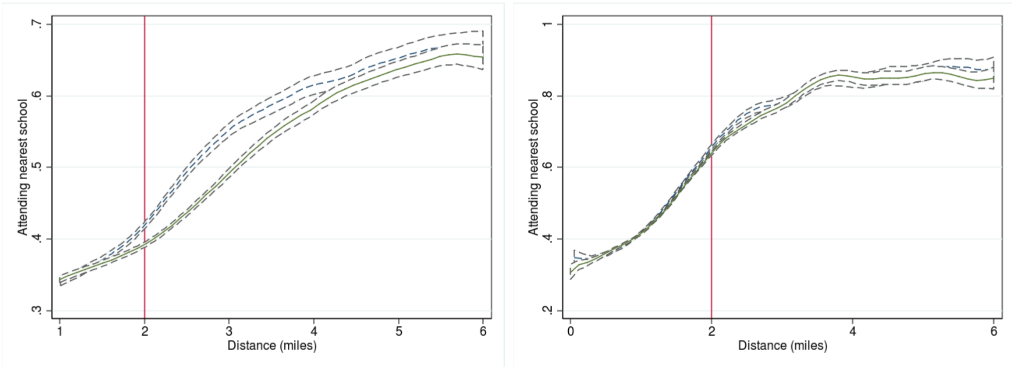
Notes: The solid line displays the coefficients of a regression of the quality of the secondary school attended on the interaction between the year dummies and the eligibility dummy. 90% confidence intervals. Omitted category: year 2004/2005.

Figure 7: Probability of attending the nearest school by distance to the second nearest school



Notes: Author's calculations on PLASC data for the period 2004/2005-2010/2011. Local mean smoothing with 95% confidence interval. The dashed lines refer to the pre policy period, the solid lines to the post policy period.

Figure 8: Probability of attending the nearest school by distance to the second nearest school: non-linear effects



(a) Distance nearest school>1

(b) Distance nearest school<1

Notes: Author's calculations on PLASC data for the period 2004/2005-2010/2011. Local mean smoothing with 95% confidence interval. The dashed lines refer to the pre policy period, the solid lines to the post policy period.

Table 1: Free transport to school

	$dist_1$	$dist_2$	PRE 2007/2008	POST 2007/2008	SAMPLE %
INELIGIBLE	< 2	< 2	**NO**	**NO**	**73.31**
ELIGIBLE	< 2	> 2	**NO**	**YES** ($School_2$)	**17.60**

Table 2: School characteristics

	All schools	Bottom decile	Top decile
Panel A: Schools			
Number of schools	3,323		
Community schools (%)	50.23		
Academies (%)	7.52		
Foundation schools (%)	23.14		
Voluntary schools (%)	2.29		
Other schools (%)	16.28		
Number of new enrolments	147.19	2.07	274.86
Average exit cohorts' test scores	0.21	-0.78	1.60
Panel B: Students' composition			
White British (%)	79.24	15.58	98.23
FSME (%)	19.29	1.33	56.63
Females (%)	48.72	10.59	90.45
English speakers (%)	88.49	36.00	99.86

Notes: Author's calculations on PLASC data. The table reports summary statistics for the period 2004/2005-2010/2011. School quality is defined as the average of test scores of Year 11 students over the whole period. It has been standardized at the school level such that school quality in the period has an average of zero and a unit standard deviation.

Table 3: FSMS students' characteristics

	All	Eligible	Ineligible
Panel A: Demographics			
White British (%)	76.34	87.42	73.68
Pakistani (%)	6.91	2.06	8.07
Indian (%)	1.4	0.44	1.63
Bangladeshi (%)	1.78	0.53	2.07
Black African (%)	2.16	0.94	2.45
Other ethnic group (%)	11.42	8.61	12.09
Females (%)	49.46	49.00	49.57
English speakers (%)	85.76	94.79	83.59
Panel B: Available schools			
Distance to nearest school (miles)	0.88	1.08	0.83
Distance to second nearest school (miles)	1.77	2.86	1.51
Attending nearest school (%)	47.83	65.84	43.50
Attending second nearest school (%)	17.60	8.16	19.87
Quality of school attended	-0.06	0.03	-0.08
Quality of nearest school	-0.04	-0.04	-0.04
Quality of second nearest school	0.08	0.14	0.07
N	416,366	80,589	335,777

Notes: See table 2. Eligible students are defined as FSME students having the second nearest school between 2 and 6 miles from home.

Table 4: The effect of the Free Transport policy on school choice

	[1]	[2]	[3]	[4]
Attend:				
1. School 1	-0.027***	-0.024***	-0.023***	-0.018*
	(0.007)	(0.007)	(0.006)	(0.007)
2. School 2	0.012**	0.009*	0.009*	0.010*
	(0.004)	(0.004)	(0.004)	(0.005)
3. Other schools	0.016*	0.015*	0.014*	0.009
	(0.007)	(0.007)	(0.007)	(0.006)
Time Fixed Effects	X	X	X	X
LA Fixed Effects	X	X	X	X
Additional controls	X	X	X	X
$dist_2$		X	X	X
$dist_1$			X	X
Postcode Fixed Effects				X
N	416,365	416,365	416,365	416,365

Notes: OLS estimates of equation 1. See text for details. Clustered (at the Local Authority level) standard errors in parenthesis.

Table 5: The effect of the Free Transport policy on the quality of the school attended

	[1]	[2]	[3]	[4]	N
School characteristics:					
1. Test scores	-0.022**	-0.021*	-0.021**	-0.022**	413,691
	(0.008)	(0.008)	(0.008)	(0.007)	
2. % White British	-0.224	-0.182	-0.185	-0.130	413,744
	(0.308)	(0.298)	(0.296)	(0.270)	
3. % FSME	0.643***	0.698***	0.610***	0.369**	413,744
	(0.153)	(0.150)	(0.150)	(0.127)	
4. % English	-0.337	-0.299	-0.301	-0.118	413,744
	(0.242)	(0.233)	(0.231)	(0.210)	
Time Fixed Effects	X	X	X	X	
LA Fixed Effects	X	X	X	X	
Additional controls	X	X	X	X	
$dist_2$		X	X	X	
$dist_1$			X	X	
Postcode Fixed Effects				X	

Notes: See table 4. See text for details.

Table 6: Robustness checks

	Attend:			**School quality:**
	$School_1$	$School_2$	Other schools	Test scores
	[1]	[2]	[3]	[4]
Restricted sample around 2 miles threshold:				
	-0.021	0.012	0.009	-0.009
	(0.010)	(0.008)	(0.010)	(0.010)
N	129,853	129,853	129,853	129,131
Restricted sample schools continuously present:				
	-0.015**	0.010**	0.005	-0.022***
	(0.006)	(0.004)	(0.006)	(0.005)
N	255,462	255,462	255,462	253,789

Notes: See table 4. The first panel focuses on the restricted sample of postcodes with the first nearest school between 1 and 2 miles from home and the second nearest school between 1 and 3 miles from home. The second panel focuses on the restricted sample of postcodes that were not subject to school openings/closures or school conversions. See text for details.

Table 7: Falsification tests

	Attend:			School quality:
	$School_1$	$School_2$	Other schools	Test scores
	[1]	[2]	[3]	[4]
London:				
	-0.007	0.005	0.002	-0.037
	(0.017)	(0.013)	(0.019)	(0.019)
N	131,979	131,979	131,979	131,979
Non-FSME sample:				
	-0.004	0.001	0.003	-0.010**
	(0.003)	(0.001)	(0.003)	(0.003)
N	2,092,691	2,092,691	2,092,691	2,065,935

Notes: See table 4. The first panel focuses on the restricted sample of students residing in London. The second panel focuses on the sample of non-FSME students. See text for details.

Table 8: Non-linear effects

	Attend: School$_1$ [1]	School$_2$ [2]	Other schools [3]	N
By dist$_1$:				
$dist_1 < 1$	-0.007	0.006	0.002	266,428
	(0.009)	(0.005)	(0.010)	
$dist_1 > 1$	-0.025**	0.015*	0.010	149,937
	(0.009)	(0.007)	(0.009)	
By dist$_2$:				
$2 < dist_2 < 3$	-0.019**	0.011*	0.008	393,379
	(0.008)	(0.006)	(0.008)	
$3 < dist_2 < 6$	-0.013	0.005	0.008	358,763
	(0.010)	(0.005)	(0.009)	

Notes: see table 4. The first panel shows estimates of equation 1 for a) the sample of students living within 1 mile from the nearest school and b) the sample of students living more than 1 mile from the nearest school. The second panel shows estimates of equation 1 focusing on a) eligible students living within 3 miles from the second nearest school and b) eligible students living more than 3 mile from the second nearest school. See text for details.

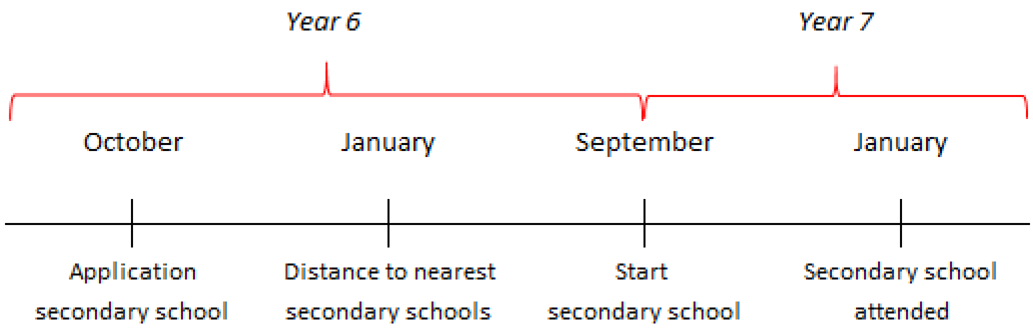
Table 9: Heterogeneous effects

	By region:		By IDACI:		By quality:		By over-subscription:	
	Urban	Rural	Least deprived	More deprived	$Q_1 < Q_2$	$Q_1 > Q_2$	Oversubscribed	Non oversubscribed
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
School 1								
	-0.013	-0.022*	-0.009	-0.026**	-0.014	-0.021*	-0.005	-0.027***
	(0.009)	(0.011)	(0.012)	(0.009)	(0.011)	(0.009)	(0.011)	(0.009)
School 2								
	0.004	0.019*	0.001	0.016**	0.008	0.011	-0.001	0.018**
	(0.006)	(0.008)	(0.008)	(0.006)	(0.008)	(0.006)	(0.008)	(0.007)
Other schools								
	0.009	0.003	0.008	0.010	0.006	0.011	0.006	0.010
	(0.009)	(0.008)	(0.010)	(0.010)	(0.010)	(0.008)	(0.010)	(0.008)
N	229,538	174,969	237,832	178,533	139,407	274,575	253,782	146,851

Notes: See table 4. Refer to text for details on the definition of the different sub-samples.

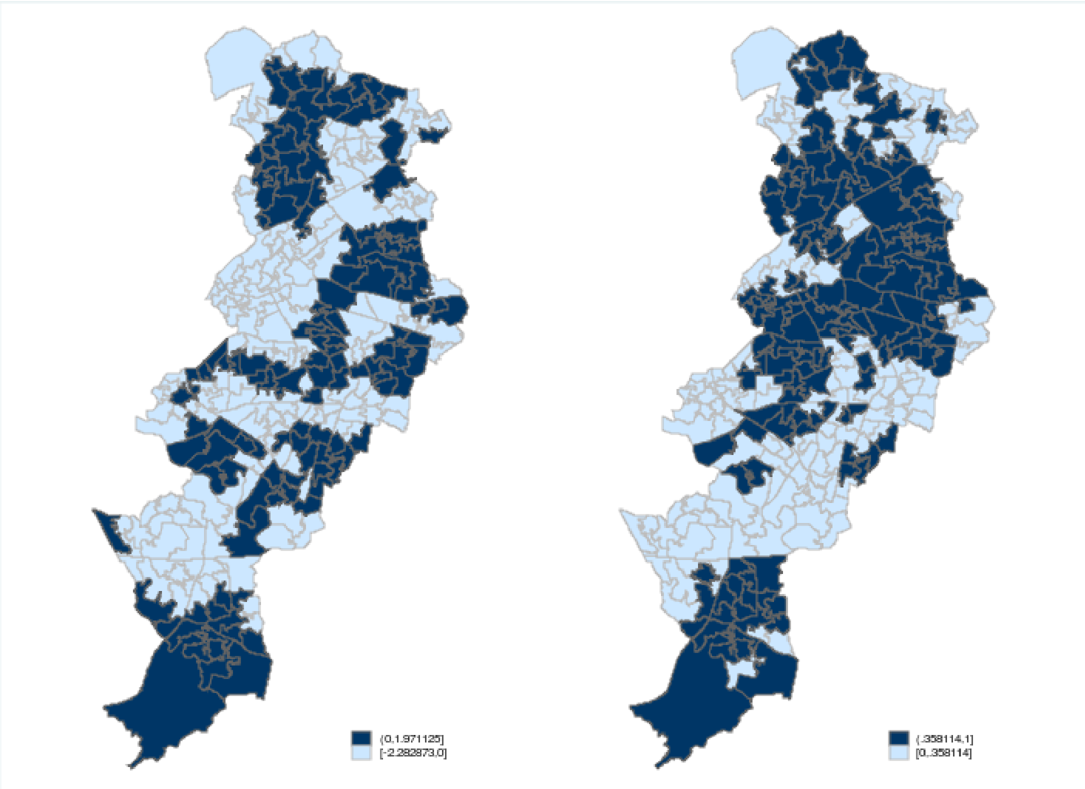
Appendix A: Supplementary tables and figures

Figure 1.A1: Timeline of data building



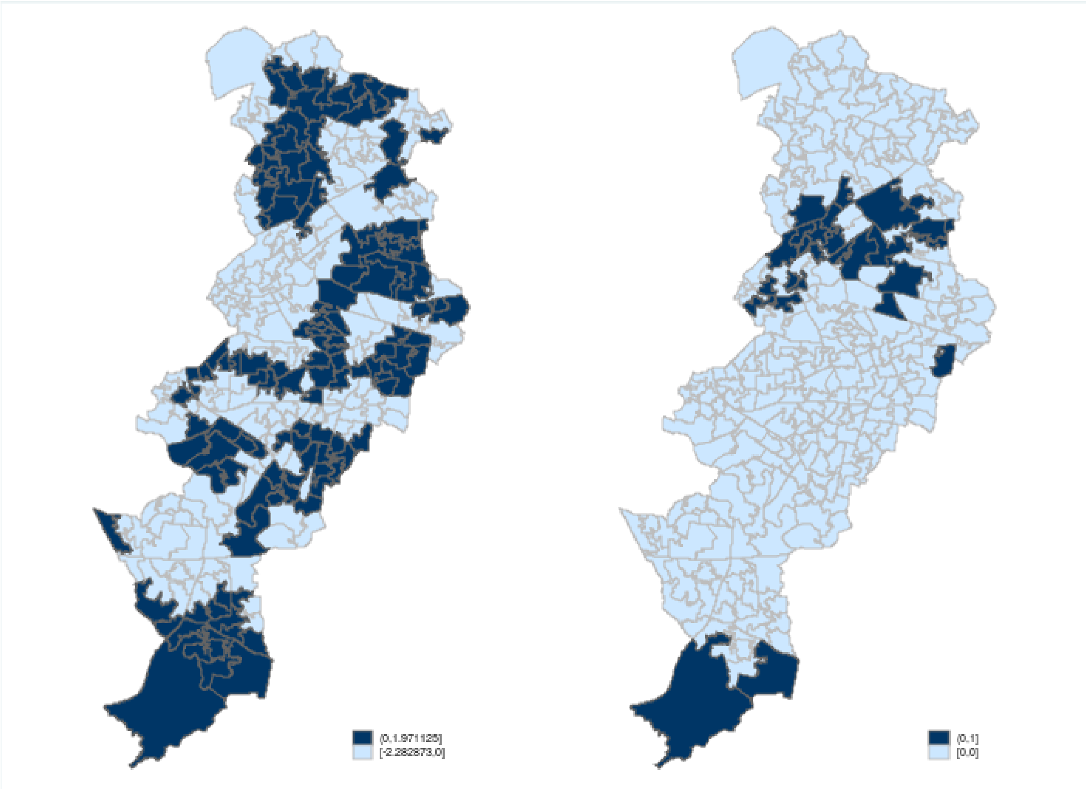
Notes: The figure shows the time-line of data building. In January of the last year of primary school (Year 6) the Pupil Census reports the address of students and each pupil is matched to his three nearest secondary schools (and corresponding distances). One year after, the Census reports the information relative to the secondary school attended and the variable "quality of school attended" is determined.

Figure 1.A2: School quality and FSME students distribution by neighbourhood. City of Manchester



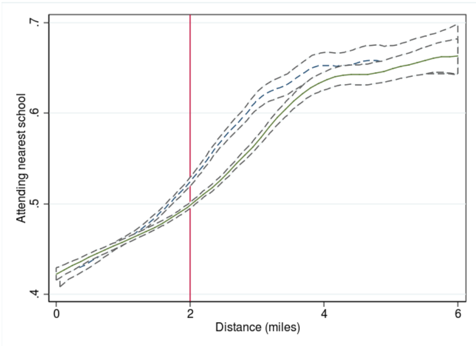
Notes: Author's calculations on PLASC data for the period 2004/2005-2010/2011. The map on the left shows the difference in the quality of the second nearest and the nearest school (ΔQ) by LLSOA (Lower Layer Super Output Area). The maps on the right shows the proportion of FSME students by LLSOA. The dark areas represent regions with a level above the median, the lighter below.

Figure 1.A3: School quality and eligible students distribution by neighbourhood (FSME only). City of Manchester

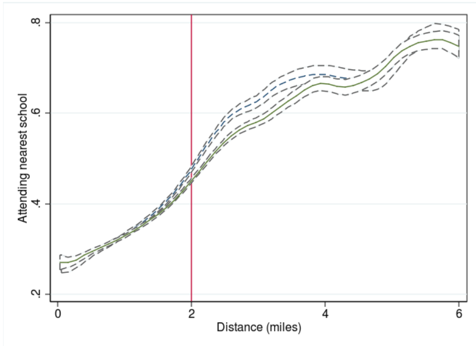


Notes: Author's calculations on PLASC data for the period 2004/2005-2010/2011. The map on the left shows the difference in the quality of the second nearest and the nearest school (ΔQ) by LLSOA (Lower Layer Super Output Area). The maps on the right shows the proportion of FSME students by LLSOA. The dark areas represent regions with a level above the median, the lighter below.

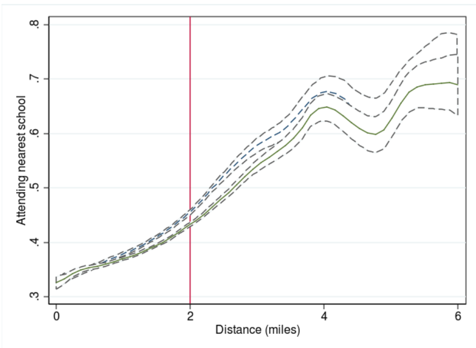
Figure 1.A4: Heterogeneous effects: probability of attending the nearest school by distance to the second nearest school



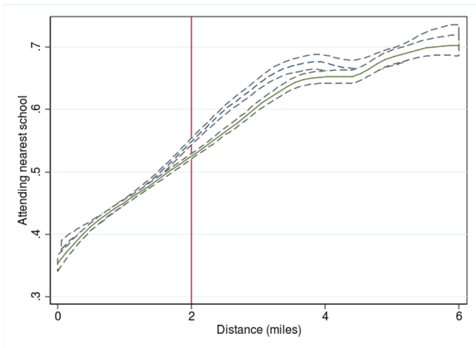
(a) $\text{Qual}_2 > \text{Qual}_1$



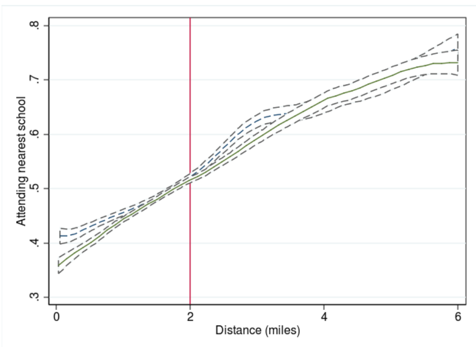
(b) $\text{Qual}_2 < \text{Qual}_1$



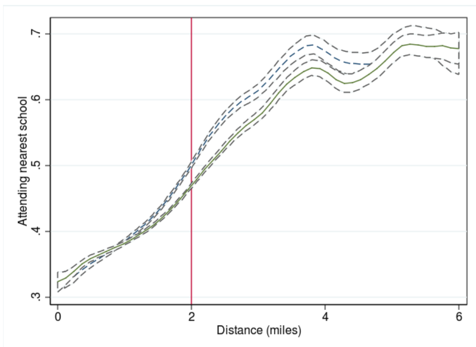
(c) Urban areas



(d) Rural areas



(e) Less deprieved



(f) More deprieved

Notes: Author's calculations on PLASC data for the period 2004/2005-2010/2011. Local mean smoothing with 95% confidence interval. The dashed lines refer to the pre policy period, the solid lines to the post policy period.

Table 1.A1: Estimates for the sample of non-FSME students

	Attend:			School quality:
	School$_1$	School$_2$	Other schools	Test scores
	[1]	[2]	[3]	[4]
$2 < dist_1 < 3$	0.002	0.001	-0.003	-0.008
	(0.003)	(0.002)	(0.004)	(0.005)
N	2,547,817	2,547,817	2,547,817	2,512,175

Notes: OLS estimates of the following equation: $y_{ipt} = \gamma_0 + \gamma_1 T_{pt} + \eta_p + \eta_t + \omega_{ipt}$, where T_{pt} is equal to 1 if the nearest school is between 2 and 3 miles form home in the post reform period and η_p are postcode fixed effects. See text for details.

Table 1.A2: Estimates for the sample including students with the nearest school above 2 miles from home

	Attend:			School quality:
	School$_1$	School$_2$	Other schools	Test scores
	[1]	[2]	[3]	[4]
	-0.013	0.010*	0.003	-0.022**
	(0.007)	(0.005)	(0.008)	(0.007)
N	458,008	458,008	458,008	454,570

Notes: see table 4.