How do schools shape neighbourhoods? Endogenous residential location in response to local school quality

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Abstract

Education systems around the world use different criteria to assign pupils to schools. More research is needed to study the implications that policymakers' design choices have on neighbourhood composition. This is an important area of study if segregation at the neighbourhood-level, in addition to the school-level, affects individuals' well-being and economic outcomes. This paper studies how geographical priorities for school admissions affect households' residential choices across the life-cycle. Geographical admissions priorities are defined as those that rank pupils by their location to determine access to over-subscribed schools, and as such give parents an incentive to choose the location that improves access to their preferred school. In the alternative, non-geographical system, pupils are sorted by ability and location is largely irrelevant. Using a difference-in-differences design, the results indicate that sorting for school quality in response to geographical admissions is not widespread in England. Only higher social classes migrate towards areas with higher school quality to a limited extent. This result has implications for the design of potential reforms to school choice.

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1 Introduction

Households weigh up the costs and benefits of moving to a particular neighbourhood. For some households, this decision may include the quality of the local school. Households might wish to move close to their preferred school to reduce their commuting time, and, in some contexts, improve their probability of admission. This means that the design of the education system in how pupils are allocated to schools is consequential for neighbourhood composition in addition to school composition. There is wide variation in policy across and even within countries. In some contexts, places at popular over-subscribed schools are decided by lottery, in others by aptitude (test scores) and finally by geography (for example school zones or distance rank). There is little evidence, however, about how these policy choices affect households' residential choices and therefore the formation of, and segregation within, neighbourhoods. This is important evidence to determine the role of school admissions priorities in households' overall welfare, and aggregate sorting across neighbourhoods that may affect societal outcomes.

This paper studies the influence of geographical admissions priorities on the frequency and timing of residential moves. The context is England, where there are two dominant school admissions priorities in use. For the majority of areas, admission to over-subscribed schools is largely determined by geography - either catchment areas (elsewhere known as 'school zones' or 'la carte scolaire') where those resident inside have priority, or distance between home and school, where closer pupils have a higher rank. A minority of areas historically retained the previous non-geographical selective system (otherwise dismantled in the 1960s and 1970s), where pupils are admitted according to test scores rather than location.

The methodology is to compare households' residential choices across these two types of area - those with geographical or non-geographical admissions priorities. In areas with geographical admissions, the hypothesis is that valuing admission to a 'good' local school leads to endogenous residential sorting to a neighbourhood that guarantees admission (or, more precisely, improves the probability of admission). In areas with non-geographical admissions, households that have children value admission in the same way, but the residential location is not strategic, as factors other than location (test scores) determine admission. To account for the possibility of non-random selection into alternative admissions arrangements, a difference-in-differences design is used. The second difference is between households that ever have children and households that never have children, that are defined using nationally representative longitudinal data. The intuition is that 'ever parents' value admission to the local school while 'never parents' gain no flow utility from the local school, but may value neighbourhood attributes that are correlated with local school quality, such as public or private amenities, the housing stock and neighbourhood composition. This comparison therefore isolates the effect of local school quality on residential choices.[1] This intuition is similar to that discussed in Bayer et al. (2007), that neighbourhood attributes, such as school quality and peer composition, can be correlated or causally related. This paper uses households that are never parents to control for these (observable and unobservable) factors that are correlated with local school quality.

The first finding is that the extensive margin - whether households decide to move home or not - is largely unaffected by whether the school admissions priorities are geographical or non-

[1] Measurement error induced by uncertainty in the likelihood of ever or never becoming a parent is discussed in section 4.1. A full description of the methodology and identifying assumptions follow in sections 3 and 5, respectively.

geographical (selective). Younger households that ever become parents are more likely to move than younger households that never become parents, but this pattern is the same across geographical and non-geographical admissions areas. This implies that geographical admissions priorities do not impose additional moving costs for households across the life-cycle. For the intensive margin - the quality of the local school conditional on moving - there is no effect on average across all households. Households with high social class (defined by occupation) are slightly more likely to move closer to higher quality schools at younger ages if they ever become parents and live in geographical admissions areas, however. This suggests that the observed property price increases around popular oversubscribed schools (discussed below) are due to strongly increased demand for a minority of households. This is in contrast to the received wisdom that schools are a driving factor for many households' residential decisions. These results present the picture of endogenous residential choices for only a limited proportion of (more affluent) households.

The paper contributes to four research themes. First, in relation to the large, well-established and robust empirical literature on the effect of popular over-subscribed schools on local property prices, this paper delves into the "black box" to uncover *when* households move and *which* households move for local school quality. This is important to determine whether geographical admissions impose costly additional moves, affecting households' welfare, and whether inequality in school access is exacerbated by geographical admissions priorities. This paper finds that geographical admissions priorities do not reduce households' welfare, on average, by imposing additional moves, but do increase inequality in access by social class. Knowing whether households move away from 'good' schools after their children have left school also helps to interpret the existing empirical literature, as the estimated reduced form effect is a combination of flows in and out of neighbourhoods around good schools. This paper shows that households tend to move earlier in the life-cycle, so there will be limited dampening of the empirical house price premium through households exiting shortly after the school choice phase.[2]

The identification problem for this strand of literature is to separate the effect of school quality on property prices from the effect of other neighbourhood attributes that are correlated with school quality, such as proximity to amenities. Fack and Grenet (2010) state the additional problem of reverse causality clearly:

> The estimation is complicated by the endogeneity of school performance in the housing price equation, since better schools tend to be located in wealthier neighborhoods and pupils drawn from privileged socio-economic backgrounds generally have higher academic achievement.

Beginning with Black (1999), Boundary Discontinuity Design is typically used to estimate the causal effect of local school quality on property prices, where the identifying assumption is that neighbourhood attributes are continuous at the boundary while school quality jumps discontinuously. Across studies in this literature, households are typically willing to pay a premium of around 3-4% for access to a one standard deviation increase in school average test scores, although there is variation across contexts, from 1.4% in Paris to 7-10% in Olso.[3]

[2] Greaves and Turon (2021) show that the reduced form effect is also dampened by the presence of households that gain (or will gain in the future) no flow utility from local school quality, for example households that never have children or households where the dependent children have moved on.

[3] The existing empirical estimates (in order of magnitude for a one standard deviation increase in test scores) are:

Boundary Discontinuity Design is appropriate when there are clear school zones that determine school admission. A new research theme studies how the introduction of school choice (or 'choice schools' in the US) weakens the relationship between school quality and property prices, as it breaks the deterministic link between home location and school. Schwartz et al. (2014) find that new 'choice schools' reduce the property price premium of traditional 'zoned' schools by approximately one third. Following the introduction of a system of school choice, property prices around 'good' schools reduce by around half in Olso (Machin and Salvanes (2016)) and 10-30% in Seoul (Chung (2015)). In a related contribution, Reback (2005) finds that property prices across Minnesota school districts respond to whether students are able to transfer from and to the district, and Brunner et al. (2012) use variation across US states in the adoption of school choice to find a similar pattern. Taken together, this large body of research in economics is to date silent about the types of households that move in response to school quality, and at what life-stage.[4] Recent work in sociology explores how school choice expedites the gentrification of inner-city neighbourhoods, particularly by college-educated white households (Pearman and Swain (2017)). This paper shows that it is largely high social class households that make endogenous residential choices in response to the school choice environment.

The second contribution is to inform the likely bias in discrete choice models that estimate parents' preferences for school attributes. In these models, parents' preferences are inferred from the observed attributes of the their school choice(s) relative to the observed attributes of other schools in their choice set. Universally, in this large literature, these models are estimated assuming that households have fixed location.[5] Bias is introduced to the estimation if some households move close to their preferred school to improve the probability of admission. In this case, when choosing the closest school reflects preferences for other school attributes (for example the peer group and/or school quality) that induced the residential move, the estimated preference for proximity would be upward biased. In fact, with this non-linear estimation method, all coefficients would be biased. The common finding in this literature that more advantaged households have different preferences for school attributes than less advantaged households may also be due to the bias induced by residential sorting. This paper shows that endogenous residential sorting to guarantee school admission is limited to the highest social classes. This implies that comparisons of preferences across social classes is problematic. Positively, estimated preferences for school attributes for lower social classes should be largely free of bias.

The third contribution is to expand the research on the selective grammar school system to

Fack and Grenet (2010) (Paris): 1.4% for school test scores, 2.1-2.4% for school peer-group; Bayer, Ferreira, and McMillan (2007) (San Francisco Bay): 1.8%; Black (1999) (Massachusetts): 2.1%; Harjunen et al. (2018) (Helsinki): 3.3%; Davidoff and Leigh (2008) (Australia): 3.5%; Gibbons et al. (2013) (England): 3.5%; Kane et al. (2003) (North Carolina): 5%; Machin and Salvanes (2016) (Oslo): 7-10%. Bayer, Ferreira, and McMillan (2007) note that school quality induces sorting of neighbourhood peers across the boundary. Accounting for this factor roughly halves the estimated effect of school quality. This is also noted by Kane et al. (2006). Dhar and Ross (2012) find slightly lower estimates using school district boundaries rather than school zone boundaries. Goldstein and Hastings (2019) relate differences in property price premiums to differences in inequality, with the hypothesis that inequality increases the perceived need to access a 'good' school.

[4] An exception is that Bayer et al. (2007) estimate heterogenous preferences for local neighbourhood preferences across household types, which is informative, but does not explicitly study the frequency and location of residential moves.

[5] In chronological order, see Hastings et al. (2009), Burgess et al. (2015), Borghans et al. (2015), Abdulkadiroğlu et al. (2017), Glazerman and Dotter (2017), Ruijs and Oosterbeek (2019), Beuermann et al. (2018), Oh and Sohn (2019), Harris and Larsen (2019), Ajayi and Sidibe (2020), Walker and Weldon (2020), Abdulkadiroğlu et al. (2020), Bertoni et al. (2020)).

include the effect on residential sorting. Previous research has documented little evidence of improved test scores for pupils that are marginally admitted vs rejected (Clark (2010))[6] although stronger effects for longer-run outcomes (Clark (2010), Clark and Del Bono (2016)). Other studies are externally valid to the whole population of grammar school pupils (rather than only those close to the admission threshold) but suffer from omitted variable bias from unobservable pupil characteristics that may differ between pupils at selective and non-selective schools, including pre-existing attainment trajectories (Pischke and Manning (2006), Coe et al. (2008)). Typically, findings from these papers are that attainment is marginally higher for pupils at selective schools (relative to the counterfactual) but lower for pupils at the remaining schools (Atkinson et al. (2006)). Overall, this increases inequality in attainment, that translates into inequality in earnings (Burgess et al. (2019)). This paper instead focuses on the important general equilibrium consideration of households' residential choices and therefore neighbourhood formation.

The final contribution is to the literature that estimates households' valuation of neighbourhood amenities through discrete choice models. School quality is often (although not universally) included as an independent variable in discrete choice models of residential choices (see, for example Kim et al. (2005) and Brasington and Hite (2005)).[7] The estimate is given the interpretation of "willingness-to-pay" for school quality, although without overcoming the problem that school quality is an endogenous variable. This paper's empirical strategy overcomes the problem that school quality is correlated with other neighbourhood attributes, and in fact can be causally related in both directions as stated by Fack and Grenet (2010), above. That is, school quality can influence neighbourhood amenities/peers and neighbourhood amenities/peers can influence school quality. This is because school quality is defined as the combined effect of the incoming school cohort and value added by the school, and there is a positive correlation between academic ability and household income, for example.[8] This paper provides evidence that local school quality is important for a minority of households' residential choices, and that urban choice models should allow heterogeneity in the effect of local school quality across households.

The remainder of the paper is structured as follows. Section 2 provides further detail on the education system in England and the incentives induced for parents. Section 3 describes the methodology to identify the causal effect of geographical admissions priorities on households' neighbourhood sorting. Section 4 details the data employed, including data construction and summary statistics. Section 5 presents evidence that the identifying assumptions hold in the data. Section 6 shows the descriptive and main results for the role of school priorities on neighbourhood sorting, before section 7 concludes.

[6] This is consistent with most evidence from marginal students at 'elite' schools worldwide (Abdulkadiroğlu et al. (2014), Dobbie and Fryer (2014), Lucas and Mbiti (2014), Dee and Lan (2015), Zhang (2016)), although some studies find positive (but small) effects (Pop-Eleches and Urquiola (2013), Deming et al. (2014), Ding and Lehrer (2007)).

[7] Couture and Handbury (2020) study the role of schools in contributing to urban revival.

[8] On-going work by the author seeks to provide an instrument for local school quality that could be used in urban discrete choice models.

2 Context

Everywhere in England, parents submit a ranking of preferred schools to their Local Authority of residence (LA).[9] Each LA then runs a truth-revealing assignment mechanism to allocate pupils to schools, given parents' preferences, schools' capacity and admissions criteria. The assignment mechanism is known as 'equal preferences' and is equivalent to the Gale-Shapley deferred acceptance mechanism with a short list length (between 3 and 6 choices, depending on the LA). This short list length means that some parents have an incentive to misreport their true preferences to include a safe school, as they would be allocated to a school with spare places (by definition unpopular) in the event of being unassigned to any of their ranked schools. Misreporting preferences by omitting some schools is coined "skipping the impossible" by Fack et al. (2019). The allocation mechanism therefore permits parents to make multiple school choices with limited distortions to their preferences, but in practice, successful admission to a chosen school depends on the school's admissions priorities.

The following sub-sections present the two most common admissions priorities used in England, 'outside options' available to parents, and nuances to the two main systems.

2.1 Main admissions priorities

There are two main school admissions criteria in England. The predominant form is a comprehensive system with geographical admissions priorities. If a school is over-subscribed, then the priority ranking to determine which pupils are admitted is normally ordered by location. That is, whether pupils live inside or outside a catchment area (equivalent to a 'school zone' or 'la carte scolaire') or by distance between the home and school. The second admissions system is (largely) non-geographical. Instead, it is a 'selective' or 'grammar' system, where pupils must pass an entry test to gain admission to certain prestigious schools in an LA.[10] Pupils that do not pass the test, known as the '11-plus', attend 'comprehensive' schools (previously called 'secondary modern' schools).

The key distinction between these systems, for this paper, is the induced residential incentives for parents. Parents have an incentive to move close to their preferred school (or schools) in an LA with predominantly geographically based admissions criteria to maximise the probability of admission. This incentive is absent in an area where schools select by test scores, as geography is largely irrelevant for admission to these schools. Geography is 'largely irrelevant' in selective areas as 'catchment areas', where present, are very wide.[11] Geography remains relevant to reduce commuting time to school in both areas.[12]

Figure 1 shows the number of grammar (selective) schools in England over time. Grammar schools were first introduced in 1944, following the extension of free education to all state secondary schools and introduction of the 'tripartite system' for secondary education. This 'tripartite system' included three types of schools: Grammar, technical and secondary modern. In practice, most

[9]Parents can choose schools from other LAs by nominating them on their LAs list. The capital, London, has a single coordinated system.

[10]'Non-geographical', 'selective' and 'grammar' will be used interchangeably.

[11]Further evidence is presented in the following sub-section.

[12]This dis-utility of distance to school is modelled by Greaves and Turon (2021) across two adjacent neighbourhoods.

pupils who did not pass the selective test at age 11 attended a secondary modern secondary school, as few technical schools opened (Kerckhoff et al. (1996)).

The 'tripartite' (or effectively 'bipartite') system was largely dismantled starting from 1965, when 'circular 10/65' was issued by the Ministry of Education (under a Labour government). This circular encouraged LAs to move to non-selective or comprehensive education, providing six options for change. These options were partly informed by existing experimentation in some LAs. Indeed, Kerckhoff et al. (1996) note that two-thirds of pupils attended secondary schools in LAs that were already implementing or planning a comprehensive schools policy in 1965. See Morris and Perry (2017) for an excellent summary of evidence for the public dissatisfaction with the tripartite system before 1965, including the lack of resources for secondary modern schools, the crudeness of the entry test, the separation of siblings and wider concerns about segregation and social justice.[13]

Figure 1 shows that the move away from selective education took place in LAs across England, as the number of grammar schools dramatically declines through the 1960s and 1970s. The creation of new grammar schools was outlawed in 1998 (again under a Labour government) but in practice the number of grammar schools had been largely constant since the 1980s.

What types of areas chose to maintain the selective system of education against the tide? The leading explanation, discussed further in section 5.1, is that Conservative controlled areas were more likely to retain the selective system, although Kerckhoff et al. (1996) conclude that it was "far from axiomatic" (p164). Section 5.2 explores the characteristics of these selective areas in comparison to non-selective areas in recent years.

Although historic, it is possible that areas self-selected into alternative school admissions priorities according to observed or unobserved characteristics. This means that it is not possible to identify the effect of school admissions priorities on households' behaviour from a simple comparison across these two systems. The following section describes the methodology to identify the causal effect of geographical school admissions priorities on households' residential choices.

2.2 'Outside options'

Everywhere across England, private schools are an 'outside option' to the state sector, typically available to households with high incomes.[14] Table 1 shows the distribution of private secondary school share (unweighted by pupil numbers) across LAs in England. The mean share of private schools within an LA is around a quarter (14% at the 25th percentile and 35% at the 75th percentile). Only 10 (from 151) LAs contain no private secondary school. This type of outside option is therefore readily available for most households across England with sufficient means.

Table 1 shows that LAs with geographical admissions priorities have, on average, a larger share of private secondary schools (25% compared to 20%). Although descriptive rather than causal evidence, this could suggest that households use private schools as an alternative to residential

[13] Griffiths (1971) describes the government reports and public discontent that led to the creation and dismantling of the tripartite system.

[14] Some private schools offer scholarships or discounted fees. From the Independent Schools Council, only 14% of means tested bursaries and scholarships from member private schools cover fees completely, however, and 54% cover only 50% or less (Parkes et al. (2021).

mobility to gain access to a desirable school. One could hypothesise that demand for private schools is lower in non-geographical (selective) LAs as higher income households are likely to gain admission to the selective (desirable) school, which is a close substitute to a private school, at least in peer group.

Another form of 'outside option' are religious state-funded schools, that typically prioritise pupils according to religious rather than geographic/test-score criteria.[15] Across LAs in England, on average, 22% of state secondary schools have a religious denomination of some form (Table 1).[16] Not all of these schools will be feasible outside options for all pupils, for example those of atheist households, or households practising an alternative religion. There is evidence that some households misrepresent or strategically enhance their religious affiliation to gain entry to a desirable school, however.[17] Only 6 (from 151) LAs contain no religious state secondary school. Like private schools, therefore, this form of school is a feasible alternative option for many households across England.

Table 1 shows that LAs with geographical admissions priorities also have, on average, a larger share of religious state secondary schools (22% compared to 17%). There is less variation in the share across LAs with non-geographical (selective) admissions priorities, however. This is unlikely to be an endogenous response to the admissions system (decided in the 1960s and 1970s) as the presence and location of religious schools depend on more historical factors. Allen and Vignoles (2016) describe the development of faith schools as best described as "a late nineteenth-century expansion, then a financially induced stagnation to 1950, followed by a final moderate growth (principally in RC [Roman Catholic] schools) in the 1950s and 1960s."

2.3 Nuances in 'geographical' and 'non-geographical' areas

The paper has so far characterised LAs as having 'geographical' or 'non-geographical' (selective) admissions priorities. The discussion around outside options has already softened this distinction across areas, as households have outside options that may limit strategic incentives in response to their admissions system. A further nuance is that geography plays some role even in 'non-geographical' LAs. This is because schools in selective LAs may choose to adopt a catchment area and/or distance based tie-breakers. Table 2 shows that 47% of schools in 'non-geographical' LAs actually have a catchment area in their admissions policy. This compares to 53% in 'geographical' LAs.[18] Selective schools in selective LAs have catchment area as a prominent criteria - 61% have catchment area in their first three priorities, compared to 37% of non-selective schools in selective LAs. Only 6% of selective schools in selective LAs have distance so prominently, compared to 21%

[15] Unlike private schools, religious state-funded schools are part of the LA application and allocation process described above. This means that private schools can act as an outside option for those unsuccessful at their preferred state school(s) after the coordinated allocation run by the LA. Religious schools can not be used in this way, but may represent and alternative option to moving home for schools in areas with geographical admissions, or passing the test in selective LAs.

[16] Around half of religious secondary schools are Roman Catholic, and one third are Church of England. The remainder are largely another Christian denomination, with a handful of Jewish, Muslim and Sikh schools.

[17] For example, a recent survey of parents found that between 20% and 37% of households across social classes knew households that had "attended church/religious services so that their child(ren) could enter a church/religious school" (Montacute and Cullinane (2018)).

[18] Proximity is more often used as a tie-breaker - to decide admission between pupils that are equal according to all other criteria. This is evident from Table 2, as proximity rarely features in schools' first three admissions criteria (16% in 'non-geographical' LAs and 18% in 'geographical' LAs).

of non-selective schools in selective LAs.

The overall pattern in Table 2 is that selective schools are more likely to have catchment areas than non-selective schools in the same LAs, but less likely to prioritise pupils according to proximity. This implies that households have some incentive to reside in a particular catchment area to access their preferred selective school, but not necessarily very close to the school. To what extent can 'non-geographical' areas therefore be considered free from geographical incentives? First, note that the catchment areas for selective schools are typically very large. For example, for Bournemouth and Poole, the catchment areas for the selective schools are the size of the whole Borough. In Kent, many selective schools reserve a proportion of school places for pupils outside the catchment area, that are typically large, for example, within a 9-mile radius of the school. In Reading, the catchment areas are much larger than the city of Reading (shown in Appendix Figure B.1). In Wirral, five selective schools have no catchment area, and one has a catchment area that is 'Wirral, Cheshire West and Chester and any other areas within 5 miles'.[19]

Second, geography is not the primary consideration in these areas: residence in the catchment area does not facilitate admission if the pupil fails the test. Incentives for residential mobility to access non-selective schools in selective areas are muted, as the distribution of school quality for these schools is more even than in geographical LAs (presented in section 6.1).

3 Methodology

The causal effect of geographical school admissions criteria on households' neighbourhood sorting is estimated through a difference-in-differences design. The goal is to estimate the effect of geographical school admissions criteria on the frequency and location of residential choices. The hypothesis is that geographical admissions criteria increase the lifetime moves per household (as households may move into a neighbourhood for a school, and then out again once the child is admitted or has left the school) and the quality of local schools (as households have an incentive to move close to preferred schools to gain access).

The first difference is between households residing in LAs that use geographical vs non-geographical school admissions priorities. It is useful to note why this simple comparison across areas would not be sufficient to identify the causal effect. This is because, as explored in the previous section and further in section 5, there could have been historical non-random selection into (retaining) the

[19] For the other non-geographic/selective areas: Bexley, Medway, Plymouth and Torbay: there are no catchment areas for the selective schools; Buckinghamshire: the catchment areas for selective schools are around one-third of the LA; Kingston upon Thames: one selective school has a catchment area of 14km from the school, and the other school's catchment area includes 11 electoral wards and 44 postcode districts; Lincolnshire: three selective schools have catchment areas defined by a radius from the school - 6.5 miles, 12 miles, 9 miles. Also, two selective schools have no catchment area, and five are difficult to classify; Slough: one selective school has no catchment area, one has a radius of 4 miles, and one contains 42 postcode districts; Southend-on-Sea: two selective schools have catchment areas of 10 postcode districts, and two are difficult to classify; Sutton: three selective schools have no catchment area, and two reserve places for pupils outside the catchment area; Trafford: one school reserves places for pupils outside the catchment area, four schools have a catchment area of between 4 and 8 postcode districts, one school has a radius of 8 miles, and one school is difficult to classify; Warwickshire: difficult to classify as catchment areas normally constructed from parishes. Future research will geocode this catchment areas and provide quantitative comparisons across admissions areas.

non-geographical school admissions criteria. There may still be observable and unobservable differences between areas with geographical and non-geographical school admissions priorities, that are correlated with their population's residential choices. As an example, it may be that geographical LAs have lower housing costs. This might lead to more frequent residential moves, perhaps into relatively more expensive areas with better schools, and so a positive correlation between the error term and dependent variable (the frequency and location of residential moves).

A second difference is therefore used to account for the potential observable and unobservable differences between LAs with geographical and non-geographical school admissions priorities. This difference is between individuals that ever become parents vs never become parents. The reasoning is that parents value local school quality, while non-parents gain no direct flow utility from being close to good schools. 'Ever parents' are defined rather than current parents to allow households to be forward-looking and make expectations about the probability of becoming a parent. This second difference means that any systematic differences across LAs with geographical and non-geographical catchment areas are accounted for, as long as these differences are common between 'ever parents' and 'never parents' within areas.

The main estimating equation is of the general form:

$$Y_{in} = \alpha + \beta_1 GEOG + \beta_2 PARENT + \beta_3 GEOG * PARENT + \epsilon_{in} \tag{1}$$

Where Y_{in} is the dependent variable of interest for household i in neighbourhood n. The dependent variable is either at the extensive margin: the probability of moving (which implies the frequency of moves) or the intensive margin: local school quality, conditional on moving. $GEOG$ is a binary variable equal to one if the LA has geographical school admissions. $PARENT$ is a binary variable equal to one if individual i ever becomes a parent. $GEOG * PARENT$ is the interaction of these two binary variables. The coefficient of interest is therefore β_3, the effect of ever being a parent in an area with geographical admissions on the frequency/location of residential moves.

To give further intuition for this model, it is assumed that all households care about local rents and amenities, such as proximity to parks, shops and leisure facilities. All 'ever parents' care about proximity to school to reduce commuting costs. All 'ever parents' also value access to a good school. The key difference is that in LAs with geographical school admissions this leads 'ever parents' to place weight on location to gain school access, whereas in LAs within non-geographical admissions access is (largely) independent of location. Finally, 'ever parents' value property size more than 'never parents' given the additional space required for children.

To explain clearly how equation (1) estimates β_3, the preferences for the four different household groups are presented. First, for 'ever parents' (ep) under geographical admissions (G):

$$Y_{in}^{G_{ep}} = \alpha + \delta_1 A_n + \delta_2 R_n + \delta_3 SQC_n + \delta_4 N_n + \delta_5 SQA_n + \delta_7 SEL_n + \epsilon_{in}^{G_{ep}} \tag{2}$$

Where $Y_{in}^{G_{ep}}$ is the dependent variable of interest for household i in neighbourhood n, for 'ever parents' (ep) under geographical admissions (G). Local amenities in n are denoted by A_n and rents by R_n. These 'ever parents' also care about the commute to the local school, SQC_n, and access to the local school (dependent on location), SQA_n. 'Ever parents' also value property size, N_n. SEL represents the potential non-random selection into retaining the non-geographical admissions criteria - shorthand for all factors that are correlated with retaining the selective Grammar system and the dependent variable of interest. For example, taken from the literature, areas that retained the selective system are more likely to have been under Conservative party control. This factor could be correlated with the frequency and location of residential moves if, for example, Conservative voters are more likely to move/move to desirable locations than Labour voters. The second difference removes this selection term if it affects households that ever and never become parents equally. In this example, that both sets of households are influenced in the same way by the local political party control.

'Never-parents' (np) under geographical admissions also value local amenities, A_n, and rents, R_n, and are affected by selection into geographical admissions areas (SEL):

$$Y_{in}^{G_{np}} = \alpha + \delta_1 A_n + \delta_2 R_n + \delta_7 SEL_n + \epsilon_{in}^{G_{np}} \tag{3}$$

The equivalent equations for 'ever parents' and 'never parents' in areas with non-geographical admissions areas are the same (see equations (4) and (5), respectively), except that 'ever parents' do not value proximity to school for access and there is no selection term.

$$Y_{in}^{NG_{ep}} = \alpha + \delta_1 A_n + \delta_2 R_n + \delta_3 SQC_n + \delta_4 N_n + \epsilon_{in}^{NG_{ep}} \tag{4}$$

$$Y_{in}^{NG_{np}} = \alpha + \delta_1 A_n + \delta_2 R_n + \epsilon_{in}^{NG_{np}} \tag{5}$$

For clarity, taking the difference between 'ever parents' across admissions areas (equation (2) - (4)) and assuming strict exogeneity (the explanatory variables are uncorrelated with the idiosyncratic error across both groups) in the error terms gives:

$$Y_{in}^{G_{ep}} - Y_{in}^{NG_{ep}} = \delta_3 SQA_n + \delta_7 SEL \tag{6}$$

Taking the difference between 'never parents' across admissions areas (equation (3) - (5)) and again assuming strict exogeneity in the error terms gives:

$$Y_{in}^{G_{np}} - Y_{in}^{NG_{np}} = \delta_7 SEL \tag{7}$$

Taking the difference between the differences (equation (6) - (7)) therefore leaves only SQA_n, the effect of access to a good school through location.

The required assumptions are that 'never parents' have the same value of amenities and rents across admissions areas (δ_1 and δ_2 are common across areas for 'never parents') and that 'ever parents' have the same value of amenities, rents, commuting to school and property size across admissions areas (δ_1, δ_2, δ_3 and δ_4 are common across areas for 'ever parents'). Note that these assumptions allow 'ever parents' and 'never parents' to have different preferences for local amenities and rents. For example, 'never parents' might place greater weight on inner-city amenities such as proximity to restaurants and nightlife, while 'ever parents' might value proximity to child-centred amenities such as play parks. Regarding rents, 'ever parents' might respond differently to local rents if children reduce disposable household income and the marginal utility of consumption is non-linear. Examples such as these do not violate the assumptions of this model. To reiterate, the model requires only common preferences between 'never parents' across admissions areas, and, separately, 'ever parents' across admissions areas. Also, that any area-level factors that affected retaining the non-geographic admissions system affect 'ever' and 'never' parents in the same way.

To estimate the residential choices of households across the life-cycle, the coefficients are interacted with binary variables for five-year age bands (denoted by AGE):

$$\begin{aligned} Y_{in} = \alpha + \gamma_1 AGE + \gamma_2 GEOG + \gamma_3 PARENT + \gamma_4 GEOG * PARENT + \\ \gamma_5 GEOG * AGE + \gamma_6 PARENT * AGE + \gamma_7 GEOG * PARENT * AGE + \epsilon_{in} \end{aligned} \tag{8}$$

This specification makes it possible to estimate how school admissions criteria affect households' residential decisions across the life-cycle. The hypothesis is that residential choices might be particularly sensitive to admissions priorities when dependent children approach secondary school age, although moves might happen at earlier stages if households are forward-looking and they try to reduce the number of (costly) moves.[20]

It is novel to estimate whether there is movement *away from* school quality later in life. This unstudied fact is important to interpret the existing estimates of the property price premium around good schools, because the estimates are muted by exits from the neighbourhood after the child is successfully admitted or has left the school. The regression is also run for particular sub-groups to explore *who* makes endogenous residential choices in response to geographical admissions criteria.[21] Again, this is important to interpret existing estimates of the property price premium around good schools: is this driven by a minority of households or households across the distribution?

Threats to identification include the violation of strict exogeneity. One potential concern is that there are other neighbourhood attributes that households value that are correlated with school quality. This would induce a correlation between the error term and the independent variable of interest. For example, popular schools may attract child-centred businesses to the area, that are valued by parents. This is not problematic as long as the relationship between unobserved amenities and school quality is the same across areas with geographical and non-geographical admissions priorities, which seems plausible.

Another potential threat is that 'ever parents' have different preferences across areas with geographical and non-geographical admissions, for amenities, rents, commuting to school and property size. This assumption could be violated if there is non-random selection by households into admissions areas, or if there are differences in incomes across areas that reflect the historical selection into geographical admissions. Differences in average incomes across admissions areas, combined with non-linear marginal utility of consumption, would lead households to have different preferences for local rents and property size. This potential threat to identification is considered in section 5, following a description of the data used.

[20] Greaves and Turon (2021) study these dynamic considerations in depth, through a structural model of neighbourhood and school choices with forward-looking households, that anticipate moving and travel costs.

[21] In this case, the identifying assumptions have the same structure: households within each sub-group must have the same preferences within 'never parents' and 'ever parents', as described above.

Note that in this specification, the ‘treatment’ is a time invariant attribute. This has the advantage of avoiding differential timing of treatment that can be problematic for the interpretation of the difference-in-differences design as an average effect of treatment on the treated (Goodman-Bacon (2021)). The difference-in-differences specification is run without the inclusion of covariates, that require additional assumptions (Sant’Anna and Zhao (2020)).

4 Data

A cohort study is used to track residential choices across the life-cycle. The Office for National Statistics (ONS) Longitudinal Study (LS) is a longitudinal study of a 1% sample of the whole population of England and Wales.[22] England has had a national Census every 10 years since 1801, except for in 1941 during the Second World War. The LS began in 1971 and covers the following four Censuses (1981, 1991, 2001 and 2011) for people usually resident in England and Wales, and born on one of four birth dates. Sample members can enter the LS at each Census through birth and immigration and exit through emigration or death (leavers’ existing data is retained). Only LS sample members are linked across Censuses, but information about other members of the household is collected at each Census.[23] From this information, variables are constructed at the household rather than individual level, for example the maximum level of education of parents in the household. These are described in section 4.1.

The LS is well-suited to this study because it is large (over 500,000 people in each Census and over 1,000,000 people across the whole dataset), nationally representative, and longitudinal. The longitudinal design means that residential moves can be studied after children have left school, before children start school, and even before children are conceived. This is important if households have expectations about the future, for example if they expect to have children and therefore care about local school quality.

To investigate the link between residential mobility and local school quality, local area characteristics are merged to the LS. These are the quality of local schools, the local school system (geographical or not), and local property prices. To preserve the anonymity of the LS sample members, these local area characteristics must be non-disclosive, in that any combinations of the area characteristics do not uniquely identify any small areas. These variables are described fully in section 4.2. A key point to note here is that these area characteristics of interest are available from the 1991 Census. It is therefore possible to study household moves in relation to area characteristics only from this Census. Earlier Census years are used to define household attributes.

[22]The ONS LS also contains linked life events data (for example births to sample members) but these are not used in this paper.

[23]The linkage rate between Censuses is high, ranging from 87.7% between the 2001 and 2011 Censuses and 91.3% between the 1971 and 1981 Censuses (Lynch et al. (2015)). In the final sample used in this paper, around 72% of LS sample members are present across all five Censuses.

4.1 Derived variables in the ONS Longitudinal Study

Three cohorts of interest are defined, and presented in Table 3. The first cohort is LS sample members aged between 20 and 30 in the 1991 Census, so ranging between 0 and 50 across the longitudinal data. This cohort is used to study household moves in early life, for example as households form and children are born and start school. The second cohort is LS sample members aged between 30 and 40 in the 1991 Census, so ranging between 10 and 60 across the longitudinal data. The third and final cohort is those aged between 40 and 50 in 1991, so ranging between 20 and 70 in the longitudinal data. This cohort is used to study moves later in life, as dependent children leave secondary school, for example.[24] Focusing on these three cohorts selects 58% of the total available sample. The final sample also excludes those with missing key covariates and focuses only on the later Census years. Appendix Table A.1 shows the sample restrictions applied for the final analysis sample in detail.

The following derived variables at the household level are created to have consistent categories across Censuses: completed fertility; social class; immigrant status; education; ages of dependent children. For each variable in each Census, information from only the LS sample member is used where the LS sample member is single, and information from two household members is used if the LS sample member is part of a couple (married or cohabiting). Figure 2 shows the time-varying derived variables over Census years and cohorts, for each cohort starting when the LS sample member is an adult. Only completed fertility and social class are used in the empirical analysis. The other variables are used to describe the sample only.

The presence of a partner is coded as whether a household member is recorded as a spouse or cohabiting partner. Panel (a) of Figure 2 shows that LS sample members in each cohort are increasingly likely to live with a partner as they age. For a given age, younger cohorts are less likely to live with a partner.

Panel (b) of Figure 2 shows that the households of LS sample members are increasingly likely to be owner occupiers as they age, particularly to own outright.[25] Again, this is less likely for younger cohorts at a given age. The proportion living in socially rented housing decreases across cohorts and Censuses.

Immigrant status is aggregated into 'born in the UK' and 'not born in the UK'. Where the LS sample member is part of a couple, three categories are defined: 'both born in the UK', 'one born in the UK' and 'none born in the UK'. Note that 'both born in the UK' and 'one born in the UK' therefore combine the effects of couple formation and origin of birth. Panel (c) of Figure 2 shows that most households contain a couple where both were born in the UK. This percentage is increasing across Censuses and as cohorts age, which could be driven by couple formation. The youngest cohort are most likely to have one individual born outside the UK.

Education is defined coarsely to be consistent across Censuses, to be whether the individual has

[24] Some cleaning of ages recorded in the Censuses is required. For example, age does not increment by 10 years across Censuses for 13% of LS sample members. This is re-coded where possible, where there is a clear pattern and clear anomaly to be fixed. Only 0.04% of cases are dropped from the final sample as it is not possible to infer the correct age sequence across Censuses - see Appendix Table A.1 for full details.

[25] Note that it is not possible to separate the categories of 'owns outright' and 'owns with mortgage' for the 1971 Census.

a degree. As for social class, this measure is defined to be the highest of the couple where the LS sample member is part of a couple. Panel (d) of Figure 2 shows that the percentage of households that have at least one adult with a degree increases across Censuses. This is true for each cohort, so that in 2011, around 40% of all households have at least one adult with a degree.

Social class is the Standard Occupational Classification (SOC), that has categories defined consistently across Censuses. Where the LS sample member is part of a couple, the highest SOC is taken. Panel (e) of Figure 2 shows that the percentage of households with each social class category is roughly constant across Censuses, with slight increases in the percentage of households with 'Intermediate' occupations and slight decreases in the percentage with 'Skilled manual' occupations.

Finally, panel (f) shows that as households in cohort 3 age, they are increasingly likely to have only one or no adults in work, particularly as they reach retirement age in 2011. Cohort 1 shows that households are increasingly likely to have two adults in work as they age, partly due to household formation and partly due to employment status.

Turning to a time-invariant variable, completed fertility is coded as whether the LS sample member is ever observed living with a dependent child in a Census. This definition applies to male as well as female LS sample members, as the dependent child(ren) can be born to another household member, and includes step-children. This definition will have some measurement error, as some parents may never live with their dependent child on a Census date, but it will correctly classify most sample members as 'ever' or 'never' parents. There is also measurement error in the expectation of becoming an 'ever parent', as some households would like/expect to become parents and are unable to, while others become parents unexpectedly.[26]

The age of dependent children is grouped for ease of interpretation to focus on secondary school aged children. That is, at each Census date, whether the household has dependent children below, at, or above secondary school age. Figure 3 shows the proportion of households with a dependent child (panel (a)) and dependent child of secondary school age (panel (b)) by age of the LS sample member. The average age for LS sample members to be first observed as a parent is 31-32 (with only slight variation across cohorts, where younger cohorts have children later, on average). This in turn means that children first start secondary school when the parent is 41-42, on average.

To allow comparison between 'ever parents' and 'never parents', a 'key age' is defined at which most households that are 'ever parents' have children. All the variables described above are recorded at this 'key age', which is the closest Census to when the LS sample member is aged 40. For example, if an individual was 34 in 1991 and 44 in 2001, then the variables from the 2001 census would be used to define their 'key age' variables.

Table 4 shows summary statistics for the 'key age' variables in the ONS LS for the three cohorts of interest. As for Figure 3, social class around age 40 is largely constant across cohorts, with a minority classified at the tails ('professional' and 'unskilled') and between 19% and 25% across other categories. The percentage with a degree at age 40 is higher for younger cohorts, ranging from 39% for cohort 1 to 24% for cohort 3. Younger cohorts are less likely to live with a partner

[26] The National Institute for Health and Care Excellence in England states that "infertility affects 1 in 7 heterosexual couples in the UK". For these couples, the success rate of IVF varies by the age of the women, decreasing from 32% for women under 35 to 4% for women aged over 44 (NHS). Other couples will choose to adopt. In the alternative case, Wellings et al. (2013) estimate that around 15% of pregnancies are unplanned, but these unplanned pregnancies may only shift the timing of birth rather than the overall likelihood of becoming a parent.

at age 40 (83% compared to 90% for cohort 3) or ever become parents (77% compared to 88% for cohort 3). Younger cohorts are also less likely to have all adults in the household born in the UK (76% compared to 81% for cohort 3). Local school quality and property prices (defined below) are roughly constant across these cohorts around age 40.

4.2 Local area characteristics

All local area characteristics are ultimately defined at the lower level super output area (LSOA), based on the 2011 LSOA boundaries. There are over 30,000 LSOAs in England, each with a minimum of 400 households and maximum of 1,200 (ONS). These small geographical units are used as the building blocks for classifying small area characteristics across Census years. A Geographic Information System (GIS), QGIS, is used to make consistent look-ups between boundaries over time and differently sized geographies.

For school quality, the LSOA is classified according to the school closest to the population-weighted mid-point of the LSOA. For property prices, the LSOA is assigned the mean property price of properties sold in the LSOA. For the admissions system, each LSOA is assigned to the LA that it has the largest overlap with. 6.6% of observations have no linked area characteristics, and so are dropped from the final sample. Each data source is now described in turn.

4.2.1 School quality

Publicly available information on secondary school performance is downloaded from the official statistics available on the 'Find and compare schools in England' website. The only consistent school accountability measure across the census years is the percentage of pupils that achieve at least 5 GCSE grades at A* to C (including English and Maths). The average school performance across academic years close to each census year is recorded for each school.[27] This measure of school quality - raw academic results - includes the contribution of the school's intake and school effectiveness, rather than a measure of pure 'value-added' by the school. In other words, a more advantaged pupil intake leads to higher school quality for the measure used in this paper. This is especially relevant in a selective admissions system, as the intake of the school is by definition the highest ability. It is also relevant in a geographical admissions system, however, as sorting into 'good schools' through residential location by higher-income households would amplify differences in measured school quality.

School quality measures are converted into deciles to preserve the anonymity of the ONS LS. Another version of the school quality data is also transformed to be the ranking (in deciles) of the school within the Local Authority. This allows finer distinctions between local schools. For example, historically, secondary schools in London had lower performance, on average, than other regions in England. In this era, this would mean that many schools in London would be recorded as being in the lowest deciles of national performance. Since the 2000s, however, schools in London have had higher performance, on average, and so now would disproportionately be recorded as

[27] For the 2011 Census, academic years 2009/2010 and 2010/2011 are taken. For the 2001 Census, academic years 1999/2000 and 2000/2001 are taken. For the 1991 Census, academic years 1993/1994 and 1994/1995 is taken, as data for earlier academic years is missing or largely missing.

being in the highest deciles of national performance. A local measure of school quality would instead identify schools as relatively higher or lower performing within their area, rather than being grouped together using a definition at a national level.[28]

Figure 4 shows school quality, defined at the national level, for 2011. Panel (a) shows school quality across LSOAs in England, while panel (b) focuses on LSOAs in London and the South East. Figure 5 shows the equivalent figures using the local measure of school quality: the academic ranking of the school *within* the LA. This second measure is used in the empirical analysis.

4.2.2 Admissions system

The admissions system is classified at the Local Authority level, to be geographical or non-geographial. For this paper, ‘non-geographical’ equates to ‘selective’ and ‘grammar’, that are used interchangeably. The classification is derived from the school performance tables described in the previous sub-section, that record whether each schools’ admissions policy is ‘selective’, ‘modern’ or ‘non-selective’. ‘Modern’ is the equivalent school to the ‘selective’ in a grammar school system that takes the pupils that do not pass the selective test. LAs are defined as non-geographical if at least 25% of schools are classified as ‘selective’ or ‘modern’. To preserve anonymity of the ONS LS and for ease of interpretation, four (out of 152) LAs were re-coded to have consistent classifications of selective or not across Census years, by selecting the modal classification across years.[29] So few LAs are re-classified as the grammar school system has remained largely unchanged since the 1960s, and new grammar schools were banned in 1998, as described in section 2.

The LAs classified as selective are shown graphically in Figure 6 and listed in the notes to this figure.[30] These selective LAs are spread across England, but are primarily in the South. Section 5 provides a description of these two types of admissions areas in relation to the methodology described in section 3.

4.2.3 Property prices

Property prices are taken from the Consumer Data Research Centre, that in turn are derived from the Price Paid Data from HM Land Registry, which covers all property sales in England and Wales that are sold for full market value and are lodged with HM Land Registry for registration. These Consumer Data Research Centre data contain median property prices for all properties sold in the

[28]To ensure anonymity, 14% of values were further re-coded to the closest alternative value. This introduces some measurement error into the variable.

[29]Some LA boundaries were re-drawn between the 1991 and 2001 Censuses. Using GIS to classify postcodes into consistent LA boundaries leads to some re-classification of areas into selective or not. Half of ten LAs’ classification as selective or not are affected by changing boundaries.

[30]This classification is very similar to previous research on the grammar school system in England. For example, almost all LAs have the same classification as that in Burgess et al. (2018), which is based on the percentage of pupils in 1983, rather than the percentage of schools in later (Census) years. Burgess et al. (2018) include Liverpool as selective and exclude Reading and Warwickshire. In a later unpublished exercise, also based on pupil numbers, Crawford includes Wirral as selective and excludes North Yorkshire, but the other Local Authorities are consistent with the definition used here. Cribb et al. (2013) classify LAs as selective if at least 10% of pupils attend a grammar school. This definition leads to largely to the same classification, the only differences being the exclusion of Warwickshire and inclusion of Gloucestershire and Calderdale.

LSOA in a given quarter. As for school quality, data is collected for the period around the Census year, taking the mean price across the calendar year. In this case, the calendar years are 1991, 2001 and 2011, respectively.

Figure 8 shows property prices at the LSOA level across England in 2011. Prices are typically higher in the South and in urban areas, but there is variation within each LA.[31]

4.2.4 Census 2011

Publicly available data from the 2011 Census at the Lower Level Super Output Area (LSOA) from nomis are also used to describe selective and non-selective Local Authorities, but is not linked to the ONS LS to preserve anonymity. These data include: age composition, social class, and the presence of dependent children.

4.2.5 Dependent variables

There are two main dependent variables. First, for the extensive margin, the variable of interest is a binary variable equal to one if the LS sample member moves between Censuses and zero otherwise. This variable has some measurement error. First, the LS sample member might move more frequently between Census years. That is, the Censuses reveal a maximum of one move every 10 years, but households might in fact move multiple times within those 10 years. The total number of moves observed across the life-cycle across the data is therefore a lower bound to the actual total number of moves. Second, the definition of 'move' varies slightly across Census years.[32] In future work, with collaboration from ONS, it may be possible to create a consistent variable across Censuses, using movement across LSOAs.

Figure 9 shows the percentage of LS sample members that move between Censuses, by age and by cohort. For all cohorts, moving at least every 10 years (the time between Censuses) is very common. Over 80% of households are observed to move around age 30. This monotonically declines with age, to around 40% around age 50. Descriptively, it seems that households are more likely to move around the time children are born or start school than later in life.

The second dependent variable of interest is the local school quality of the LSOA of residence (described in section 4.2.1).

[31] To ensure anonymity, 28% of values were further re-coded to the closest alternative value. This introduces some measurement error into the variable.

[32] Between 1971 and 1981, 'move' is coded to one if the LS sample member's address is different. Between 1981 and 1991, 'move' is coded to one if the LS sample member moved more than 500m. Between 1991 and 2001, the definition is more vague: 'move' is coded to one if the LS sample member is "assumed to have moved". Finally, between 2001 and 2011, 'move' is coded to one if the LS sample member moved more than 250m.

5 Identifying assumptions

Section 3 outlined the identifying assumptions required to estimate the causal effect of geographical admissions priorities on households' residential location decisions in the difference-in-differences design. Having presented the data in section 4, this section now examines the plausibility of these identifying assumptions. First, it is required that area-level selection into retaining the non-geographic admissions system affects 'ever' and 'never' parents in the same way. This is examined in subsection 5.1. Second, it is required that the group of 'ever parents', on average, have the same preferences across admissions areas, and likewise for the group of 'never parents'. Differences in preferences within groups across areas could be driven by two factors. First, whether there was historically non-random selection at the area-level into geographical admissions priorities that lead to differences in residents' choices, for example due to differences in political control or property prices. This is examined in subsection 5.1. Second, whether there is non-random selection by households into admissions areas that is correlated with preferences, for example stronger preferences for school quality. This is examined in subsection 5.2.

5.1 Historical evidence of non-random selection

This section discusses evidence drawn from elsewhere about the potentially area-level non-random selection into retaining the non-geographical (selective) admissions system. Recall that the chosen research design for this paper does not require balance between all residents in geographical vs non-geographical admissions areas, only that the selection factors into non-geographical admissions areas are the same between 'ever' and 'never' parents, and that historical selection doesn't alter current preferences within 'ever' and 'never' parent household types. This is helpful, as Pischke and Manning (2006) conclude that the selection problem is not solved through "careful choice of treatment and control areas" or "using political control of the county as an instrument for early implementation of the comprehensive regime".[33]

Writing in 1971, at the time of transition, Griffiths (1971) summarises that:

> It is no accident that comprehensive schools have development most quickly in urban areas which suffered extensive war damage necessitating radical rebuilding of shattered schools, and in thinly populated rural areas where the provision of the full range of secondary education required large multi-purpose schools in which teachers and facilities could be most effectively and economically deployed.

In their detailed study of the transition to comprehensive education across Local (Education) Authorities between the 1940s and 1970s, Kerckhoff et al. (1996) agree that structural factors affected the pace of change, such as the extent of bomb damage that determined the need for new school building, perhaps in combination with housing policy. The level of funding/resources at the local level could also delay the implementation of plans, as the move to comprehensive education was not funded by central government.

[33] Looking at the data retrospectively, Pischke and Manning (2006) find that areas that moved to geographical admissions priorities are "systematically poorer, and have students with lower previous achievement".

The other leading explanation is the local political control, with more 'progressive' Labour controlled areas more likely to give support to comprehensive education. From Galindo-Rueda and Vignoles (2004), where 'LEA' refers to Local Education Authority, equivalent to Local Authorities today:

> Kerckhoff et al. (1996) showed that the political orientation of the LEA was crucially important. Specifically, LEAs that had Conservative political control experienced slower change towards mixed ability schooling than LEAs under Labour control. Furthermore, LEAs under Labour control initially but that then switched to Conservative control, appeared to have been able to reverse or slow plans to move towards comprehensive schooling.

Kerckhoff et al. (1996) conclude that although local political control was an important predictor of the pace of change, it was "far from axiomatic" (p164), however.[34] There were also idiosyncratic factors such as the role of individuals, for example the persuasion of the local Chief Education Officer (that may or may not align with political party affiliation). The presence of local pressure groups and views of the public were also factors, that were in turn influenced by the views of the local press (and perhaps vice versa). Where the local press had vested interests in the preservation of the grammar schools (perhaps as successful products of the system) they were more likely to present negative information about the transition to a comprehensive system. Kerckhoff et al. (1996) summarise that each of the ten Local Education Authorities in their study had a unique combination of these factors that affected the speed of implementation.

Burgess et al. (2019) discuss the issue of non-random selection in depth in order to motivate the matching variables for their research design. These authors choose the following variables to find the nearest neighbour match for each selective LA. First, political control at the local level, that is cited as one of the most important determinants of the pace and nature of re-organisation of the schooling system during the 1960s and 1970s. Burgess et al. (2019) also match according to area characteristics in the 1981 Census (the proportion of residents with a degree, high social class and in employment) and time-varying economic characteristics (local unemployment rate and local male hourly wage rate). Cited in Galindo-Rueda and Vignoles (2004), Kerckhoff et al. (1996) find that, surprisingly, such economic variables explain "less than 5% of the variation in the proportion of LEA state supported schools that were comprehensive". Only the pupil teacher ratio is a significant predictor of transition in some specifications, with better resourced areas shifting towards mixed ability schooling sooner.

This sub-section has discussed the existing evidence for potential area-level characteristics that determined area-level selection into geographical (comprehensive) or non-geographical (selective/grammar) admissions priorities. The historical evidence presents some reasoning for differences in the speed of implementation across areas, but concludes that there were numerous independent and varying factors across LAs. As noted above, any historical differences between areas that removed versus retained selective admissions are *not* challenges to the identification strategy used in this paper unless they *differentially* affect households that ever vs never become parents.[35] Or, that

[34] For example, the Labour Prime Minister, Harold Wilson, was reported to have said that grammar schools would be abolished "over my dead body". See footnote 6 on page 26 of Kerckhoff et al. (1996).

[35] Differential selection by either 'ever' or 'never' parents would mean that the selection term, SEL, in equations (2) and (3) would not cancel, leading to bias in the main estimates.

they might lead 'ever' or 'never' parents to have different preferences across admissions areas. The discussion in the literature to date reveals no such concern, with the caveat that the most detailed studies focus on the pace of change from the old selective system, rather than (most relevant to this study) whether LAs largely or completely retained it.

The following sub-section conducts new tests to study non-random selection of households into and out of geographical admissions areas in recent years. Selection of this kind would be problematic if it implies that 'ever parents' have different preferences (for school quality or household size, for example) across admissions areas.

5.2 Current non-random selection

Figure 7 shows the balance of detailed characteristics across areas. Overall, there are few cases where the population of geographical LAs appears different from non-geographical LAs, on average. The exception is the age structure across areas, as non-geographical areas have fewer young people (25-29 and potentially 20-24) than geographical areas. Recall, however, that balance in all observed and unobserved characteristics across admissions areas is not necessary for identification. Imbalance is problematic only if it implies that 'ever parents' differentially select into non-geographical admissions areas compared to 'never parents', or that 'ever parents' inside non-geographical areas have different preferences to those outside.

To explore this, Table 5 shows the characteristics of households that are always resident in geographical or non-geographical admissions areas, and the characteristics of households that move between admissions areas over the life-course. The majority (around 80%) of households are always resident in LAs with geographical admissions priorities. Around 7% of households are always resident in LAs with non-geographical (selective) admissions. Roughly equal proportions of households move into and out of LAs with non-geographical admissions over their life-course (6% and 5%, respectively) and a minority move both in and out (1%).

There are few significant differences between households that move in and out of geographical admissions areas (columns 3 and 4). The exception is that households that switch *to* non-geographical (selective) areas are more likely to be 'ever parents' than those that switch *from* non-geographical areas for the first and third cohorts. Overall, the population that moves to and from non-geographical admissions areas is similar, which provides encouraging evidence that there isn't systematic selection into admissions areas according to observable household characteristics. The small population that move in both directions are also largely comparable, with a few exceptions.

There are some observable differences between households that move between admissions areas versus always live within one type of admissions area over their life-course. For example, households that are always in one admissions area are less likely to have professional and intermediate social class, and less likely to have a degree than those that switch, on average. Households that are 'stable' in one admissions area are more likely to be 'ever parents', however, suggesting that the patterns are not driven by households with children.

This might reflect the characteristics of more mobile households in general, rather than households that move across admissions areas, however. Appendix Table A.2 shows the summary statistics for the groups of households, conditional on moving at least twice. This removes the potential effect of characteristics associated with households that move often. For this sample, there are very few differences across the population always remaining within geographical and non-geographical areas, moving in either direction, or moving in both directions. The exception is the social class of the household, where there are larger differences between households that are stable versus move across admission area types. For example, the proportion of households with 'Intermediate' social class in cohort 1 is 0.23 and 0.19 for households that always live within geographical and non-geographical areas, respectively, and 0.31 for households that move in either direction across admissions areas. The balance between those that move in either direction suggests that there is not systematic selection into non-geographical areas according to observable characteristics, however.

Unfortunately, it is not possible to rule out that there are no unobservable differences between these households. For example, parents with strong preferences for school quality and a child with high ability may select into a selective admissions area to access the grammar school. This assumption therefore remains untestable, but plausible given the overall balance in observable characteristics.

6 Results

This section presents the main findings for the causal effect of geographical admissions priorities on households' residential decisions. First, descriptive evidence on the relationship between property prices and school quality across LAs with geographical and non-geographical admissions priorities is shown. The effect of selective admissions criteria on the distribution of schools quality within an area is also presented.

6.1 Descriptive evidence

There is a strong correlation between local school quality and local property prices in LAs with geographical admissions criteria. Table 6 shows that an increase of one decile in local school quality is associated with around a 0.4 increase in the decile of local property prices. One explanation for this is that there is higher demand for properties around 'good' schools, as parents try to secure access to them through proximity. The relationship in Table 6 can not be given a causal interpretation, however, as there is likely to be reverse causality. That is, higher local property prices imply higher incomes for local residents, which in turn imply higher ability local children, on average.[36] Recall that the raw measure of 'school quality' used in this paper is a combination of the school's pupil intake/ability and the school's value added.

Table 6 shows that the correlation between local school quality and local property prices declines with the share of schools that have non-geographic/selective admissions priorities. In areas with the highest concentration of selective schools, for example, the correlation is less than 0.1. The interpretation is that a one decile increase in local school quality is associated with an increase in property prices of around one tenth of a decile. This is preliminary suggestive evidence that sorting

[36]See the introduction and Gibbons and Machin (2008), Black and Machin (2011) and Nguyen-Hoang and Yinger (2011) for detailed summaries of causal evidence of the relationship.

across neighbourhoods in response to school quality is less prevalent in areas with non-geographical admissions.

Figure 10 shows the distribution of school quality across areas with geographical and non-geographical (selective) admissions. As school quality is defined by test scores, and selective schools admit pupils with higher initial test scores, it follows that the distribution of school quality is more unequal in LAs with selective admissions. Note that the uneven distribution of measured school quality is likely due to the uneven allocation of pupils by ability, rather than differences in school-effectiveness. For example, recall that the causal evidence on test scores for the effect of being marginally admitted to a selective school is close to zero (Clark (2010)).

In non-geographic/selective LAs, more than 25% of schools are in the top decile of national school attainment. That is, around a quarter of schools in these LAs are among the highest attaining in England. The distribution is bi-modal, however, with just under 20% of schools in these LAs in the *bottom* decile. The implication of the selective system is that a pupil will attend a school with either among the highest or lowest test scores in the country. This in turn provides incentives for households' behaviour. If a child does not pass the '11-plus' exam to gain entry to a prestigious secondary school, the child will be assigned to a school with low-performing peers, or exit to the private sector. This pattern is also evident in panel (b) of Figure 4, where non-geographical admissions areas (highlighted in red) have more inequality in school quality across LSOAs (represented by very light and very dark blue) than geographical areas.

In contrast, the distribution of school quality in LAs with geographical admissions is more even, with roughly 10% of schools in each decile defined nationally. The exception is the top decile, where fewer schools in geographical admissions areas feature, given the dominance of schools in non-geographical (selective) areas. In these areas, parents can choose to make strategic residential moves to gain access to a higher-attaining school. The following section tests whether geographical admissions priorities have a causal effect on households residential choices, at which stage of life and for which households.

Figure 11 shows the difference in the probability of moving across Censuses for 'ever parents' and 'never parents', by age and by cohort. For each cohort, the percentage of 'ever parents' with a child of secondary school age is shown in the lower panel. These patterns show that 'ever parents' are more likely to move than 'never parents' at younger ages, typically before most households have a child of secondary school age. This is suggestive that households who ever have children make different choices at the extensive margin. The following section will interrogate whether this difference is causal - due to the geographical admissions priorities - or explained by other factors that differ between 'ever parents' and 'never parents', for example demand for property size.

6.2 Causal evidence

The estimated difference-in-differences models are shown in full in Appendix Tables A.3 and A.4 and marginal effects are shown in Appendix Figures B.2 and B.3.

Table 7 shows the interaction effects of interest for the extensive margin: the probability of moving between Censuses. For cohort 1, the youngest cohort, studied as households form and children begin school, households are more likely to move home between ages 26 and 30, relative to ages 21 and 25, than those living in non-geographical admissions areas. The interpretation of this is that geographical admissions criteria induce moving shortly before the age of family formation (for the mean household) for those that expect to become parents. There are no significant effects of living in a geographical admissions area and being an 'ever parent' on the probability of moving between censuses at other ages, however. For cohort 3, the oldest cohort that are studied as children leave school and home, and cohort 2, studied in mid-life, there are no significant effects of living in a geographical admissions area and being an 'ever parent' on the probability of moving between censuses. Overall, there is little evidence that households that ever have children move more frequently in areas with geographical admissions priorities.

For the intensive margin (the school quality of the nearest school) the interaction effects shown in Table 8 reveal no significant differences. That is, on average, households in areas with geographical admissions priorities do not live closer to schools that are relatively highly ranked. The full model shows that, overall, local school quality is significantly higher for those living in areas with geographical admissions priorities (Appendix Table A.4). This may be due to the bi-modal distribution of school quality in non-geographical (selective) areas shown in Figure 10. That is, school quality in geographical areas has less variation (as measured by raw test scores) than in non-geographic/selective areas, where local school quality is typically at the tails of the distribution. On average, this leads to higher local school quality in geographical admissions areas.

These results reveal that, overall, there is little evidence of household sorting across neighbourhoods to a greater extent in areas with geographical compared to non-geographical (selective) admissions. This is true at the extensive margin, considering whether households move at all, and at the intensive margin, considering the local school quality of the destination moved to. This is perhaps unsurprising. First, for the extensive margin, over 80% of households move between Censuses at young ages. At such a high baseline level, it may be difficult to detect additional moves due to an area's school admissions priorities. Second, at the intensive margin, the average effect includes all movements for all households. If population density is similar around schools with higher and lower quality, it must be the case that some households move near to higher quality and some to lower quality schools. It is therefore important to test for heterogeneity in the response across household types.

The sample is split according to social class, as this variable is stable over time and across cohorts (Table 4). Tables 9 and 10 present the equivalent results for the sample of households with 'Professional' and 'Intermediate' social class only. The full results are shown in Appendix Tables A.5 and A.6. Table 9 shows that the probability of moving is unaffected by geographical admissions priorities even for households of the highest social class, with the exception of cohort 1. As in the main sample, households in cohort 1 are more likely to move between Censuses at ages 26 to 30, relative to 21 to 25, if they are ever parents and resident in an LA with geographical school priorities. This could suggest that for this younger cohort, moves are shifted close to average childbirth age, for those that expect to become parents. This cohort are also more likely to move between Censuses at ages 46-50, which for many households would be as children leave secondary school. This could be tentative evidence that this high social class sub-group make more frequent moves after the school phase, although this pattern is not evident for older cohorts.[37] Overall, these results imply that considerations about school access largely do not affect *whether* a household chooses to move,

[37] In fact, for cohort 3, there is a marginally negative coefficient for this age, suggesting that 'ever parent' households are less likely to move at this stage of life in geographical admissions areas.

even for relatively advantaged households.

Table A.6 presents some suggestive evidence that the location of moves is influenced by the admissions system for households with high social class. This implies that this group might consider the location of moves in relation to local school quality, if not the timing of moves. The evidence is not overwhelming, however. Younger households in geographical admissions areas are more likely to move to areas with higher local school quality (around 0.7 of a decile) than households in non-geographical admissions areas, with borderline statistical significance. The youngest cohort is more likely to move while still without children (according to the mean age of first childbirth) while cohort 2 are more likely to move between the ages of 36 and 40, for most households just before their first child begins secondary school. Cohort 3 shows suggestive evidence that older households move to areas with lower school quality later in life. This is consistent with lower flow utility from local school quality as children age and exit secondary school. Despite the large sample size, these effects are not strongly significant or economically meaningful.

The findings therefore appear to contradict well-established and robust existing literature that finds evidence of property price premiums around good schools, that it is assumed are driven by greater demand for properties by parents seeking admission for their child. Three factors might reconcile the findings. First, the measurement error in the dependent and independent variables used in this paper could cause downward bias in the estimates. The standard errors are large, despite the large sample size. Further research using continuous variables, in collaboration with the ONS, would test the sensitivity of these estimates to measurement error induced by the requirement to make the data anonymous.

Second, the existing literature uses Boundary Discontinuity Design to estimate the local price premium immediately around the catchment area boundary for high performing schools. This paper, instead, uses variation across all neighbourhoods, inside and close to catchment area boundaries, using 'never parents' and non-geographical admissions areas as the counterfactual, rather than neighbouring areas. This has the advantage of having higher external validity, if households that select to be marginally inside the boundary are different to those choosing to locate closer to the school. The disadvantage is that this approach might abstract from very local effects at the boundary.

Finally, this paper studies the whole of England rather than particular over-subscribed schools. For example, Bayer et al. (2007) estimate boundary discontinuities for the subset of boundaries where the "test score gap comparing low and high sides is in excess of the median gap (38.4 points)", reasoning that "if schools were identical on either side, there would be little reason to expect to see sorting". It could be that the positive effect for a minority of popular schools is muted by the majority. This would imply that sorting across neighbourhoods in response to local school quality is not a widespread phenomenon, but instead concentrated around particularly high-performing schools. In addition to occurring for a minority of schools, the property premiums could be driven by a minority of households with strong demand for school quality. This is in contrast to the received wisdom that schools are a driving factor for many households' residential decisions, although note that this minority of households could still drive equilibrium outcomes. Bayer et al. (2007) conclude that heterogeneous preferences for neighbourhood composition, in addition to heterogeneous preferences for school quality, would generate strong "second-round 'social multiplier' effects on prices", that are potentially stronger than direct effects of school quality.

7 Conclusion

The design of an education system has important implications for students' learning, later life outcomes, and ultimately total welfare in society. This is because different design choices influence efficiency and equity in public schools, and the level of segregation or integration between groups of pupils. This paper addresses another important, and understudied, consequence of education system design choices: neighbourhood formation. The intuition is that how schools choose to admit pupils if oversubscribed affects parents' residential choices. In particular, geographical admissions priorities can induce households to move close to their preferred school to gain access. As demand around desirable schools increases, so do property prices, increasing inequality in school access between more and less affluent households.

Previous empirical work has clearly, consistently and robustly demonstrated this property price premium around popular schools with high pupil attainment. But less is known about how this process ultimately affects neighbourhoods, the costs imposed on households, and how widespread the phenomenon is. These are all important questions to move towards assessing the overall welfare calculations of different policy choices.

This paper explicitly compares two alternative school admissions priority arrangements in England. Most areas use some form of geography - a catchment area/school zone or distance ranking - to order pupils if a school is oversubscribed. A minority of areas retained a non-geographical admissions system, where spots at the 'top' schools are awarded primarily by test score. A second difference between households that ever become parents versus never become parents accounts for any area-level selection into retaining the non-geographical admissions system, isolating the effect of geographical admissions criteria on the probability of moving home and the characteristics of the destination.

This paper finds that only a minority of households (those with high social class) make endogenous residential choices in response to geographical school admissions priorities. Only the intensive margin - where to move to - not the extensive margin - whether to move - is affected. This implies that households don't incur additional moving costs through the choice of a geographical admissions system. Residential mobility is high for young families (around 80% of these households move within the 10-year interval of the panel data) but mobility is no more likely in areas with geographical compared to non-geographical school admissions. On the intensive margin, households with high social class are more likely to move to areas with higher school quality, earlier in life. Moves later in life are not affected significantly, suggesting that moving costs (either monetary or non-monetary) are larger at this life-stage.

These results are useful for primarily two strands of literature. First, these results give interpretation to the 'black box' of the estimated house price premium around 'good' schools. The results suggest that rather than being a widespread phenomenon, moving for schools occurs for a minority of households, for a minority of schools. It would be informative for forthcoming estimates of the property price premiums around 'good' schools to include the distribution of the premium, including the percentage of schools that have a non-zero premium. Confirming the intuition presented in this previous literature, these households are more affluent (in this paper measured by social class). This paper shows that the previous empirical estimates are not dampened by subsequent movement away once children have gained admission or left school. On this point, Greaves and Turon (2021) show that the estimates *are* dampened by the presence of households that don't gain flow utility from school quality (such as non-parents), but value neighbourhood attributes that are correlated with school quality.

Why is endogenous residential location confined to higher-social class households? Two explanations are differences in budget constraints and differences in preferences for school quality. Budget constraints bind more tightly for households with lower socio-economic status, and may prohibit moving to the area with the most desirable school (and therefore the highest premium). In a natural experiment, holding location fixed, Greaves and Hussain (2021) find that all households respond to information revealed about school quality, suggesting that preferences are similar across groups. Previous literature has found differences in preferences between socio-economic groups, however, when estimated from discrete choice models of parents' school choices.

Turning to this second strand of literature, discrete choice models to estimate parents' preferences have, to date, uniformly assumed a fixed residential location from which households make their school choices. Any endogenous residential location causes bias to the estimated preferences. While acknowledged as problematic, the scale of this problem has remained unquantified. This paper reveals that residential choices are endogenous for a limited set of households with high social class. This is a positive result for the literature, in that estimating discrete choice models for lower social class households should be free of this form of bias. Less encouragingly, however, it is not possible to infer differences in preferences between groups from these models, where location is endogenous for one group.

These results are based on the comparison of two existing admissions systems in England. Are the results externally valid for other contexts, and alternative admissions arrangements, such as lotteries, that also break the near deterministic link between residential location and school access? School assignment clearly depends on alternative admissions arrangements, for example whether students are sorted randomly or by ability. Exit to the private sector may also depend on the admissions arrangements, eventual distribution of 'school quality' and peer group. Both these factors (school assignment and exit to the private sector) are likely to affect the efficiency and equity of the resulting education system. The residential location decisions may behave similarly under both systems, however, as both remove the incentive for residential choice decisions to factor in the probability of admission to a desirable school. (Commuting costs to school may still play a role in households' decisions.)

The role of the private sector is an important factor in the generalisability of the results. Private schools are an outside option for parents under geographical and non-geographical admissions criteria. For geographical admissions criteria, parents might choose to pay for school, rather than pay more for a house close to a desirable state school. Contexts with more limited provision of private schooling might therefore see larger endogenous residential movement in response to geographical admissions arrangements. Heterogeneity in the response in England according to local market characteristics (such as the private school provision or other outside options, such as faith schools) is left to future research, as it would need to incorporate the potential endogeneity of private school provision to local market characteristics.

One limitation of this empirical paper is the measurement error induced by anonymisation, namely using discrete rather than continuous variables for local school quality. There is also measurement error in the classification of 'ever' and 'never' parents, and inconsistency in the measurement of a residential move over time. These factors suggest that the results are a lower-bound on the differences between admissions systems. Future work, in collaboration with ONS, could reduce this measurement error problem.

The role of school admissions priorities, and the design of the education system more generally, on neighbourhood formation in addition to school composition is an important area of study. Individuals are shaped by their environment at home and school. Re-designing education systems to shift either or both of these factors could economically affect future generations of pupils. Further research is needed to evaluate reforms and provide evidence on the overall total welfare effects of alternative school choice policies, including the general equilibrium effects on residential choices.

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8 Tables

Table 1: The share of private and state-funded religious secondary schools across Local Authorities in England

	Mean	S.D.	10th %ile	25th %ile	Median	75th %ile	90th %ile
Private	0.25	0.16	0.06	0.14	0.22	0.35	0.45
Private: geog.	0.25	0.16	0.06	0.14	0.22	0.36	0.47
Private: non-geog.	0.20	0.15	0.07	0.14	0.20	0.29	0.40
Religious	0.22	0.14	0.08	0.13	0.20	0.29	0.38
Religious: geog.	0.22	0.11	0.08	0.13	0.16	0.27	0.39
Religious: non-geog.	0.17	0.06	0.11	0.13	0.18	0.20	0.27
N LAs	151	151	151	151	151	151	151

Source: School Performance Tables (Department for Education), 2011. Note: The sample excludes one LA (the City of London) that has no state secondary schools, and only one private school. Colleges and Special Schools (that cater for pupils with some Special Educational Needs) are excluded from the sample. The share of religious schools is for state-funded secondary schools only.

Table 2: The prevalence of geographical admissions priorities across 'geographical' and 'non-geographical' Local Authorities

	Geographical	Non-geographical		
		All	Non-selective	Selective
Priority ever mentioned				
Catchment	0.53	0.47	0.43	0.61
Proximity	0.58	0.50	0.55	0.35
Catchment | Proximity	0.87	0.84	0.84	0.85
Priority mentioned in first 3				
Catchment	0.48	0.41	0.37	0.61
Proximity	0.18	0.16	0.21	0.06
Catchment | Proximity	0.64	0.56	0.56	0.61
Priority mentioned in first 5				
Catchment	0.53	0.47	0.43	0.61
Proximity	0.46	0.46	0.52	0.28
Catchment | Proximity	0.83	0.83	0.84	0.83

Source: Data collection by Min Zhang, funded by the Keynes Fund (PI Anna Vignoles and Simon Burgess). Collection of all secondary schools' admissions policies for entry in the school year 2020/2021. Note: The data are collapsed to the Local Authority (LA) level. The sample excludes Hartlepool. 'Priority ever mentioned' means that the priority (catchment or proximity) is mentioned at any point in the schools' admissions priorities. 'Priority mentioned in first 3' means that the priority is given as one of the top three admissions priorities. 'Priority mentioned in first 5' means that the priority is given as one of the top five admissions priorities.

Table 3: Cohorts of interest in the ONS Longitudinal Study

Census	Cohort 1	Cohort 2	Cohort 3
1971	0-10	10-20	20-30
1981	10-20	20-30	30-40
1991	20-30	30-40	40-50
2001	30-40	40-50	50-60
2011	40-50	50-60	60-70
N	358,309	334,130	351,125
N final sample	248,952	251,542	281,190
N observed in 1991 to 2011	149,389	150,175	166,473

Source: ONS Longitudinal Study. Note: This table shows the age range of LS sample members in three chosen cohorts across Censuses. The number of observations is individual by Census year. The process from unrestricted to final sample is shown in Appendix Table A.1.

Table 4: Summary statistics for three cohorts at the 'key age' of 40 (mean, and standard deviation in brackets)

Census Age in 1991	Cohort 1 20-30	Cohort 2 30-40	Cohort 3 40-50
'Ever parent'	0.77 (0.42)	0.83 (0.37)	0.88 (0.33)
Not born in UK	0.01 (0.12)	0.05 (0.22)	0.05 (0.22)
One born in UK	0.22 (0.42)	0.18 (0.39)	0.14 (0.35)
Both born in UK	0.76 (0.43)	0.77 (0.42)	0.81 (0.39)
Professional	0.02 (0.13)	0.02 (0.12)	0.03 (0.16)
Intermediate	0.22 (0.42)	0.21 (0.41)	0.20 (0.40)
Skilled Non-Manual	0.22 (0.41)	0.21 (0.41)	0.19 (0.39)
Skilled Manual	0.24 (0.43)	0.24 (0.43)	0.25 (0.43)
Partly Skilled	0.23 (0.42)	0.23 (0.42)	0.22 (0.41)
Unskilled	0.07 (0.25)	0.08 (0.27)	0.09 (0.28)
Degree	0.39 (0.49)	0.34 (0.47)	0.24 (0.43)
One in work	0.30 (0.46)	0.31 (0.46)	0.37 (0.48)
Both in work	0.63 (0.48)	0.62 (0.49)	0.61 (0.49)
Partner	0.83 (0.37)	0.87 (0.33)	0.90 (0.30)
Local school quality (LA deciles)	5.67 (2.83)	5.64 (2.81)	5.62 (2.81)
Property price (national deciles)	5.50 (2.78)	5.60 (2.81)	5.77 (2.81)

Source: ONS Longitudinal Study. Note: The final common sample is applied. Variables refer to the LS sample member if the LS sample member is single, or combined characteristics of LS member and partner if the LS sample member is part of a couple (married or cohabiting). The 'key age' of 40 is selected as an age where most LS sample members that ever have children will have dependent children at the household. All the variables in the table are recorded at this 'key age', which is the closest Census to when the LS sample member is aged 40. For example, if an individual was 34 in 1991 and 44 in 2001, then the variables from the 2001 census would be used to define their variables at the key age.

Table 5: Characteristics of LS sample members that are resident in or move between Local Authorities with 'selective' or 'grammar' school admissions

Cohort 1 Variable	Always geographic Mean (SD)	Always non-geographic Mean (SD)	Switch to non-geographic Mean (SD)	Switch to geographic Mean (SD)	Switch to and from Mean (SD)
Not born in UK	0.02 (0.13)	0.01 (0.12)	0.01 (0.12)	0.01 (0.09)	0.01 (0.09)
Both born in UK	0.76 (0.43)	0.76 (0.43)	0.78 (0.42)	0.79 (0.41)	0.72 (0.45)
Professional	0.02 (0.13)	0.01 (0.11)	0.03 (0.17)	0.03 (0.17)	0.02 (0.14)
Intermediate	0.22 (0.41)	0.18 (0.38)	0.31 (0.46)	0.31 (0.46)	0.38 (0.48)
Skilled Non-Manual	0.21 (0.41)	0.22 (0.42)	0.23 (0.42)	0.25 (0.43)	0.21 (0.41)
Skilled Manual	0.24 (0.43)	0.26 (0.44)	0.19 (0.39)	0.19 (0.39)	0.21 (0.41)
Partly Skilled	0.23 (0.42)	0.24 (0.43)	0.18 (0.38)	0.17 (0.38)	0.14 (0.35)
Unskilled	0.07 (0.26)	0.08 (0.27)	0.04 (0.20)	0.04 (0.19)	0.03 (0.16)
Degree	0.39 (0.49)	0.32 (0.47)	0.49 (0.50)	0.51 (0.50)	0.53 (0.50)
One in work	0.30 (0.46)	0.32 (0.47)	0.30 (0.46)	0.29 (0.45)	0.29 (0.46)
Both in work	0.63 (0.48)	0.62 (0.48)	0.65 (0.48)	0.67 (0.47)	0.66 (0.47)
Partner	0.83 (0.37)	0.83 (0.38)	0.87 (0.33)	0.88 (0.33)	0.82 (0.39)
'Ever parent'	0.78 (0.41)	0.79 (0.41)	0.76 (0.42)	0.73 (0.44)	0.71 (0.45)
Cohort 2					
Not born in UK	0.06 (0.24)	0.04 (0.19)	0.03 (0.17)	0.03 (0.16)	0.02 (0.13)
Both born in UK	0.76 (0.43)	0.78 (0.41)	0.77 (0.42)	0.77 (0.42)	0.71 (0.45)
Professional	0.01 (0.12)	0.01 (0.12)	0.02 (0.15)	0.03 (0.16)	0.04 (0.20)
Intermediate	0.21 (0.40)	0.19 (0.39)	0.29 (0.45)	0.31 (0.46)	0.30 (0.46)
Skilled Non-Manual	0.21 (0.41)	0.24 (0.43)	0.25 (0.44)	0.26 (0.44)	0.31 (0.46)
Skilled Manual	0.24 (0.43)	0.24 (0.43)	0.19 (0.40)	0.16 (0.37)	0.14 (0.34)
Partly Skilled	0.24 (0.42)	0.23 (0.42)	0.18 (0.38)	0.17 (0.38)	0.15 (0.36)
Unskilled	0.08 (0.28)	0.08 (0.28)	0.04 (0.21)	0.05 (0.22)	0.04 (0.20)
Degree	0.34 (0.47)	0.31 (0.46)	0.43 (0.49)	0.44 (0.50)	0.44 (0.50)
One in work	0.31 (0.46)	0.31 (0.46)	0.34 (0.48)	0.32 (0.47)	0.33 (0.47)
Both in work	0.62 (0.48)	0.64 (0.48)	0.60 (0.49)	0.63 (0.48)	0.63 (0.48)
Partner	0.88 (0.33)	0.88 (0.32)	0.88 (0.33)	0.88 (0.32)	0.84 (0.36)
'Ever parent'	0.84 (0.37)	0.85 (0.35)	0.81 (0.39)	0.80 (0.40)	0.79 (0.41)
Cohort 3					
Not born in UK	0.05 (0.23)	0.04 (0.20)	0.03 (0.17)	0.03 (0.17)	0.02 (0.14)
Both born in UK	0.81 (0.40)	0.81 (0.39)	0.81 (0.39)	0.81 (0.40)	0.85 (0.36)
Professional	0.03 (0.16)	0.02 (0.15)	0.03 (0.16)	0.03 (0.16)	0.03 (0.16)
Intermediate	0.20 (0.40)	0.20 (0.40)	0.25 (0.43)	0.29 (0.45)	0.29 (0.45)
Skilled Non-Manual	0.19 (0.39)	0.20 (0.40)	0.23 (0.42)	0.24 (0.43)	0.19 (0.39)
Skilled Manual	0.25 (0.43)	0.25 (0.43)	0.22 (0.42)	0.20 (0.40)	0.24 (0.43)
Partly Skilled	0.22 (0.42)	0.22 (0.41)	0.17 (0.38)	0.17 (0.38)	0.13 (0.33)
Unskilled	0.09 (0.28)	0.08 (0.27)	0.07 (0.25)	0.05 (0.21)	0.09 (0.29)
Degree	0.24 (0.43)	0.23 (0.42)	0.28 (0.45)	0.32 (0.47)	0.25 (0.43)
One in work	0.37 (0.48)	0.39 (0.49)	0.33 (0.47)	0.39 (0.49)	0.32 (0.47)
Both in work	0.61 (0.49)	0.59 (0.49)	0.64 (0.48)	0.59 (0.49)	0.65 (0.48)
Partner	0.90 (0.30)	0.91 (0.29)	0.91 (0.28)	0.88 (0.32)	0.91 (0.29)
'Ever parent'	0.88 (0.33)	0.89 (0.31)	0.88 (0.33)	0.84 (0.36)	0.90 (0.30)

Source: ONS Longitudinal Study and School Performance Tables (Department for Education). Note: The final common sample is applied. 'Selective' and 'grammar' are used interchangably. Local Authorities are defined as 'selective' if at least 25% of schools are classified as 'selective' or 'modern' in the School Performance Tables around the Census years 1991, 2001 and 2011. The definition is refined by consistent across Census years and accounting for changes in Local Authority boundaries between the 1991 and 2001 Censuses.

Table 6: The relationship between local property prices and local school quality at the LSOA level

	Grammar school concentration (LA level)			
	(1)	(2)	(3)	(4)
(a) Unconditional	<10%	10-25%	25-50%	>50%
Local school quality	0.388***	0.212***	0.170***	0.098***
	(0.006)	(0.033)	(0.024)	(0.013)
Urban/rural FE	No	No	No	No
Region FE	No	No	No	No
Observations	27,979	867	892	2,694
(b) Conditional	<10%	10-25%	25-50%	>50%
Local school quality	0.267***	0.180***	0.161***	0.101***
	(0.004)	(0.023)	(0.021)	(0.011)
Urban/rural FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Observations	27,979	867	892	2,694

Source: Consumer Data Research Centre and School Performance Tables (Department for Education). Note: + p<0.10, * p<0.05, ** p<0.01, *** p<0.001. The table shows coefficients from an ordinary least squares regression, with standard errors in parentheses. The relationship between local prices and school quality at the LSOA level, estimated using OLS. The dependent variable is the decile of local property prices, where 1 is the lowest price and 10 is the highest price. The independent variable is the decile of local school quality, where 1 is the lowest test scores and 10 is the highest. Panel (b) is conditional on urban/rural (4 categories) and region fixed (9 categories) effects.

Table 7: Difference-in-differences estimation for the effect of geographical admissions priorities for secondary schools in England on the probability of moving, by cohort and age band. Interaction effects of interest.

	Cohort 1	Cohort 2	Cohort 3
0-20 # Geographic LA = 1 # 'Ever parent' = 1	-0.009		
	(0.054)		
21-25 # Geographic LA = 1 # 'Ever parent' = 1	*ref.*		
26-30 # Geographic LA = 1 # 'Ever parent' = 1	0.063*	0.041	
	(0.030)	(0.056)	
31-35 # Geographic LA = 1 # 'Ever parent' = 1	0.013	*ref.*	
	(0.030)		
36-40 # Geographic LA = 1 # 'Ever parent' = 1	0.001	0.014	-0.054
	(0.030)	(0.035)	(0.062)
41-45 # Geographic LA = 1 # 'Ever parent' = 1	-0.012	-0.011	*ref.*
	(0.031)	(0.034)	
46-50 # Geographic LA = 1 # 'Ever parent' = 1	0.029	0.030	-0.042
	(0.033)	(0.035)	(0.037)
51-55 # Geographic LA = 1 # 'Ever parent' = 1		0.043	-0.031
		(0.023)	(0.037)
55-60 # Geographic LA = 1 # 'Ever parent' = 1		-0.017	-0.004
		(0.028)	(0.038)
61-65 # Geographic LA = 1 # 'Ever parent' = 1			-0.005
			(0.038)
66-70 # Geographic LA = 1 # 'Ever parent' = 1			-0.034
			(0.043)
N	149,389	150,175	166,473
R^2	0.097	0.143	0.057

Source: ONS Longitudinal Study linked to School Performance Tables (Department for Education). Note: + p<0.10, * p<0.05, ** p<0.01, *** p<0.001. The final common sample is applied. # refers to the interaction between variables. The table shows coefficients from an ordinary least squares regression, with standard errors in parentheses. Full results from this specification are shown in Appendix Table A.3.

Table 8: Difference-in-differences estimation for the effect of geographical admissions priorities for secondary schools in England on the local school quality of chosen residence, by cohort and age band. Interaction effects of interest.

	Cohort 1	Cohort 2	Cohort 3
0-20 # Geographic LA = 1 # 'Ever parent' = 1	-0.038		
	(0.338)		
21-25 # Geographic LA = 1 # 'Ever parent' = 1	*ref.*		
26-30 # Geographic LA = 1 # 'Ever parent' = 1	0.239	0.019	
	(0.189)	(0.340)	
31-35 # Geographic LA = 1 # 'Ever parent' = 1	-0.040	*ref.*	
	(0.187)		
36-40 # Geographic LA = 1 # 'Ever parent' = 1	0.070	0.195	-0.115
	(0.190)	(0.210)	(0.375)
41-45 # Geographic LA = 1 # 'Ever parent' = 1	-0.056	0.003	*ref.*
	(0.194)	(0.207)	
46-50 # Geographic LA = 1 # 'Ever parent' = 1	0.017	0.217	-0.104
	(0.208)	(0.214)	(0.223)
51-55 # Geographic LA = 1 # 'Ever parent' = 1		0.166	-0.243
		(0.213)	(0.223)
55-60 # Geographic LA = 1 # 'Ever parent' = 1		-0.033	-0.129
		(0.239)	(0.229)
61-65 # Geographic LA = 1 # 'Ever parent' = 1			0.004
			(0.231)
66-70 # Geographic LA = 1 # 'Ever parent' = 1			-0.072
			(0.259)
N	149,389	150,175	166,473
R^2	0.003	0.002	0.002

Source: ONS Longitudinal Study linked to School Performance Tables (Department for Education). Note: + p<0.10, * p<0.05, ** p<0.01, *** p<0.001. The final common sample is applied. # refers to the interaction between variables. The table shows coefficients from an ordinary least squares regression, with standard errors in parentheses. Full results from this specification are shown in Appendix Table A.4.

Table 9: Difference-in-differences estimation for the effect of geographical admissions priorities for secondary schools in England on the probability of moving, by cohort and age band. Interaction effects of interest. Highest social class only (Professional and Intermediate)

	Cohort 1	Cohort 2	Cohort 3
0-20 # Geographic LA = 1 # 'Ever parent' = 1	0.077		
	(0.094)		
21-25 # Geographic LA = 1 # 'Ever parent' = 1	*ref.*		
26-30 # Geographic LA = 1 # 'Ever parent' = 1	0.120*	0.045	
	(0.054)	(0.098)	
31-35 # Geographic LA = 1 # 'Ever parent' = 1	0.086	*ref.*	
	(0.054)		
36-40 # Geographic LA = 1 # 'Ever parent' = 1	0.033	0.001	-0.016
	(0.053)	(0.061)	(0.115)
41-45 # Geographic LA = 1 # 'Ever parent' = 1	0.015	-0.025	*ref.*
	(0.056)	(0.061)	
46-50 # Geographic LA = 1 # 'Ever parent' = 1	0.129*	0.068	-0.121+
	(0.059)	(0.062)	(0.072)
51-55 # Geographic LA = 1 # 'Ever parent' = 1		-0.006	-0.128+
		(0.063)	(0.071)
55-60 # Geographic LA = 1 # 'Ever parent' = 1		-0.028	-0.049
		(0.070)	(0.075)
61-65 # Geographic LA = 1 # 'Ever parent' = 1			-0.100
			(0.074)
66-70 # Geographic LA = 1 # 'Ever parent' = 1			-0.088
			(0.085)
N	35,918	33,747	38,460
R^2	0.099	0.190	0.088

Source: ONS Longitudinal Study linked to School Performance Tables (Department for Education). Note: + p<0.10, * p<0.05, ** p<0.01, *** p<0.001. The final common sample is applied. # refers to the interaction between variables. The table shows coefficients from an ordinary least squares regression, with standard errors in parentheses. Full results from this specification are shown in Appendix Table A.5.

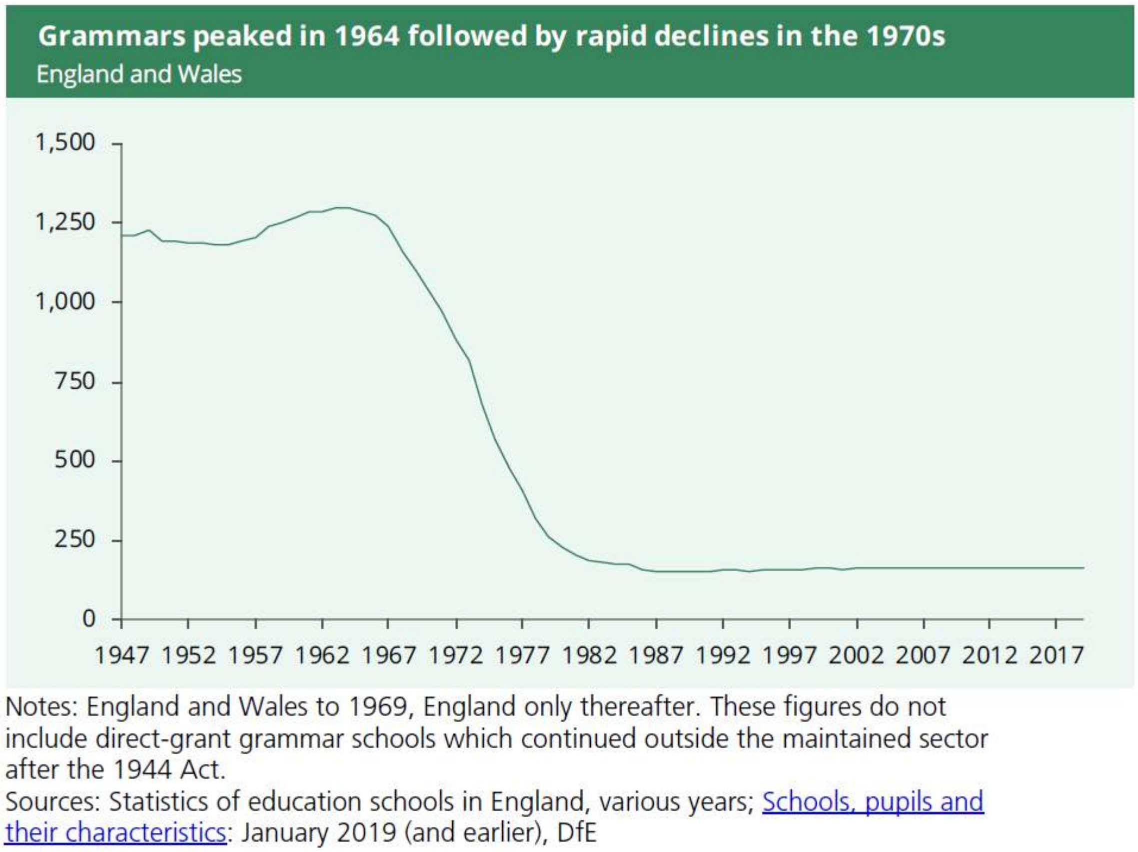
Table 10: Difference-in-differences estimation for the effect of geographical admissions priorities for secondary schools in England on the local school quality of chosen residence, by cohort and age band. Interaction effects of interest. Highest social class only (Professional and Intermediate)

	Cohort 1	Cohort 2	Cohort 3
0-20 # Geographic LA = 1 # 'Ever parent' = 1	1.151+		
	(0.625)		
21-25 # Geographic LA = 1 # 'Ever parent' = 1	*ref.*		
26-30 # Geographic LA = 1 # 'Ever parent' = 1	0.708*	-0.208	
	(0.359)	(0.621)	
31-35 # Geographic LA = 1 # 'Ever parent' = 1	0.110	*ref.*	
	(0.358)		
36-40 # Geographic LA = 1 # 'Ever parent' = 1	0.161	0.754*	0.086
	(0.353)	(0.384)	(0.675)
41-45 # Geographic LA = 1 # 'Ever parent' = 1	-0.237	0.054	*ref.*
	(0.374)	(0.384)	
46-50 # Geographic LA = 1 # 'Ever parent' = 1	0.171	0.488	0.006
	(0.388)	(0.395)	(0.425)
51-55 # Geographic LA = 1 # 'Ever parent' = 1		0.514	-0.693+
		(0.395)	(0.416)
55-60 # Geographic LA = 1 # 'Ever parent' = 1		0.481	-0.194
		(0.444)	(0.443)
61-65 # Geographic LA = 1 # 'Ever parent' = 1			0.027
			(0.434)
66-70 # Geographic LA = 1 # 'Ever parent' = 1			-0.704
			(0.500)
N	35,918	33,747	38,460
R^2	0.006	0.004	0.007

Source: ONS Longitudinal Study linked to School Performance Tables (Department for Education). Note: + p<0.10, * p<0.05, ** p<0.01, *** p<0.001. The final common sample is applied. # refers to the interaction between variables. The table shows coefficients from an ordinary least squares regression, with standard errors in parentheses. Full results from this specification are shown in Appendix Table A.6.

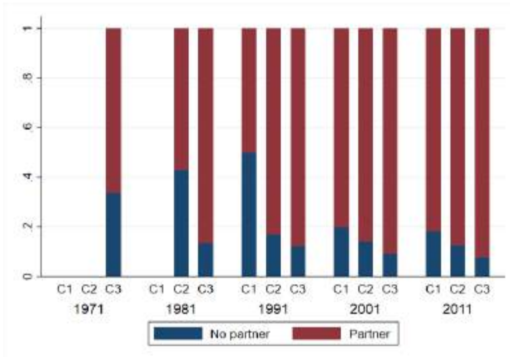
9 Figures

Figure 1: The number of grammar schools in England over time

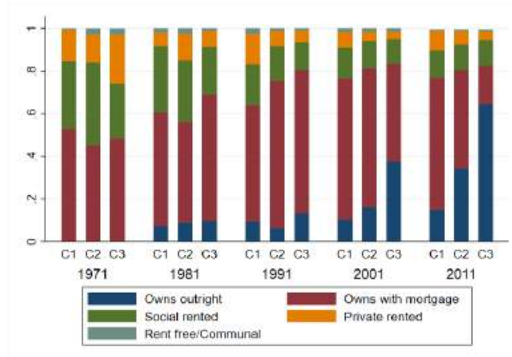


Source: Parliamentary Briefing Paper.

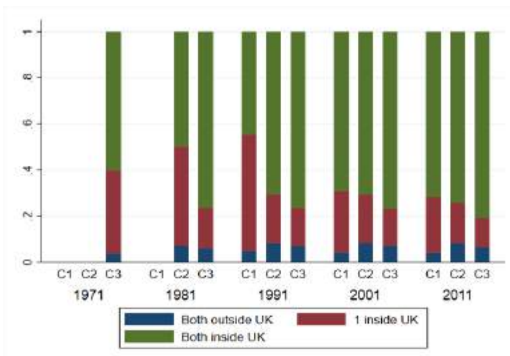
Figure 2: Characteristics of Longitudinal Study sample members' households over Census and cohorts



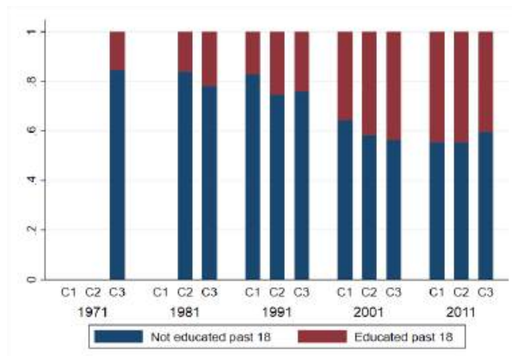
(a) Partner



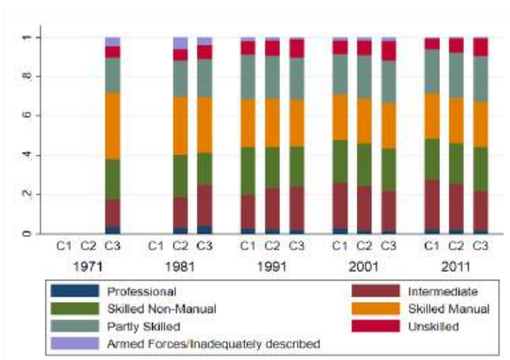
(b) Housing tenure



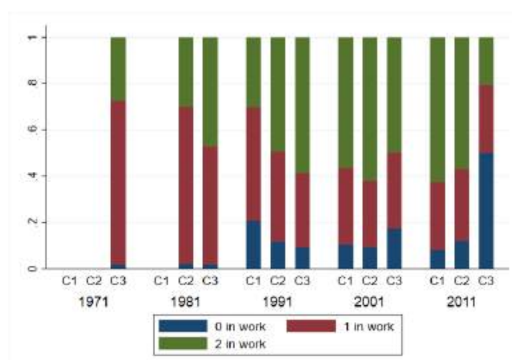
(c) Born in UK



(d) Education (degree)



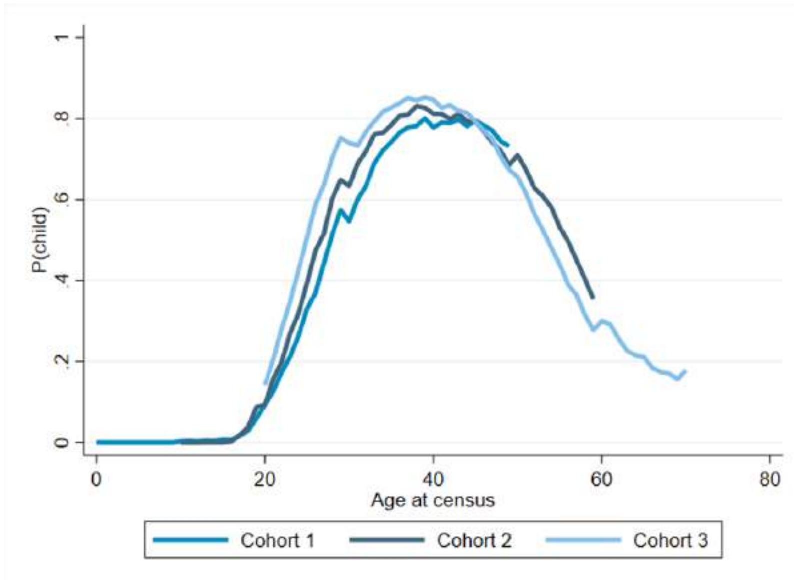
(e) Social class



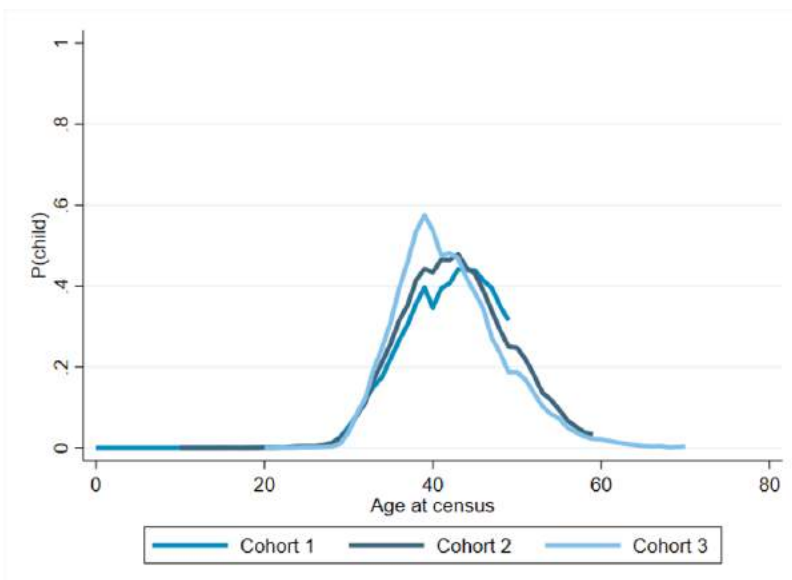
(f) In work

Source: ONS Longitudinal Study. Not that housing tenure is necessarily coded differently in 1971, when there is not separate categories for owning a home with or without a mortgage. All variables are coded at the household level. Information from only the LS sample member is used where the LS sample member is single, and information from two household members is used if the LS sample member is part of a couple (married or cohabiting). This is the maximum value (for education and social class) or count (for born in the UK and in work).

Figure 3: The proportion of households with dependent children and dependent children of secondary school age



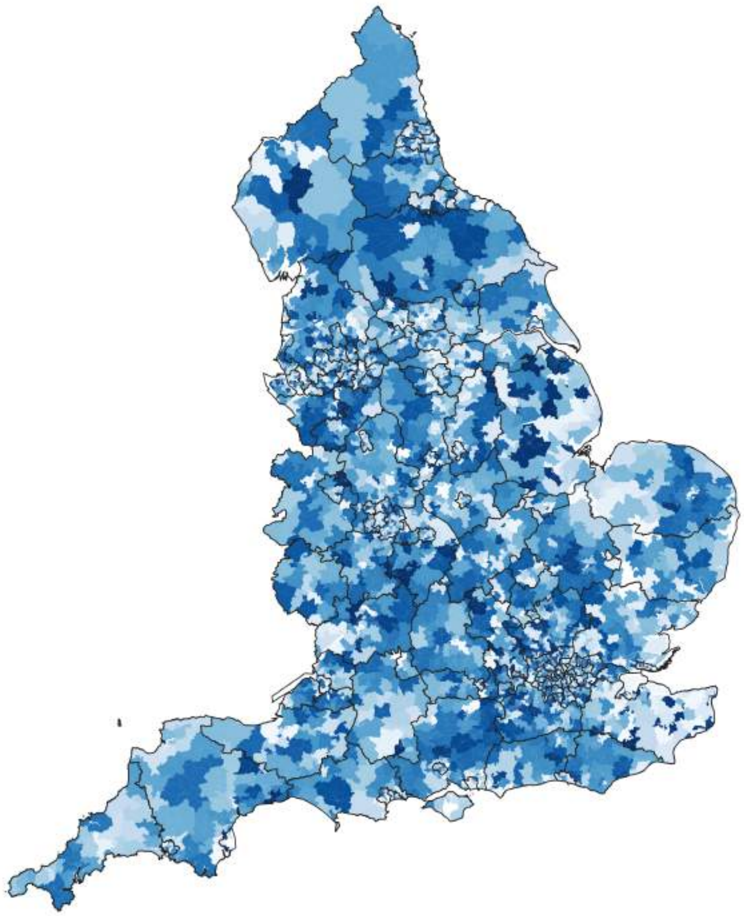
(a) Child in household



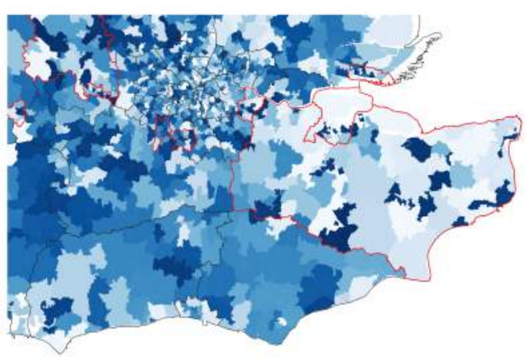
(b) Child of secondary age in household

Source: ONS Longitudinal Study. Note: The final common sample is applied.

Figure 4: School quality of the closest secondary school across England at the LSOA level



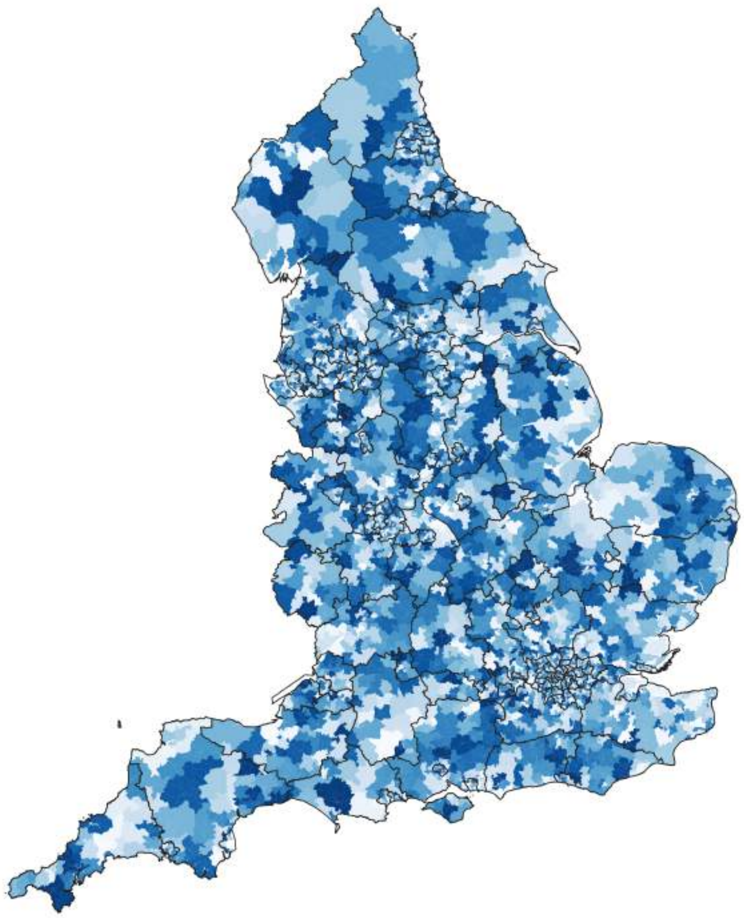
(a) England



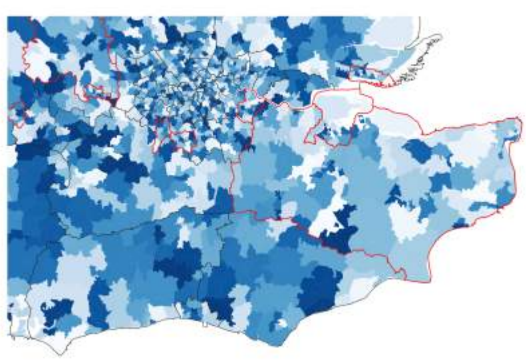
(b) London and South East

Source: School Performance Tables (Department for Education). Note: The school quality in each LSOA is the secondary school performance (5A*-C) of the closest school to the LSOA population-weighted centroid in 2011. Local Authority geographical boundaries rather than LSOA boundaries are shown in black. In panel (b), Local Authorities with non-geographical (selective) admissions are shown with a red boundary. In both panels, a darker shade represents higher school quality.

Figure 5: Relative local school quality of the closest secondary school across England at the LSOA level



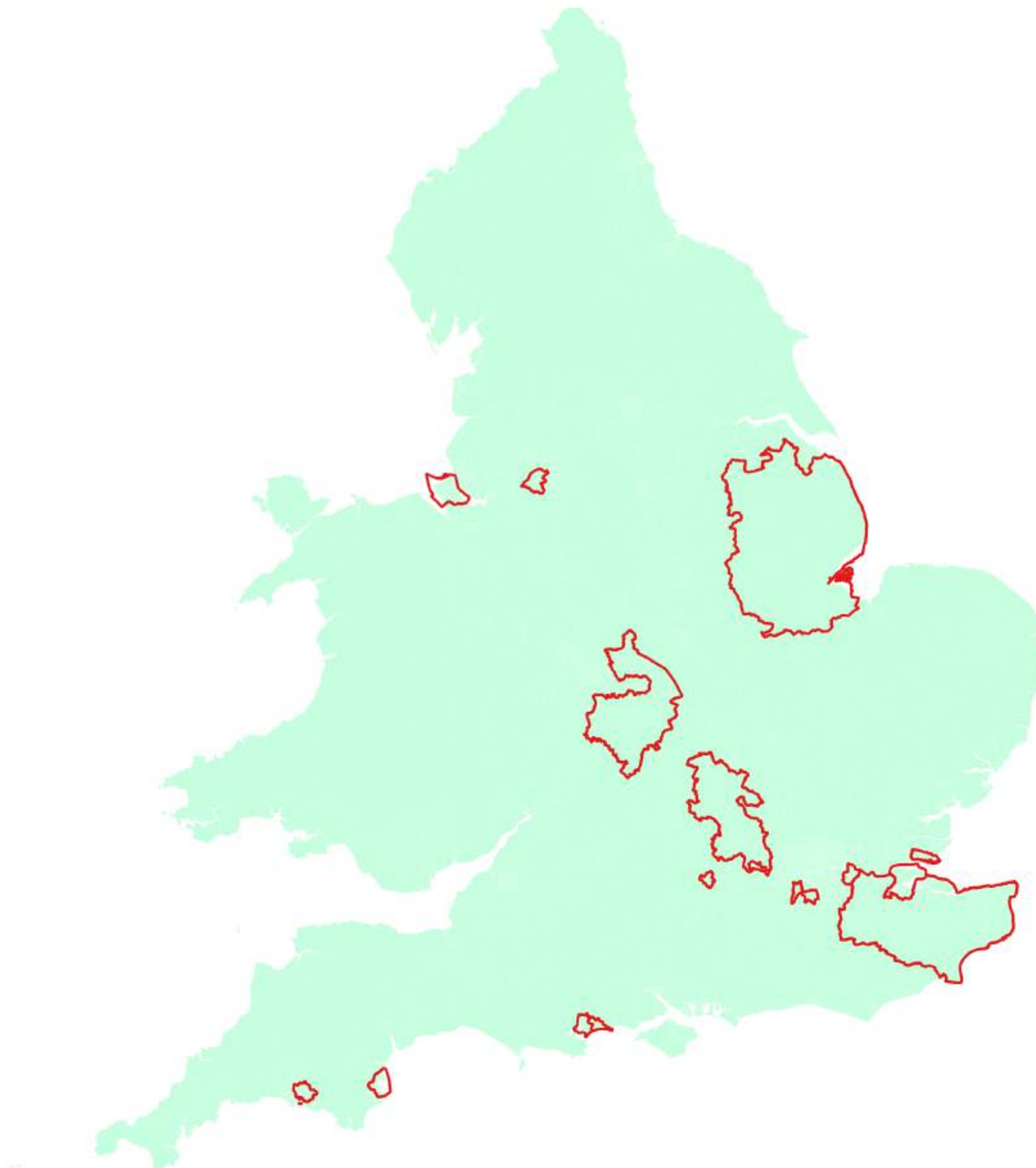
(a) England



(b) London and South East

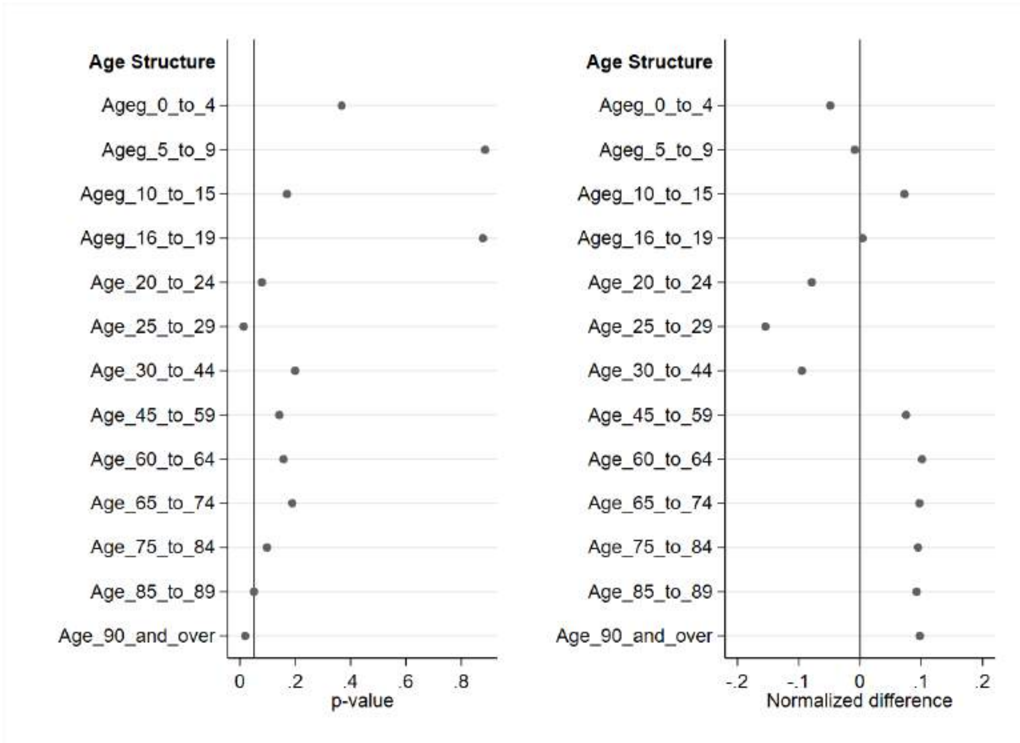
Source: School Performance Tables (Department for Education). Note: The school quality in each LSOA is the secondary school performance (5A*-C) of the closest school to the LSOA population-weighted centroid in 2011, relative to all other schools in the Local Authority. Local Authority geographical boundaries rather than LSOA boundaries are shown in black. In panel (b), Local Authorities with non-geographical (selective) admissions are shown with a red boundary. In both panels, a darker shade represents higher school quality.

Figure 6: The location of Local Authorities with at least 25% of schools classified as part of a 'selective' or 'grammar' system

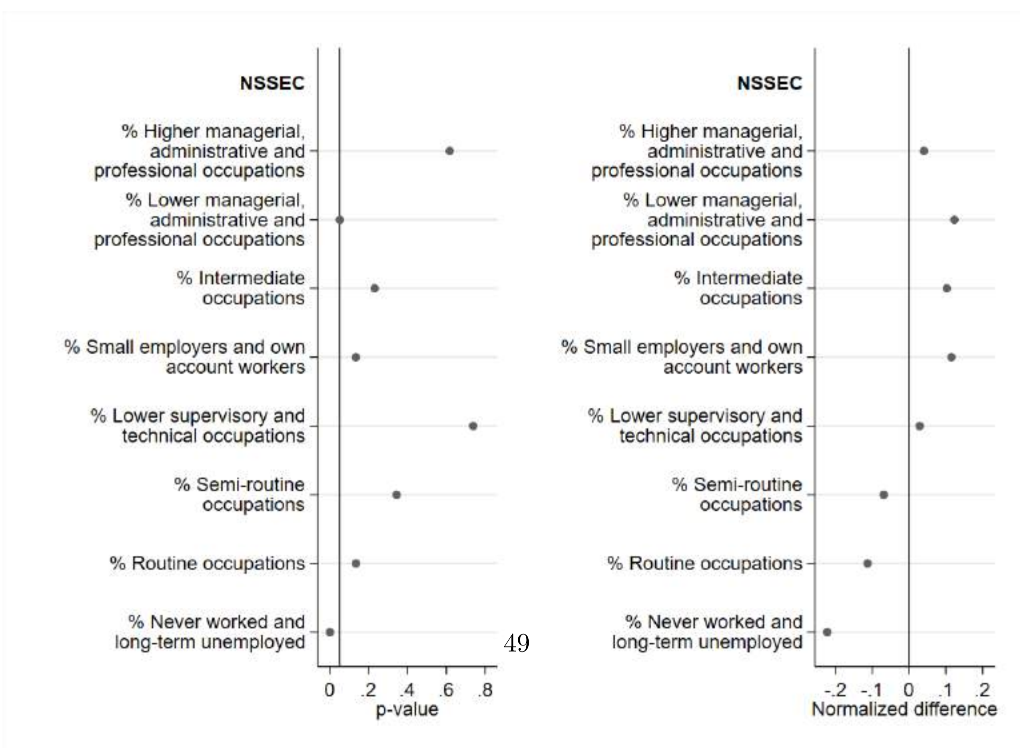


Source: School Performance Tables (Department for Education). Note: 'Selective' and 'grammar' are used interchangeably. Local Authorities are defined as 'selective' if at least 25% of schools are classified as 'selective' or 'modern' in the School Performance Tables around the Census years 1991, 2001 and 2011. The definition is refined by consistent across Census years and accounting for changes in Local Authority boundaries between the 1991 and 2001 Censuses. Local Authorities with bordered highlighted in read have at least 25% selective schools. These areas are, in alphabetical order: Bexley; Bournemouth; Buckinghamshire; Kent; Kingston upon Thames; Lincolnshire; Medway; Plymouth; Poole; Reading; Slough; Southend-on-Sea; Sutton; Torbay; Trafford; Warwickshire; Wirral.

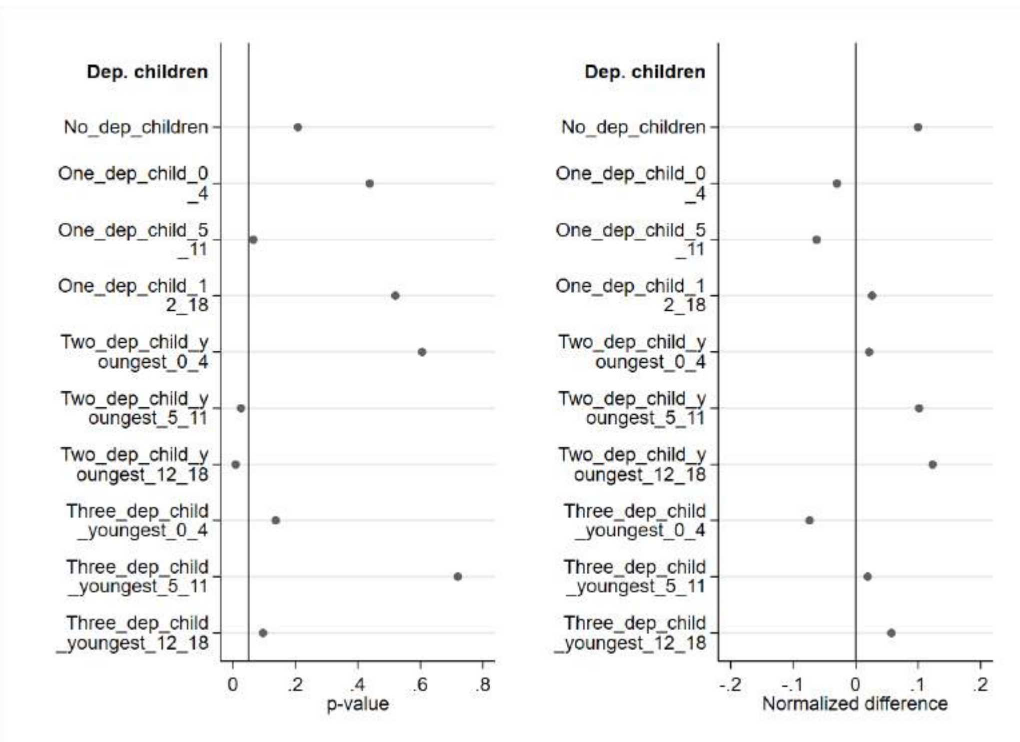
Figure 7: The characteristics of Local Authorities with at least 25% of schools classified as part of a 'selective' or 'grammar' system



(a) Age structure



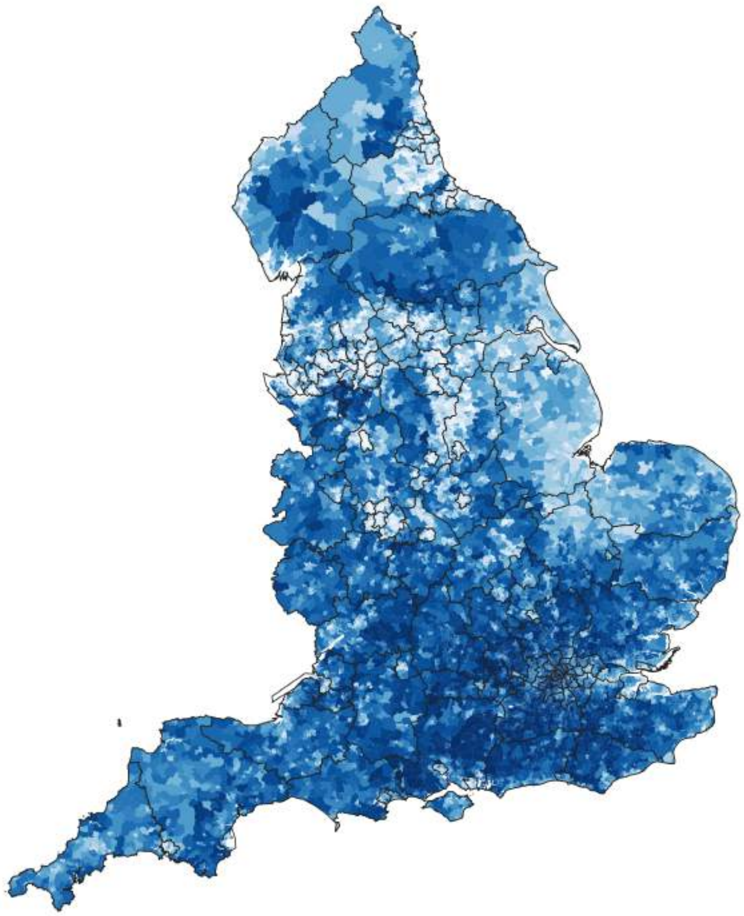
(b) Socio-economic classification



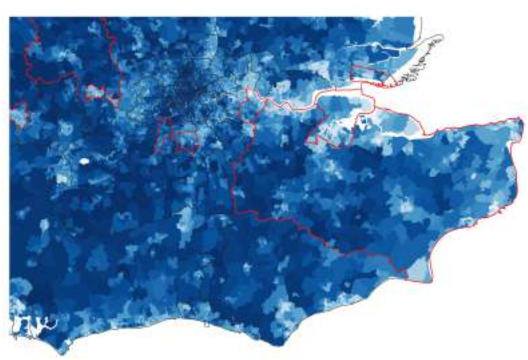
(c) Dependent children

Source: NOMIS (area-level Census data for 2011). Note: The normalised difference is between geographical and non-geographical LAs. A positive difference means that non-geographical LAs have a higher value.

Figure 8: Average property prices across England at the LSOA level



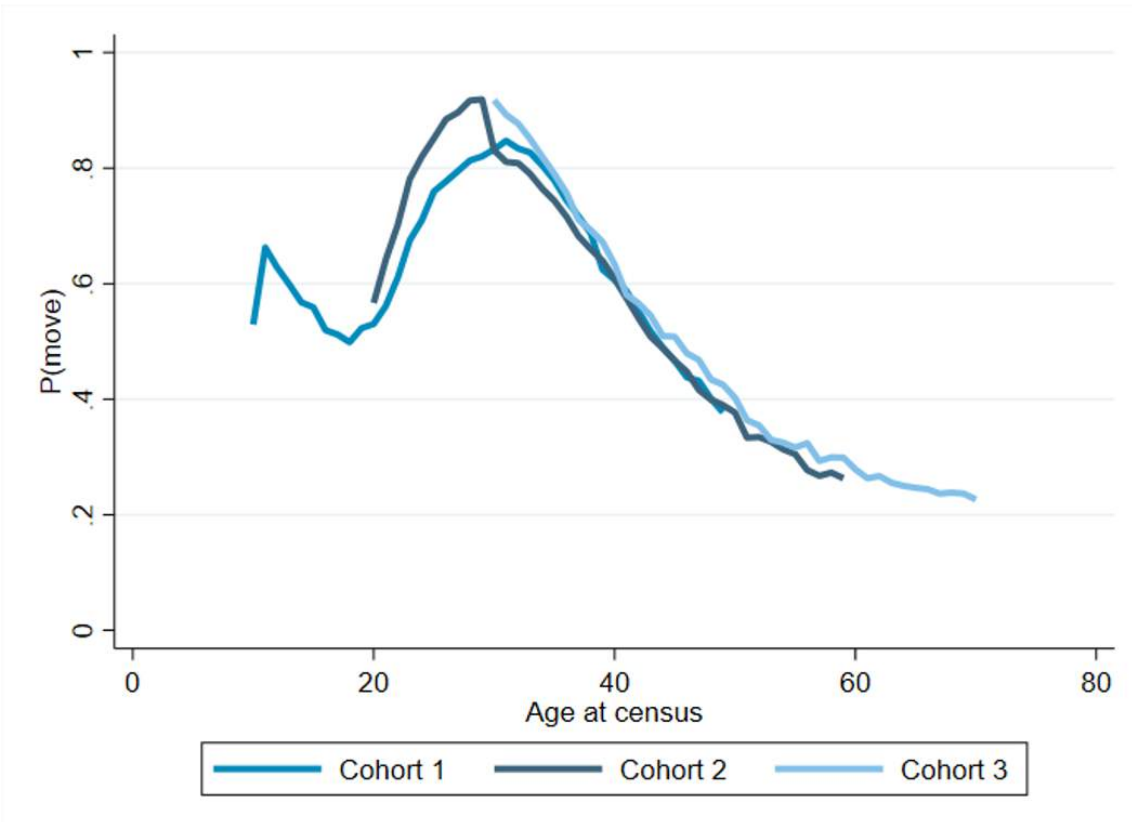
(a) England



(b) London and South East

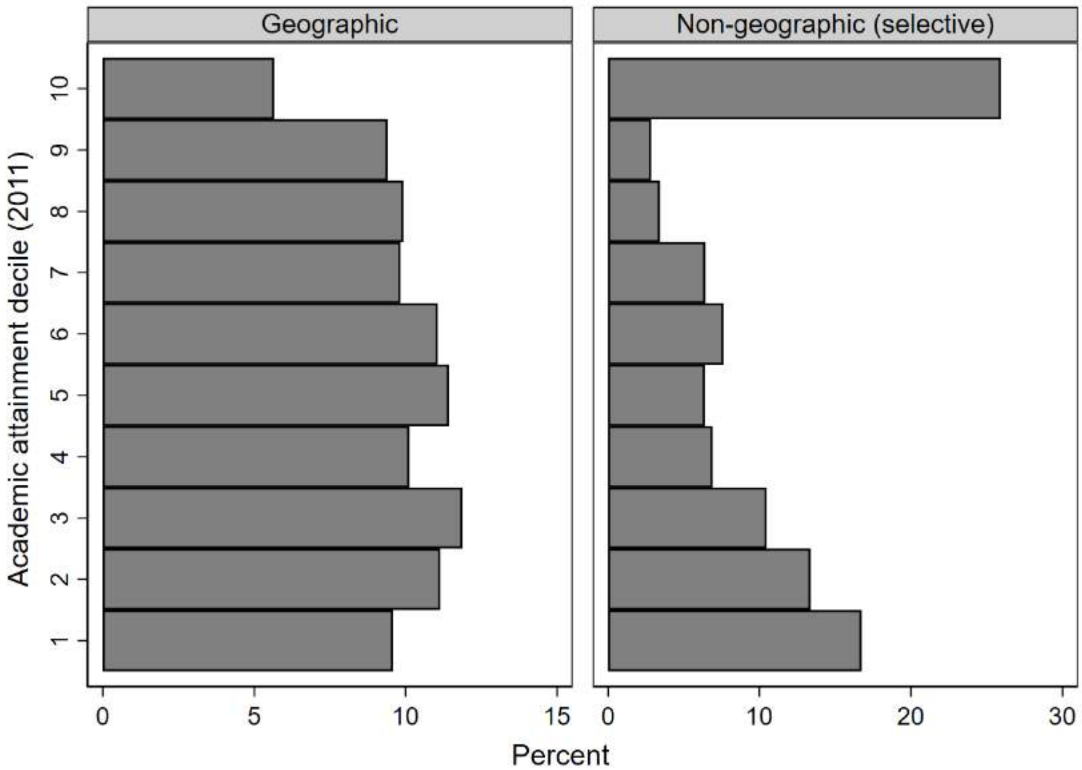
Source: Consumer Data Research Centre. Note: The property price in each LSOA is the average price across median price in the four quarters in 2011. Local Authority geographical boundaries rather than LSOA boundaries are shown in black. In panel (b), Local Authorities with non-geographical (selective) admissions are shown with a red boundary. In both panels, a darker shade represents higher property prices.

Figure 9: The percentage of LS sample members that move between Census years, by age and cohort



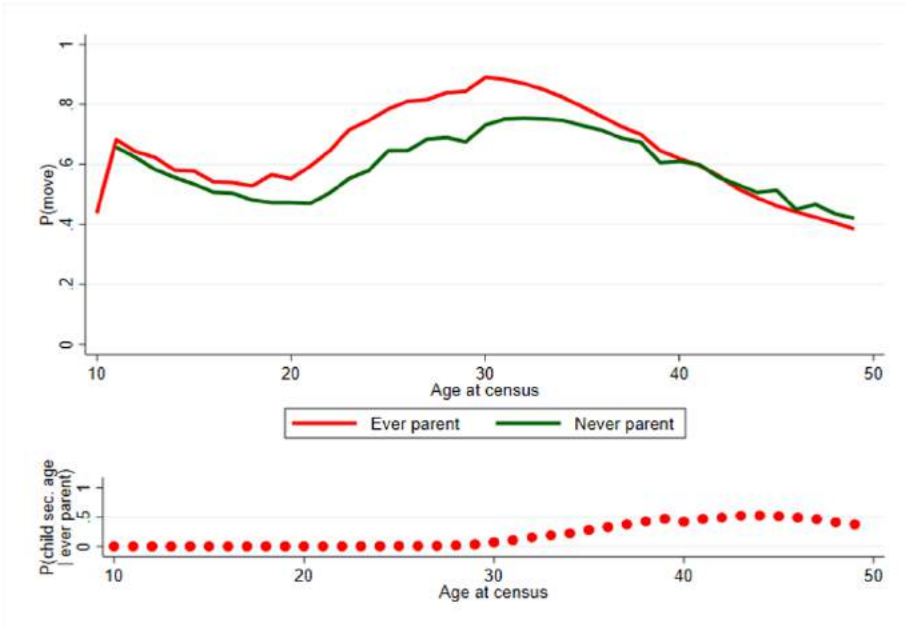
Source: ONS Longitudinal Study. Note: The final common sample is applied.

Figure 10: The distribution of school quality across Local Authorities with geographical and non-geographical (selective) admissions priorities

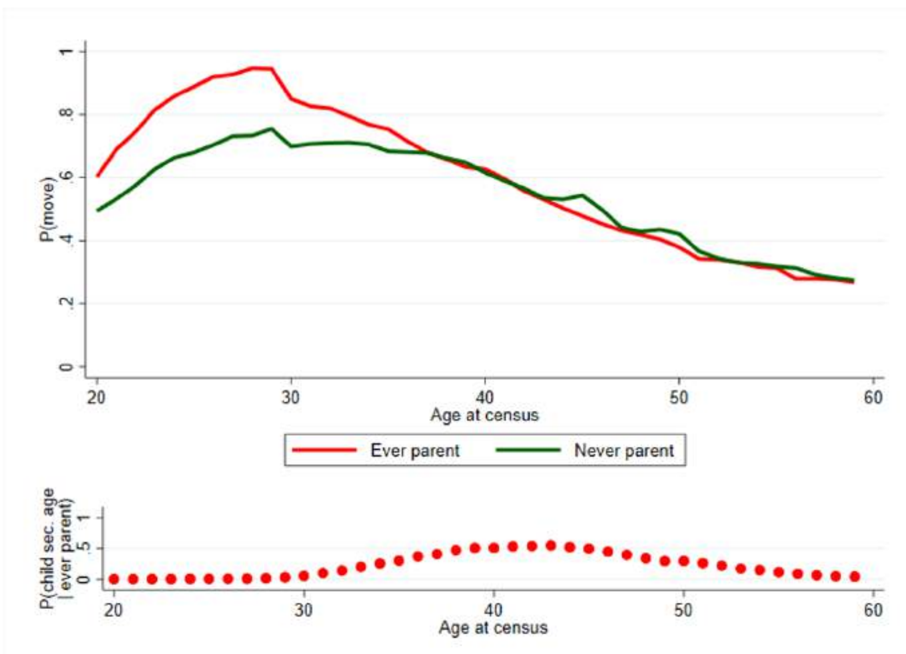


Source: School Performance Tables (Department for Education). Note: 'Selective' and 'grammar' are used interchangably. Local Authorities are defined as 'selective' if at least 25% of schools are classified as 'selective' or 'modern' in the School Performance Tables around the Census years 1991, 2001 and 2011. The definition is refined by consistent across Census years and accounting for changes in Local Authority boundaries between the 1991 and 2001 Censuses.

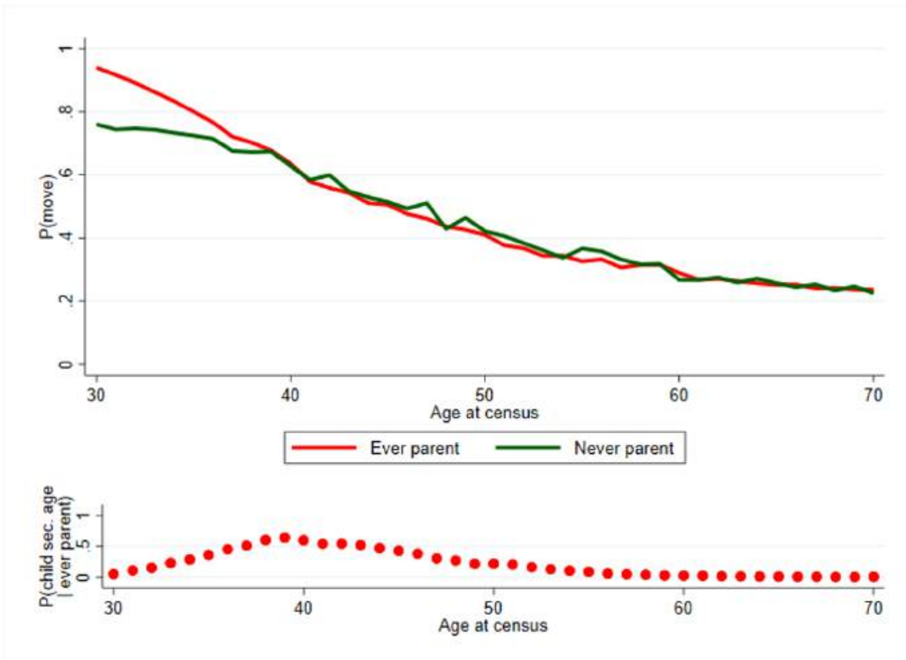
Figure 11: The percentage of LS sample members that move between Census years, by geographical vs non-geographical admissions area, age and cohort



(a) Cohort 1



(b) Cohort 2



(c) Cohort 3

Source: ONS Longitudinal Study. Note: The final common sample is applied.

A Appendix Tables

Table A.1: Final sample selection for the ONS Longitudinal Study

Census	Cohort 1	Cohort 2	Cohort 3
No restrictions	358,309	334,130	351,125
Age consistent across Censuses	358,165	334,029	351,020
Age correct at Key Census	340,561	332,257	350,147
Observe social class at Key Census	328,806	319,988	338,538
Observe 'ever parent'	328,630	318,893	336,389
Observe area characteristics (1991, 2001 and 2011)	306,765	298,419	314,379
Observe move (1991, 2001 and 2011)	248,952	251,542	281,190
Observations (1991, 2001 and 2011 only)	149,389	150,175	166,473

Source: ONS Longitudinal Study. Note: This table shows the process from unrestricted to final sample. The number of observations is at the individual by Census level. 'Age consistent across Censuses' refers to age correctly increasing by 10 years across Censuses, or it is possible to infer the correct age sequence across Censuses. The 'Key Census' is the closest Census to when the LS sample member is aged 40. For example, if an individual was 34 in 1991 and 44 in 2001, then the variables from the 2001 census would be used to define their 'key age' variables. 'Age correct at Key Census' means that the Key Census occurs at the expected age. Where the Key Census is too early or too late, it means that LS sample members are missing from the Census closest to when they are 40. 'Observe social class at Key Census' means that social class is observed for the LS sample member at the Key Census. 'Observe 'ever parent" means that whether the LS sample member ever becomes a parent is observed. 'Observe area characteristics (1991, 2001 and 2011)' means that it is possible to match area-level data on local school quality, local prices, and the admissions system to the LS sample member's home postcode in each of the relevant Census years. 'Observe move (1991, 2001 and 2011)' means that whether the LS sample member moved between Censuses is observed (non-missing) in each of the relevant Census years. The final row, 'Observations (1991, 2001 and 2011 only)' shows the number of observations in the relevant Census years only.

Table A.2: Characteristics of LS sample members that are resident in or move between Local Authorities with 'selective' or 'grammar' school admissions, conditional on moving at least twice

Cohort 1 Variable	Always geographic Mean (SD)	Always non-geographic Mean (SD)	Switch to non-geographic Mean (SD)	Switch to geographic Mean (SD)	Switch to and from Mean (SD)
Not born in UK	0.02 (0.13)	0.02 (0.13)	0.02 (0.12)	0.01 (0.10)	0.01 (0.09)
Both born in UK	0.78 (0.42)	0.78 (0.42)	0.78 (0.42)	0.79 (0.41)	0.72 (0.45)
Professional	0.02 (0.14)	0.01 (0.11)	0.03 (0.17)	0.03 (0.17)	0.02 (0.14)
Intermediate	0.23 (0.42)	0.19 (0.39)	0.31 (0.46)	0.31 (0.46)	0.38 (0.48)
Skilled Non-Manual	0.22 (0.41)	0.22 (0.42)	0.23 (0.42)	0.25 (0.43)	0.21 (0.41)
Skilled Manual	0.23 (0.42)	0.26 (0.44)	0.19 (0.39)	0.19 (0.39)	0.21 (0.41)
Partly Skilled	0.23 (0.42)	0.23 (0.42)	0.18 (0.38)	0.17 (0.38)	0.14 (0.35)
Unskilled	0.07 (0.25)	0.08 (0.27)	0.04 (0.20)	0.04 (0.19)	0.03 (0.16)
Degree	0.41 (0.49)	0.34 (0.47)	0.50 (0.50)	0.51 (0.50)	0.53 (0.50)
One in work	0.29 (0.45)	0.31 (0.46)	0.30 (0.46)	0.29 (0.45)	0.29 (0.46)
Both in work	0.65 (0.48)	0.64 (0.48)	0.65 (0.48)	0.67 (0.47)	0.66 (0.48)
Partner	0.86 (0.35)	0.85 (0.35)	0.88 (0.33)	0.88 (0.33)	0.82 (0.39)
'Ever parent'	0.80 (0.40)	0.82 (0.38)	0.77 (0.42)	0.73 (0.44)	0.71 (0.45)
Cohort 2					
Not born in UK	0.06 (0.24)	0.04 (0.19)	0.03 (0.17)	0.03 (0.16)	0.02 (0.13)
Both born in UK	0.78 (0.42)	0.80 (0.40)	0.77 (0.42)	0.77 (0.42)	0.71 (0.45)
Professional	0.02 (0.13)	0.01 (0.12)	0.02 (0.15)	0.03 (0.16)	0.04 (0.20)
Intermediate	0.23 (0.42)	0.20 (0.40)	0.29 (0.45)	0.32 (0.47)	0.30 (0.46)
Skilled Non-Manual	0.22 (0.41)	0.25 (0.43)	0.25 (0.44)	0.26 (0.44)	0.31 (0.46)
Skilled Manual	0.23 (0.42)	0.23 (0.42)	0.19 (0.39)	0.16 (0.37)	0.14 (0.34)
Partly Skilled	0.22 (0.42)	0.22 (0.41)	0.18 (0.39)	0.17 (0.37)	0.15 (0.36)
Unskilled	0.08 (0.26)	0.07 (0.26)	0.05 (0.21)	0.05 (0.22)	0.04 (0.20)
Degree	0.37 (0.48)	0.33 (0.47)	0.43 (0.49)	0.45 (0.50)	0.44 (0.50)
One in work	0.30 (0.46)	0.29 (0.45)	0.34 (0.47)	0.32 (0.47)	0.33 (0.47)
Both in work	0.64 (0.48)	0.66 (0.47)	0.60 (0.49)	0.64 (0.48)	0.63 (0.48)
Partner	0.89 (0.31)	0.90 (0.30)	0.88 (0.33)	0.89 (0.32)	0.84 (0.36)
'Ever parent'	0.86 (0.35)	0.88 (0.32)	0.82 (0.38)	0.80 (0.40)	0.79 (0.41)
Cohort 3					
Not born in UK	0.05 (0.23)	0.05 (0.21)	0.03 (0.17)	0.03 (0.18)	0.02 (0.14)
Both born in UK	0.80 (0.40)	0.81 (0.39)	0.81 (0.39)	0.81 (0.39)	0.85 (0.36)
Professional	0.03 (0.17)	0.03 (0.16)	0.03 (0.16)	0.03 (0.16)	0.03 (0.16)
Intermediate	0.24 (0.43)	0.23 (0.42)	0.26 (0.44)	0.29 (0.45)	0.28 (0.45)
Skilled Non-Manual	0.21 (0.41)	0.21 (0.41)	0.23 (0.42)	0.24 (0.43)	0.19 (0.39)
Skilled Manual	0.23 (0.42)	0.24 (0.42)	0.22 (0.41)	0.20 (0.40)	0.24 (0.43)
Partly Skilled	0.20 (0.40)	0.20 (0.40)	0.18 (0.38)	0.17 (0.37)	0.13 (0.33)
Unskilled	0.07 (0.26)	0.07 (0.25)	0.07 (0.25)	0.05 (0.21)	0.09 (0.29)
Degree	0.28 (0.45)	0.26 (0.44)	0.28 (0.45)	0.33 (0.47)	0.25 (0.43)
One in work	0.36 (0.48)	0.37 (0.48)	0.33 (0.47)	0.38 (0.49)	0.32 (0.47)
Both in work	0.61 (0.49)	0.60 (0.49)	0.64 (0.48)	0.59 (0.49)	0.65 (0.48)
Partner	0.91 (0.29)	0.91 (0.29)	0.92 (0.27)	0.88 (0.32)	0.91 (0.29)
'Ever parent'	0.88 (0.32)	0.90 (0.30)	0.88 (0.33)	0.84 (0.36)	0.91 (0.29)

Source: ONS Longitudinal Study and School Performance Tables (Department for Education). Note: The final common sample is applied. 'Selective' and 'grammar' are used interchangably. Local Authorities are defined as 'selective' if at least 25% of schools are classified as 'selective' or 'modern' in the School Performance Tables around the Census years 1991, 2001 and 2011. The definition is refined by consistent across Census years and accounting for changes in Local Authority boundaries between the 1991 and 2001 Censuses.

Table A.3: Difference-in-differences estimation for the effect of geographical admissions priorities for secondary schools in England on the probability of moving, by cohort and age band

	Cohort 1	Cohort 2	Cohort 3
0-20	-0.033		
	(0.043)		
26-30	0.193***	0.026	
	(0.025)	(0.047)	
31-35	0.185***		
	(0.024)		
36-40	0.099***	-0.035	0.006
	(0.025)	(0.030)	(0.054)
41-45	-0.039	-0.201***	
	(0.025)	(0.029)	
46-50	-0.120***	-0.267***	-0.140***
	(0.028)	(0.030)	(0.033)
51-55		-0.373***	-0.250***
		(0.030)	(0.033)
56-60		-0.478***	-0.286***
		(0.034)	(0.034)
61-65			-0.327***
			(0.034)
66-70			-0.360***
			(0.038)
‘Ever parent’	0.165***	0.129***	-0.026
	(0.020)	(0.022)	(0.024)
Geographic LA	-0.022	0.006	-0.035
	(0.018)	(0.021)	(0.024)
Geographic LA # ‘Ever parent’	-0.013	-0.050*	-0.004
	(0.021)	(0.023)	(0.026)
0-20 # ‘Ever parent’	-0.069		
	(0.051)		
26-30 # ‘Ever parent’	-0.052+	0.021	
	(0.028)	(0.053)	
31-35 # ‘Ever parent’	-0.066*		
	(0.028)		
36-40 # ‘Ever parent’	-0.110***	-0.099**	0.056
	(0.028)	(0.033)	(0.059)
41-45 # ‘Ever parent’	-0.152***	-0.091**	
	(0.029)	(0.032)	
46-50 # ‘Ever parent’	-0.204***	-0.126***	0.050
	(0.031)	(0.033)	(0.035)
51-55 # ‘Ever parent’		-0.120***	0.052
		(0.033)	(0.035)
56-60 # ‘Ever parent’		-0.071+	0.050
		(0.037)	(0.036)
61-65 # ‘Ever parent’			0.045
			(0.036)
66-70 # ‘Ever parent’			0.068+

Continued on next page

Table A.3 – continued from previous page

	Cohort 1	Cohort 2	Cohort 3
			(0.041)
0-20 # Geographic LA	-0.046		
	(0.045)		
26-30 # Geographic LA	-0.067*	-0.027	
	(0.026)	(0.050)	
31-35 # Geographic LA	0.007		
	(0.026)		
36-40 # Geographic LA	-0.003	-0.019	0.070
	(0.027)	(0.032)	(0.058)
41-45 # Geographic LA	0.018	0.017	
	(0.027)	(0.031)	
46-50 # Geographic LA	0.002	-0.033	0.029
	(0.029)	(0.032)	(0.035)
51-55 # Geographic LA		-0.024	0.028
		(0.032)	(0.035)
56-60 # Geographic LA		0.040	0.001
		(0.036)	(0.036)
61-65 # Geographic LA			0.008
			(0.036)
66-70 # Geographic LA			0.026
			(0.041)
0-20 # Geographic LA # 'Ever parent'	-0.009		
	(0.054)		
26-30 # Geographic LA # 'Ever parent'	0.063*	0.041	
	(0.030)	(0.056)	
31-35 # Geographic LA # 'Ever parent'	0.013		
	(0.030)		
36-40 # Geographic LA # 'Ever parent'	0.001	0.014	-0.054
	(0.030)	(0.035)	(0.062)
41-45 # Geographic LA # 'Ever parent'	-0.012	-0.011	
	(0.031)	(0.034)	
46-50 # Geographic LA # 'Ever parent'	0.029	0.030	-0.042
	(0.033)	(0.035)	(0.037)
51-55 # Geographic LA # 'Ever parent'		0.043	-0.031
		(0.035)	(0.037)
56-60 # Geographic LA # 'Ever parent'		-0.017	-0.004
		(0.039)	(0.038)
61-65 # Geographic LA # 'Ever parent'			-0.005
			(0.038)
66-70 # Geographic LA # 'Ever parent'			-0.034
			(0.043)
N	149,389	150,175	166,473
R^2	0.097	0.143	0.057

Source: ONS Longitudinal Study linked to area characteristics from the School Performance Tables (Department for Education). Note: + p<0.10, * p<0.05, ** p<0.01, *** p<0.001. The final common sample is applied. # refers to the interaction between variables. The table shows coefficients from an ordinary least squares regression, with standard errors in parentheses.

Table A.4: Difference-in-differences estimation for the effect of geographical admissions priorities for secondary schools in England on local school quality, by cohort and age band

	Cohort 1	Cohort 2	Cohort 3
0-20	0.279		
	(0.269)		
26-30	0.262+	0.203	
	(0.156)	(0.287)	
31-35	0.086		
	(0.153)		
36-40	0.168	0.245	-0.300
	(0.157)	(0.182)	(0.325)
41-45	0.133	0.116	
	(0.160)	(0.177)	
46-50	0.130	0.327+	-0.159
	(0.174)	(0.185)	(0.198)
51-55		0.260	-0.156
		(0.184)	(0.196)
56-60		0.221	-0.160
		(0.207)	(0.203)
61-65			0.023
			(0.204)
66-70			0.060
			(0.231)
'Ever parent'	-0.268*	0.037	-0.174
	(0.124)	(0.135)	(0.145)
Geographic LA	0.247*	0.367**	0.329*
	(0.115)	(0.130)	(0.144)
Geographic LA # 'Ever parent'	0.072	-0.121	0.127
	(0.132)	(0.143)	(0.154)
0-20 # 'Ever parent'	0.068		
	(0.319)		
26-30 # 'Ever parent'	-0.158	-0.091	
	(0.178)	(0.321)	
31-35 # 'Ever parent'	0.102		
	(0.176)		
36-40 # 'Ever parent'	0.170	-0.149	0.065
	(0.179)	(0.199)	(0.352)
41-45 # 'Ever parent'	0.209	0.051	
	(0.182)	(0.195)	
46-50 # 'Ever parent'	0.252	-0.150	0.121
	(0.196)	(0.202)	(0.211)
51-55 # 'Ever parent'		-0.162	0.280
		(0.201)	(0.210)
56-60 # 'Ever parent'		0.019	0.124
		(0.225)	(0.216)
61-65 # 'Ever parent'			0.057
			(0.217)
66-70 # 'Ever parent'			0.089

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Table A.4 – continued from previous page

	Cohort 1	Cohort 2	Cohort 3
			(0.244)
0-20 # Geographic LA	-0.349		
	(0.286)		
26-30 # Geographic LA	-0.296+	-0.269	
	(0.166)	(0.304)	
31-35 # Geographic LA	0.013		
	(0.163)		
36-40 # Geographic LA	-0.102	-0.168	0.365
	(0.167)	(0.192)	(0.346)
41-45 # Geographic LA	0.031	-0.019	
	(0.170)	(0.188)	
46-50 # Geographic LA	-0.027	-0.170	0.135
	(0.185)	(0.196)	(0.209)
51-55 # Geographic LA		-0.085	0.154
		(0.195)	(0.208)
56-60 # Geographic LA		-0.016	0.148
		(0.219)	(0.215)
61-65 # Geographic LA			-0.082
			(0.216)
66-70 # Geographic LA			-0.057
			(0.244)
0-20 # Geographic LA # 'Ever parent'	-0.038		
	(0.338)		
26-30 # Geographic LA # 'Ever parent'	0.239	0.019	
	(0.189)	(0.340)	
31-35 # Geographic LA # 'Ever parent'	-0.040		
	(0.187)		
36-40 # Geographic LA # 'Ever parent'	0.070	0.195	-0.115
	(0.190)	(0.210)	(0.375)
41-45 # Geographic LA # 'Ever parent'	-0.056	0.003	
	(0.194)	(0.207)	
46-50 # Geographic LA # 'Ever parent'	0.017	0.217	-0.104
	(0.208)	(0.214)	(0.223)
51-55 # Geographic LA # 'Ever parent'		0.166	-0.243
		(0.213)	(0.223)
56-60 # Geographic LA # 'Ever parent'		-0.033	-0.129
		(0.239)	(0.229)
61-65 # Geographic LA # 'Ever parent'			0.004
			(0.231)
66-70 # Geographic LA # 'Ever parent'			-0.072
			(0.259)
N	149,389	150,175	166,473
R^2	0.003	0.002	0.002

Source: ONS Longitudinal Study linked to area characteristics from the School Performance Tables (Department for Education). Note: + p<0.10, * p<0.05, ** p<0.01, *** p<0.001. The final common sample is applied. # refers to the interaction between variables. The table shows coefficients from an ordinary least squares regression, with standard errors in parentheses.

Table A.5: Difference-in-differences estimation for the effect of geographical admissions priorities for secondary schools in England on the probability of moving, by cohort and age band. Highest social class only (Professional and Intermediate)

	Cohort 1	Cohort 2	Cohort 3
0-20	-0.085		
	(0.070)		
26-30	0.212***	0.038	
	(0.043)	(0.078)	
31-35	0.228***		
	(0.042)		
36-40	0.103*	-0.064	0.063
	(0.042)	(0.050)	(0.097)
41-45	-0.052	-0.223***	
	(0.045)	(0.050)	
46-50	-0.129**	-0.257***	-0.226***
	(0.047)	(0.052)	(0.063)
51-55		-0.424***	-0.311***
		(0.051)	(0.061)
56-60		-0.556***	-0.394***
		(0.060)	(0.066)
61-65			-0.429***
			(0.064)
66-70			-0.463***
			(0.076)
‘Ever parent’	0.172***	0.088*	-0.057
	(0.036)	(0.040)	(0.046)
Geographic LA	0.013	0.004	-0.068
	(0.032)	(0.036)	(0.044)
Geographic LA # ‘Ever parent’	-0.072+	-0.014	0.067
	(0.039)	(0.042)	(0.049)
0-20 # ‘Ever parent’	-0.072		
	(0.089)		
26-30 # ‘Ever parent’	-0.095+	-0.004	
	(0.051)	(0.093)	
31-35 # ‘Ever parent’	-0.128*		
	(0.051)		
36-40 # ‘Ever parent’	-0.050	-0.041	0.031
	(0.050)	(0.057)	(0.108)
41-45 # ‘Ever parent’	-0.097+	-0.018	
	(0.053)	(0.057)	
46-50 # ‘Ever parent’	-0.235***	-0.152*	0.126+
	(0.055)	(0.059)	(0.068)
51-55 # ‘Ever parent’		-0.063	0.101
		(0.059)	(0.067)
56-60 # ‘Ever parent’		-0.067	0.087
		(0.067)	(0.071)
61-65 # ‘Ever parent’			0.093
			(0.070)

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Table A.5 – continued from previous page

	Cohort 1	Cohort 2	Cohort 3
66-70 # 'Ever parent'			0.104
			(0.081)
0-20 # Geographic LA	-0.057		
	(0.075)		
26-30 # Geographic LA	-0.076+	-0.045	
	(0.045)	(0.083)	
31-35 # Geographic LA	-0.035		
	(0.045)		
36-40 # Geographic LA	-0.024	0.006	0.005
	(0.044)	(0.053)	(0.104)
41-45 # Geographic LA	0.011	0.006	
	(0.048)	(0.053)	
46-50 # Geographic LA	-0.021	-0.072	0.095
	(0.050)	(0.055)	(0.067)
51-55 # Geographic LA		-0.035	0.090
		(0.054)	(0.065)
56-60 # Geographic LA		0.047	0.053
		(0.063)	(0.070)
61-65 # Geographic LA			0.066
			(0.068)
66-70 # Geographic LA			0.056
			(0.080)
0-20 # Geographic LA # 'Ever parent'	0.077		
	(0.094)		
26-30 # Geographic LA # 'Ever parent'	0.120*	0.045	
	(0.054)	(0.098)	
31-35 # Geographic LA # 'Ever parent'	0.086		
	(0.054)		
36-40 # Geographic LA # 'Ever parent'	0.033	0.001	-0.016
	(0.053)	(0.061)	(0.115)
41-45 # Geographic LA # 'Ever parent'	0.015	-0.025	
	(0.056)	(0.061)	
46-50 # Geographic LA # 'Ever parent'	0.129*	0.068	-0.121+
	(0.059)	(0.062)	(0.072)
51-55 # Geographic LA # 'Ever parent'		-0.006	-0.128+
		(0.063)	(0.071)
56-60 # Geographic LA # 'Ever parent'		-0.028	-0.049
		(0.070)	(0.075)
61-65 # Geographic LA # 'Ever parent'			-0.100
			(0.074)
66-70 # Geographic LA # 'Ever parent'			-0.088
			(0.085)
N	35,918	33,747	38,460
R^2	0.099	0.190	0.088

Source: ONS Longitudinal Study linked to area characteristics from the School Performance Tables (Department for Education). Note: + p<0.10, * p<0.05, ** p<0.01, *** p<0.001. The final common sample is applied. # refers to the interaction between variables. The table shows coefficients from an ordinary least squares regression, with standard errors in parentheses.

Table A.6: Difference-in-differences estimation for the effect of geographical admissions priorities for secondary schools in England on on local school quality, by cohort and age band. Highest social class only (Professional and Intermediate)

	Cohort 1	Cohort 2	Cohort 3
0-20	0.959*		
	(0.466)		
26-30	0.676*	0.090	
	(0.285)	(0.491)	
31-35	0.394		
	(0.278)		
36-40	0.159	0.614+	0.188
	(0.278)	(0.318)	(0.570)
41-45	0.223	0.193	
	(0.297)	(0.314)	
46-50	0.277	0.566+	0.022
	(0.311)	(0.330)	(0.372)
51-55		0.676*	-0.499
		(0.324)	(0.359)
56-60		0.732+	-0.040
		(0.377)	(0.390)
61-65			-0.070
			(0.376)
66-70			-0.588
			(0.444)
'Ever parent'	-0.047	0.507*	-0.061
	(0.241)	(0.251)	(0.269)
Geographic LA	0.427*	0.777***	0.520*
	(0.212)	(0.230)	(0.260)
Geographic LA # 'Ever parent'	-0.008	-0.432	0.196
	(0.255)	(0.266)	(0.286)
0-20 # 'Ever parent'	-0.885		
	(0.589)		
26-30 # 'Ever parent'	-0.563+	0.230	
	(0.340)	(0.585)	
31-35 # 'Ever parent'	-0.023		
	(0.337)		
36-40 # 'Ever parent'	0.270	-0.682+	-0.164
	(0.333)	(0.363)	(0.633)
41-45 # 'Ever parent'	0.403	0.030	
	(0.352)	(0.362)	
46-50 # 'Ever parent'	0.236	-0.404	-0.112
	(0.366)	(0.373)	(0.401)
51-55 # 'Ever parent'		-0.508	0.659+
		(0.372)	(0.392)
56-60 # 'Ever parent'		-0.558	0.044
		(0.421)	(0.419)
61-65 # 'Ever parent'			0.114
			(0.410)

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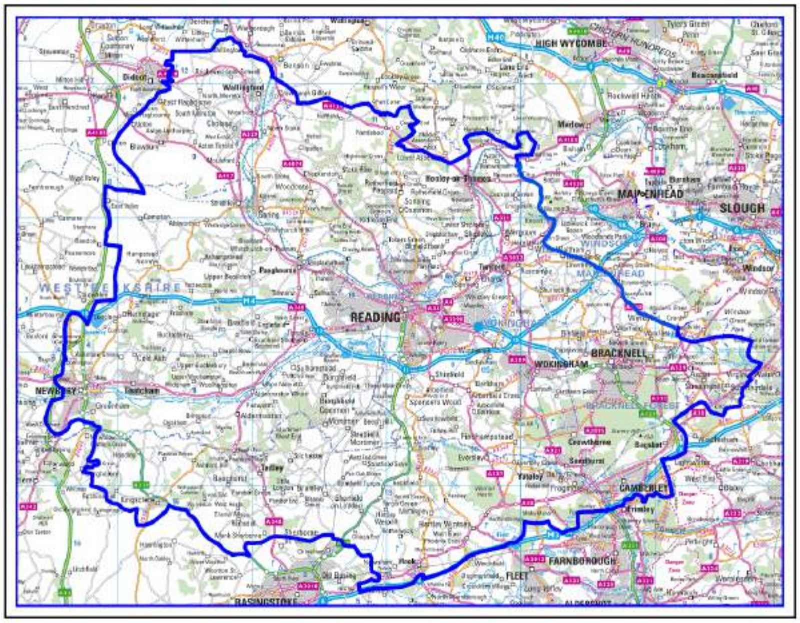
Table A.6 – continued from previous page

	Cohort 1	Cohort 2	Cohort 3
66-70 # 'Ever parent'			0.687
			(0.473)
0-20 # Geographic LA	-1.125*		
	(0.494)		
26-30 # Geographic LA	-0.673*	-0.281	
	(0.301)	(0.523)	
31-35 # Geographic LA	-0.224		
	(0.295)		
36-40 # Geographic LA	-0.122	-0.513	-0.043
	(0.295)	(0.337)	(0.608)
41-45 # Geographic LA	0.033	-0.089	
	(0.315)	(0.333)	
46-50 # Geographic LA	-0.147	-0.405	0.137
	(0.329)	(0.349)	(0.394)
51-55 # Geographic LA		-0.515	0.472
		(0.344)	(0.380)
56-60 # Geographic LA		-0.501	0.155
		(0.397)	(0.413)
61-65 # Geographic LA			-0.107
			(0.398)
66-70 # Geographic LA			0.638
			(0.469)
0-20 # Geographic LA # 'Ever parent'	1.151+		
	(0.625)		
26-30 # Geographic LA # 'Ever parent'	0.708*	-0.208	
	(0.359)	(0.621)	
31-35 # Geographic LA # 'Ever parent'	0.110		
	(0.358)		
36-40 # Geographic LA # 'Ever parent'	0.161	0.754*	0.086
	(0.353)	(0.384)	(0.675)
41-45 # Geographic LA # 'Ever parent'	-0.237	0.054	
	(0.374)	(0.384)	
46-50 # Geographic LA # 'Ever parent'	0.171	0.488	0.006
	(0.388)	(0.395)	(0.425)
51-55 # Geographic LA # 'Ever parent'		0.514	-0.693+
		(0.395)	(0.416)
56-60 # Geographic LA # 'Ever parent'		0.481	-0.194
		(0.444)	(0.443)
61-65 # Geographic LA # 'Ever parent'			0.027
			(0.434)
66-70 # Geographic LA # 'Ever parent'			-0.704
			(0.500)
N	35,918	33,747	38,460
R^2	0.006	0.004	0.007

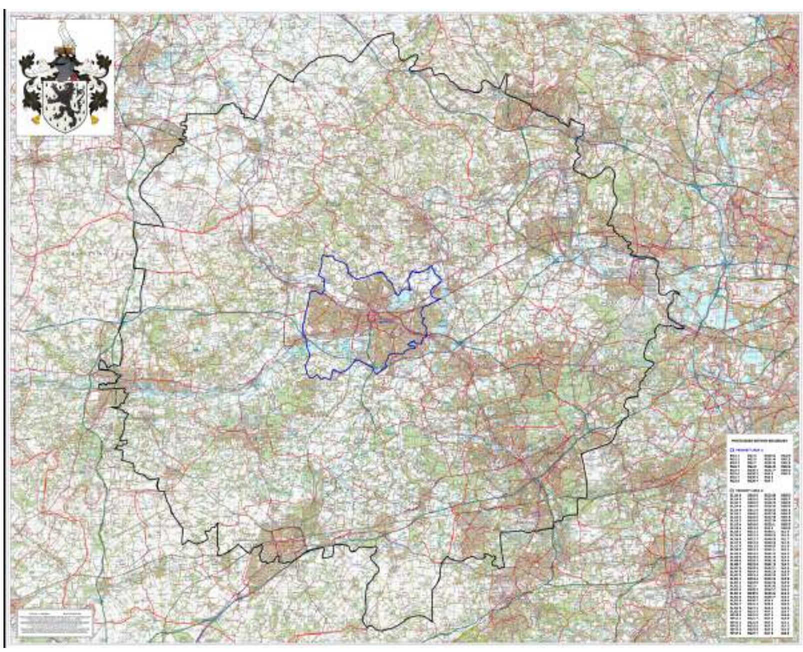
Source: ONS Longitudinal Study linked to area characteristics from the School Performance Tables (Department for Education). Note: + p<0.10, * p<0.05, ** p<0.01, *** p<0.001. The final common sample is applied. # refers to the interaction between variables. The table shows coefficients from an ordinary least squares regression, with standard errors in parentheses.

B Appendix Figures

Figure B.1: Example catchment areas: selective schools in Reading



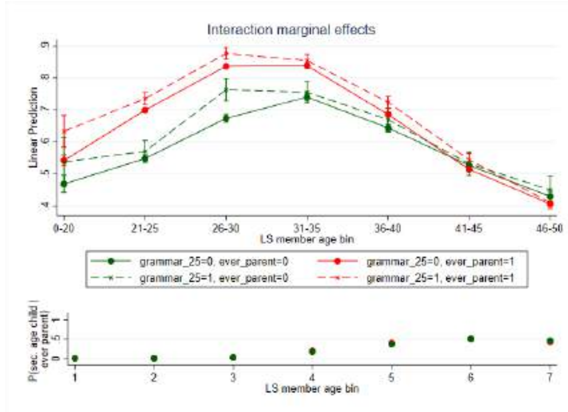
(a) Reading School



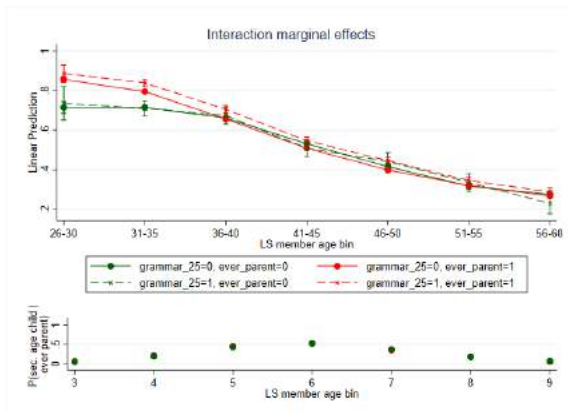
(b) Kendrick School

Source: School websites.

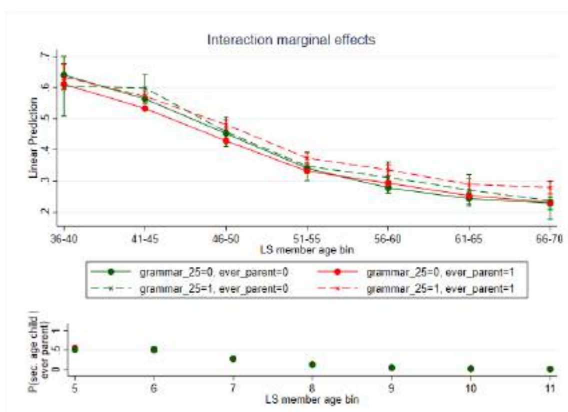
Figure B.2: Marginal effects from difference-in-differences model for the extensive margin



(a) Cohort 1



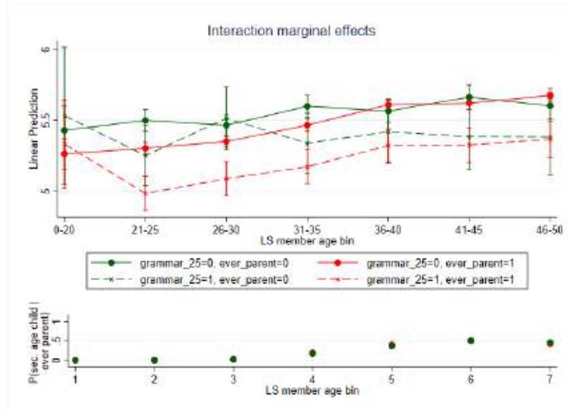
(b) Cohort 2



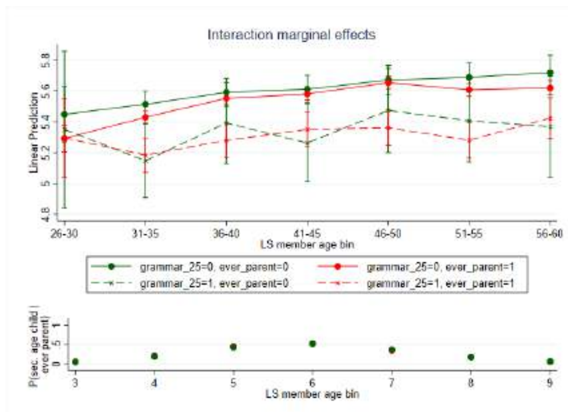
(c) Cohort 3

Source: ONS Longitudinal Study linked to area characteristics from the School Performance Tables (Department for Education). Note: The final common sample is applied.

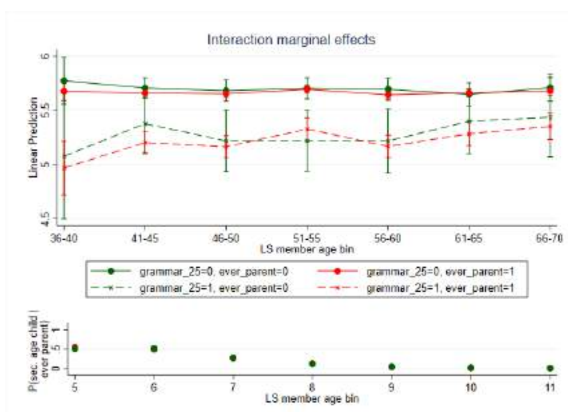
Figure B.3: Marginal effects from difference-in-differences model for the intensive margin



(a) Cohort 1



(b) Cohort 2



(c) Cohort 3

Source: ONS Longitudinal Study linked to area characteristics from the School Performance Tables (Department for Education). Note: The final common sample is applied.