From Immediate Acceptance to Deferred Acceptance: Effects on School Admissions and Achievement in England

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Abstract

Countries and cities around the world increasingly rely on centralized systems to assign students to schools. Two algorithms, deferred acceptance (DA) and immediate acceptance (IA), are widespread. The latter is often criticized for harming disadvantaged families who fail to get access to popular schools. This paper investigates the effect of the national ban of the IA mechanism in England in 2008. Before the ban, 49 English local authorities used DA and 16 used IA. All IA local authorities switched to DA afterwards, giving rise to a cross-market difference-in-differences research design. Our results show that the elimination of IA reduces measures of school quality for low-SES students *more* than high-SES students. After the ban, low-SES students attend schools with lower value-added and more disadvantaged and low-achieving peers. This effect is primarily driven by a decrease in low-SES admissions at selective schools. Our findings point to an unintended consequence of the IA to DA transition: by encouraging high-SES parents to report their preferences truthfully, DA increases competition for top schools, which crowds out low-SES students.

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1 Introduction

The use of centralized assignment systems in education markets has risen sharply in recent years. Between 1970 and 2020, more than 90 countries have adopted centralized systems to assign students to schools or universities (CCAS Project, 2021). These systems have three common features: (i) students submit preferences over schools, (ii) schools use admission criteria to prioritize students, and (iii) a central administration uses an algorithm to determine admission offers. When facing this last choice, more than thirty countries have adopted deferred acceptance (DA) and a dozen have chosen immediate acceptance (IA). The widespread adoption of these two schemes has led to active discussions on their benefits and costs.

DA is strategy-proof, meaning that participants do not benefit from misreporting their preferences. In contrast, IA can be manipulated, leading to two main concerns (Abdulkadiroğlu and Sönmez, 2003). First, IA is criticized for disadvantaging families less familiar with admissions procedures (Abdulkadiroğlu et al., 2006; Pathak and Sönmez, 2008).[1] Second, evidence from cities using IA shows that low-SES families often do not understand how to strategize (Dur, Hammond and Morrill, 2018; Abdulkadiroğlu et al., 2006; Calsamiglia and Güell, 2018; Agarwal and Somaini, 2018). The vulnerability of IA to strategic behavior may contribute to socioeconomic gaps in school access and educational outcomes. These concerns led authorities in places like Amsterdam, Boston, and China to replace IA by variants of DA (Pathak, 2016; Chen and Kesten, 2017; De Haan et al., 2023). Our study focuses on England, which banned IA nationwide in 2008 partly because "those who get it wrong or don't understand, lose out" (Carter, 2006). We study how the transition from IA to DA in England affected school admissions and achievement for low and high-SES students. We use evidence of an SES gradient in parent strategies to motivate our assumption that socioeconomic status proxies for levels of sophistication.

Theoretically, whether low-SES students benefit from moving to DA is unclear. Survey evidence shows that parents often have incorrect beliefs about admission chances (Kapor, Neilson and Zimmerman, 2020). As a result, sophisticated parents may strategically avoid ranking over-demanded schools in which they could sometimes have been accepted.[2] These costly mistakes reduce the competition faced by low-SES students and allows them to access sought-after schools. We call this the *competition-for-top-schools* effect.[3] Conversely, low-SES students who rank schools truthfully under IA may have lower chances at their lower ranked choices because they obtain admissions offers only after other students who rank those schools first. We term this the *trickle-down* effect.

[1] Immediate acceptance is also known as the Boston mechanism.

[2] Several lab experiments show high levels of preference manipulation under IA (Chen and Sönmez, 2006; Pais and Pintér, 2008; Calsamiglia, Haeringer and Klijn, 2011), a finding confirmed in cities using IA, including Barcelona, Beijing, Cambridge MA, and New Haven (Agarwal and Somaini, 2018; He, 2017; Calsamiglia and Güell, 2018; Kapor, Neilson and Zimmerman, 2020).

[3] Dur, Hammond and Morrill (2018) and Pathak and Sönmez (2013) find suggestive evidence of this effect in Charlotte-Mecklenburg and Chicago.

Ultimately, whether IA benefits low-SES students depends on the balance between these effects, which is influenced by admission uncertainty, competition levels, and oversubscription rates.

Empirically, whether low-SES students benefit from moving to a strategy-proof mechanism is also unclear. Substantial progress has been made in estimating welfare effects of the IA-to-DA transition using data on applicant rankings under the IA mechanism (e.g. Agarwal and Somaini, 2018; Calsamiglia, Fu and Güell, 2020; De Haan et al., 2023; He, 2017; Hwang, 2017; Kapor, Neilson and Zimmerman, 2020). By combining choice models, new methods to recover preferences from untruthful mechanisms, and within-market counterfactual analysis, these studies compare allocations and welfare under DA and IA and find mixed evidence on whether unsophisticated parents benefit more than sophisticated parents.[4] An alternative approach compares outcomes across IA and DA markets that change mechanisms. However, evidence based on such cross-market comparisons is scant, primarily due to the lack of comparison markets that change mechanisms.[5]

A nationwide reform in England that banned IA provides an opportunity to address this gap. The third School Admissions Code, effective February 2007, required some English local authorities to switch from IA to DA by September 2008. Before the reform, 49 local authorities used DA and 16 used IA.[6] After the ban, all IA authorities switched to DA. We use a difference-in-differences research design to compare the evolution of outcomes in local authorities that transitioned from IA to DA (treated group) with those that used DA throughout (control group). Our focus is on students' access to their stated first-choice school, school value-added, school peer composition, access to selective schools, and achievement inequality three years post-assignment.[7]

We also examine how competition levels affect the IA-to-DA transition. The *competition-for-top-schools* effect suggests that increased competition for top-ranked schools could lead to greater gains for low-SES students under IA, as high-SES parents strategically avoid these schools. England offers a rich environment to test this hypothesis because some local authorities have greater levels of oversubscription at schools.[8] We hypothesize that the impact of the IA ban is amplified in more competitive local authorities, also considering the availability of outside options (private schools), which might weaken parents' incentives to strategize (Akbarpour et al., 2022).

Before the reform, IA increased access to stated first-choice schools by 26 percentage points (pp), but only in competitive local authorities, suggesting that mechanism choice matters more in

[4]While many papers find that sophisticated parents lose more from the IA-to-DA transition than sincere parents (Agarwal and Somaini, 2018; He, 2017; Hwang, 2017), Calsamiglia, Fu and Güell (2020) find the opposite. Kapor, Neilson and Zimmerman (2020) show that students can benefit from DA over IA when parents have incorrect beliefs about admission chances.

[5]Chen, Jiang and Kesten (2020) and Song, Tomoeda and Xia (2020) study the IA-to-DA transition in China. We discuss these papers at the end of the introduction.

[6]There are 152 local authorities in England responsible for allocating students to 3,963 secondary schools. The remaining local authorities used a hybrid of IA and DA, as explained in Section 3.

[7]The outcome variables for school characteristics are measured pre-reform. We do not have individual data on parents' preferences? Data on access to the first-choice school is aggregated at the local authority level.

[8]Approximately 31% of schools were oversubscribed in 2006 (Coldron et al., 2008).

competitive environments. In the two years following the ban, access dropped by eight pp in these areas compared to DA authorities.[9] This effect is smaller than that observed in Chen, Jiang and Kesten (2020) for China, reflecting different competitive environments.[10]

We next examine how the ban differentially affected high- and low-SES students. The first outcome considered is the value-added of the school attended, measured by its contribution to success in national exams called the General Certificate of Education (GCSE) that are taken at age 15.[11] Value-added is an important outcome as before the 2008 reform, low-SES students attended schools with a 10.4 pp lower value-added than those of high-SES students. We find that the IA-to-DA transition increased this gap by 7.7%. In IA local authorities, the value-added of the schools that low-SES students attended dropped by 0.8 pp relative to high-SES students after the ban.

Reduced access to high value-added schools suggests that eliminating IA may not improve low-SES student achievement. However, school value-added may not affect student welfare if low-SES parents do not value school effectiveness (Abdulkadiroğlu et al., 2020). We therefore examine effects of the IA-to-DA transition on students' peers' characteristics, as research shows that parents prefer schools with high-achieving and high-SES peers (Black, 1999; Bayer, Ferreira and McMillan, 2007; Hastings and Weinstein, 2008; Burgess et al., 2015; Abdulkadiroğlu et al., 2020). We again find that the IA ban more negatively affected low-SES students: they became 1.6 pp more likely to have low-SES peers and peers with 0.03 standard deviations (SD) lower baseline test scores. This suggests that, for low-SES parents, the benefit of reduced competition for top schools under IA offsets the cost of not securing second or third choices, an effect previously observed by Agarwal and Somaini (2018) in Cambridge, MA.

To further explore the *competition-for-top-schools* effect, we show first that the effect on low-SES students is partly driven by reduced admission chances at selective schools, which admit students via entrance tests.[12] Second, the negative effects of the IA ban for low-SES students are significantly more pronounced in competitive local authorities: the decline in value-added moves from -0.8 pp to -1.3 pp. Similarly, the negative impact on peer test scores shifts from -0.03 SD to -0.071 SD, the share of low-SES peers increases from +1.6 pp to +3.1 pp, and access to selective schools drops from -1.1 pp to -2.5 pp. Thus, competition for top schools amplifies the IA ban's effects. Importantly, the switch from IA to DA did not increase the achievement gap between high- and low-SES students, partly because low-SES students benefit less from high-value-added schools.

So far, we have examined the impact of replacing IA with DA when all schools use the same

[9] A gap in stated first-choice access persists post-2008, but diminishes when accounting for differences in number of reported preferences between IA and DA authorities.

[10] In Chen, Jiang and Kesten (2020), 10 million Chinese students competed for 7 million university seats, with 74% assigned to their top choice under IA. In contrast, 31% of schools in England were oversubscribed in 2006, and 93% of students in IA authorities received their first choice.

[11] A school's value-added measures its contribution to a performance metric: achieving a level 2 qualification in at least five GCSE exams, including English and Mathematics. This is part of the school accountability system and is necessary for students to enter the final two years of secondary education.

[12] Selective schools have 0.4 SD higher test scores, 8 pp fewer low-SES students, and a 7.8% higher value-added.

mechanism. We find that low-SES students gain access to high-value-added and selective schools because some high-SES parents strategically avoid them. This raises the question: would this *competition-for-top-schools* effect also happen in environments in which each school is free to adopt a manipulable admission criterion that gives parents a higher priority for their top-ranked school (often called *First Preference First* criterion)? Environments where schools set their own criteria, similar to "early decision" policies in college admissions, enable strategic behavior.

To explore the effect of schools adoption of manipulable admission criteria, we utilize a unique aspect of the English system: In addition to the 65 local authorities that used DA and IA, some "mixed" local authorities have a portion of schools using FPF, where schools prioritize students who rank them first.[13] FPF encourages high-SES parents to rank these schools first, especially when the alternative choice is a nearby selective schools to which admission is uncertain. In England, we find that schools in competitive local authorities were more likely to adopt FPF if their closest school was selective (+16.6 pp) or had higher-achieving students (+35.2 pp). The 2008 ban on FPF allows us to examine if it reduced high-SES student enrollment in these schools.

Using a difference-in-differences design, we compare enrollment changes between schools forced to abandon FPF and those using the equal preference (EP) criterion, which does not alter priorities based on rank. We find that banning FPF significantly affected enrollment. Compared to EP schools, former FPF schools enrolled 1.5 pp fewer top-decile students, 1.4 pp more bottom-decile students, and 3.9 pp more low-SES students. This supports the *competition-for-top-schools* effect in settings where schools choose their admission criteria.

Our paper adds to the literature on strategy-proof student assignment mechanisms. Theoretical work suggests DA is generally more efficient than IA under complete information (Chen and Sönmez, 2006; Ergin and Sönmez, 2006), but IA can be advantageous when information is imperfect since it can reveal preference intensity (Abdulkadiroğlu, Che and Yasuda, 2011; Featherstone and Niederle, 2016; Miralles, 2009; Troyan, 2012). Papers using estimates of parents' preferences and counterfactual analysis of assignments have found some support for IA in the aggregate and mixed findings across levels of sophistication (Kapor, Neilson and Zimmerman, 2020; Agarwal and Somaini, 2018; He, 2017; Calsamiglia, Fu and Güell, 2020; De Haan et al., 2023; Hwang, 2017).[14] Accounting for incorrect beliefs about admission chances can reverse these findings, making the IA-to-DA transition welfare-improving, particularly for low-SES students (Kapor, Neilson and Zimmerman, 2020).

We complement the existing literature in several ways. First, unlike studies relying on choice models and simulations, we examine a real-life mechanism change affecting over 60 local authorities in England. Second, we focus on policy-relevant outcomes, such as school value-added, peer composition,

[13] In 2007, 35% of English schools could choose their criteria, and 32% adopted FPF.

[14] Agarwal and Somaini (2018) and He (2017) found that high-SES students lose more from an IA-to-DA switch in Cambridge and Beijing, respectively, while Calsamiglia, Fu and Güell (2020) reported welfare decreases more for non-strategic than strategic parents. He (2017) observed an 8% increase in home-to-school distance for sincere parents, which rises to 40% for strategic parents.

and student achievement, rather than school allocations only. This direct examination is crucial, as revealed preferences do not always align with productive aspects of school assignment like value-added or peer characteristics (e.g., Abdulkadiroğlu et al., 2020; Abdulkadiroğlu, Pathak and Walters, 2018; Cullen, Jacob and Levitt, 2006).[15] Fair access, diversity, and academic performance, are stated objectives of admission authorities.[16] Third, our dataset covers the entire student population in England over ten years, allowing us to analyze the transition from IA to DA over time. Fourth, while other studies model parent behavior with various assumptions, our reduced-form approach captures the overall effect of the IA-to-DA shift, including both the direct effect of the algorithm change and any changes in applicant strategies.[17] Finally, the variation in school competition across local authorities enables us to explore how competitiveness influences the IA-to-DA transition's effects.

Our paper is closely related to Chen, Jiang and Kesten (2020) and Song, Tomoeda and Xia (2020), both of which examine the IA-to-DA transition in college admissions in China. In contrast, we study secondary school admissions in England, where the competitive environment is less intense and varied, which allows us to analyze the importance of differences in the competitive environment.[18] Our study also covers more than 10 years of data, enabling us to explore pre-trends and long-term effects, consider a wider set of outcomes (e.g., access to first-choice schools, value-added, and student achievement), and focus on the differential impact on high- and low-SES students. Additionally, Akbarpour et al. (2022) examine the IA-to-DA change in New Haven, Connecticut, highlighting how DA's strategy-proofness neutralizes the effect of inequality in outside options.

Our findings have broad policy implications. As of 2021, over 90 countries use centralized assignment systems, with 40 adopting IA or DA for secondary school admissions (CCAS Project, 2021). We show that the IA-to-DA transition leads to higher enrollment rates for high-SES parents in top schools, as they no longer strategically avoid ranking these schools. This increases competition for low-SES students, particularly when selective schools favor sophisticated applicants based on test scores. Selective admissions are common globally, both in secondary school and university admissions.[19] Thus, our results raise important concerns about equity in admissions systems with selective schools.

[15] Improving outcomes like school value-added or peer composition may not always translate to increased student welfare, as parents' preferences may not correspond to school effectiveness (Abdulkadiroğlu et al., 2020; Abdulkadiroğlu, Pathak and Walters, 2018; Cullen, Jacob and Levitt, 2006) or because disadvantaged students may prefer similar peers, even if this lowers peer test scores (Burgess et al., 2015; Hastings, Kane and Staiger, 2009; Abdulkadiroğlu et al., 2020).

[16] For instance, England's 2007 School Admissions Code emphasizes "equity and fair access" to improve opportunities for disadvantaged children. Similarly, in New York City and Chicago, policies reserve seats for low-SES students in selective high schools (Ellison and Pathak, 2021).

[17] Switching to a strategy-proof mechanism has two effects: the algorithm change itself and the change in parents' strategies. Without data on true preferences before and after the change, we cannot separate these effects.

[18] When there is no competition for schools—i.e., when none of the schools are oversubscribed—every student can be assigned to their preferred school, regardless of the algorithm used.

[19] Appendix Table A.1 lists countries that use IA or DA for secondary school admissions and include selective schools.

The next section describes the first preference first mechanism and parent strategic incentives. Sections 3 and 4 present the English institutional context and the data. After outlining the research design in Section 5, we discuss the findings in Section 6, and report robustness checks in Section 7. Section 8 turns to our school-level analysis, before concluding in Section 9.

2 First Preference First: A Hybrid Between DA and IA

2.1 The First Preference First Mechanism (FPF)

Until 2008, several local authorities in England used the FPF mechanism. As defined by Pathak and Sönmez (2013), under the FPF mechanism, a school either uses a FPF admission criterion or the EP criterion. FPF schools give a higher priority to parents who rank the school higher whereas EP schools do not account for parents' rankings. More formally, the priorities of the students are defined as follows:

- (i) for each EP school, the base priorities for each student are used
- (ii) for each FPF school, the base priorities of students are adjusted so that
  - any student who ranks school s as his first choice has higher priority than any student who ranks school s as his second choice,
  - any student who ranks school s as his second choice has higher priority than any student who ranks school s as his third choice,
  - ...

Schools rank students based on these criteria, and the student-proposing deferred acceptance algorithm is used to determine the match. Thus, the FPF mechanism serves as a hybrid between DA and IA. When all schools use the EP admission criterion, the allocation coincides with the DA outcome. In contrast, when all schools use the FPF admission criterion, the outcome coincides with the IA outcome. To examine the effect of the IA-to-DA transition in England, our analysis begins by considering the 49 DA local authorities in which all the schools were using the EP criterion before 2008, and the 16 IA local authorities in which all the schools were using the FPF criterion. A key objective is to explore how banning IA differentially affects high- and low-SES students. We next present a conceptual framework to understand why this change might have varied impacts.

2.2 Parent Strategic Behavior

Since IA is not strategy-proof, parents have incentives to misreport their preferences, especially when the schools they prefer are oversubscribed and their perceived priority is not high enough (Abdulkadiroğlu and Sönmez, 2003). Several papers have used lab experiments to show high levels

of preference manipulation under IA (Chen and Sönmez, 2006; Pais and Pintér, 2008; Calsamiglia, Haeringer and Klijn, 2011).[20] This finding has been confirmed in various cities that use the IA mechanism, such as Barcelona (Calsamiglia and Güell, 2018), Beijing (He, 2017), Cambridge MA (Agarwal and Somaini, 2018), and New Haven (Kapor, Neilson and Zimmerman, 2020).

In England, a survey conducted two years before the IA ban revealed strategic behavior: 5% of parents chose not to apply to a favored school, while another 5% admitted to not listing schools in their true order of preference (Coldron et al., 2008). Competition partly influenced these decisions—43% avoided their preferred school due to oversubscription and their child not meeting those criteria. Among parents that actively considered oversubscribed schools, 25% were influenced by oversubscription criteria when choosing schools. Notably, "Good exam results" was the most commonly listed reason (52%) for avoiding certain schools. This survey supports our framework's first assumption: some parents strategically misreport preferences under IA.

2.3 Heterogeneous Levels of Sophistication

Manipulable mechanisms are often criticized for being unfair, as not all parents can strategize equally. Parents may differ in their information about the competitiveness of various schools or may vary in their understanding of the mechanism. Pathak and Sönmez (2008) formalized these differences with a model with "sincere" parents, who rank schools based on true preferences, and "sophisticated" parents, who recognize that truthful reporting may not be optimal when competition is high and if parents lose priority in a school unless they rank it first. In this model, sincere students can benefit under IA in some circumstances.[21]

Growing evidence from cities using manipulable mechanisms shows that low-SES families are more likely to be sincere (Dur, Hammond and Morrill, 2018; Abdulkadiroğlu et al., 2006; Calsamiglia and Güell, 2018; Agarwal and Somaini, 2018).[22] The evidence in England is similar (Coldron et al., 2008). Low-SES families in England are less likely to have access to information about school admissions, which often comes from local authority booklets. In 2006, only 44% of parents had access to the booklet.[23] 59% of parents turned to individual secondary school prospectuses and 44% of parents used school achievement and attainment data. In 2006, parents with higher

[20] Between 72% and 86% of students misreport their true preferences in Chen and Sönmez (2006), a result which has been confirmed when the students have access to more information (Pais and Pintér, 2008), and when the number of schools that can be ranked is limited (Calsamiglia, Haeringer and Klijn, 2011).

[21] A sincere student can out compete another sincere students if she ranks a school higher, but has lower priority.

[22] In Charlotte-Mecklenburg, Dur, Hammond and Morrill (2018) find that Asian students are significantly more likely to be sophisticated, while Black students are significantly more likely to be sincere. In New York City, many households made obvious mistakes in their schools' applications. 80% of the students unassigned due to these mistakes received subsidized lunch. 62% were Black (Abdulkadiroğlu et al., 2006). In Barcelona, the fraction of strategic parents increases with their level of education (Calsamiglia and Güell, 2018), and in Cambridge MA free lunch students are less strategic than paid lunch students, a difference that partially reflects the lower competition they face for schools due to reserved seats (Agarwal and Somaini, 2018).

[23] Among parents using the booklet, 36% received it from local authorities, 46% from primary schools, and 11% from secondary schools.

levels of education were more likely to know the admission criterion of schools to which they applied. Mothers who had an undergraduate degree or higher were three times more likely to use formal sources of information on schools' admission criteria and oversubscription status as mothers without qualifications. In addition, homeowners were nearly twice as likely to search for school achievement data as renters. The survey evidence supports our framework's second assumption: differing sophistication levels between high-SES and low-SES families in England.

2.4 Sophisticated Parents' Mistakes

The belief that strategy-proof mechanisms like DA provide more equal access to schools is common among policymakers in the U.S. and Europe. However, it is unclear if low-SES students fare better under DA than IA. Under perfect information, IA benefits sophisticated students, who always weakly prefer their IA assignment to their DA one (Pathak and Sönmez, 2008).[24] However, imperfect information alters the welfare benefit of IA compared to DA (Kapor, Neilson and Zimmerman, 2020). Without knowing other parents' preferences, priorities, or tie-breakers, sophisticated parents may avoid ranking over-demanded schools, even if they could have been admitted.[25] This tendency for high-SES families to misreport preferences forms a key assumption in our framework. In England, inaccurate beliefs were plausible before 2008 since the highest-performing schools (selective schools) used school-specific test scores, which parents did not know when submitting applications. Additionally, oversubscribed schools with waiting lists were not required to inform parents of their child's position, further contributing to uncertainty.

2.5 Competition-for-Top-Schools vs. Trickle-Down

Sophisticated parents' mistakes (avoiding ranking over-demanded schools when they could have been admitted) have two main effects, as we show in Figure 1. First, they reduce the benefits these parents get from IA, and second, they increase the benefits for sincere parents, who face less competition and gain priority at top-choice schools. We call this the *competition-for-top-schools* effect.[26] This benefit for sincere parents may be partially offset by the *trickle-down* effect, where students who fail to gain access to their top choice lose priority at second or third choices due to a lack of strategizing (Pathak and Sönmez, 2008; Agarwal and Somaini, 2018; Abdulkadiroğlu

[24] Perfect information means parents know others' preferences, schools' priorities, and tie-breaker rules, allowing them to form accurate admission expectations and optimize their choices.

[25] The chances that sophisticated parents make mistakes in their applications increase as information becomes less available to them. In England's IA system; some sophisticated parents may have strategized correctly if they had perfect information on capacities, preferences, and priorities.

[26] Dur, Hammond and Morrill (2018) identified this effect in Charlotte-Mecklenburg, showing sophisticated students avoid over-demanded schools. Similarly, in Chicago, high-scoring students were rejected from elite college preps due to their ranking order (Pathak and Sönmez, 2013). In China, Song, Tomoeda and Xia (2020) found over 10% of students were cautious when applying to colleges under IA.

et al., 2006).[27] The overall welfare impact for sincere students depends on whether the benefits of increased top-choice access outweigh the loss of priority at lower-ranked options.

Several features of the school choice environment can amplify or mitigate the competition-for-top-schools effect. First, distance-based priority structures, common in many cities, can amplify the effect (Calsamiglia and Miralles, 2016; Calsamiglia, Martínez-Mora and Miralles, 2021). When priorities are based on distance to school (as in England) or on catchment areas, any residential segregation implies that sincere (low-SES) students have high priority in relatively poor-performing schools, whereas sophisticated (high-SES) students have high priority in relatively high-performing schools that are more likely to be oversubscribed. This dynamic creates greater incentives for high-SES families to strategize under IA.

In contrast, the availability of private schools can weaken the above effects (Akbarpour et al., 2022). When sophisticated parents have private school options, they are less likely to strategize under IA, reducing the competition-for-top-schools effect. If all high-SES parents have outside options and avoid skipping oversubscribed schools, competition levels under IA and DA would be similar, negating the effect for low-SES students (who are more likely to lack these outside options).

Other factors influencing the competition-for-top-schools effect include: (i) parents' access to information, which determines the accuracy of their beliefs (ii) the level of correlation in parents' preferences, (iii) competition for top-choice schools, and (iv) competition for second and third choices, which affects the size of the trickle-down effect. Our analysis provides empirical evidence on these factors.

3 Institutional Background

The English education system consists of primary education (ages 5–10) and secondary education (ages 11–16), as shown in Figure A.1. Our focus is on secondary school admissions at age 11, the transition between Key Stage 2 and Key Stage 3. There are 152 local authorities responsible for assigning students to one of 3,963 secondary schools. In 2007, 3,122 were public (state-funded) schools, while 841 (21.2%) were private, enrolling 9% of students.[28] State-funded schools can be selective and use student test scores as an admission criterion (called grammar schools, 11.7%) or non-selective (called comprehensive schools).[29] Comprehensive schools include community (60.8%), voluntary controlled (2.2%), voluntary aided (17.1%), foundation (18.1%), and academies (0.9%).

[27] Evidence exists for the harmful effect of losing priority in second or third choice. When Boston was using the IA mechanism, nearly 20% of students listed two over-demanded schools as their top two choices, a clear mistake, 27% of which ended up unassigned (Abdulkadiroğlu et al., 2006). In Germany, high-performing students who truthfully reported preferences received suboptimal placements (Braun, Dwenger and Kübler, 2010).

[28] Private schools are smaller than public schools, so the share of students is lower than the share of private schools. Our analysis takes into account the share of private schools in the local authority (measured at baseline).

[29] 77.5% of selective schools were fully selective and 22.4% were partially selective, meaning that they only fill a portion of the class by ability.

Admission authorities. We group these five categories into two subsets. The first subset consists of foundation schools, voluntary aided schools, and academies. These schools are their own admission authority, so they determine the admission criteria used and they rank applications under the chosen criteria. As illustrated in Figure 2, we call these schools *active adopters* (of the EP or FPF criterion). In contrast, community and voluntary controlled schools, which represent 63.1% of the schools in 2007, are not their own admission authority: they follow the admission criteria decided by their local authority. We call them *passive adopters* of the EP or FPF criterion.

IA and DA local authorities. Some local authorities have a mix of schools using different criteria (FPF and EP), while others exclusively use EP (pure DA) or FPF (pure IA). For simplicity, we refer to these as DA and IA local authorities. We define a mixed DA (respectively IA) local authority as a local authority that has chosen the EP (resp. FPF) criterion but there may be some schools using FFP (resp. EP). Figure 3 shows the types of local authorities.[30]

Admission criteria. Schools and local authorities also set other criteria, such as sibling status or catchment area. Table 1 lists these criteria for IA and DA authorities, and Figure A.2 provides a detailed description of each oversubscription criterion. In 2007, schools did not reserve seats or use criteria explicitly targeting low-SES students, so competition for schools does not directly vary by socioeconomic status. Selective schools are the only ones allowed to admit students based on ability, using a combination of tests and previous grades. Grammar schools are selective schools that fill the entire cohort on the basis of ability and they can leave spots unfilled if there are not enough eligible applicants. Partially selective schools fill only a portion of the class by ability but cannot leave seats unfilled if there are not enough applicants. They use the standard admissions process to fill the rest of the class. In the rest of the analysis, we refer to both grammar schools and partially selective schools as selective schools.

Coordinated System. The 2003 School Admissions Code introduced a coordinated system requiring a single application form where parents rank 3 to 6 schools, depending on the local authority. Local authorities run the algorithm and issue offers, but private schools are not included.[31] In 2007, 64% of local authorities allowed only 3 preferences, 8% allowed 4 or 5, and 28% allowed 6 or 7.[32] This limit on the number of preferences that parents can report can affect the impact of the IA-to-DA transition since DA is not fully strategy-proof with truncated lists (Haeringer and Klijn, 2009), however, it remains less manipulable than the IA mechanism (Pathak and Sönmez, 2013).

[30] We miss data for 6 local authorities, colored white, in Figure 3. Four LAs (Bedfordshire, Bedford, Central Bedfordshire, and Poole) are depreciated. The remaining two (St. Helens and Cheshire) are missing due to an incompleteness in the crosswalk to produce the map but are included in the remaining analysis.

[31] Carter, Pathak and Terrier (2020) provides more details on the assignment process.

[32] No IA authorities offered 6 preferences, limiting analysis of the ban's effects by list size.

The expected effect of the IA-to-DA transition and the underlying mechanisms presented earlier still prevail, but they might be weakened with truncated lists.

Ban of the FPF criterion. The FPF mechanism raised widespread concerns in England regarding its vulnerability to manipulation by parents and the strategic adoption of the FPF admission criterion by schools (see Section 8). On the parents' side, policy makers warned against the strategic complexity of the FPF system which could harm less sophisticated parents who were not able to strategize well, as illustrated by these quotes from the chair of the London Inter-Authority Admissions Group (Carter, 2006):

"FPF forces parents to make tactical, rather than genuine preferences"
"Those who get it wrong or don't understand, lose out"
"Parents have to identify school most likely to offer a place – often impossible"
"Parents cannot be sure whether they will meet criteria for schools they might wish to put as first preference."

These concerns on the potential harm of the mechanism for disadvantaged parents led to the ban of the FPF admission criterion in England for admission to schools in September 2008.[33] From 2008 onward, all schools in England used the equal preference criterion, hence transitioning to the DA mechanism in which incentives to misreport preferences were lower.

Other changes that came with the 2007 School Admissions Code. The 2007 School Admissions Code affected other aspects of schools' admissions arrangements. Two changes are important in our context. First, some admission criteria were banned (parental commitment and children of associated adults) while one became mandatory (children in care). Second, the new code recommended that parents who apply to selective schools (and whose children must take an entry test) are informed of the outcome of entry tests before they make their applications for other schools. Previously, parents were asked to express school preferences before they know the outcome of selective tests. Finally, the 2007 code affected other school admission policies, notably by introducing "choice advice services" and free transport for low-income households to any one of the three nearest suitable schools. We discuss these other changes in Section 7 (Robustness Checks) and we rule out their confounding effects.

[33]The 2007 School Admissions Code openly refers to the "prohibition of unfair oversubscription criterion" and states that "in setting oversubscription criteria the admission authorities for all maintained schools must not give priority to children according to the order of other schools named as preferences by their parents, including 'first preference first' arrangements".

4 Data and Descriptive Statistics

Here we describe the datasets that we use in our analysis. We also provide a description of the final dataset that we use for our analysis and formally define a competitive local authority. Terrier, Pathak and Ren (2024) provide more information on the data and replication.

Student-level data. We use data from the National Pupil Database (NPD), an administrative dataset of students in state-funded secondary schools in England from academic years 2002-2003 to 2013-2014 (Department for Education, 2024). This dataset includes information on the school attended, local authority, gender, ethnicity, and free school meal (FSM) eligibility, which we use to classify students as low-SES (FSM-eligible) or high-SES (non-eligible). We link educational attainment data from the end of KS2 (age 11)—i.e just before students enroll in secondary school—and KS3 (age 14). KS2 scores come from standardized national tests that are taken before students move to secondary school. We normalize these at the cohort level to have a mean of zero and a standard deviation of one. KS3 scores include teacher assessments and an externally graded exam (before 2008). We create indicators for scores of six or higher on the teacher assessments, indicating students meet minimum academic expectations. After 2008, KS3 assessments relied solely on teacher evaluations, so we use these throughout the sample period. Finally, we link General Certificate of Secondary Education (GCSE) exam results, taken at the end of KS4 (age 16). However, since GCSEs occur five years after secondary school entry, there are insufficient post-reform years to include this as an outcome. We only use GCSEs to calculate school value-added.

School and local authority level data. We complement NPD data with two additional sources on schools (Department for Education, 2024; UK Government, 2024*b*). First, we use the school census data (2002-2003 to 2013-2014), which provides schools' addresses, postcodes, and types. We also incorporate information on schools' admission criteria from Coldron et al. (2008), including criteria related to siblings, catchment area, special needs, feeder schools, or faith. Notably, this dataset identifies which schools used EP or FPF in 2007, before the FPF ban. Lastly, we use local authority-level data on the share of students receiving their first, second, and third school choices, which is available only from one year before the reform. Department for Education (2024) and UK Government (2024*b*) provide more information on these data and on how to obtain them.

Publicly available data. We augment the confidential data from the Department of Education and data from Coldron et al. (2008) with various publicly available datasets. We use UK geography data to identify LAs and to classify whether or not they are urban or rural, LA-level GDP data to construct economic performance measures, and private school data to account for the presence of

private schools. These datasets are available from Terrier, Pathak and Ren (2024).[34]

IA and DA local authorities before the ban. Our sample includes 146 local authorities, 2,770 schools, and 9,302,625 students in England between 2002-2003 and 2013-2014. Columns 3 and 4 of Table 2 present statistics for the 16 IA and 49 DA authorities in 2007, just before the IA ban. IA authorities are 17 pp more likely to be rural, partly because all London authorities adopted DA early (Carter, Pathak and Terrier, 2020). Correspondingly, IA authorities have a 17 pp larger share of White students and 4 pp fewer students eligible for free school meals. Additionally, 79% of schools in IA authorities are managed by local authorities, compared to 65% in DA areas.

A key difference is the number of preferences students can rank: all IA authorities limit students to three choices, while only 45% of DA authorities have this limit, with 43% allowing six preferences. Shorter lists increase strategic incentives, which we account for in our analysis. In 2007, the share of private schools was 9 pp lower in IA authorities than in DA authorities, suggesting weaker strategic incentives in DA areas due to more outside options. We control for the baseline share of private schools in our analysis. Overall, these statistics indicate that EP and FPF authorities differed in several ways before the 2008 reform. Local authorities and schools might have chosen to use the FPF admission criterion for reasons we do not observe. Our identification strategy accounts for fixed differences that might have influenced the choice of admission criteria.

Competitive local authorities. As discussed, the level of competition for top-choice schools influences how the IA ban affects student sorting. To test this, we use the fact that 32% of English local authorities have selective schools that admit students based on test scores. We define "competitive local authorities" as those in the top quartile by the proportion of selective secondary schools in 2007, and "non-competitive local authorities" as the rest.[35] This distinction matters because competitive local authorities have greater vertical differentiation between schools. Students' test scores in selective schools are, on average, 0.4 SD higher than in non-selective schools (Table 2), leading to a larger between-school variance of students' test scores in competitive local authorities (Figure 4). Numerous studies show that parents prioritize school performance when ranking schools, resulting in higher competition in these areas.[36] According to Coldron et al. (2008), 47% of schools in the 14 most selective authorities are oversubscribed, compared to 20% in others (Table 3).[37]

Our definition of competitive local authorities comes with two caveats. First, it implies differences not only in competition levels but also in admission criteria, as selective schools use test scores.

[34]These data can also be obtained from searching on the UK government's public data repository (UK Government, 2024*a*).

[35]We do not know whether a school is oversubscribed. Two local authorities that have a selective school are not classified as competitive as they have many secondary schools and have a very low share of selective schools.

[36]See Black (1999); Bayer, Ferreira and McMillan (2007); Hastings and Weinstein (2008); Burgess et al. (2015).

[37]This definition does not divide the sample between London local authorities in the competitive group and rural local authorities in the other group. Table 3 shows that 15.2% of the schools in competitive DA local authorities are in London versus 11.3% of the schools in non-competitive DA local authorities.

After the IA ban, high-SES students may benefit more in these areas because they apply more to the preferred schools, but also because they have higher admission chances due to higher test scores. The results we present in competitive local authorities are therefore particularly relevant for markets where top schools screen students based on academic performance. Second, fewer competitive authorities used IA before 2008. The full sample contains 16 IA and 49 DA authorities, but only 3 IA and 14 DA authorities are in the competitive subset. While this limits the sample size, our identifying assumptions hold across both groups.

5 Research Design

Identification challenge. Identifying the causal effect of replacing IA with DA is challenging because local authorities that used IA differ from local authorities that used DA in a number of observable and unobservable dimensions. Local authorities could use either IA or DA before 2008, but the 2008 reform forced all IA local authorities to switch to DA. We therefore compare changes in outcomes before and after this ban between local authorities that were forced to abandon the IA mechanism (our treated group) and in local authorities that used the DA mechanism from the beginning and were unaffected by the ban (our control group).

Difference-in-differences specification (DiD). We estimate difference-in-differences regressions, where the outcome of student i in local authority l in year t (Y_{ilt}) depends on a dummy variable indicating whether the local authority is using the IA mechanism before the ban (IA_l), a dummy variable equal to one for the post-reform years ($Post_t$), and the interaction between IA and post-reform years. While the estimates from this specification document the effect of the IA ban for *all* students, irrespective of social background, we are particularly interested in the differential effect of the ban for high- and low-SES students. To estimate this heterogenous effect (in a triple difference spirit), the specification contains a dummy variable equal to one for students qualifying for a free school meal ($LowSES_i$), and an interaction between $LowSES_i$ and $IA_l \cdot Post_t$:

$$Y_{ilt} = \mu + \alpha \cdot IA_l + \beta \cdot Post_t + \phi \cdot LowSES_i + \gamma \cdot IA_l \cdot Post_t + \eta \cdot IA_l \cdot Post_t \cdot LowSES_i + \delta \cdot X_{lt} + \varepsilon_{ilt}. \quad (1)$$

X_{lt} is a vector of LA-level control variables for the average share of each school type, the share of schools that use each admission criterion, the number of schools that students can rank on their list, and the share of private schools measured at baseline. X_{lt} also includes the following interaction terms: $Post_t \cdot LowSES_i$ and $IA_i \cdot LowSES_i$. We cluster standard errors at the local authority level.

The coefficient γ captures the change in outcome in IA local authorities compared to the change in DA local authorities for high-SES students. We are particularly interested in η. It indicates whether the change in outcome (such as school value-added) in IA local authorities compared to the

change in DA local authorities was different for low-SES students than for high-SES students.

Identifying assumptions. Our identification relies on the assumption that the difference in outcome between high- and low-SES students would have evolved in the same way in DA and IA local authorities without the ban. Another important assumption is that the ban of the IA mechanism was the only change that affected IA local authorities in 2008, i.e that no other policy was adopted at the same time. We discuss and test the validity of both assumptions in Section 7.

6 Effects of Transitioning from IA to DA

We start by showing that the number of local authorities that used the IA mechanically dropped after the Ministry for Education banned this mechanism in 2008. Figure 5 shows that more than 30% of the local authorities were using IA pre-ban, which dropped to 0% after the ban. In the next section, we start by documenting the overall effect of this transition from IA to DA, looking at student access to their reported first choice, and student test scores. We then analyse the differential effect for high- and low-SES students.

Overall effect on first choice accommodation. We first examine the share of students assigned to their first-choice school. This data is only available for one year before the ban (2007), limiting our ability to use the full history of the outcome. Additionally, due to IA's strategic incentives, the reported first choice may not reflect the student's true preference, so these results should be interpreted cautiously. Since IA is designed to maximize first-choice access, replacing it with DA is expected to reduce first-choice accommodation.

Figure 6 shows that before the reform, IA was associated with a 25 pp higher likelihood of parents gaining access to their stated first choice compared to DA. This boost was more pronounced in competitive local authorities. In these areas, parents in IA local authorities were 25 pp more likely to get their first choice, whereas in non-competitive areas, the difference was only 8 pp. This suggests that in environments with higher competition and uncertainty, the choice of mechanism (IA vs. DA) significantly affects school assignments. We then look at the effect of the reform in competitive local authorities. Access to first choice dropped by 8 pp in IA local authorities, compared to DA local authorities, in the year that followed the ban of the IA mechanism. In contrast, the reform had a limited effect on first choice accommodation in non-competitive local authorities.[38,39]

Putting our findings in perspective, England's high first-choice satisfaction rate in IA local authorities (93%) is notable compared to other IA-using cities: 74% in Beijing (Chen, Jiang and

[38]Although the gap in first-choice access narrows after the ban, it persists due to IA authorities limiting preference lists to 3 schools, encouraging strategic reporting, while DA authorities allow up to 6 choices (see Table 2). Figure A.3 shows this gap shrinks when controlling for list length.

[39]The drop could be due to changes in behavior (more truthful reporting) or changes in the mechanism, but we cannot separate these effects without information on parents' true preferences.

Kesten, 2020), 84% in Cambridge (Agarwal and Somaini, 2018), and 93% in Barcelona (Calsamiglia, Fu and Güell, 2020). This suggests overall lower competition in England, explaining the relatively modest 8 pp drop in first-choice accommodation compared to larger effects found elsewhere, such as the 24 pp drop observed in Beijing (Chen, Jiang and Kesten, 2020).

Overall effect on student test scores. Figure A.4 reports the event-study differential evolution of student KS3 test scores—measured three years after they enrol in secondary school—in IA local authorities compared to DA local authorities. Student test scores did not evolve deferentially in IA and DA local authorities. This result holds both when considering all local authorities and competitive local authorities.[40] This null effect is in line with the recent literature that has estimated the welfare effects of the IA-to-DA transition (Agarwal and Somaini, 2018; Calsamiglia, Fu and Güell, 2020; Kapor, Neilson and Zimmerman, 2020; De Haan et al., 2023). Our results complement these studies by showing no real-life effect of the IA-to-DA transition on student test scores in England.

The ban of the FPF mechanism might have a limited overall effect on first choice satisfaction and on student test scores if the average effect hides a negative effect for low-SES students but a positive one for high-SES students. This might happen if low-SES students benefit from lower competition in their preferred school under IA. We examine next heterogeneous effects by social origin.

Effect on access to a high value-added school. We first analyze whether low-SES students (compared to high-SES students) attend higher value-added (VA) schools under DA compared to IA. Our VA measure reflects a school's contribution to a student's likelihood of obtaining level 2 qualifications in at least five GCSE exams, including English and Mathematics.[41] Before the IA ban, low-SES students attended schools with a VA 10.4 pp lower than those attended by high-SES students. Understanding if changing mechanisms increases low-SES students' access to high-VA schools is important for addressing achievement inequalities.

We measure school effectiveness using value-added regression models, following methods commonly used to assess the causal effects of teachers and schools (Koedel, Mihaly and Rockoff, 2015). Our model regresses student GCSE scores on KS2 scores, student and school characteristics, and school fixed effects (see Appendix B for details). Recent research shows these models, which rely on a standard selection-on-observables assumption, reliably estimate the causal effects of school attendance (Angrist et al., 2020).

[40]The corresponding DiD coefficients are equal to -0.003 in all local authorities and to -0.017 in competitive local authorities. Neither are statistically significant.

[41]GCSE scores come from national standardized evaluations taken at the end of secondary school and are reported in school performance tables by the Department for Education. We compute schools VA in 2007 and use this time-invariant measure as our outcome.

Results in Table 4, column (1), indicate that the IA ban led to a 0.8 pp decline in the VA of schools attended by low-SES students compared to high-SES students.[42] This represents a 7.7% increase in the pre-reform gap. As a benchmark, pre-reform in IA local authorities low-SES students enrolled in schools whose value-added was 10.4 pp lower than high-SES students. We also tested a separate VA measure for high-SES and low-SES students at each school, yielding similar results.[43] Although reduced access to high-VA schools raises equity concerns, it may not impact low-SES parents' welfare if they do not prioritize school effectiveness.

Effect on access to high-achieving peers. We next analyze whether low-SES students attend schools they prefer under DA compared to IA. Welfare considerations make it essential to analyze students' access to schools they like. While we cannot estimate parents' preferences directly without access to their submitted rankings, we use available school characteristics, such as peer test scores, share of low-SES peers, and school value-added, which are known to influence preferences (Black, 1999; Bayer, Ferreira and McMillan, 2007; Hastings and Weinstein, 2008; Burgess et al., 2015; Abdulkadiroğlu et al., 2020).[44] If low-SES students enroll in schools with higher peer quality post-IA ban, it would indicate they are attending schools they prefer.[45]

We use two outcomes to measure peer characteristics in the first year of secondary school: (i) peers' KS2 test scores and (ii) the share of low-SES peers. The IA-to-DA transition reduced peer quality for low-SES students more than for high-SES students. After the ban, in IA authorities (relative to DA), the average test scores of low-SES students' peers dropped by 0.03 SD compared to the test scores of high-SES students' peers. Low-SES students also become 1.6 pp more likely to have low-SES peers compared to high-SES students.[46] These results suggest that the benefit low-SES students gain from reduced competition in their preferred school under IA (*competition for top-school* effect) might outweigh the cost of missing second or third choices (*trickle-down* effect), a pattern observed in Cambridge (Agarwal and Somaini, 2018).[47] However, we should be cautious about equating changes in peer quality with changes in student welfare, as there may be other welfare-related changes in school attributes not captured in our analysis.

[42] The sum of γ and η is -0.5 pp, indicating a lower VA for low-SES students in former IA areas, though this sum is not statistically significant.

[43] The estimate of η changes from -0.013^{**} to -0.012^{*} in competitive authorities and from -0.008^{*} to -0.009^{*} in the full sample. The estimate of γ remains unchanged (within three decimal places). The stars correspond to the same levels of significance as in Table 4.

[44] High-SES parents generally value school peers and performance more than low-SES parents (e.g. Bayer, Ferreira and McMillan, 2007; Hastings and Weinstein, 2008; Deming et al., 2014; Hofflinger, Gelber and Tellez Cañas, 2020). This social gradient means the welfare impact of better peers is greater for high-SES students.

[45] Access to quality peers aligns with the equity motivation discussed earlier. Table B.1 shows that effective schools typically have higher-ability and fewer low-SES students, a pattern seen in other contexts (Abdulkadiroğlu et al., 2020).

[46] In formerly IA areas, post-reform, all students have peers with lower baseline scores, though the estimate for high-SES students' share of low-SES peers is not statistically significant.

[47] In Cambridge, the probability of being assigned to a top choice is higher for naïve agents than for sophisticated ones (78.4% vs. 76.2%), but at the cost of lower second-choice assignments (6.5% vs. 12.3%).

***Competition for top schools* effect.** To further explore the *competition-for-top-schools* and *trickle-down* effects, we examine whether the negative impact of the IA-to-DA transition for low-SES students is due to reduced admission chances to selective schools and increased admission to low-performing schools. The theory suggests that, under DA, low-SES students might face more competition for their preferred schools because sophisticated parents are more likely to rank these schools after the IA ban.

Selective schools in England, known for having 0.4 SD higher student test scores, 8 pp fewer low-SES students, and 7.8 pp higher value-added than non-selective schools,[48] are likely ranked first by many parents. These schools tend to be oversubscribed, particularly in the 14 most selective local authorities (median = 47% vs. 20% in other LAs; Coldron et al., 2008). Thus, the competition-for-top-schools effect is expected to be present.[49] After the ban, low-SES students in IA local authorities (compared to DA local authorities) become 1.1 pp less likely than high-SES students to enroll in selective schools.[50]

Interestingly, results in Panel A of Table 4 show that high-SES students' peers' average test scores dropped by 0.02 SD, and their access to selective schools decreased by 2.2 pp after the ban. This surprising result—since high-SES students would be expected to gain more access under DA—is explained by a post-ban reduction in selective school capacities in IA local authorities.[51] All students had reduced access, but low-SES students were more affected, which is in line with the competition-for-top-schools effect.

***Trickle-down* effect.** Under IA, low-SES students who fail to gain access to their first choice may lose priority at their second or third choice schools if those schools are oversubscribed. This trickle-down effect does not occur under DA, as rejected students do not lose priority at their other preferred schools. DA is therefore expected to reduce the likelihood that low-SES students are assigned to schools they rank low. We investigate if low-SES students are less likely to enroll in low-performing schools after the ban—specifically, schools in the bottom 25th percentile of KS2 test scores in the local authority. However, we find no evidence of lower enrollment in low-performing schools. This is unsurprising in England, where only the most attractive schools are oversubscribed. In 2006, only 31% of English schools were reported as oversubscribed (Coldron et al., 2008). Low-SES students rejected from their top choice under IA likely still gain access to their second or third

[48] See Tables 2 and B.1.

[49] The competition effect is significant given that in 2007, 5.8% of low-SES students were enrolled in a selective school (2% in a partially selective school and 3.8% in a fully selective school) vs. 10.6% of high-SES students (2.9% in a partially selective school and 7.6% in a fully selective school)

[50] Although this effect (measured in all local authorities) is not statistically significant, we show in the next section that the effect in competitive local authorities is larger in magnitude and statistically significant.

[51] Selective school seats increased by 3.7% (38 seats) in DA local authorities but decreased by 1.7% (23 seats) in IA local authorities, a 5.4% differential.

choice if these schools are not in high demand.[52]

Our results on the competition-for-top-schools effect are conservative due to the limited number of preferences parents can rank in England (between three and six). The competition effect is strongest when high-SES parents strategize under IA, but not under DA. In England, some parents might have kept strategizing under DA due to the list length limitation, which would tone down the competition effect.[53] In contrast, the impact of the list-length limitation on the trickle-down effect is unclear, as it may encourage strategic parents to rank a "safe" school that coincides with schools highly ranked by low-SES parents.

An amplifying effect: The level of competition for top schools. Greater competition, especially for top-ranked schools, likely benefits low-SES parents when high-SES parents strategically avoid over-demanded schools. To test this, we compare our results between competitive and non-competitive local authorities (as defined in Section 4). Panel B of Table 4 displays results for competitive local authorities, while Panel A shows all IA and DA local authorities.

The IA ban's impact is notably stronger in competitive areas. In these regions, low-SES students' access to high-VA schools dropped by 1.3 pp post-ban, almost double the 0.8 pp drop across all local authorities. Similarly, peer test scores fell by -0.071 SD (-0.030 SD overall), the share of low-SES peers increased by $+3.1$ pp ($+1.6$ pp overall), and access to selective schools dropped by -2.5 pp (-1.1 pp overall). The IA ban had no effect in non-competitive areas, which aligns with the expectation that mechanisms matter less when schools are not oversubscribed. These findings confirm that competition level under IA affects the gains for low-SES students, influencing their losses when transitioning to a less manipulable mechanism.

Effect on achievement inequalities. Finally, we examine the effect of the ban on student test scores three years after starting secondary school (age 13, end of Key Stage 3). We find a precisely estimated null effect; the IA ban did not widen the achievement gap between high- and low-SES students. This result may seem surprising given other findings indicating a negative impact on low-SES students. To explore this discrepancy, we show that low-SES students benefit significantly less from attending high-value-added schools than high-SES students. We decompose school value-added into separate measures for high- and low-SES students.[54] Figure 8 reveals a

[52]The fact that second or third choices are not over-subscribed questions the motivation that high-SES parents have to strategize. If their second or third choice is not oversubscribed, ranking their preferred school first is not risky, which limits incentives to strategize. However, it is likely that high- and low-SES parents have different preferences. High-SES parents tend to value schools' performance more than low-SES parents (e.g. Bayer, Ferreira and McMillan, 2007; Hastings and Weinstein, 2008; Deming et al., 2014; Hofflinger, Gelber and Tellez Cañas, 2020), and high-performing schools are more likely to be oversubscribed.

[53]Admission brochures often suggest parents consider both their preferences and admission chances by including a school they like and are likely to be admitted to.

[54]As explained in greater details in Appendix B, we modify the standard value-added regression by interacting the school fixed effects with a low-SES binary variable, which gives us two value-added estimates for each school.

leftward shift in the VA distribution for low-SES students compared to that of high-SES students. Additionally, Figure 9 indicates that the gap in value-added for low-SES students is larger in high-VA schools. This findings align with evidence of heterogeneous peer effects: low-SES students tend to form friendships with similar peers, limiting the positive effects of higher-achieving peers (Carrell, Sacerdote and West, 2013). This suggests that under immediate acceptance, low-SES students' access to high-VA schools might not reduce the achievement gap as much as expected.[55]

Dynamic effect of the ban. We find that the transition from IA to DA has a progressive effect on the outcomes we consider. Whether we consider the effect on peers' characteristics or on school value-added, the effect of the IA ban increases over time (see Figure 7). This dynamic effect is not a threat for our identification strategy because the reform was not staggered.[56] However, it raises the interesting question of the underlying dynamic channels. A likely explanation is that it takes time for strategic parents to update their behavior. In other related studies, parents learn about mechanisms and adjust their strategies over time (Hakimov and Kubler, 2021; Chen and Kesten, 2019; Ding and Schotter, 2019; Bo and Hakimov, 2020; Hastings, Kane and Staiger, 2009).[57]

7 Robustness Checks

Parallel trends in outcomes. Our identification relies on the assumption that the difference in outcome between high- and low-SES students would have evolved in the same way in DA and IA local authorities, had the IA mechanism not been banned. To test this assumption, we run an event-study regression which is identical to Equation (1), except that we replace the post-reform dummy variable by a dummy for each year (excluding 2008, the reference year). Figure 7 plots the coefficients over time and provides a graphical visualization of our parallel pre-trends. To further rule out suspicions that our estimates capture pre-trends in outcomes, we show below that our results are robust to the inclusion of time trends in oversubscription criterion.

Ruling out other policy changes. A key assumption of our research design is that the IA ban in 2008 was the only policy change affecting IA local authorities, and no other simultaneous policy had a differential impact compared to DA local authorities. To support this, we must consider other oversubscription criteria affected by the 2007 school admissions code. Two criteria were banned (parental commitment and children of associated adults), while one became mandatory (children in

[55] This also suggests potential efficiency gains from the FPF ban by aligning students with schools that maximize their score gains.

[56] Numerous papers have stressed the potential bias of difference-in-difference estimators when treatment effects are heterogenous over time (e.g. de Chaisemartin and D'Haultfœuille, 2020; Athey and Imbens, 2022; Goodman-Bacon, Forthcoming; Sun and Abraham, 2021). The bias is only a concern when treatment adoption is staggered over time, which is not the case in our setting; all treated local authorities transitioned from IA to DA in the same year.

[57] Hakimov and Kubler (2021) reviews the literature on learning under DA and IA.

care).[58] Figure A.2 summarizes the criteria discussed in the 2003 and 2007 admissions codes. We use data on schools' criteria in 2007 to examine their pre-reform frequency and differences between DA and IA local authorities.[59]

Three reasons suggest our estimates are not confounded by these changes. First, the affected criteria were rarely used before the reform: children of associated adults (4% of schools), parental commitment (9%), and children in care (77%, though applying to less than 1% of students).[60] Additionally, differences between IA and DA authorities in using these criteria were small compared to the 100 pp difference in the FPF criterion.[61] To address this, we systematically control for the share of schools using each criterion. As reported in the next section, our results remain robust even after adding these controls and time trends.[62] We conduct several other robustness checks, shown in Figures 10 (all IA and DA authorities) and 11 (competitive authorities). Each outcome is separated by a vertical bar, and the bottom of each figure indicates the regression controls included, such as school types, admission criteria, time trends for schools' oversubscription criteria, and preference list size.

Ruling out the effect of parents' information on children test scores in selective schools. Another change introduced by the 2007 School Admissions Code was the recommendation that parents applying to selective schools be informed of their children's test results before applying to other schools. Before 2008, parents made their school preferences without knowing the test outcomes. Importantly, the effect of the IA-to-DA transition should not vary based on whether parents know their child's performance on entrance tests since, under DA, parents no longer need to strategize, and admission uncertainty in selective schools becomes irrelevant. However, our difference-in-differences design could be affected if this new recommendation influenced the control group (DA authorities). After 2008, sophisticated high-SES parents in DA local authorities might face less uncertainty about selective school admission, potentially increasing their applications. To test this, we examined whether the overall composition of selective schools, particularly the share of high-SES students, changed in DA authorities over time.[63] Table A.2 shows that selective school

[58] Parental commitment was used to give priority to parents willing to support the school's ethos in a financial manner or any other way, while children of associated adults was used to give priority to children who have associated parents such as current or former staff. From 2007 onward, children in care must be given the highest priority, while the previous school admissions code only recommended to give these children top priority. Children in public care are a disadvantaged group who have very low average levels of attainment, often related to frequent changes of school because their care placements change. Local authorities are legally responsible for looked after children.

[59] We do not have information on oversubscription criteria for post-reform years as this information is not centrally collected by the English department of education. The 2007 data was collected for a 2008 report on policy admissions in England by Coldron et al. (2008), and afterwards generously shared with us.

[60] In 2010, there were 24,900 children in public care aged 10 to 15, less than 1% of all year 7 students.

[61] In 2007, DA authorities were 8.2 pp and 8 pp more likely to use parental commitment and children of associated adults, but 2.3 pp less likely to use the children in care criterion (Table 1).

[62] We also tested non-linear effects and interaction effects between criteria; results were unchanged.

[63] Using the sample of DA local authorities, we regressed a selective school enrollment dummy on a low-SES student dummy, a post-reform dummy, and their interaction.

enrollment did not increase more for high-SES students than for low-SES students in DA local authorities. This indicates that the recommendation to inform parents of test scores did not affect selective school intakes.[64]

Ruling out the effect of the financial crisis. Although the timing of the IA ban coincided with the financial crisis, the tests we perform suggest that IA and DA local authorities were not differentially affected by the crisis. Table A.3 shows that, although the share of FSM students went up during the financial crisis, this increase did not differ in DA and IA local authorities. Our main estimates are also robust to the inclusion of control variables for the lagged real GDP growth of each local authority, a measure of how severely each local authority was affected by the financial crisis (See Figures A.5 and A.6).

Controls for list length, school type, and admission criteria. We test the robustness of our results to removing control variables for the number of schools that students can report on their preference list. Checking sensitivity to preference list size is important because IA local authorities limit the number of reported preferences to three, whereas 43% of DA local authorities let students rank six preferences (and 45% let students rank three preferences). The results are not sensitive to this control. We further show our results are not sensitive to the inclusion of control variables for the share of each school type in a local authority, and for the share of schools using each admission criterion in a local authority. We also tested a specification that includes fixed effects for each local authority. This specification does not affect the results in competitive local authorities. When considering all local authorities, two results that were previously statistically significant at 10% are no longer significant, although they keep the same sign.

Omitting London local authorities. We run our regressions on a sample that excludes students from the local authorities in London. The results, reported in Table A.4, are almost identical.

Time trends in admission criteria. Finally, a standard concern with our difference-in-differences approach is that the change in outcome we observe after the reform was already happening prior to the reform. A way to mitigate this concern is to account for existing time trends that are specific to treated/control units or to account for time trends in variables that determine the outcome. We prefer not to include local authority-specific time trends, following evidence from Borusyak and Jaravel (2018) that group-specific trends introduce under-identification problems.[65] We control,

[64] Figures A.5 and A.6 confirm that our main results are robust to including controls for the share of selective schools at the local authority level.

[65] Borusyak and Jaravel (2018) show that including a group-specific trend is an inappropriate solution to nonparallel trends because the group-specific trend is collinear with the (time) distance to the treatment. Difference-in-difference specifications that include group-specific trends estimate an average of the dynamic treatment effects that severely overweighs short-run effects and weighs long-run effects negatively. This is a particular concern in our setting because

however, for time trends associated with each admission criterion as changes in these criteria constitutes the most likely reason for why our outcomes (access to good peers and schools) might vary over time.[66] Again, overall our results are very robust to the inclusion of these time trends.[67]

8 Effect of Banning the First Preference First Admission Criteria

In the first part of the paper, we investigate what would be the effect of replacing IA by DA in environments in which all schools use IA or DA. In the second part of the paper, we analyze what the effect of replacing IA by DA would be in environments in which schools are free to decide whether they want to use the first preference first (FPF) criterion. This new environment is interesting for three reasons. First, environments in which schools or universities set their admission criteria are common, especially in higher education. Second, free choice of admission criteria opens the door to strategic behaviors, such as "early decision" policies in college admissions. Early decision is similar to FPF in that the school commits to favoring applicants who have committed to accepting its offer. The English context allows us to check whether some schools strategically adopted the FPF admission criterion to attract better students. Finally, a market in which schools can freely choose their admission criteria allows us to test whether the mechanism documented at the local authority level—low-SES students losing access to top schools when IA is replaced by DA—also applies when individual schools are prevented from strategically adopting the FPF admission criterion.

8.1 Schools' Strategic Adoption of the FPF Admission Criterion

Schools' strategies and incentives. We explore a unique aspect of the English system: In addition to the 65 local authorities that used DA and IA, there were also "mixed" local authorities in which some schools, but not all, were using an admissions criteria called first preference first (FPF), giving priority to students who ranked them first. In 2007, 35% of schools were free to choose their admission criteria, and 32% of these "active adopters" used FPF, encouraging strategic behavior from parents. Crucially, schools also faced strong strategic incentives to use the FPF criterion, and the incentives differed across schools.

Selective schools, focused on admitting top students using test scores, had little incentive to adopt FPF, as it could reduce student quality by prioritizing first-choice applicants over potentially

the long-run effects are often larger than the short-run effects.

[66] For each oversubscription criterion we create an indicator of whether the proportion of schools that use this criterion in a local authority is above the median among all local authorities. Then we interact this term with a continuous measure of time to generate the time trends.

[67] In the sample of competitive local authorities, Figure 11 shows that one coefficient on school value-added (out of 16) and two coefficients on enrollment in selective schools (out of 16) are not significantly different from zero and have large standard errors. In both cases, the outlying coefficients correspond to specifications that do not control for school admission criteria. This is not a specification we favor for the reasons discussed in this section. All results discussed in the paper come from regressions that control for schools' admission criteria.

higher-achieving second-choice students. This is illustrated by Graham Carter's (Chair of the London Inter-Authority Admissions Group) following statement: *"FPF [was] less likely to be agreed by admission authorities wishing to apply ability/aptitude, religious commitment to all applicants."*

In contrast, non-selective schools competing with selective ones had strong incentives to use FPF to deter strategic parents from applying to oversubscribed selective schools, perceived as too risky when their second choice is using FPF. Numerous quotes from policy makers illustrate the non-selective schools' strategic incentives:

> *"FPF can deter parents from applying for a selective school", Carter (2006)*
>
> *"EP risks a reduction in ability profile of non-selective schools, as parents can put a grammar [selective] school first", Carter (2006)*
>
> *"In areas like Kent or Calderdale where wholly selective grammars attract a majority of the highest attaining children, nonselective schools may wish to use the first preference first criterion so that parents who are not sure whether their children will gain a place at their preferred grammar school will be encouraged to put their preferred comprehensive as their first expressed preference. In this way the non-selective schools hope to gain a better balanced intake which evidence shows [...] would benefit all of the children in their school. Similar issues arise in non-selective areas where there are very popular and very unpopular comprehensive schools.", Coldron et al. (2008).*
>
> *"Basically, what those [FPF] schools were doing was sort of blackmailing parents, saying, 'If you don't put us down first, you'll lose your place in the queue.' I do not think that that is fair.", House of common testimony*

These statements highlight how schools used FPF to encourage parents to list them as their first choice, a tactic supported by evidence showing schools influencing application behavior, especially when families lack information about admissions (Bergman and McFarlin, 2018; DeArmond, Jochim and Lake, 2014; Hastings and Weinstein, 2008; Kapor, Neilson and Zimmerman, 2020).

Schools' strategic play with admission criteria in England is driven by the strong incentives to attract and enroll high achieving students. For example, the Department for Education (DfE) publishes performance tables and reports from the inspection authority (called OFSTED). The information provided primarily focuses on the absolute performance of a school rather than its value-added.[68] A very high profile is given to these 'league tables' because their content influences parents school choice (Burgess et al., 2015; Hussain, 2020).[69]

[68] Ofsted inspectors also rate schools according to factors associated with value-added, such as the quality of teaching and management.

[69] Hussain (2020) shows that parents' school choice and house prices react to changes in inspection ratings. A unit increase in the nearest school's rating leads to a 5 pp rise in the probability of listing that school as the first choice,

Our data supports this strategic adoption of FPF. We analyze the admission criteria used by all active schools in England in 2007, excluding DA local authorities (where none used FPF) and selective schools (who do not have incentives to use the FPF criterion). The results, reported in Table A.5, show that in competitive local authorities, active schools were 16.6 pp more likely to use FPF if their closest school was selective. They were also more likely to adopt FPF if the nearest school had a higher share of high-achieving students. Consistent with the quotes from policy makers, this strategic behavior occurred only in local authorities with selective schools but was not solely driven by their presence. The results in column 4 of Table A.5 show that, even conditional on having a selective school as a neighbour, having a nearby school with higher-achieving students increased the likelihood of FPF adoption.

Expected effect of the FPF ban. Our results show that some schools strategically adopted the FPF criterion as a defense against the local competition they faced from a good neighbouring school. The FPF schools were therefore not the highest performing schools in a neighbourhood; the good neighbouring schools were. In 2007, the average KS2 score was 0.37 SD higher in selective schools but only 0.07 SD higher in active FPF schools (see Table 2). Using the FPF criterion was a way for non-selective schools of getting a better intake by encouraging parents to rank FPF schools as their first choice instead of the nearby selective school. These strategies from sophisticated high-SES parents should generate a similar competition-for-top-schools effect as the one we illustrated in the previous section (See Figure 1). This makes active FPF schools particularly relevant to test whether the local authority-level mechanism—where low-SES students lose access to top schools when IA is replaced by DA—also applies when individual schools can no longer use the FPF criterion. This section aims to verify if the FPF ban made FPF schools worse off (first step) and whether neighboring schools benefited from this change (second step).

8.2 Research Design

Difference-in-Differences. The challenge we face when analyzing the effect of the FPF ban on schools' composition is the fact that schools that adopted the FPF criterion in the first place might differ from schools that used the EP criterion. Table 2 shows that FPF schools enrolled fewer low-SES students and students with higher test scores. To address this selection, we rely on a difference-in-differences approach that compares the evolution of students' characteristics in active FPF schools (our treatment group) and in a group of schools, presented below, that used the EP criterion during the entire period (our control group). Said differently, we measure the post-reform change in the characteristics of the students who enroll in a former FPF school, using changes in

and a 0.5 percent increase in prices (equivalent to around £800) of properties located near the school, an effect that jumps to 1.3 percent for top performing schools. Other papers have stressed that failing to get a good evaluation discourages principals from staying in the school (Hussain, 2009), and affects teaching practices (Hussain, 2015) and the time that parents devote to their children's academic studies (Greaves et al., 2021).

EP schools' student composition to control for natural year-to-year variation in school composition. Under the assumption that, absent the ban, student characteristics would have evolved in the same way in EP and FPF schools, the double difference provides a set of estimates of the effect of the FPF ban on schools' composition.

Let school-level outcome (Y_{st}) be a function of a dummy variable indicating whether it was a school actively using FPF (FPF_s), a dummy variable equal to one for the post-reform years ($Post_t$), and the interaction between FPF and post-reform years as follows:

$$Y_{st} = \mu + \alpha \cdot FPF_s + \beta \cdot Post_t + \gamma \cdot FPF_s \cdot Post_t + \delta \cdot X_{st} + \varepsilon_{st}, \tag{2}$$

X_{st} controls for school-level characteristics including school type, and each admission criterion used by schools. The coefficient of interest γ captures the change in outcome in active FPF schools compared to the change in the control group of EP schools. In all regressions, we cluster standard errors at the local authority level. In this analysis we only consider non-selective schools since these schools are more likely to employ the FPF criterion.

Outcomes. We use five outcome variables: in each school, we compute the share of low-SES students, as well as the share whose KS2 test score is below the 10th and 25th percentiles of their cohorts' distribution, and the share of students whose KS2 test score is above the 75th and 90th percentiles. Looking at the effect of the ban on the enrollment of the very top performers is particularly important because schools' selection strategies might affect the enrollment of high-performing kids whose parents are more sophisticated.

Control group. The control group of EP schools has to be carefully chosen because there is a risk of spillover between the FPF and EP schools that are located in the same local authority. After the ban, any change in the enrollment at FPF schools should almost mechanically be compensated by the opposite change in EP schools, which means that the control group would also be affected by the reform. To avoid spillover effects between schools, we use EP schools in DA local authorities as the control group, i.e EP schools that are in local authorities in which zero schools were using the FPF criterion before its ban. By design, these schools cannot be affected by the FPF ban.

Identifying assumptions. The key assumption of our method is that student outcomes in EP and FPF schools would have evolved similarly if the FPF criterion had not been banned. We test this in two ways. First, we check if outcome trends were parallel before the ban. Using an event-study specification, we regress the outcome variable on a dummy for schools using the FPF criteria, year fixed-effects, the interaction between FPF and each year, and controls from Equation (2). Figure 12 shows that all five outcomes had similar trends in EP and FPF schools before 2008. The figure also includes p-values from an F-test across all pre-reform years, which indicate no

significant differences in pre-reform trends. To address any concerns about capturing pre-trends, Section 8.4 shows our results are robust to including time trends in oversubscription criteria. We also rule out other potential confounders, such as changes in admission criteria and the academy sector's expansion around 2008.

8.3 Results

Effect of the FPF ban on FPF schools. Table 5 shows the results of Equation (2). Before the ban, active FPF schools were 1.4 pp (14%) more likely to enroll top-achieving students (top 10th percentile of KS2 scores) than EP schools. We find no significant differences in other parts of the achievement distribution, suggesting the FPF criterion mainly attracted top students.

After the ban, active FPF schools lost this advantage. The likelihood of enrolling students in the top 10th percentile dropped by 1.5 pp (a 14.4% relative decrease) compared to EP schools. Similarly, the probability of enrolling students in the top 25th percentile fell by 2.2 pp (–8.7%). Conversely, enrollment of low-performing students (bottom 10th and 25th percentiles) increased by 1.4 pp (+13.3%) and 2.5 pp (+9.8%), respectively. FPF schools also became 3.9 pp (+21.5%) more likely to enroll low-SES students. Panel B of Table 5 shows that these effects were equally strong, if not stronger, in competitive local authorities.[70]

Effect of the FPF ban on schools located near FPF schools. The significant effects of the FPF ban suggest that FPF schools had previously attracted high-SES parents by discouraging them from applying to better but oversubscribed schools. These neighboring schools should benefit from the ban by enrolling more high-SES and higher-achieving students. To test this, we identify the two nearest schools to each active FPF and EP school. We then compare changes in student characteristics using a difference-in-differences approach from Equation (2).[71]

Table A.6 shows that schools near FPF schools benefited from the ban, compared to those near EP schools. Panel A reports results for all local authorities, and Panel C for competitive local authorities.[72] The two closest schools to active FPF schools became 3.5 pp less likely to enroll low-SES students and 2.4 pp less likely to enroll students in the bottom 25th percentile.[73] These benefits were particularly pronounced in competitive local authorities, consistent with the larger strategic adoption of the FPF criterion in these areas.

[70] See Figure A.7 for event-study coefficients in competitive local authorities.

[71] We exclude the 14.9% of neighboring schools that used the FPF criterion, as we know their intake worsened after the ban.

[72] See Figures A.8 and A.9 for event-study coefficients.

[73] We find similar results when considering the closest school only. That school became 2 percentage points less likely to enroll low-SES students and 1.6 pp less likely to enroll students who score in the bottom 25th percentile. These results are not significant due to smaller sample size.

8.4 Robustness Checks

We run a number of robustness checks that are similar to the ones we ran in the previous section, when looking at the effect of IA-to-DA transition. We therefore refer the reader to that section for a detailed justification of the alternative specifications. We present the results in Figure 13.

Sample variations. In addition to the original sample (labeled as "Base Sample" in Figure 13), we run our regressions on (i) a sample that excludes students from the local authorities in London and (ii) a sample that discards academy schools.[74] With this last test, we want to check that our results are not driven by the rapid expansion of the academy sector between 2010 and 2020. Originally introduced in 2002 under the Labour Government to replace poorly performing secondary schools, academies massively expanded after the change of government in May 2010 and the Academies Act of that year (Eyles, Machin and McNally, 2017; Eyles and Machin, 2019). Almost 60% of state-funded secondary schools are academies in 2020, up from 6% in 2010.

Yet, our results do not differ when we discard academy schools from our sample, a reassuring finding that might be explained by two features of academies. First, the bulk of the academy expansion took place at the very end of the period we consider. Second, in almost all cases, academies are conversions of existing schools that inherit currently enrolled pupils and existing admission criteria. Changes in admission criteria and students' composition might take time.[75]

Additional control variables. We also test the robustness of our results to removing control variables for school type and admission criteria. The results are not sensitive to it, nor are they sensitive to the addition of a time trend specific to each admission criterion.

9 Conclusion

A few years after Boston replaced IA with DA in 2005, England enacted a nationwide ban on IA, mandating DA from 2008 onward through an Act of Parliament. We use this natural experiment in market organization to examine whether a strategy-proof mechanism like DA affects access to school quality for disadvantaged students. A common motivation for replacing IA with DA is that unsophisticated families, who are more likely to be low-SES, may be better off under a strategy-proof mechanism because sophisticated parents' strategic advantage is nullified.

Comparing outcomes in IA and DA local authorities before and after the ban, our findings suggest that low-SES students were disadvantaged by the IA-to-DA transition. They attended schools with lower value-added and had more low-SES and low-achieving peers. This unintended effect of DA

[74] More precisely, we discard any schools that will become an academy school at some point in the sample.

[75] Finding that our results are not driven by academies is reassuring since Eyles and Machin (2019) show that post-conversion, academies became less likely to admit free school meal eligible pupils and more likely to admit pupils with higher KS2 scores. They mostly attribute these changes to a post-conversion change in parents' preferences.

partly resulted from low-SES students losing access to selective schools. Under IA, high-SES parents avoided these schools to prevent wasting a top choice. However, under DA, they applied freely, increasing competition. The negative impact was more pronounced in competitive local authorities, which supports the competition-for-top-schools effect. Additionally, the 2008 reform increased the share of low-SES students in schools that previously used the FPF admission criterion, reflecting their displacement from selective schools and is consistent with the competition-for-top-schools effect.

Our findings represent novel evidence on the debate on the benefits and costs of strategy-proof mechanisms for school assignment. More than a dozen countries and cities—among which Belgium, Germany, Spain, Cambridge MA and Seattle—still use IA to allocate students to schools or universities. Yet, opposition to manipulable mechanisms is still widespread due to the harm they might incur for unsophisticated families. The main mechanism we identify suggests that under IA low-SES students face lower competition for their preferred schools because sophisticated high-SES parents strategically avoid ranking these schools. After a transition to DA, high-SES parents enroll in top schools at higher rates. The resulting competition faced by low-SES students is more likely in environments in which top schools use admission criteria like test scores that favor sophisticated parents. Our results highlight the importance of the competitive environment and fallback options for measuring effects on unsophisticated families. They also illustrate that a transition to DA by itself may not increase access for low-SES applicants when schools are selective. Additional reforms that remove selection criteria that favor advantaged students such as descreening or reserve policies for disadvantaged groups may also be necessary.

The forces that we highlight in English school admissions may also be present in other admissions systems. For example, the early admission or early decision systems used by selective U.S. universities to admit students before the regular process have been criticized for benefiting well off and well informed students (Avery, Fairbanks and Zeckhauser, 2003; Avery and Levin, 2010). However, as with the elimination of FPF, a possible advantage of early admissions systems could be that disadvantaged students do not face as much competition in the general pool of applicants. Exploring these possibilities in other settings is an exciting direction for future work.

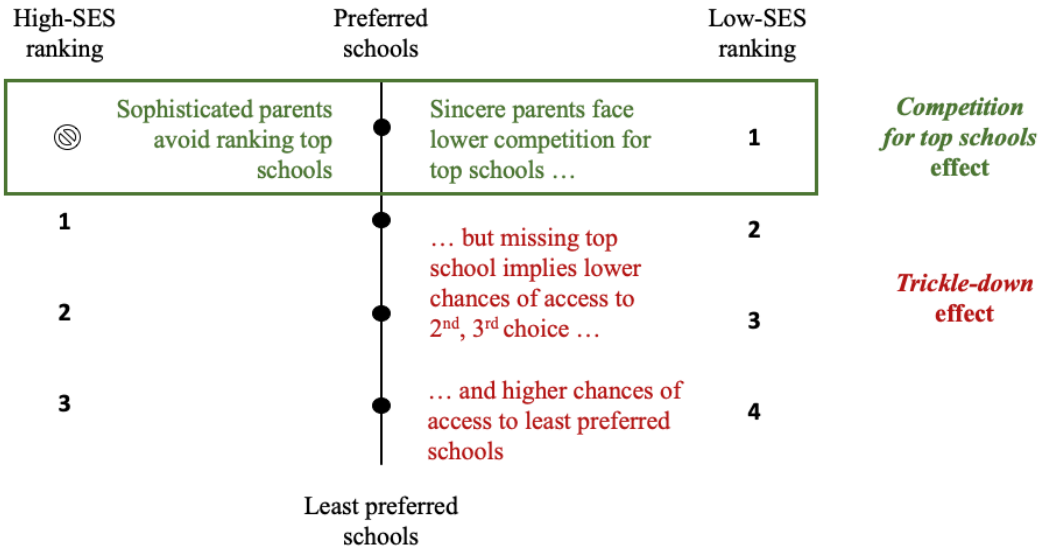


Figure 1: Illustration of the *Competition-for-Top-Schools* and *Trickle-Down* Effects

Notes: This figure illustrates the *competition-for-top-schools* and *trickle-down* effects. Inaccurate beliefs about admission chances lead sophisticated parents to avoid ranking over-demanded schools, even when they could have been admitted. Due to these mistakes sincere parents face less competition and gain priority at top-choice over-demanded schools. We refer to the latter effect as the *competition-for-top-school* effect. This beneficial effect of IA for sincere parents might be partially offset by a negative effect on their chances of being assigned their second or third choice. Sincere students' lack of strategizing implies that those who fail to gain access to their top choice are also less likely to be assigned their second or third choice as they lose priority at these schools to parents who ranked it as their first choice. We refer to this as the *trickle-down* effect.

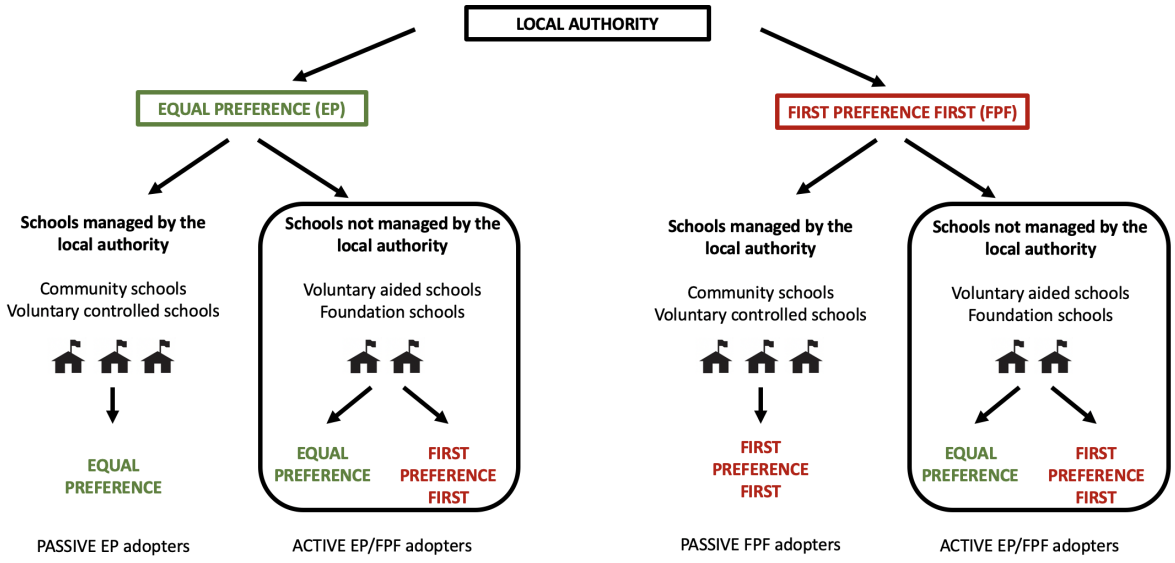


Figure 2: School-level Active and Passive Adopters of the FPF Admission Criterion

Notes: This figure illustrates the two levels of decisions on admission criteria: the local authority and the school. Three types of schools in England are their own admission authority: foundation schools, voluntary aided schools, and academies. We call these schools "active" adopters (of the EP or FPF criterion). In contrast, community and voluntary controlled schools, which represent 63.1% of the schools in 2007, are not their own admission authority: they follow the admission criteria decided by their local authority. We call them "passive" adopters of the EP or FPF criterion.

Table 1: Oversubscription Criteria Used Before the FPF Ban

	Local Authorities		Schools					
			All Schools			Active Schools		
	IA	DA	FPF	EP	Selective	FPF	EP	Selective
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. Criteria That Changed								
First Preference First (FPF)	1.000	0.000	1.000	0.000	0.219	1.000	0.000	0.119
Parental Commitment	0.048	0.130	0.073	0.105	0.031	0.193	0.192	0.044
Children of Associated Adults	0.004	0.084	0.016	0.049	0.034	0.046	0.068	0.050
Children in Care	0.785	0.808	0.838	0.736	0.741	0.643	0.566	0.566
Panel B. Other Unaffected Criteria								
Siblings	0.930	0.911	0.913	0.929	0.809	0.807	0.820	0.654
Catchment Area and Proximity	0.952	0.911	0.904	0.919	0.852	0.750	0.792	0.742
Medical/Social Needs	0.684	0.569	0.535	0.502	0.444	0.357	0.381	0.245
Special Educational Needs	0.754	0.598	0.538	0.534	0.312	0.296	0.276	0.220
Feeder Schools	0.544	0.231	0.276	0.366	0.077	0.357	0.373	0.088
Faith	0.096	0.147	0.164	0.165	0.062	0.500	0.470	0.126
Other	0.096	0.058	0.072	0.075	0.052	0.050	0.065	0.057
Number of Schools	228	845	858	1659	324	280	557	159

Notes: This table reports how frequently each admission criterion is used by IA and DA local authorities (columns 1 and 2), by FPF and EP schools (columns 3 and 4), and by active FPF and EP schools (columns 6 and 7). Columns 3, 4, 6, and 7 do not contain selective schools. Panel A reports statistics for the criteria that were affected by the 2007 Admission Code, while Panel B reports statistics for those that were not affected by the new code. Appendix A.2 provides a detailed description of each oversubscription criterion.

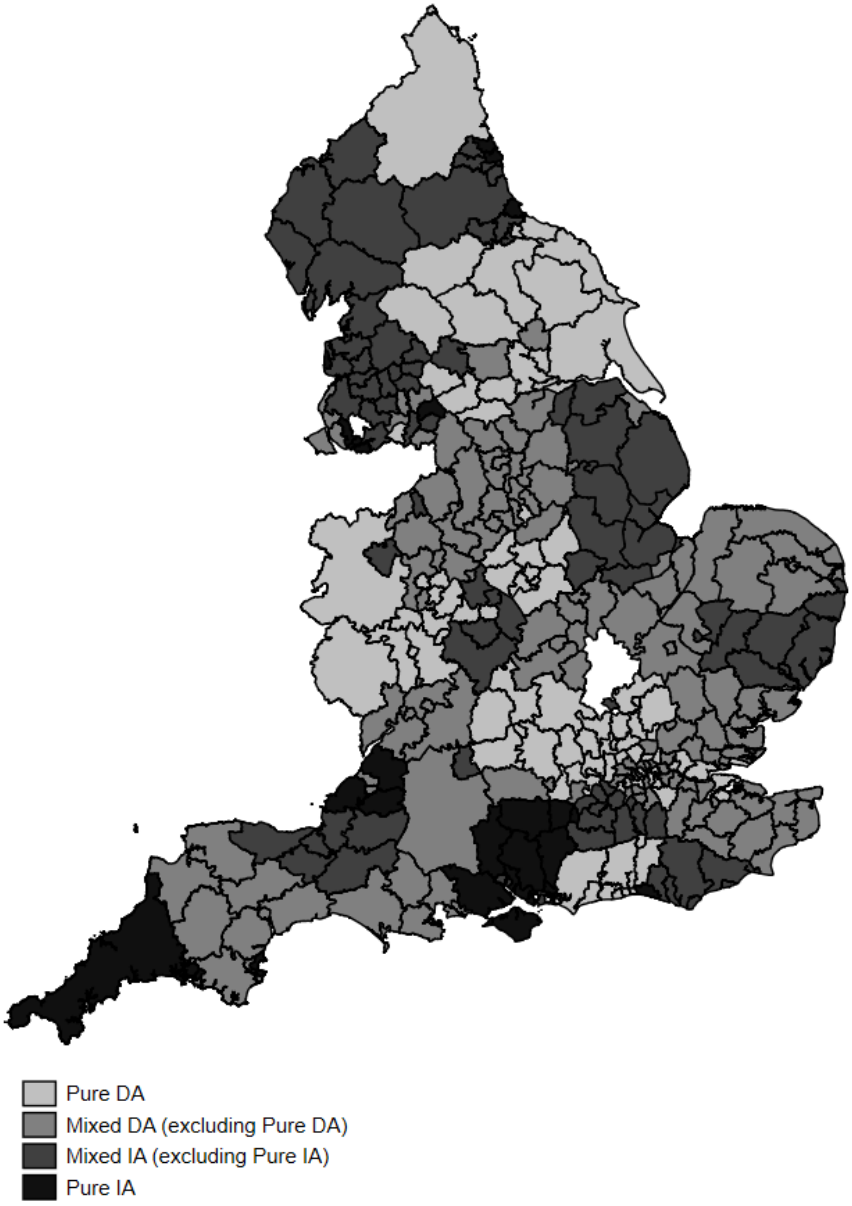


Figure 3: IA and DA Local Education Authorities in England in 2007

Notes: This map shows the location of deferred acceptence (DA) and immediate acceptence (IA) local authorities in England. 46 local authorities (31.5%) use the IA criterion for the schools they control, and 100 use the DA criterion. Some schools are their own admission authority and do not have to follow the criteria guidelines of their local authority. As a result, schools using the FPF criterion can coexist with schools using the EP criterion within each local authority. We call local authorities in which all schools use the EP (or FPF) criterion "pure DA" and "pure IA". Throughout the paper we drop the word "pure" for brevity. We call "mixed DA" (resp "mixed IA") the local authorities in which the local authority has chosen the EP criterion (resp FPF) but there may be some schools using FFP (resp EP). As such a DA (resp. IA) local authority is a special case of a mixed DA (resp. IA) local authority in which all schools are using EP (resp. FPF).

Table 2: Descriptive Statistics on Local Authorities and Schools (in 2007)

	Local Authorities				Schools					
					All Schools			Active Schools		
	Mixed IA	Mixed DA	IA	DA	FPF	EP	Selective	FPF	EP	Selective
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A. Local Authorities Characteristics										
Three preferences	0.96	0.49	1.00	0.45	-	-	-	-	-	-
Six preferences	0.00	0.40	0.00	0.43	-	-	-	-	-	-
Fraction of selective schools	0.08	0.10	0.06	0.10	-	-	-	-	-	-
Fraction of private schools	0.18	0.24	0.16	0.25	-	-	-	-	-	-
At least one selective school	0.28	0.34	0.19	0.33	-	-	-	-	-	-
N	46	100	16	49	-	-	-	-		
Panel B. School Characteristics										
Number of Students	187	185	201	181	191	187	163	192	183	155
Urban	0.42	0.56	0.45	0.62	0.46	0.56	0.45	0.51	0.54	0.55
Greater London Area	0.00	0.18	0.00	0.16	0.04	0.17	0.12	0.11	0.22	0.16
Community school	0.66	0.58	0.78	0.63	0.64	0.62	0.46	0.00	0.00	0.00
Voluntary Controlled school	0.02	0.02	0.01	0.02	0.02	0.02	0.04	0.00	0.00	0.00
Voluntary Aided school	0.17	0.17	0.11	0.17	0.18	0.17	0.15	0.55	0.51	0.31
Foundation school	0.14	0.20	0.10	0.15	0.15	0.17	0.34	0.45	0.49	0.69
Academy	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00
N	837	1,933	228	845	787	1,659	324	261	557	159
Panel C. Student Characteristics										
Female	0.49	0.49	0.49	0.49	0.50	0.49	0.50	0.51	0.48	0.47
Free School Meal	0.15	0.17	0.14	0.18	0.15	0.18	0.10	0.12	0.15	0.07
White	0.89	0.79	0.92	0.75	0.88	0.79	0.82	0.86	0.79	0.75
White British	0.87	0.75	0.90	0.71	0.85	0.76	0.78	0.82	0.74	0.70
Special Education Needs	0.40	0.41	0.40	0.40	0.41	0.42	0.33	0.38	0.39	0.21
Distance to School (km)	1.80	1.79	1.63	1.73	1.72	1.68	2.66	2.13	2.06	3.29
KS2 Score	0.01	0.02	0.02	0.02	-0.02	-0.03	0.37	0.07	0.04	0.72
KS3 Score	0.38	0.38	0.37	0.39	0.37	0.36	0.56	0.41	0.39	0.72
N	156,133	358,180	45,831	152,699	150,523	310,866	118,215	50,142	102,040	24,654

Notes: This table reports descriptive statistics for the sample of 146 local authorities, 2,770 schools, and 461,389 students in 2007. Column 1 and 2 report statistics for mixed IA and DA local authorities, columns 3 and 4 for IA and DA local authorities in which 100% of the schools are using the EP (resp FPF) admission criterion. Columns 5 to 10 report statistics for all FPF and EP schools in columns 5 and 6 and for active FPF and EP schools in columns 8 and 9. These columns only contain non-selective schools. Columns 7 and 10 contain the statistics for selective schools.

Table 3: Comparison between Competitive and Non-Competitive Local Authorities

	High Competition		Low Competition	
	IA	DA	IA	DA
	(1)	(2)	(3)	(4)
	Panel A. Local Authority Characteristics			
Fraction of Selective Schools	0.308	0.354	0.000	0.003
Three Preferences	1.000	0.143	1.000	0.559
Six Preferences	-0.000	0.643	0.000	0.353
SD of School KS2	0.501	0.531	0.212	0.241
SD of School KS3	0.264	0.274	0.131	0.143
Fraction of Private Schools	0.086	0.217	0.173	0.245
Number of IA and DA LAs	3	14	13	34
	Panel B. School Characteristics			
Number of Students (mean)	182	169	200	186
Urban	1.000	0.693	0.354	0.573
Greater London Area	-0.000	0.167	-0.000	0.157
Community School	0.576	0.471	0.795	0.722
Voluntary Controlled School	0.000	0.015	0.010	0.030
Voluntary Aided School	0.182	0.199	0.092	0.151
Foundation School	0.212	0.295	0.103	0.072
Academy	-0.000	0.020	-0.000	0.024
	Panel C. Student Characteristics			
Female	0.493	0.492	0.488	0.489
Free School Meal	0.156	0.187	0.134	0.170
White	0.903	0.671	0.924	0.782
White British	0.868	0.626	0.905	0.745
Ever Special Education Needs	0.441	0.404	0.404	0.415
Distance to School (km)	1.537	1.847	1.669	1.662
KS2 Score	0.030	0.075	0.026	-0.014
KS3 Score	0.358	0.436	0.387	0.382

Notes: This table shows the conditional means by the competitiveness of the local authority and whether it is IA or DA. In Panel A we show the local authority level characteristics as well as student level characteristics within each local authority. In Panel B we show the school level characteristics within each Local Authority. Both Panels B and C include selective schools/students who attend selective schools in the computations.

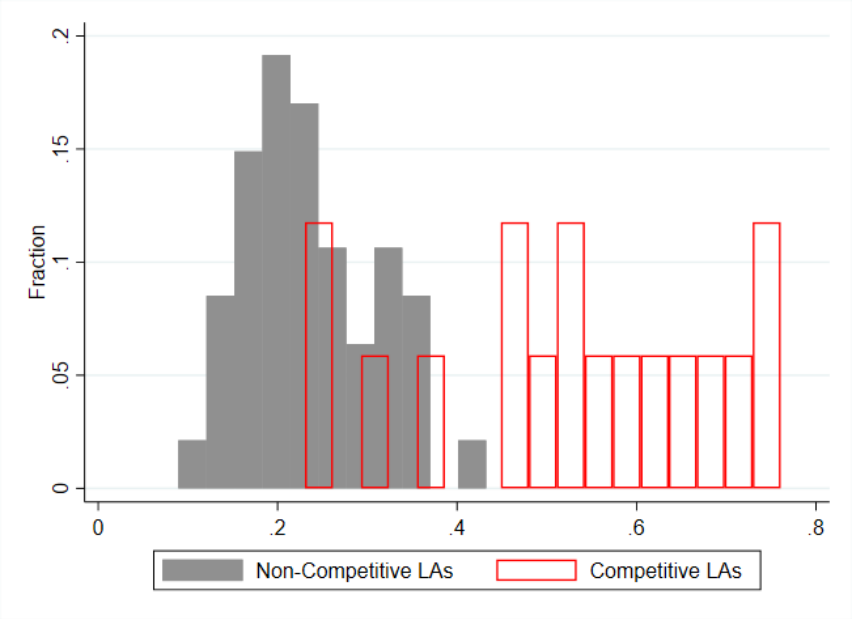


Figure 4: Distribution of Standard Deviation of School KS2 Test Scores

Notes: This figure shows the within-local authority standard deviation of the school KS2 scores. Non-competitive local authorities are denoted in gray bars and competitive local authorities are denoted in red outlined bars.

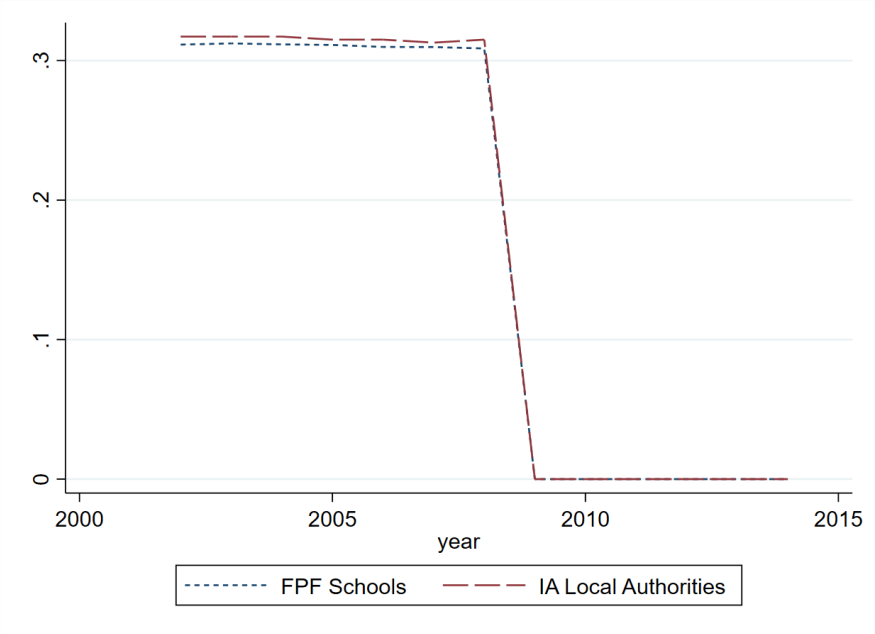
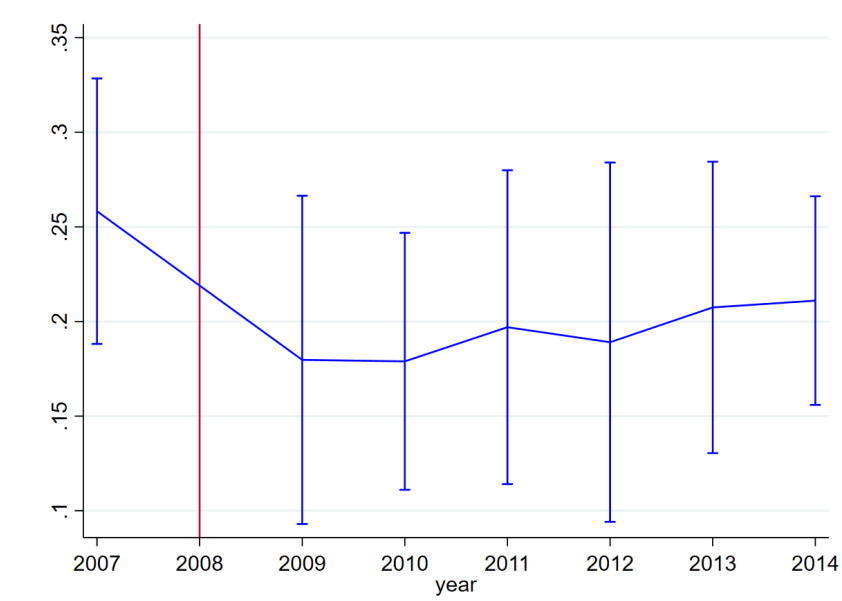


Figure 5: Effect of the FPF Ban on FPF Usage

Notes: This Figure reports the share of local authorities (dashed line) that use the IA mechanism and the share of schools (dotted line) that use the FPF admission criterion over time.

(a) Competitive IA and DA Local Authorities



(b) Non-Competitive IA and DA Local Authorities

Figure 6: First Choice Accommodation

Notes: This figure reports the β_t coefficients from the following event-study regression: $y_{it} = \sum_{t \in \mathcal{T}} \beta_t IA_i \cdot T_t + X_i'\delta + \varepsilon_{it}$ where y_{it} is the proportion of students in local authority i in year t receiving their first choice, $\mathcal{T}$ is the set of years that have first choice data from 2007 onwards, IA_i is a dummy variable that is equal to one for IA local authorities, T_t is an indicator for the year t, X_i is a vector of local authority level controls, and ε_{it} is an idiosyncratic error term. The specification shown in this figure does not include any controls. Panel (a) is the regression for competitive local authorities, which are local authorities in the top quartile of local authorities by proportion of selective schools in 2007. Non-competitive local authorities are all remaining local authorities. We show the 95% confidence interval of all coefficients. We cluster standard errors at the local authority level.

Table 4: Effect of the Transition from IA to DA on High-SES and Low-SES Students

	School Value-Added	Peers' Baseline Scores	Share of Low-SES	Attends Selective	Attends B25 School	Student KS3 Score
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. All IA and DA Local Authorities						
Post-Reform X IA LA	0.003	-0.024*	0.007	-0.022*	-0.010**	-0.006
	(0.006)	(0.013)	(0.006)	(0.013)	(0.005)	(0.012)
Post-Reform X IA LA X Low-SES	-0.008*	-0.030**	0.016*	-0.011	0.002	-0.007
	(0.005)	(0.012)	(0.008)	(0.007)	(0.010)	(0.008)
Scaled Effect (D-in-D)	.6%	-43.2%	4.4%	-17.9$	-5.3%	-1.5%
Scaled Effect (D-in-D-in-D)	-1.7%	-54.2%	10.4%	-8.6%	1.3%	-1.7%
Observations	2,149,304	2,155,130	2,155,483	2,155,483	2,149,235	1,541,279
Panel B. Competitive IA and DA Local Authorities						
Post-Reform X IA LA	0.008**	-0.017	0.004	0.005	-0.013*	-0.010
	(0.004)	(0.018)	(0.007)	(0.005)	(0.007)	(0.042)
Post-Reform X IA LA X Low-SES	-0.013**	-0.071***	0.031***	-0.025***	0.017	0.011
	(0.005)	(0.011)	(0.010)	(0.007)	(0.020)	(0.020)
Scaled Effect (D-in-D)	1.6%	-12.6%	2.4%	1.5%	-6.8%	-2.3%
Scaled Effect (D-in-D-in-D)	-2.8%	-52.7%	19.9%	-7.7%	9%	2.5%
Observations	710,668	710,668	710,668	710,668	710,668	498,603

Notes: This table reports the results from Equation (1), which estimates the differential effect of the FPF ban for high- and low-SES students (in a triple difference spirit). We let a student-level outcome Y_{lti} be a function of a dummy variable indicating whether the local authority is using the FPF admission criteria before the ban IA_l, a dummy variable equal to one for the post-reform years $Post_t$, a dummy variable equal to one for low-SES students $lowSES_i$, the interaction between the IA local authority indicator and post-reform indicator $IA_l \cdot Post_t$, and an interaction between that FSM variable and the $IA_l \cdot Post_t$ interaction. The control variable X_{lt} includes a vector of LA-level control variables for (i) the average share of each school type (including the fraction of private schools), (ii) the share of schools that use each admission criterion, and (iii) the number of schools that students can rank on their list. The vector X_{lt} also includes two additional interaction terms: $Post_t \cdot lowSES_i$ and $IA_l \cdot lowSES_i$. We cluster standard errors at the local authority level in all regressions. The outcome in column (1) is the shrunken value-added measure of the school that student i attends. The outcome in column (2) is the average KS2 score of all current year 7 students at the school student i attends. We call this the a student's peers' baseline score. The outcome in column (3) is the proportion of low-SES peers at the school student i attends. The outcome in column (4) is an indicator of whether the student attends a selective school. The outcome in column (5) is an indicator of whether a student attends a school with an average KS2 score in the bottom 25% of the local authority. Finally, the outcome in column (6) is an indicator of whether student i achieved level 6 in both their English and Mathematics KS3 assessment, which is the standard expectation. All regressions include students attending non-selective and selective schools. *** denote significance at the 1 percent level, ** significance at the 5 percent level, and * significance at the 10 percent level.

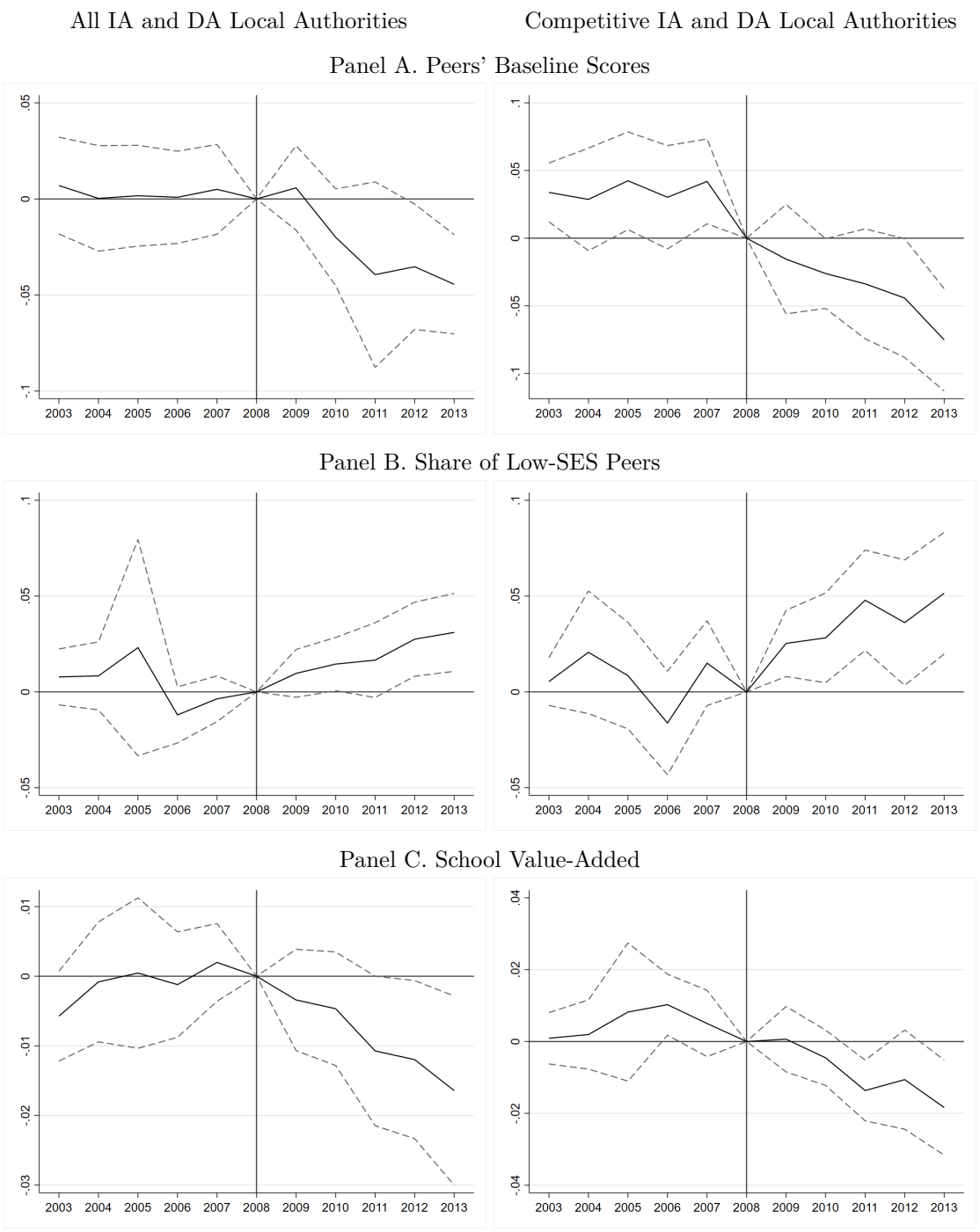


Figure 7: Event-Study - Change in Low-SES Students Peers' Characteristics

Notes: This figure provides a graphical visualization of pre-trends in outcomes by reporting coefficients (and 95% confidence intervals) from an event-study version of Equation (1) in which we replace the dummy variable equal to one for the post-reform years by a dummy for each year $Year_t$ (excluding 2008, the reference year, whose coefficient is set to zero). The coefficients we plot are the coefficient of the $IA_l \cdot Year_t \cdot FSM_i$ interaction terms which indicate whether the change in student-level outcome in IA local authorities compared to the change in outcomes in DA local authorities was more pronounced for low-SES students than for high-SES students. Each regression contains the same set of controls as Equation (1), i.e a vector of LA-level control variables for the average share of each school type (including the share of private schools), the share of schools that use each admission criterion, and the number of schools that students can rank on their list. The left column are the event studies for all IA and DA local authorities and the right column are the event studies for the competitive IA and DA local authorities, which are local authorities in the top quartile of local authorities by proportion of selective schools in 2007.

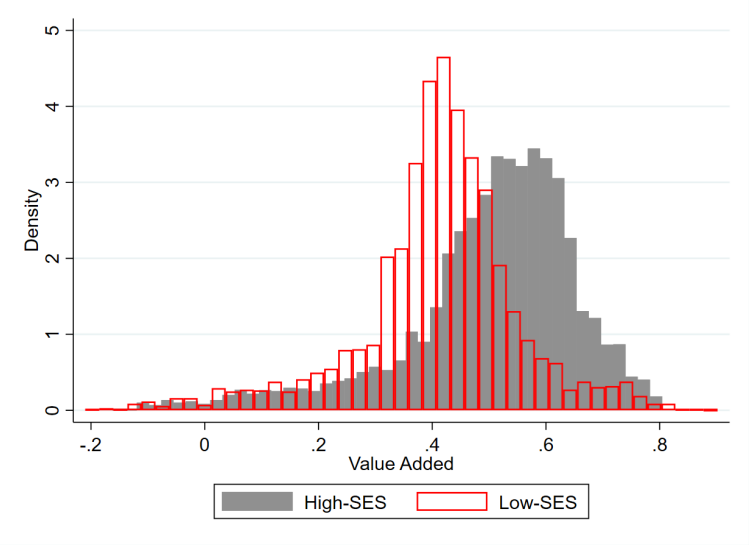


Figure 8: Heterogeneous Value-Added

Notes: This figure shows the distribution of schools' heterogeneous value-added by SES. The gray bars represent the VA distribution for high-SES students and red outlined bars represent the VA distribution for low-SES students. Appendix B provides a detailed presentation of the regression used. Our VA measure captures the contribution of a school to a standard performance metric: a student's likelihood of obtaining level 2 qualifications in at least five KS4 exams including English and Mathematics. We regress this KS4 outcome (five years after enrollment in secondary school) on KS2 test scores (taken just before enrollment in secondary school), a vector of other student characteristics, a vector of time-varying school characteristics, and a vector of school fixed effects. To measure the heterogenous effect, we interact the vector of school fixed effects with a dummy variable equal to 1 for low-SES students and 0 for high-SES students.

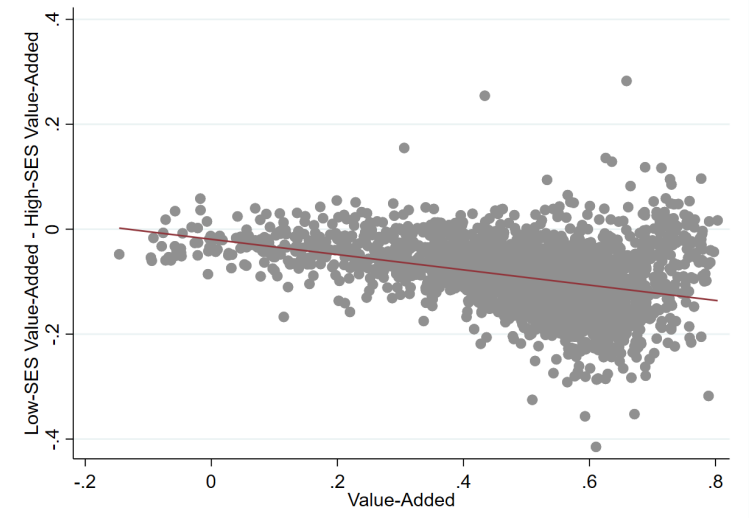


Figure 9: Difference Between Low-SES and High-SES Students' VA Along the VA Distribution

Notes: This figure shows the scatterplot and regression line of the school value-added measure on the x-axis and the difference between the low-SES and high-SES specific school value-added on the y-axis. The slope of the line of best fit is -0.146.

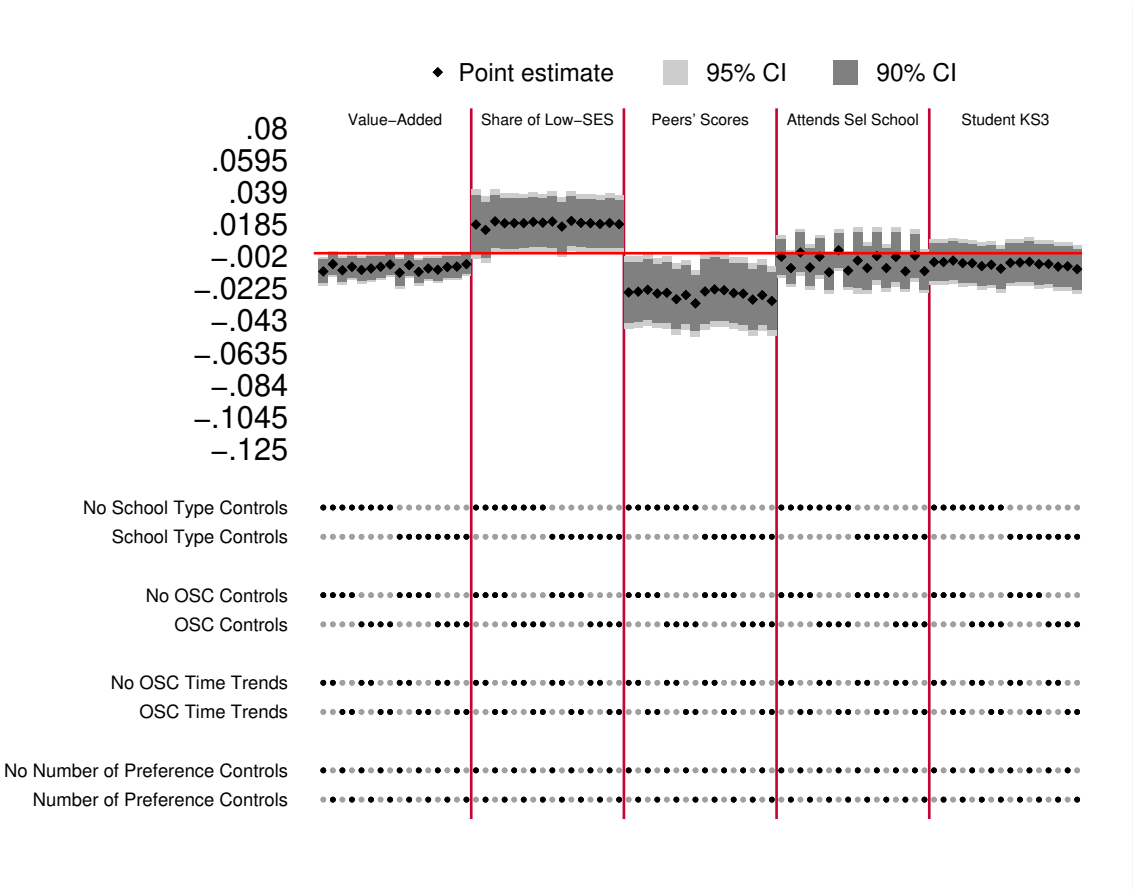


Figure 10: Robustness Checks for the Effect of the IA Ban

Notes: This figure presents robustness checks for the effect of the IA ban on the following outcomes separated by red bars: the school value-added (labelled as "Value-Added"), the share of low-SES peers (labelled as "Share of Low-SES"), peers' baseline score (labelled as "Peers' Scores"), probability of attending a selective school (labelled as "Attends Sel School"), and students' KS3 score (labelled as "Student KS3"). The four panels report whether we include (i) a set of controls for the share of schools of each type in each local authority, (ii) a set of controls for the share of schools that use each admission criterion in each local authority, (iii) time-trends for the share of schools that use each admission criterion, and (iv) controls for the number of preferences the local authority permits.

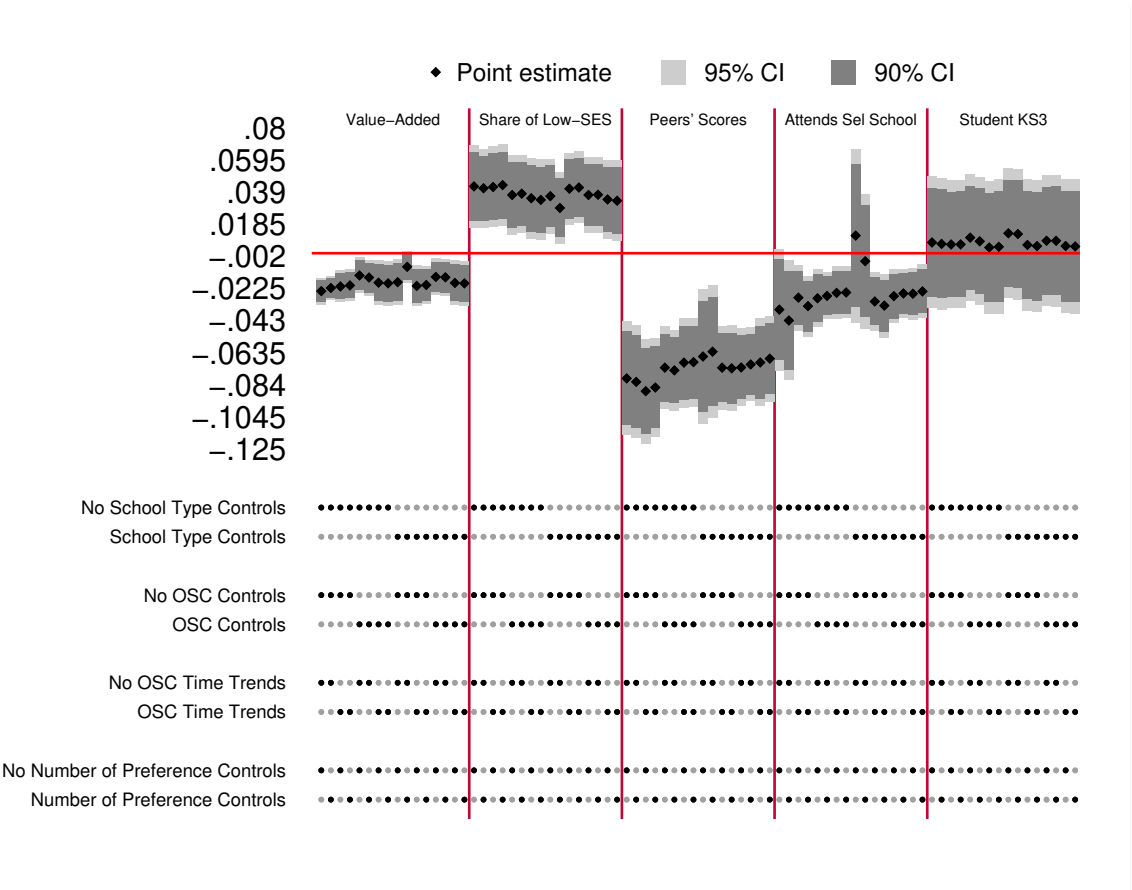
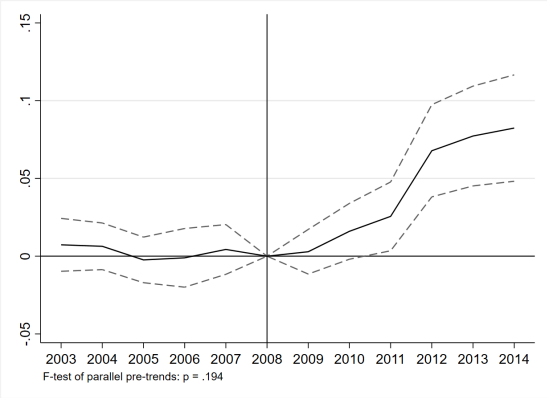


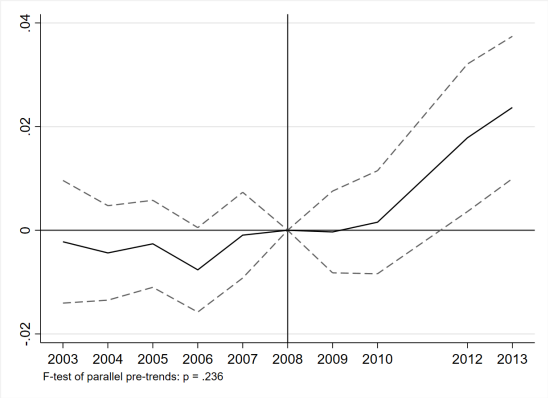
Figure 11: Robustness Checks for the Effect of the IA Ban (Competitive Local Authorities Only)

Notes: This figure presents robustness checks for the effect of the IA ban on the following outcomes separated by red bars: the school value-added (labelled as "Value-Added"), the share of low-SES peers (labelled as "Share of Low-SES"), peers' baseline score (labelled as "Peers' Scores"), probability of attending a selective school (labelled as "Attends Sel School"), and students' KS3 score (labelled as "Student KS3"). The four panels report whether we include (i) a set of controls for the share of schools of each type in each local authority (including the share of private schools), (ii) a set of controls for the share of schools that use each admission criterion in each local authority, (iii) time-trends for the share of schools that use each admission criterion, and (iv) controls for the number of preferences the local authority permits. Only competitive local authorities are shown in this figure.

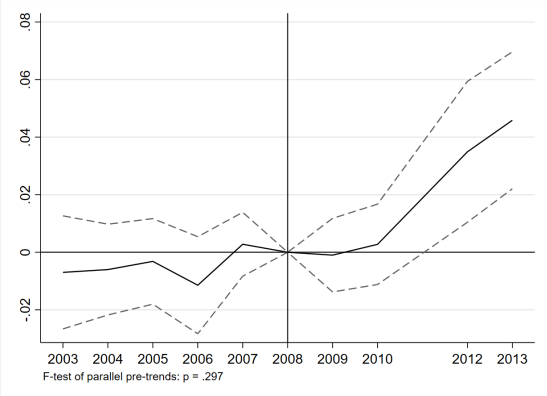
(a) % Low-SES Students



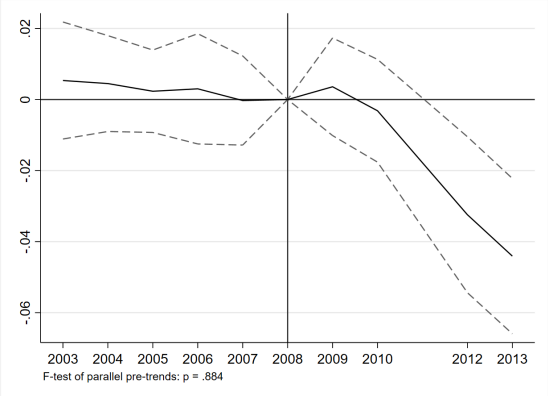
(b) % Students with Bottom 10% KS2 Score



(c) % Students with Bottom 25% KS2 Score



(d) % Students with Top 25% KS2 Score



(e) % Students with Top 10% KS2 Score

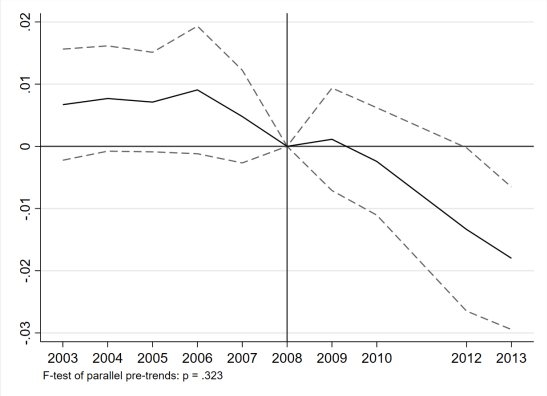


Figure 12: Event-Study Effect of the FPF Ban on FPF Schools' Composition (Relative to EP)

Notes: This figure provides a graphical visualization of pre-trends in outcomes by reporting coefficients (and 95% confidence intervals) from an event-study version of Equation (2) in which we replace the dummy variable equal to one for the post-reform years by a dummy for each year $Year_t$ (excluding 2008, the reference year, whose coefficient is set to zero). The coefficients we plot are the coefficients of the $FPF_s \cdot Year_t$ interaction terms which capture the change in outcome in FPF schools compared to the change in EP schools. Each regression contains the same set of controls as the ones in Equation (2), i.e controls for school-level characteristics including school type, and each admission criterion used by schools. We complement each regression with a formal F-test of whether the coefficients of the FPF-by-year effects are jointly equal to zero in the pre-reform years. The p-values of the test are reported in the bottom-left side of each graph. We report results for five school-level outcome variables: the share of Free School Meal recipients, the share of students whose KS2 test score is below the 90th and 75th percentiles of their cohort distribution, and the share of students whose KS2 test score is above the 25th and 10th percentiles.

Table 5: Effect of the FPF Ban on FPF School Composition

	Low	Student Test Score Percentile			
	SES	Bottom 10	Bottom 25	Top 25	Top 10
	(1)	(2)	(3)	(4)	(5)
Panel A. All Local Authorities					
FPF X Post-Reform	0.039***	0.014***	0.025***	-0.022***	-0.015***
	(0.010)	(0.004)	(0.008)	(0.007)	(0.004)
FPF	-0.026	-0.005	-0.011	0.020	0.014**
	(0.022)	(0.007)	(0.013)	(0.013)	(0.007)
Post-Reform	0.009	-0.003	-0.005	0.003	0.001
	(0.006)	(0.003)	(0.005)	(0.004)	(0.002)
Constant	0.323***	0.216***	0.418***	0.096***	0.016
	(0.032)	(0.014)	(0.044)	(0.029)	(0.016)
Scaled Effect	21.5%	13.3%	9.8%	-8.7%	-14.4%
Observations	11,024	8,574	8,574	8,574	8,574
R-squared	0.199	0.122	0.131	0.112	0.097
Panel B. Competitive Local Authorities					
FPF X Post-Reform	0.039**	0.017*	0.036**	-0.030**	-0.016**
	(0.018)	(0.009)	(0.014)	(0.012)	(0.006)
FPF	-0.071**	-0.009	-0.019	0.035**	0.025***
	(0.026)	(0.011)	(0.018)	(0.016)	(0.008)
Post-Reform	0.009	-0.005	-0.007	0.001	-0.001
	(0.010)	(0.007)	(0.011)	(0.007)	(0.003)
Constant	0.251***	0.092***	0.239***	0.248***	0.093***
	(0.053)	(0.015)	(0.028)	(0.039)	(0.022)
Scaled Effect	21.2%	16.9%	14.6%	-10.6%	-12.4%
Observations	3,371	2,620	2,620	2,620	2,620
R-squared	0.353	0.197	0.208	0.190	0.169

Notes: This table reports DiD estimates of the effect of preventing schools from using the first preference first admission criterion. Panel A. shows the results for all local authorities and panel B. shows the results for competitive local authorities. The DiD specification we use let a school-level outcome (Y_{st}) be a function of a dummy variable indicating whether a school is using the FPF admission criteria before the ban (FPF_s), a dummy variable equal to one for the post-reform years ($Post_t$), and the interaction between FPF and post-reform years $FPF_s \cdot Post_t$. Each regression includes a set of controls for school-level characteristics including school type, and each admission criterion used by schools. We cluster standard errors at the local authority level. We use five outcome variables: in each school, we compute the share of students who receive Free School Meal (FSM) who are also classified as low-SES students, as well as the share whose KS2 test score is below the 90th and 75th percentiles of their cohort distribution, and the share of students whose KS2 test score is above the 25th and 10th percentiles. *** denote significance at the 1 percent level, ** significance at the 5 percent level, and * significance at the 10 percent level.

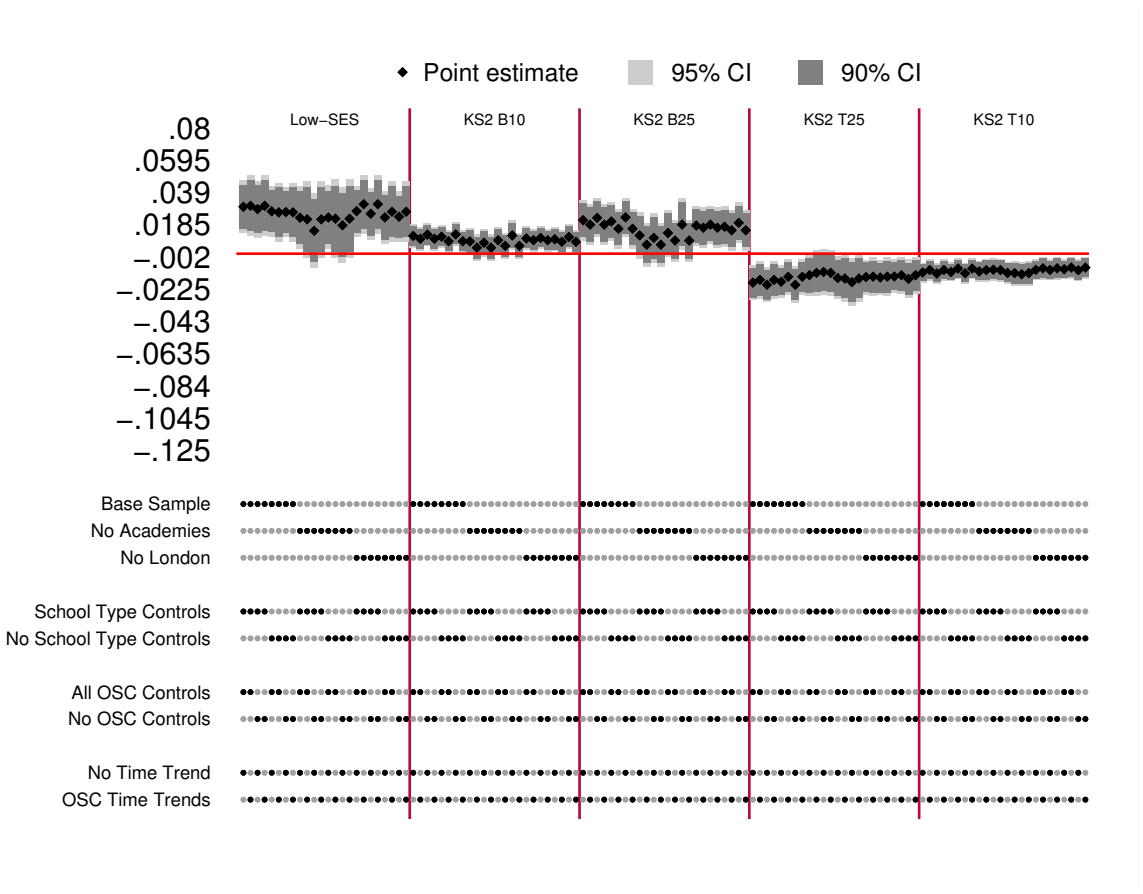


Figure 13: Robustness Checks for the Effect of the FPF Ban on FPF School Composition

Notes: This figure presents robustness checks for the effect of the FPF ban on FPF school composition. At the top of the figure we have the outcomes, which are separated by red bars, and are in order: the share of low-SES year 7 students (labelled as "Low-SES"), the share of year 7 students with a KS2 score in the bottom 10% of their cohort (labelled as "KS2 B10"), the share of year 7 students with a KS2 score in the bottom 25% of their cohort (labelled as "KS2 B25"), the share of year 7 students with a KS2 score in the top 25% of their cohort (labelled as "KS2 T25"), and the share of year 7 students with a KS2 score in the top 10% of their cohort (labelled as "KS2 T10"). Figure A.10 shows a detailed version of this Figure, outcome by outcome. The bottom part explains what sample and specification are used. The top panel reports the three samples used as alternatives to the main sample we use throughout the analysis (labelled as "Base Sample"): a sample that does not contain academy schools (labelled as "No Academies"), and a sample that excludes students from the local authorities in London (labelled as "No London"). The bottom three panels report whether we include (i) a set of controls for each school type, (ii) a set of controls for each admission criterion used by schools, and (iii) time-trends for each admission criterion.

References

Aaronson, Daniel, Lisa Barrow, and William Sander. 2007. "Teachers and Student Achievement in the Chicago Public High Schools." *Journal of Labor Economics*, 25(1): 95–135.

Abdulkadiroğlu, Atila, and Tayfun Sönmez. 2003. "School Choice: A Mechanism Design Approach." *American Economic Review*, 93(3): 729–747.

Abdulkadiroğlu, Atila, Parag A. Pathak, Alvin E. Roth, and Tayfun Sönmez. 2006. "Changing the Boston School Choice Mechanism : Strategy-proofness as Equal Access." NBER Working Paper 11965.

Abdulkadiroğlu, Atila, Parag A. Pathak, and Christopher R. Walters. 2018. "Free to Choose: Can School Choice Reduce Student Achievement?" *American Economic Journal: Applied Economics*, 10(1): 175–206.

Abdulkadiroğlu, Atila, Parag A. Pathak, Jonathan Schellenberg, and Christopher R. Walters. 2020. "Do Parents Value School Effectiveness?" *American Economic Review*, 110(5): 1502–1539.

Abdulkadiroğlu, Atila, Yeon Koo Che, and Yosuke Yasuda. 2011. "Resolving Conflicting Preferences in School Choice: The "Boston Mechanism" Reconsidered." *American Economic Review*, 101(1): 399–410.

Agarwal, Nikhil, and Paulo Somaini. 2018. "Demand Analysis Using Strategic Reports: An Application to a School Choice Mechanism." *Econometrica*, 86(2): 391–444.

Ajayi, Kehinde F. Forthcoming. "School Choice and Educational Mobility: Lessons from Secondary School Applications in Ghana." *Journal of Human Resources*.

Akbarpour, Mohammad, Adam Kapor, Christopher Neilson, Winnie van Dijk, and Seth Zimmerman. 2022. "Centralized School choice with unequal outside options." *Journal of Public Economics*, 210: 104644.

Angrist, Joshua, Peter Hull, Parag A. Pathak, and Christopher R. Walters. 2020. "Simple and Credible Value-Added Estimation Using Centralized School Assignment." NBER Working Paper 28241.

Athey, Susan, and Guido W. Imbens. 2022. "Design-based analysis in Difference-In-Differences settings with staggered adoption." *Journal of Econometrics*, 226(1): 62–79.

Avery, Christopher, and Jonathan Levin. 2010. "Early Admissions at Selective Colleges." *American Economic Review*, 100(5): 2125–2156.

Avery, Christopher, Andrew Fairbanks, and Richard Zeckhauser. 2003. *The Early Admissions Game: Joining the Elite*. Harvard University Press.

Basteck, Christian, Katharina Huesmann, and Heinrich Nax. 2015. "Matching Practices for Secondary Schools in Germany." Matching in Practice Country Profile 21.

Bayer, Patrick, Fernando Ferreira, and Robert McMillan. 2007. "A Unified Framework for Measuring Preferences for Schools and Neighborhoods." *Journal of Political Economy*, 115(4): 588–638.

Bergman, Peter, and Isaac McFarlin. 2018. "Education for All? A Nationwide Audit Study of School Choice." NBER Working Paper 25396.

Biro, Peter. 2012. "Matching Practices for Secondary Schools in Hungary." Matching in Practice Country Profile 6.

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

Bo, Inacio, and Rustamdjan Hakimov. 2020. "Iterative Versus Standard Deferred Acceptance: Experimental Evidence." *The Economic Journal*, 130(626): 356–392.

Borusyak, Kirill, and Xavier Jaravel. 2018. "Revisiting Event Study Designs." SSRN Working Paper 2826228.

Braun, Sebastian, Nadja Dwenger, and Dorothea Kübler. 2010. "Telling the Truth May Not Pay Off: An Empirical Study of Centralized University Admissions in Germany." *B.E. Journal of Economic Analysis and Policy*, 10(1).

Burgess, Simon, Ellen Greaves, Anna Vignoles, and Deborah Wilson. 2015. "What Parents Want: School Preferences and School Choice." *Economic Journal*, 125(587): 1262–1289.

Calsamiglia, Caterina. 2014. "Matching Practices for Elementary and Secondary Schools in Spain." Matching in Practice Country Profile 17.

Calsamiglia, Caterina, and Antonio Miralles. 2016. "Catchment Areas and Access to Better Schools." *Working Paper*.

Calsamiglia, Caterina, and Maia Güell. 2018. "Priorities in School Choice: The Case of the Boston Mechanism in Barcelona." *Journal of Public Economics*, 163: 20–36.
Calsamiglia, Caterina, Chao Fu, and Maia Güell. 2020. "Structural Estimation of a Model of School Choices: The Boston Mechanism versus Its Alternatives." *Journal of Political Economy*, 128(2): 642–680.
Calsamiglia, Caterina, Francisco Martínez-Mora, and Antonio Miralles. 2021. "School choice design, risk aversion and cardinal segregation." *The Economic Journal*, 131(635): 1081–1104.
Calsamiglia, Caterina, Guillaume Haeringer, and Flip Klijn. 2011. "A Comment on "School Choice: An Experimental Study"." *Journal of Economic Theory*, 146(1): 392–396.
Carrell, Scott E., Bruce I. Sacerdote, and James E. West. 2013. "From Natural Variation to Optimal Policy? The Importance of Endogenous Peer Group Formation." *Econometrica*, 81(3): 855–882.
Carter, Graham. 2006. "The New School Admissions Code - Preference Arrangements." *CSN conference*.
Carter, Graham, Parag A. Pathak, and Camille Terrier. 2020. "Matching practices for Primary and Secondary Schools - England." *Matching in Practice Country Profile 30*.
CCAS Project. 2021. "CCAS Project."
Chandra, Amitabh, Amy Finkelstein, Adam Sacarny, and Chad Syverson. 2016. "Health Care Exceptionalism? Performance and Allocation in the US Health Care Sector." *American Economic Review*, 106(8): 2110–2144.
Chen, Li. 2012. "Matching Practices for Secondary Schools in Ireland." Matching in Practice Country Profile 11.
Chen, Yan, and Onur Kesten. 2017. "Chinese College Admissions and School Choice Reforms: A Theoretical Analysis." *Journal of Political Economy*, 125(1): 99–139.
Chen, Yan, and Onur Kesten. 2019. "Chinese College Admissions and School Choice Reforms: An Experimental Study." *Games and Economic Behavior*, 115: 83–100.
Chen, Yan, and Tayfun Sönmez. 2006. "School Choice: An Experimental Study." *Journal of Economic Theory*, 127(1): 202–231.
Chen, Yan, Ming Jiang, and Onur Kesten. 2020. "An Empirical Evaluation of Chinese College Admissions Reforms Through a Natural Experiment." *Proceedings of the National Academy of Sciences*, 117(50): 31696–31705.
Chetty, Raj, John N. Friedman, and Jonah E. Rockoff. 2014. "Measuring the Impacts of Teachers I: Evaluating Bias in Teacher Value-Added Estimates." *American Economic Review*, 104(9): 2593–2632.
Coldron, John, Tanner, Emily, Finch, Steve, Shipton, Lucy, Wolstenholme, Claire, Willis, Ben, Demack, Sean, and Stiell, Bernadette. 2008. *Secondary School Admissions.* Annesley, Nottingham:DfES Publications.
Cullen, Julie Berry, Brian A Jacob, and Steven Levitt. 2006. "The Effect of School Choice on Participants: Evidence from Randomized Lotteries." *Econometrica*, 74(5): 1191–1230.
DeArmond, Michael, Ashley Jochim, and Robin Lake. 2014. "Making School Choice Work." Center on Reinventing Public Education.
de Chaisemartin, Clément, and Xavier D'Haultfœuille. 2020. "Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects." *American Economic Review*, 110(9): 2964–2996.
Dee, Thomas S. 2004. "Teachers, Race, and Student Achievement in a Randomized Experiment." *Review of Economics and Statistics*, 86(1): 195–210.
De Haan, Monique, Pieter A Gautier, Hessel Oosterbeek, and Bas Van der Klaauw. 2023. "The Performance of School Assignment Mechanisms in Practice." *Journal of Political Economy*, 131(2): 388–455.
Deming, David J., Justine S. Hastings, Thomas J. Kane, and Douglas O. Staiger. 2014. "School Choice, School Quality, and Postsecondary Attainment." *American Economic Review*, 104(3): 991–1013.
Department for Education. 2024. "National Pupil Database." *https://www.find-npd-data.education.gov.uk/*.
Ding, Tingting, and Andrew Schotter. 2019. "Learning and Mechanism Design: An Experimental Test of School Matching Mechanisms with Intergenerational Advice." *Economic Journal*, 129(623): 2779–2804.
Dur, Umut, Robert G. Hammond, and Thayer Morrill. 2018. "Identifying The Harm of Manipulable School-Choice Mechanisms." *American Economic Journal: Economic Policy*, 10(1): 187–213.
Elacqua, Gregory, Maria Luisa Iribarren, and Humberto Santos. 2018. "Private schooling in Latin America: Trends and Public Policies." Inter-American Development Bank Technical Note IDB-TN-01555.
Ellison, Glenn, and Parag Pathak. 2021. "The Efficiency of Race-Neutral Alternatives to Race-Based Affirmative Action: Evidence from Chicago's Exam Schools." *American Economic Review*, 111(3): 943–975.

Ergin, Haluk, and Tayfun Sönmez. 2006. "Games of School Choice Under the Boston Mechanism." *Journal of Public Economics*, 90(1-2): 215–237.

Eyles, Andrew, and Stephen Machin. 2019. "The Introduction of Academy Schools to England's Education." *Journal of the European Economic Association*, 17(4): 1107–1146.

Eyles, Andrew, Stephen Machin, and Sandra McNally. 2017. "Unexpected School Reform: Academisation of Primary Schools in England." *Journal of Public Economics*, 155: 108–121.

Featherstone, Clayton R., and Muriel Niederle. 2016. "Boston Versus Deferred Acceptance in an Interim Setting: An Experimental Investigation." *Games and Economic Behavior*, 100: 353–375.

Goodman-Bacon, Andrew. Forthcoming. "Difference-in-Differences with Variation in Treatment Timing." *Journal of Econometrics*.

Greaves, Ellen, Iftikhar Hussain, Birgitta Rabe, and Imran Rasul. 2021. "Parental Responses to Information About School Quality: Evidence from Linked Survey and Administrative Data." CEPR Discussion Paper 16406.

Haeringer, Guillaume, and Flip Klijn. 2009. "Constrained School Choice." *Journal of Economic Theory*, 144(5): 1921–1947.

Hakimov, Rustamdjan, and Dorothea Kubler. 2021. "Experiments on Centralized School Choice and College Admissions: A Survey." *Experimental Economics*, 24(2): 434–488.

Hastings, Justine S., and Jeffrey M. Weinstein. 2008. "Information, School Choice, and Academic Achievement: Evidence from Two Experiments." *Quarterly Journal of Economics*, 123(4): 1373–1414.

Hastings, Justine S, Thomas J Kane, and Douglas O Staiger. 2009. "Heterogeneous Preferences and the Efficacy of Public School Choice." NBER Working Paper 12415.

He, Yinghua. 2017. "Gaming the Boston School Choice Mechanism in Beijing." TSE Working Paper.

Hiller, Victor, and Victor Hiller Tercieux. 2013. "Matching Practices in Secondary Schools in France." Matching in Practice Country Profile 16.

Hofflinger, Alvaro, Denisse Gelber, and Santiago Tellez Cañas. 2020. "School Choice and Parents' Preferences for School Attributes in Chile." *Economics of Education Review*, 74: 101946.

Hussain, Iftikhar. 2009. "Essays in Household Economics and Economics of Education." PhD Thesis, University College London.

Hussain, Iftikhar. 2015. "Subjective Performance Evaluation in the Public Sector Evidence from School Inspection." *Journal of Human Resources*, 50(1): 189–221.

Hussain, Iftikhar. 2020. "Housing Market and School Choice Response to School Quality Information Shocks." Unpublished manuscript.

Hwang, Sam Il Myoung. 2017. "How Does Heterogeneity In Beliefs Affect Students In the Boston Mechanism?" Working Paper.

Kane, Thomas J., and Douglas O. Staiger. 2002. "The Promise and Pitfalls of Using Imprecise School Accountability Measures." *Journal of Economic Perspectives*, 16(4): 91–114.

Kane, Thomas J., Daniel F. Mccaffrey, Trey Miller, and Douglas O. Staiger. 2013. "Have We Identified Effective Teachers? Validating Measures of Effective Teaching using Random Assignment." Research Paper. MET Project. Bill & Melinda Gates Foundation.

Kapor, Adam J., Christopher A. Neilson, and Seth D. Zimmerman. 2020. "Heterogeneous beliefs and school choice mechanisms." *American Economic Review*, 110(5): 1274–1315.

Koedel, Cory. 2009. "An Empirical Analysis of Teacher Spillover Effects in Secondary School." *Economics of Education Review*, 28(6): 682–692.

Koedel, Cory, Kata Mihaly, and Jonah E. Rockoff. 2015. "Value-Added Modeling: A Review." *Economics of Education Review*, 47: 180–195.

Luflade, Margaux, and Meryam Zaiem. 2017. "Do Elite Schools Improve Students Performance? Evidence from Tunisia." Working Paper.

Miralles, Antonio. 2009. "School Choice: The Case for the Boston Mechanism." Working Paper.

Morris, Carl N. 1983. "Parametric Empirical Bayes Inference: Theory and Applications." *Journal of the American Statistical Association*, 78(381): 47–55.

Moshoeshoe, Ramaele. 2020. "Long-Term Effects of Free Primary Education on Educational Achievement: Evidence from Lesotho." World Bank Working Paper, Washington, DC. Accepted: 2020-09-24T18:36:51Z.

OECD. 2017. "The Romanian education system." OECD, Paris.

Pais, Joana, and Ágnes Pintér. 2008. "School Choice and Information: An Experimental Study on Matching Mechanisms." *Games and Economic Behavior*, 64(1): 303–328.

Pathak, Parag A. 2016. "What Really Matters in Designing School Choice Mechanisms." in Advanced in Economics and Econometrics, 11th World Congress of the Econometric Society, eds. Larry Samuelson, Cambridge University Press.

Pathak, Parag A., and Tayfun Sönmez. 2008. "Leveling the Playing Field: Sincere and Sophisticated Players in the Boston Mechanism." *American Economic Review*, 98(4): 1636–1652.

Pathak, Parag A., and Tayfun Sönmez. 2013. "School admissions Reform in Chicago and England: Comparing Mechanisms by Their Vulnerability to Manipulation." *American Economic Review*, 103(1): 80–106.

Salonen, Mikko A.A. 2014. "Matching Practices for Secondary Schools in Finland." Matching in Practice Country Profile 19.

Santos, Humberto, and Gregory Elacqua. 2016. "Socioeconomic School Segregation in Chile: Parental Choice and a Theoretical Counterfactual Analysis." *CEPAL Review*, 119.

Song, Yan, Kentaro Tomoeda, and Xiaoyu Xia. 2020. "Sophistication and Cautiousness in College Applications." SSRN Working Paper 3711118.

Sun, Liyang, and Sarah Abraham. 2021. "Estimating Dynamic Treatment Effects in Event Studies with Heterogeneous Treatment Effects." *Journal of Econometrics*, 225(2): 175–199.

Terrier, Camille, Parag A. Pathak, and Kevin Ren. 2024. "Data and Code for: From Immediate Acceptance to Deferred Acceptance: Effects on School Admissions and Achievement in England." American Economic Association [Publisher], Inter-university Consortium for Political and Social Research [Distributor].

Troyan, Peter. 2012. "Comparing School Choice Mechanisms by Interim and Ex-Ante Welfare." *Games and Economic Behavior*, 75(2): 936–947.

UK Government. 2024*a*. "Find Open Data - Data.Gov.Uk." *https://www.data.gov.uk/*.

UK Government. 2024*b*. "Get Information about Schools - GOV.UK." *https://get-information-schools.service.gov.uk/*.

A Additional Figures and Tables

Table A.1: Countries that use IA or DA and have selective secondary schools

Country	Mechanism	Selective Schools in Main Mechanism
Argentina	IA	Yes** (Elacqua, Iribarren and Santos, 2018)
Chile	DA (Student-Proposing)	Yes (Santos and Elacqua, 2016)
Finland	DA (School-Proposing)	Yes** (Salonen, 2014)
France	DA (School-Proposing)	Yes** (Hiller and Tercieux, 2013)
Germany	IA	Yes* (Basteck, Huesmann and Nax, 2015)
Ghana	DA (Student-Proposing)	Yes (Ajayi, Forthcoming)
Hungary	DA (Student-Proposing)	Yes** (Biro, 2012)
Ireland	IA	Yes** (Chen, 2012)
Lesotho	IA	Yes** (Moshoeshoe, 2020)
Netherlands	DA (Student-Proposing)	Yes* (De Haan et al., 2023)
Romania	DA (School-Proposing)	Yes* (OECD, 2017)
Spain	IA	No (Calsamiglia, 2014)
Tunisia	DA (School-Proposing)	Yes (Luflade and Zaiem, 2017)
United Kingdom	DA (Student-Proposing)	Yes

Notes: This tables shows countries that use either immediate acceptance (IA) or deferred acceptance (DA) to assign secondary school students and whether these countries have selective schools in the main assignment mechanism. Information on the presence of selective schools in the main assignment mechanism are in parentheses by country. * indicates that the secondary school assignment system first allocates students into different types of secondary schools with some being more academically oriented. Selection into these types is at least in part based on academic performance. Then students are allocated to a school within their type using an assignment mechanism. ** indicates that secondary schools can use academic performance as a priority or selection criterion but there is no explicit mention of selective schools as in the British system. Finally, no symbol means that there is an explicit selective school presence.

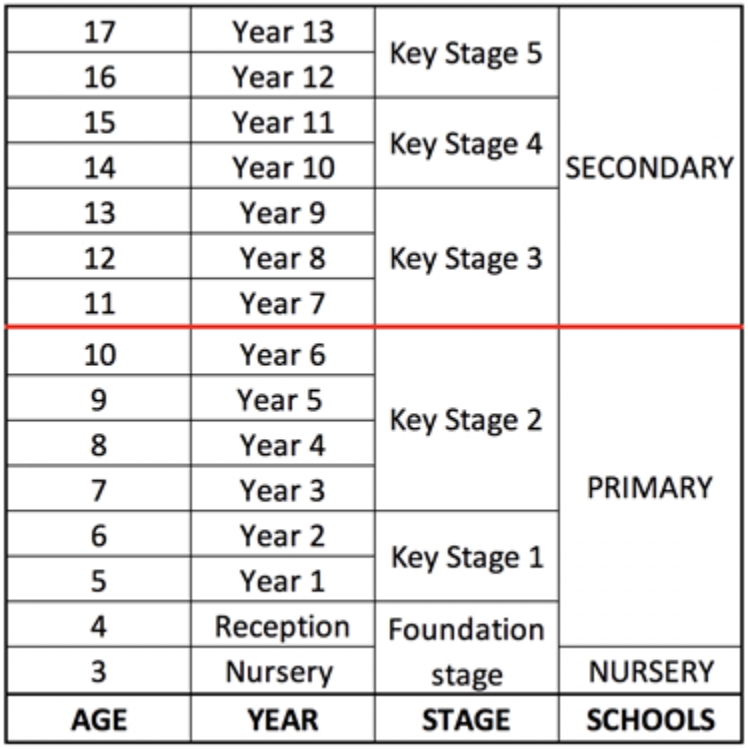


Figure A.1: British Education System

Notes: This figure presents the British education system, which is divided into primary education (from ages 5 to 10) and secondary education (from ages 11 to 16). Primary education corresponds to Key Stage 1 and 2, while secondary education corresponds to Key Stage 3 and 4, and 5. In this paper, we focus on admissions to secondary schools in England at age 11.

Criteria	2003 code	2007 code
First Preference First	NO REFERENCE	2.13 In setting oversubscription criteria the admission authorities for all maintained schools **must not give priority to children according to the order of other schools named as preferences by their parents, including 'first preference first' arrangements.**
Parental commitment	NO REFERENCE	2.13 In setting oversubscription criteria the admission authorities for all maintained **schools must not give priority to children according to their parents' willingness to give practical support** to the ethos of the school or to support the school financially or in some other way.
Children of associated adults	NO REFERENCE	2.13 In setting oversubscription criteria the admission authorities for all maintained schools **must not give priority to children whose parents are current or former staff or governors or who have another connection to the school**.
Children in care	3.14 Children in public care are a disadvantaged group who have very low average levels of attainment, often related to frequent changes of school because their care placements change. **It is recommended that all admission authorities give these children top priority in their oversubscription criteria.** Schools designated by the Department as having a religious character may give priority to looked after children of their faith over those children belonging to other faiths. Schools will then also be able to offer places that become available in the school year to these children first over others on the waiting list, if one is maintained, to ensure that they are quickly placed in a school to meet their needs.	2.7 Children in care are among the most vulnerable children in society and it is of paramount importance that a school place is found that is in the best interests of the child as quickly as possible. **All admission authorities must give highest priority in their oversubscription criteria to these children** as required by the Education (Admission of Looked after Children) (England) Regulations 2006. The practical effect of this is that in a school's published admission arrangements the first and highest oversubscription criterion must be in respect of these children.
Siblings	3.5 **Commonly used and acceptable criteria include sibling links**, distance from the school, ease of access by public transport, medical or social grounds (with an explanation of what evidence is required and how this will be assessed), catchment areas, transfer from named feeder primary schools and whether the child is in public care.	**Siblings of children who are still at the school** 2.17 **Many parents will want their children to attend the same school and most admission authorities recognize this and give priority in admissions to siblings. This is generally good practice**, with the limited exceptions set out below in the case of the small number of partially selective schools which select more than 10% of their intake by aptitude or ability (see paragraph 2.20), and at those designated grammar schools that rank children according to their performance in a test and allocate places to those who score the highest (see paragraph 2.13(n)). **Schools that use any form of selection or banding** and test children must observe the provision at paragraph 2.89. [2.89. Admission authorities must not adjust the score achieved by any child in a test in order to take account of oversubscription criteria, such as having a sibling at the school.] Giving priority to siblings particularly supports families with young children of primary school age who may not be able to travel independently. Admission authorities should also consider carefully how other relatives, including those adopted or others living permanently in the household will be treated if a sibling criterion is adopted, and must make this clear in information provided to parents including how terms such as step-children will be defined. **Siblings at secondary schools and schools that select 10% or less by ability or aptitude** 2.19 At secondary school age, children are usually more independent [than at primary schools] but many parents will still want their children to attend the same schools. **Giving**

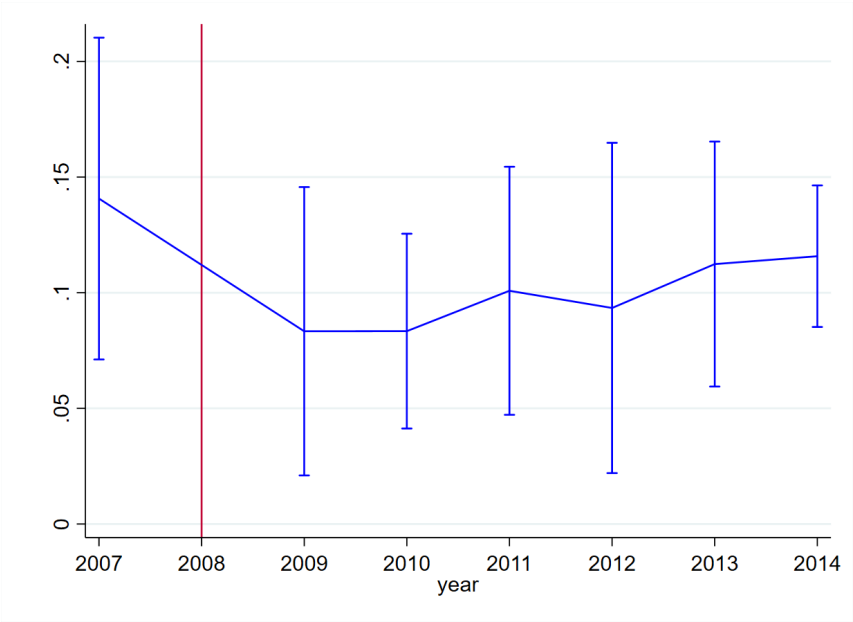
Figure A.2: Changes in Oversubscription Criteria Between the 2003 and 2007 School Admissions Codes

Criteria	2003 code	2007 code
		priority to siblings at secondary schools that have no more than 10% selection by ability or aptitude is acceptable and can be good practice. **Siblings at secondary schools that select more than 10% of their intake by ability or aptitude** 2.20 A number of secondary schools are permitted under section 100 of the School Standards and Framework Act 1998 to use pre-existing partial selection by ability or aptitude and a number of these admit substantially more than 10% of their intake in this way. Some of these schools give priority for their nonselective places to siblings of children already at the school – whether or not those older siblings secured selective or non-selective places. This reduces the number of non-selective places available to children who do not have siblings at the school. The Government believes that this may lead to the school's intake including a disproportionately high number of children who would have passed the selection test, as some younger siblings would be likely to have passed the selection test if they had taken it. At the same time, the chance for children who would not have passed the test to gain a place at the school would be correspondingly reduced. It is often the case that children admitted by selection are drawn from a much wider area than those who are not and this reduces the number of non-selective places for children who live closer to the school. Where there are a number of partially selective schools in an area this problem is exacerbated. **Former siblings** 2.13 In setting oversubscription criteria the admission authorities for all maintained schools **must not allocate places at a school on the basis that a sibling or other relative is a former pupil**, including siblings who were on roll at the time of application but will have left by the time the child starts school.
Medical/ social needs	3.5 Commonly used and acceptable criteria include sibling links, distance from the school, ease of access by public transport, **medical or social grounds (with an explanation of what evidence is required and how this will be assessed),** catchment areas, transfer from named feeder primary schools and whether the child is in public care.	2.24 If admission authorities propose to give higher priority to children for social or medical reasons they must ensure that in doing so they are not failing to comply with paragraph 2.13(g) of this Code, which prohibits the use of oversubscription criteria that discriminate against or disadvantage children because of their special educational needs or disabilities. 2.25 **Admission authorities must not use this criterion to give a child a lower priority in obtaining a place at the school**, but **it is acceptable to give higher priority to children or families where there is a social or medical need** (for example where one or both parents or the child has a disability that may make travel to a school further away more difficult).
Catchment	3.5 Commonly used and acceptable criteria include sibling links, distance from the school, ease of access by public transport, medical or social grounds (with an explanation of what evidence is required and how this will be assessed), **catchment areas**, transfer from named feeder primary schools and whether the child is in public care.	2.35 **The 1997 Rotherham40 Judgment confirmed that there is nothing unlawful in the principle of admission authorities operating catchment areas as part of their oversubscription criteria and thereby giving priority to local children whose parents have expressed a preference for the school**. However, admission authorities must not guarantee places to parents in a local catchment area, in case the pattern of preferences expressed does not allow this guarantee to be met. In drawing up catchment areas, admission authorities should ensure that they reflect the diversity of the community served by the school, and must not exclude particular housing estates or addresses in a way that might

Criteria	2003 code	2007 code
		disadvantage particular social groups. A catchment area does not prevent parents expressing a preference for the school if they do not live in the area. 2.36 Local authorities and admission authorities must not suggest that parents are required to express a preference for the school in whose catchment area they live, or that they have been allocated a place at that school before they have expressed a preference. Local authorities must be clear that parents have a statutory right to express a preference for any school they choose, although they should explain the possible consequences of not expressing a preference for a school in whose catchment area they live. 2.37 Some schools have adopted inner and outer catchment areas and these work well for some specialist schools in particular by extending choice to more parents. These work by giving priority for a specified number of places in the inner catchment area and the remaining places in the outer area. 2.38 Some schools establish a number of small catchment areas some of which are some distance from school. This practice can exclude some families and if used along with certain other criteria such as partial selection by ability or aptitude or siblings can substantially limit the number of places for families living nearer the school. If using catchment areas in this way admission authorities should take into account the possible effect of their other oversubscription criteria and the admission arrangements at other schools in the area in limiting access to the school. 2.39 For children of UK Service personnel and other Crown Servants admission authorities must treat a family returning to their area as meeting the residency criteria for that catchment area even if no house is currently owned in that area once proof of the posting has been provided. 2.40 Where catchment areas or distance from the school are used as oversubscription criteria, admission authorities should provide a map of the areas, and indicate how far parents within those areas have succeeded in getting places in the past, and whether that is likely to be a guide for the future. Catchment areas must not be set after applications have been made.
Feeder schools	3.5 Commonly used and acceptable criteria include sibling links, distance from the school, ease of access by public transport, medical or social grounds (with an explanation of what evidence is required and how this will be assessed), catchment areas, **transfer from named feeder primary schools** and whether the child is in public care.	2.66 The use of named feeder [primary] schools allows local continuity and can support good curriculum and geographical links between phases in an area. **Admission authorities must ensure that such arrangements do not disadvantage children from more deprived areas, for example they must not include only feeder primaries that serve more advantaged groups and leave out schools that are a similar distance from the school but serve less advantaged groups**.
Special Education Needs	**Children with special educational needs and banding** 2.84 Children with special educational needs can be included in banding arrangements, that is they can be allocated to the	2.6 **All governing bodies are required by section 324 of the Education Act 1996 to admit to the school a child with a statement of special education needs that names the school. This is not an oversubscription criterion. Schools must admit such children whether they have places or not**.

Criteria	2003 code	2007 code
	band appropriate to their ability, **but schools must not refuse to admit a child with a statement that names the schoo**l.	
Faith related	3.9 Schools designated by the Department as having a religious character **may give preference in their admission arrangements to members of a particular faith or denomination** (as may be required by their Trust Deed), providing this does not conflict with other legislation, such as race relations legislation. Where they do, their admission arrangements **should make clear whether a statement of religious affiliation or commitment would be sufficient**; whether it is to be 'tested' for admission purposes and if so, how; and what, if any, references would be required from the family's priest, Minister or other religious leader and how they will be used to decide on the application. 3.10 Faith schools can contribute to community cohesion by having admission arrangements that are inclusive of other faiths and of all elements of the population of their local area. Some faith schools already achieve inclusiveness by designating a proportion of places for which children of their own faith or denomination will be given priority, and the remainder as community or open places for which local children will be given priority. Note: this is quite different from 'quotas' which would reserve places solely for particular groups, and would mean leaving places empty if not enough members of those groups apply. With the repeal by the Education Act 2002 of section 91 of the School Standards and Framework Act 1998, it is no longer possible for foundation and aided schools with a religious character to agree special arrangements with their LEA by which they can keep places empty if they do not have enough applications from their particular faith or denomination. Where evidence of commitment to another faith (or denomination) is required, the guidance in paragraph 3.9 applies. 3.11 **The governing bodies of Church of England schools that are their own admission authorities must consult their local Diocesan Board** about the admission arrangements they are proposing to have for their schools before they go out to statutory consultation with other admission authorities, and they must have regard to the Board's advice.	2.41 It is unlawful under section 49 of the Equality Act 2006 for maintained, non-maintained or independent schools to discriminate against a child on the grounds of the child's religion or belief in the terms on which it offers to admit him as a pupil or by refusing to accept an application for a place at the school. **However, those schools designated by the Secretary of State as having a religious character (faith schools) are exempt and are permitted to use faith-based oversubscription criteria in order to give higher priority in admissions to children who are members of, or who practice, their faith or denomination**. This only applies if a school is oversubscribed. 2.42 Faith-based oversubscription criteria must be framed so as not to conflict with other legislation, such as equalities and race relations legislation (see Appendix 1) or the mandatory provisions of this Code. As with all other maintained schools, faith schools are required by section 86 of the School Standards and Framework Act 1998 to offer every child who applies, whether of their faith, another faith or no faith, a place at the school if there are places available. 2.43 **As with all oversubscription criteria, those that are faith-based must be clear, objective and fair**. Parents must easily be able to understand how the criteria will be satisfied. It is primarily for the relevant faith provider group or religious authority to decide how membership or practice is to be demonstrated, and, accordingly, in determining faith-based oversubscription criteria, admission authorities for faith schools should only use the methods and definitions agreed by their faith provider group or religious authority (see paragraph 2.47). It is good practice for the governing bodies of all faith schools that are their own admission authority and that are proposing to use faith-based oversubscription criteria to consult their religious authority before going out to statutory consultation with other admission authorities. 2.44 **The governing bodies of Church of England schools that are their own admission authorities must consult their local Diocesan Board** about the admission arrangements they are proposing for their schools before they go out to statutory consultation with other admission authorities, and they should follow the Board's advice.

(a) Competitive IA and DA Local Authorities



(b) Non-Competitive IA and DA Local Authorities

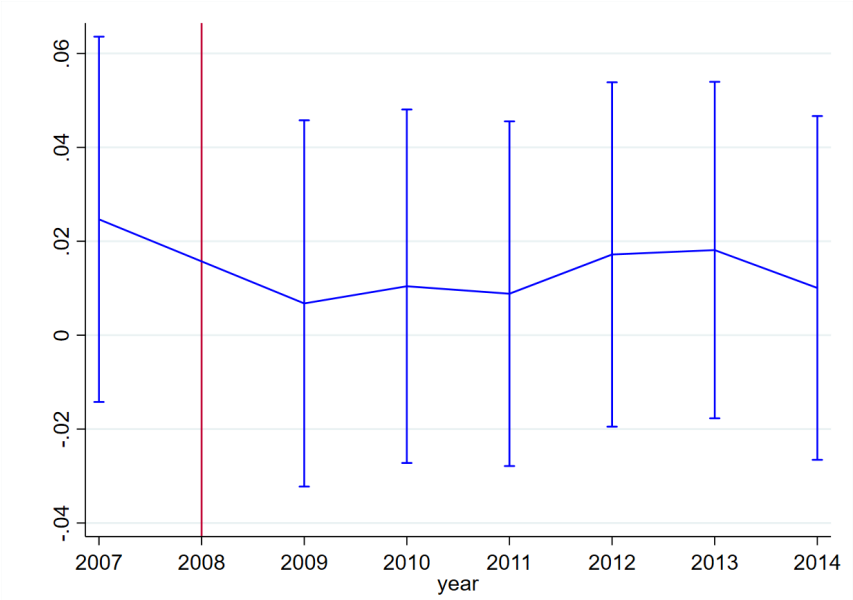
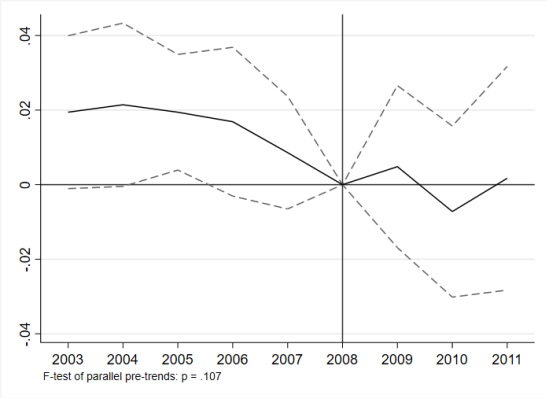


Figure A.3: First Choice Accommodation (with Preference Controls)

Notes: This figure reports the β_t coefficients from the following regression: $y_{it} = \sum_{t \in \mathcal{T}} \beta_t IA_i \cdot T_t + X_i'\delta + \varepsilon_{it}$ where y_{it} is the proportion of students in local authority i in year t receiving their first choice, $\mathcal{T}$ is the set of years that have first choice data from 2007 onwards, IA_i is a dummy variable that is equal to one for IA local authorities, T_t is an indicator for the year t, X_i is a vector of local authority level controls, and ε_{it} is an idiosyncratic error term. The specification shown in this figure controls for the number of preferences in the local authority. Panel (a) is the regression for competitive local authorities, which have a share of selective schools in the top quartile of all local authorities. Non-competitive local authorities are all remaining local authorities. We show the 95% confidence interval of all coefficients. We cluster standard errors at the local authority level.

(a) All local authorities



(b) Competitive local authorities

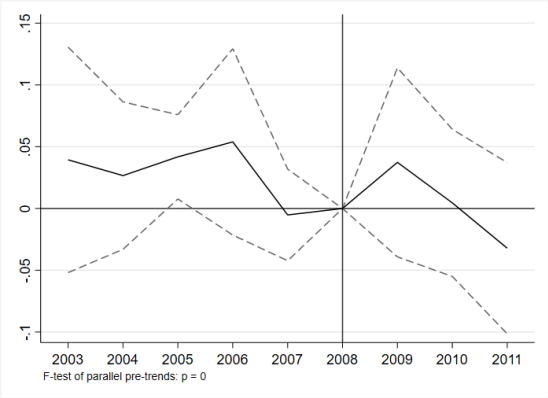


Figure A.4: Event-study evolution of student KS3 scores in IA vs. DA local authorities

Notes: This figure reports coefficients (and 95% confidence intervals) from an event-study regression in which we regress student KS3 test scores on a dummy equal to one for IA local authorities (IA_l), a dummy equal to one for each year between 2003 and 2011 (excluding 2008, the reference year, whose coefficient is set to zero), $Year_t$, and interaction terms between the IA binary variable and each year binary variables. The coefficients we plot are the coefficients of the $IA_l \cdot Year_t$ interaction terms which indicate whether the change in student KS3 scores in IA local authorities was larger than the change in student KS3 scores in DA local authorities. Each regression controls for a vector of LA-level control variables for the average share of each school type (including the share of private schools), the share of schools that use each admission criterion, and the number of schools that students can rank on their list. The coefficient in year t captures the KS3 scores of students who entered secondary school in year t and for whom we observe the KS3 score in year $t+3$. We complement each regression with a formal F-test of whether the coefficients of the IA-by-year effects are jointly equal to zero in the pre-reform years.

Table A.2: Likelihood of Attending a Selective School

Low-SES X Post-Reform	-0.002
	(0.006)
Low-SES	-0.061**
	(0.024)
Post-Reform	0.009
	(0.007)
Constant	0.123***
	(0.040)
Observations	1,959,497
R-squared	0.006

Notes: This table shows the regression output from regressing whether a student attends a selective school onto an FSM dummy, reform dummy, and their interaction. The sample contains students in DA local authorities only. Standard errors are clustered at the LA level. *** denote significance at the 1 percent level, ** significance at the 5 percent level, and * significance at the 10 percent level.

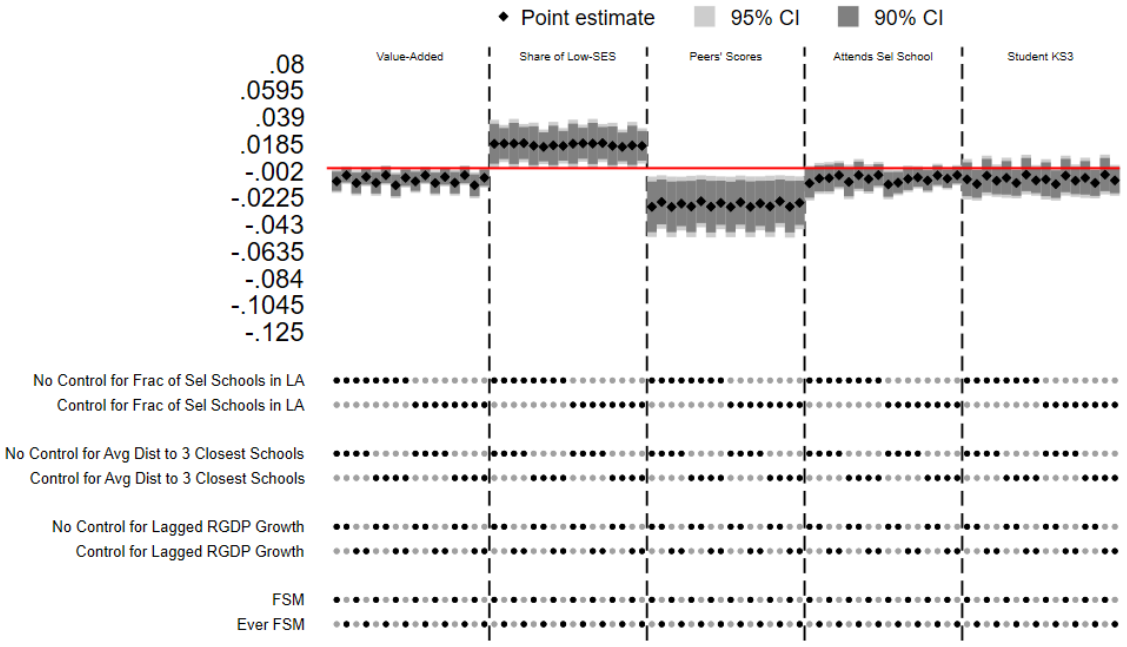


Figure A.5: Additional Robustness Checks for the Effect of the IA Ban

Notes: This figure presents robustness checks for the effect of the IA ban on the following outcomes separated by black dashed bars: the school value-added (labelled as "Value-Added"), the share of low-SES peers (labelled as "Share of Low-SES"), peers' baseline score (labelled as "Peers' Scores"), probability of attending a selective school (labelled as "Attends Sel School"), and students' KS3 score (labelled as "Student KS3"). The four panels report whether we (i) include a control for the share of selective schools in the local authority, (ii) include a control for the LA-level average students' distance to their three closest schools, (iii) include a control for the LA lagged real GDP growth, and (iv) whether we use an alternative definition of FSM (whether the student was ever FSM before). The baseline specification used here is the same as in Equation (1).

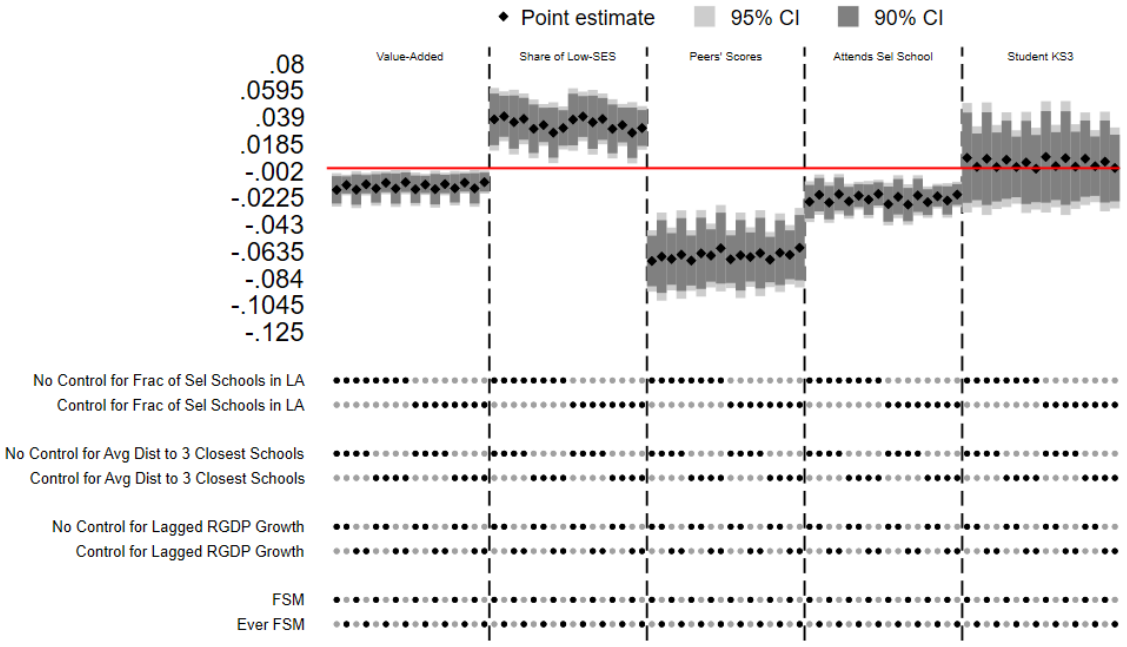


Figure A.6: Additional Robustness Checks for the Effect of the IA Ban (Competitive LAs Only)

Notes: This figure presents robustness checks for the effect of the IA ban on the following outcomes separated by black dashed bars: the school value-added (labelled as "Value-Added"), the share of low-SES peers (labelled as "Share of Low-SES"), peers' baseline score (labelled as "Peers' Scores"), probability of attending a selective school (labelled as "Attends Sel School"), and students' KS3 score (labelled as "Student KS3"). The four panels report whether we (i) include a control for the share of selective schools in the local authority, (ii) include a control for the LA-level average students' distance to their three closest schools, (iii) include a control for the LA lagged real GDP growth, and (iv) whether we use an alternative definition of FSM (whether the student was ever FSM before). The baseline specification used here is the same as in Equation (1)). Only competitive LAs are included in this figure.

Table A.3: Fraction of Low-SES Students in Local Authority

	All LAs		Competitive LAs		Non-Competitive LAs	
	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted
	(1)	(2)	(3)	(4)	(5)	(6)
IA LA X Post-Reform	0.002	0.002	0.009	0.012	0.000	-0.002
	(0.007)	(0.006)	(0.010)	(0.010)	(0.008)	(0.009)
IA LA	-0.017	-0.039	-0.001	-0.004	-0.023	-0.041
	(0.025)	(0.031)	(0.040)	(0.051)	(0.030)	(0.033)
Post-Reform	0.014***	0.012**	0.007	0.004	0.015***	0.017**
	(0.004)	(0.005)	(0.008)	(0.006)	(0.005)	(0.008)
Constant	0.195***	0.180***	0.187***	0.186***	0.200***	0.176***
	(0.016)	(0.020)	(0.028)	(0.042)	(0.021)	(0.021)
Observations	700	700	187	187	509	509
R-squared	0.009	0.028	0.003	0.001	0.013	0.041

Notes: This table shows the results from a DiD specification in which we let a LA level fraction of students who receive Free School Meal (FSM) be a function of a dummy variable indicating whether the LA is using IA before the ban (IA LA), a dummy variable equal to one for the post-reform years (Post-Reform), and the interaction between FPF and post-reform years. Standard errors are clustered at the LA level. Column (1) shows the unweighted regression results for all LAs and column (2) shows the weighted regression results where the weight is the total number of students in the LA. Columns (3) and (4), are analogous to columns (1) and (2), respectively but only competitive LAs are included in the sample. Columns (5) and (6), are analogous to columns (1) and (2), respectively but only non-competitive LAs are included in the sample. *** denote significance at the 1 percent level, ** significance at the 5 percent level, and * significance at the 10 percent level.

Table A.4: Effect of the Transition from IA to DA on High-SES and Low-SES Students (No London LAs)

	School Value-Added	Peers' Baseline Scores	Share of Low-SES	Attends Selective	Attends B25 School	Student KS3 Score
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. All IA and DA Local Authorities						
Post-Reform X IA LA	0.003	-0.018	0.003	-0.028	-0.009*	-0.006
	(0.005)	(0.013)	(0.006)	(0.017)	(0.005)	(0.012)
Post-Reform X IA LA X FSM	-0.007*	-0.021*	0.011	-0.011	0.008	-0.005
	(0.004)	(0.011)	(0.007)	(0.008)	(0.010)	(0.008)
Scaled Effect (D-in-D)	.5%	-28.7%	2.2%	-21%	-5.1%	-1.5%
Scaled Effect (D-in-D-in-D)	-1.3%	-33.6%	8.4%	-8.6%	4.1%	-1.3%
Observations	1,880,577	1,881,346	1,881,699	1,881,699	1,880,508	1,358,648
Panel B. Competitive IA and DA Local Authorities						
Post-Reform X IA LA	0.008*	-0.006	-0.002	0.006	-0.014*	-0.006
	(0.004)	(0.016)	(0.007)	(0.005)	(0.007)	(0.043)
Post-Reform X IA LA X FSM	-0.016***	-0.072***	0.032**	-0.021**	0.024	0.005
	(0.005)	(0.012)	(0.012)	(0.007)	(0.019)	(0.020)
Scaled Effect (D-in-D) 1.7%	-4.1%	-1.5%	1.6%	-7.2%	-1.3%	
Scaled Effect (D-in-D-in-D)	-3.4%	-50.4%	22.2%	-6%	12.4%	1.2%
Observations	599,690	599,690	599,690	599,690	599,690	420,657

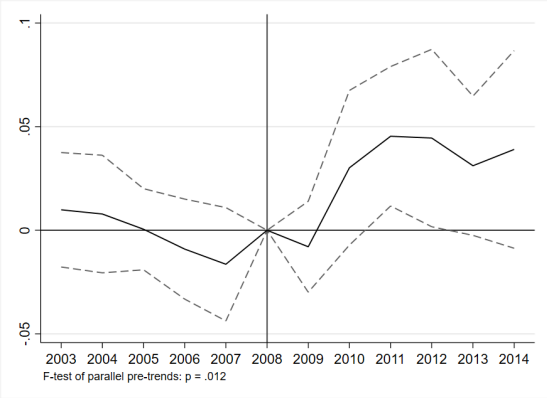
Notes: This table reports the results from Equation (1), which estimates the differential effect of the FPF ban for high- and low-SES students (in a triple difference spirit) for non-London LAs only. We let a student-level outcome Y_{lti} be a function of a dummy variable indicating whether the local authority is using the FPF admission criteria before the ban IA_l, a dummy variable equal to one for the post-reform years $Post_t$, a dummy variable equal to one for low-SES students $lowSES_i$, the interaction between the IA local authority indicator and post-reform indicator $IA_l \cdot Post_t$, and an interaction between that FSM variable and the $IA_l \cdot Post_t$ interaction. The control variable X_{lt} includes a vector of LA-level control variables for (i) the average share of each school type (including the share of private schools), (ii) the share of schools that use each admission criterion, and (iii) the number of schools that students can rank on their list. The vector X_{lt} also includes two additional interaction terms: $Post_t \cdot lowSES_i$ and $IA_l \cdot lowSES_i$. We cluster standard errors at the local authority level in all regressions. The outcome in column (1) is the shrunken value-added measure of the school that student i attends. The outcome in column (2) is the average KS2 score of all current year 7 students at the school student i attends. We call this the a student's peers' baseline score. The outcome in column (3) is the proportion of low-SES peers at the school student i attends. The outcome in column (4) is an indicator of whether the student attends a selective school. The outcome in column (5) is an indicator of whether a student attends a school with an average KS2 score in the bottom 25% of the local authority. Finally, the outcome in column (6) is an indicator of whether student i achieved level 6 in both their English and Mathematics KS3 assessment, which is the standard expectation. All regressions include students attending non-selective and selective schools. *** denote significance at the 1 percent level, ** significance at the 5 percent level, and * significance at the 10 percent level.

Table A.5: Characteristics of Nearest School of FPF School (vs. EP)

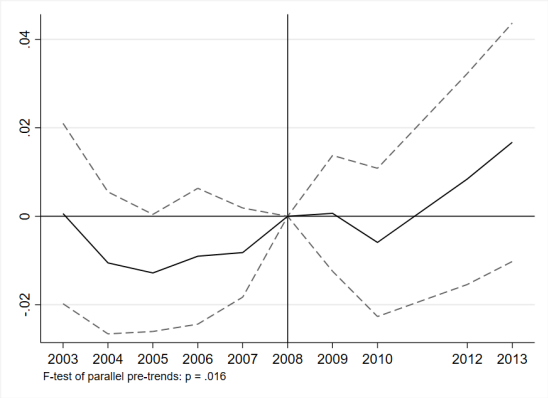
	All Local Authorities		Competitive Local Authorities	
	(1)	(2)	(3)	(4)
% low-SES students	-0.038	-0.036	-0.178	-0.144
	(0.109)	(0.111)	(0.127)	(0.130)
Selective school	0.027	-	0.166*	-
	(0.093)	-	(0.091)	-
% students with KS2 score in bottom 10th pctil	-0.046	-0.036	-0.375*	-0.291
	(0.200)	(0.205)	(0.211)	(0.205)
% students with KS2 score in bottom 25th pctil	-0.050	-0.042	-0.270*	-0.215*
	(0.121)	(0.126)	(0.132)	(0.125)
% students with KS2 score in top 25th pctil	0.084	0.071	0.352**	0.287**
	(0.106)	(0.123)	(0.146)	(0.136)
% students with KS2 score in top 10th pctil	0.203	0.188	0.654**	0.549**
	(0.165)	(0.202)	(0.275)	(0.263)
Control for selective school	no	yes	no	yes

Notes: This table shows the coefficient of interest in a series of regressions that regresses the original school's FPS status onto a school level outcome of the nearest school (proportion of FSM students, whether it is a selective school, proportion of students in the top 25%/10% KS2 and bottom 25%/10% KS2). The first two columns contain schools in all local authorities, and the latter two columns contain schools in competitive LAs only. Columns (1) and (3) contain the regression with controls of other characteristics of both the original school and the closest school. Columns (2) and (4) have the same specification as Columns (1) and (3) but also include an indicator for whether the closest school is a selective school for all regressions.

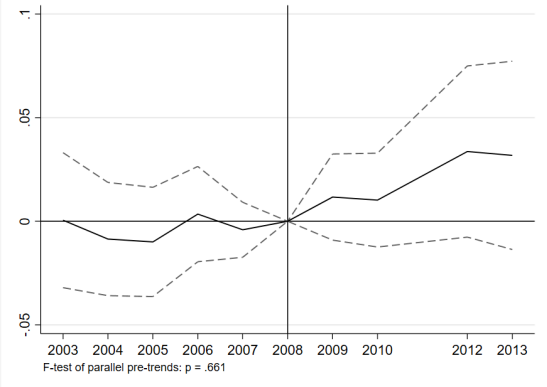
(a) % Low-SES Students



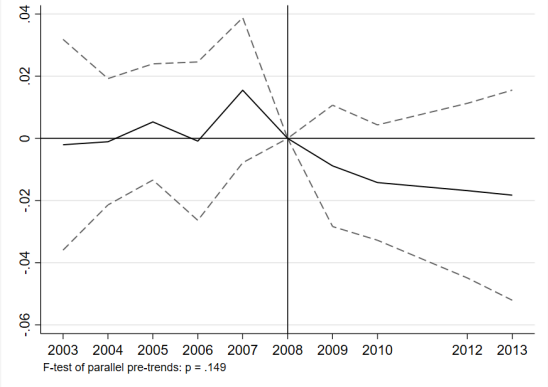
(b) % Students with Bottom 10% KS2 Score



(c) % Students with Bottom 25% KS2 Score



(d) % Students with Top 25% KS2 Score



(e) % Students with Top 10% KS2 Score

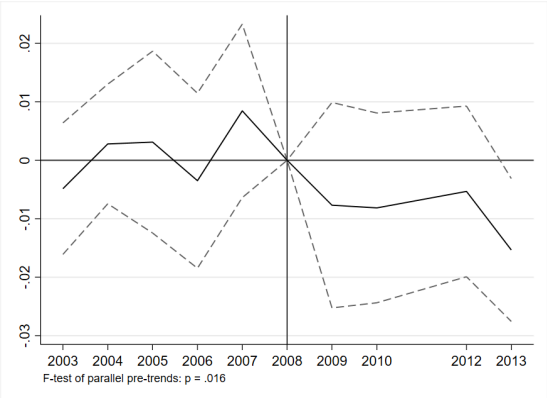


Figure A.7: Event-Study Effect of the FPF Ban on FPF Schools' Composition (Competitive LAs)

Notes: This figure provides a graphical visualization of pre-trends in outcomes by reporting coefficients (and 95% confidence intervals) from an event-study version of Equation (2) in which we replace the dummy variable equal to one for the post-reform years by a dummy for each year $Year_t$ (excluding 2008, the reference year, whose coefficient is set to zero). The coefficients we plot are the coefficients of the $FPF_s \cdot Year_t$ interaction terms which capture the change in outcome in FPF schools compared to the change in EP schools. Each regression contains the same set of controls as the ones in Equation (2), i.e controls for school-level characteristics including school type, and each admission criterion used by schools. We complement each regression with a formal F-test of whether the coefficients of the FPF-by-year effects are jointly equal to zero in the pre-reform years. The p-values of the test are reported in the bottom-left side of each graph. We report results for five school-level outcome variables: the share of Free School Meal recipients, the share of students whose KS2 test score is below the 90th and 75th percentiles of their cohort distribution, and the share of students whose KS2 test score is above the 25th and 10th percentiles. This figure only includes schools in competitive LAs.

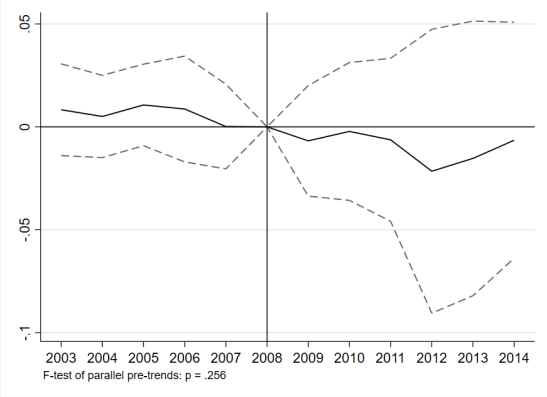
Table A.6: Effect of the FPF Ban on the Composition of FPF Schools' Neighbours

	Low	Student Test Score Percentile			
	SES	Bottom 10	Bottom 25	Top 25	Top 10
	(1)	(2)	(3)	(4)	(5)
Panel A. All Local Authorities					
FPF X Post-Reform	-0.035*	-0.017**	-0.024*	0.028	0.023
	(0.018)	(0.007)	(0.014)	(0.024)	(0.017)
Scaled Effect	-19.6%	-17.2%	-9.8%	10.5%	19.7%
Observations	16,722	14,190	14,190	14,190	14,190
R-squared	0.229	0.161	0.182	0.193	0.192
Panel B. Competitive Local Authorities					
FPF X Post-Reform	-0.069**	-0.030*	-0.066*	0.157**	0.143**
	(0.028)	(0.014)	(0.032)	(0.069)	(0.052)
Scaled Effect	-39.5%	-31.1%	-28.5%	49.3%	93.2%
Observations	5,565	4,735	4,735	4,735	4,735
R-squared	0.334	0.270	0.311	0.371	0.396

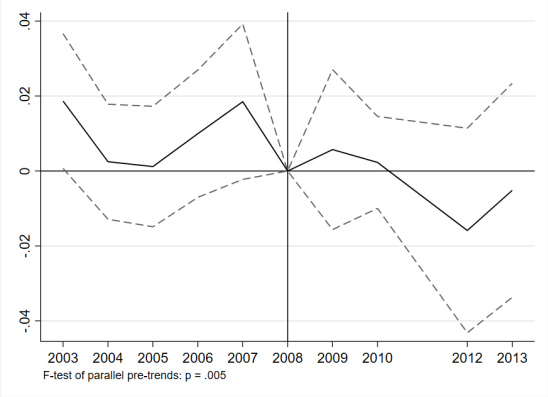
Notes: This table reports DiD estimates of the effect of preventing schools from using the first preference first admission criterion. The school-level outcome is for one of the two nearest schools given a fixed starting school. The DiD specification we use let a school-level outcome (Y_{st}) be a function of a dummy variable indicating whether a school is using the FPF admission criteria before the ban (FPF_s), a dummy variable equal to one for the post-reform years ($Post_t$), and the interaction between FPF and post-reform years $FPF_s \cdot Post_t$. Each regression includes a set of controls for school-level characteristics including school type, and each admission criterion used by schools. We cluster standard errors at the local authority level. We use five outcome variables: in each school's two nearest schools that are not using the FPF admission criterion, we compute the share of students who receive Free School Meal (FSM), as well as the share whose KS2 test score is below the 90th and 75th percentiles of their cohort distribution, and the share of students whose KS2 test score is above the 25th and 10th percentiles. *** denote significance at the 1 percent level, ** significance at the 5 percent level, and * significance at the 10 percent level.

Figure A.8: Event-Study Effect of the FPF Ban on the Composition of FPF Schools' Neighbours—All Local Authorities

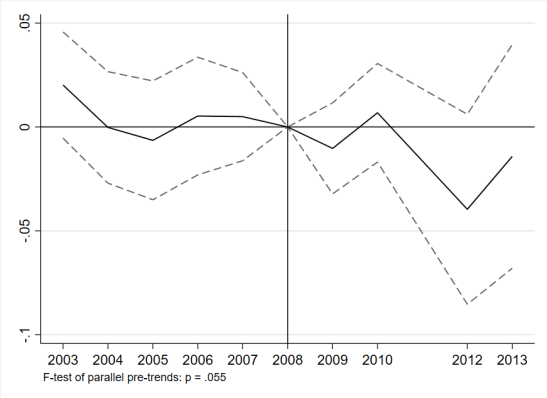
(a) % Low-SES Students



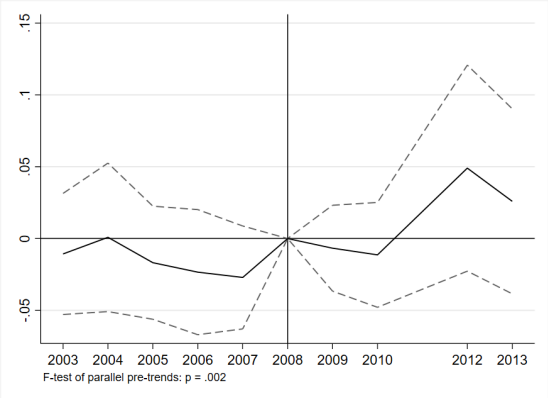
(b) % Students with Bottom 10% KS2 Score



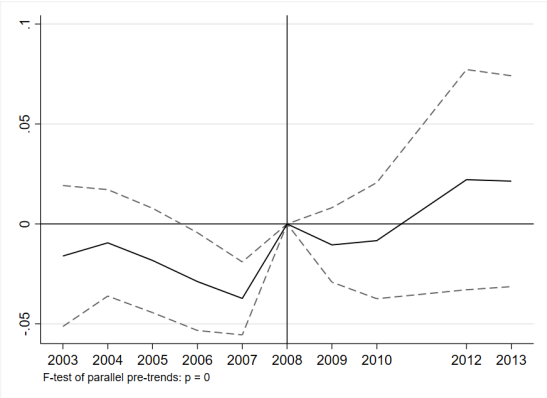
(c) % Students with Bottom 25% KS2 Score



(d) % Students with Top 25% KS2 Score



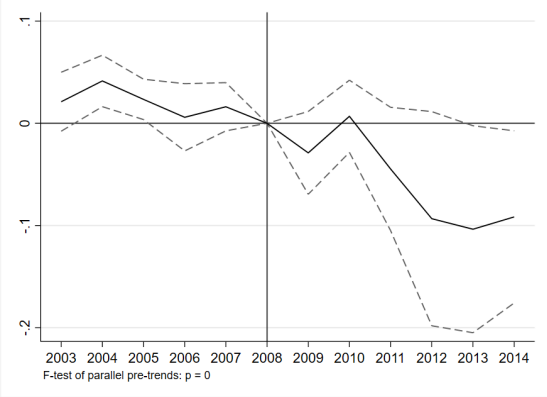
(e) % Students with Top 10% KS2 Score



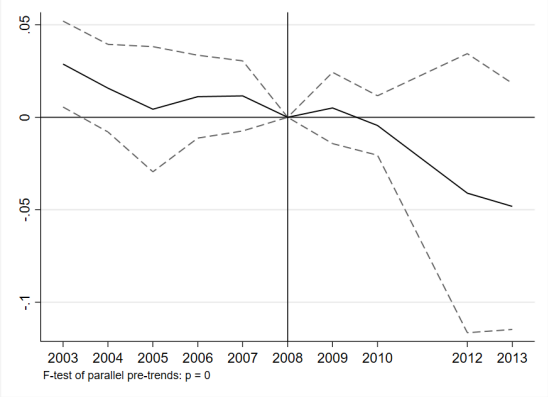
Notes: This figure provides a graphical visualization of pre-trends in outcomes by reporting coefficients (and 95% confidence intervals) from an event-study version of the regression results in Panel A. of Table A.6. We replace the dummy variable equal to one for the post-reform years by a dummy for each year $Year_t$ (excluding 2008, the reference year, whose coefficient is set to zero). The coefficients we plot are the coefficients of the $FPF_s \cdot Year_t$ interaction terms which capture the change in outcome in FPF schools' neighbouring schools compared to the change in EP schools' neighbouring schools. Each regression contains the same set of controls as the ones in Table A.6. We complement each regression with a formal F-test of whether the coefficients of the FPF-by-year effects are jointly equal to zero in the pre-reform years. The p-values of the test are reported in the bottom-left side of each graph. We report results for five school-level outcome variables: the share of Free School Meal recipients, the share of students whose KS2 test score is below the 90th and 75th percentiles of their cohort distribution, and the share of students whose KS2 test score is above the 25th and 10th percentiles.

Figure A.9: Event-Study Effect of the FPF Ban on the Composition of FPF Schools' Neighbours—Competitive Local Authorities

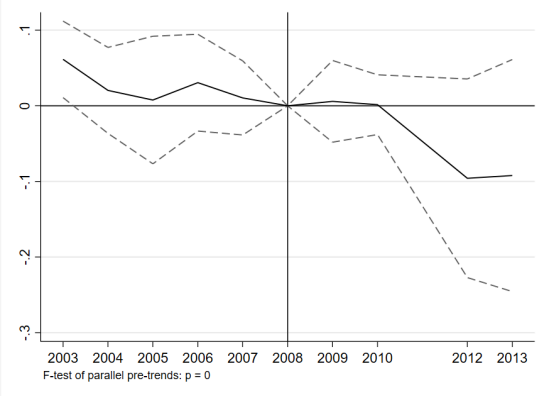
(a) % Low-SES Students



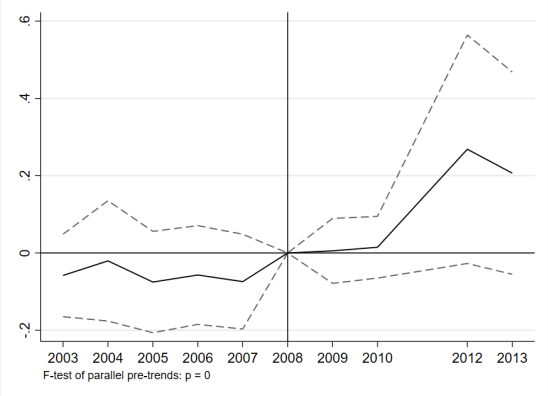
(b) % Students with Bottom 10% KS2 Score



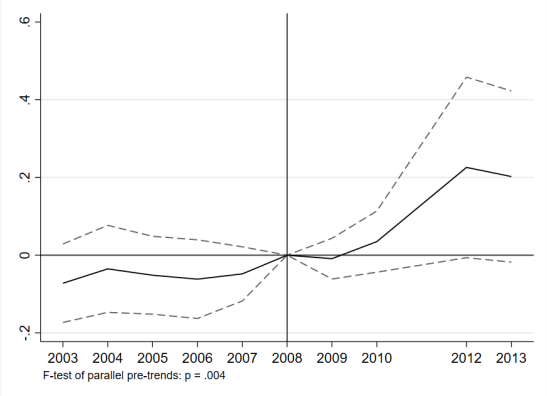
(c) % Students with Bottom 25% KS2 Score



(d) % Students with Top 25% KS2 Score



(e) % Students with Top 10% KS2 Score



Notes: This figure provides a graphical visualization of pre-trends in outcomes by reporting coefficients (and 95% confidence intervals) from an event-study version of the regression results in Panel B. of Table A.6. We replace the dummy variable equal to one for the post-reform years by a dummy for each year $Year_t$ (excluding 2008, the reference year, whose coefficient is set to zero). The coefficients we plot are the coefficients of the $FPF_s \cdot Year_t$ interaction terms which capture the change in outcome in FPF schools' neighbouring schools compared to the change in EP schools' neighbouring schools. Each regression contains the same set of controls as the ones in Table A.6. We complement each regression with a formal F-test of whether the coefficients of the FPF-by-year effects are jointly equal to zero in the pre-reform years. The p-values of the test are reported in the bottom-left side of each graph. We report results for five school-level outcome variables: the share of Free School Meal recipients, the share of students whose KS2 test score is below the 90th and 75th percentiles of their cohort distribution, and the share of students whose KS2 test score is above the 25th and 10th percentiles.

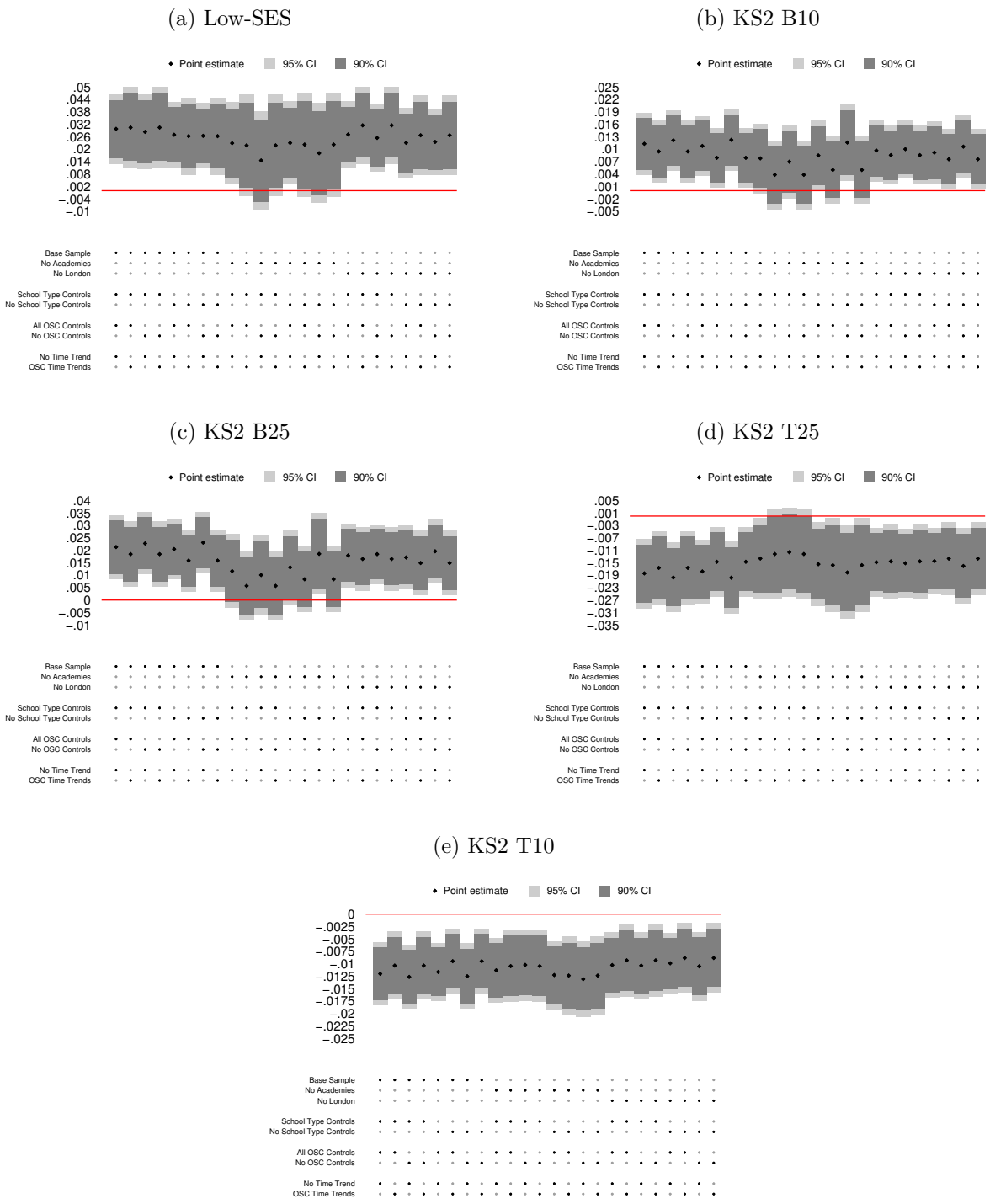


Figure A.10: Effect of the FPF Ban on FPF Schools' Composition (Relative to EP)

Notes: This figure presents a detailed version, outcome by outcome, of the robustness checks for the effect of the FPF ban on school composition presented in Figure 13. See Figure 13 for more details.

B Value-Added Computation

We compute a school's value-added using the following specification that is similar to what is outlined in Koedel, Mihaly and Rockoff (2015)

$$y_{ist} = X'_{ist}\beta + Z'_{st}\gamma + \theta_s + \varepsilon_{ist}, \tag{B.1}$$

where y_{ist} is a dummy variable that measures whether year 7 student i who attends school s in year t has level 2 qualifications in at least five GCSE exams including English and Mathematics[76], X_{ist} is a vector of student characteristics (the student's KS2 score, gender, race, and free school meal eligibility), Z_{st} is a vector of time-varying school characteristics (the average KS2 scores of the school's current intake, the school's racial and gender composition, and the proportion of the school's year 7 students who qualify for a free school meal), θ_s is school s's fixed effect, and ε_{ist} is an idiosyncratic error term. The student's KS2 score acts as a proxy for the lagged test score of student i as students take the GCSE tests after the KS2 test. These controls are consistent with those used in past studies (e.g. Aaronson, Barrow and Sander, 2007; Kane et al., 2013; Chetty, Friedman and Rockoff, 2014; Koedel, 2009). We can interpret a school's value-added as the contribution to a student's likelihood of obtaining level 2 qualifications in at least five GCSE exams including English and Mathematics.

To account for noise in the fixed effects estimates (Kane and Staiger, 2002), we construct an empirical Bayes estimate of the school's value-added. We follow the general procedure of Koedel, Mihaly and Rockoff (2015). The shrunken value-added estimate is given by:

$$\hat{\theta}_s^{EB} = \alpha_s\hat{\theta}_s + (1-\alpha_s)\bar{\theta}. \tag{B.2}$$

In Equation (B.2), $\hat{\theta}_s$ is the fixed effect estimate for school s obtained from estimating Equation (B.1), $\bar{\theta}$ is the average of all schools' value-added weighted by the number of students, and $\alpha_s = \frac{\hat{\sigma}^2}{\hat{\sigma}^2+\hat{\lambda}}$, where $\hat{\sigma}^2$ is the estimate for the variance of the school fixed effects and $\hat{\lambda}$ is the estimate of the variance of the estimate of $\hat{\theta}_s$. To compute $\hat{\lambda}$ we take the square of the standard error of $\hat{\theta}_s$. We employ the software developed by Chandra et al. (2016), who follow the procedure of Morris (1983) to compute $\hat{\sigma}^2$ and ultimately to compute the shrunk estimates of value-added. Figure B.1 plots the distribution of the value-added estimates with and without shrinkage.

Heterogenous value-added for high-SES and low-SES students. To obtain the estimates for the heterogeneous school value-added by SES we estimate the following:

$$y_{ist} = X'_{ist}\beta + Z'_{st}\gamma + \theta_s + \kappa_s LowSES_{ist} + \varepsilon_{ist}. \tag{B.3}$$

The notation of Equation (B.3) follows that of Equation of (B.1) with the addition of $LowSES_{ist}$ which is an indicator that is equal to 1 when a student is low-SES and 0 when the student is high-SES. The new term $\kappa_s LowSES_{ist}$ is an interaction between the school's fixed effect and the student's low-SES indicator. Thus the estimated value-added of school s is $\hat{\theta}_s$ for high-SES students and $\hat{\theta}_s + \hat{\kappa}_s$ for low-SES students.[77] As previously, we compute shrunk estimates following Equation (B.2) for the entire sample of value-added estimates.

[76] Achieving level 2 in five subjects including English and Mathematics is a standard performance metric used to assess both students success and school performance. This indicator is reported in schools performance tables published by the Department for Education.

[77] The specification is similar to the approach Dee (2004) uses.

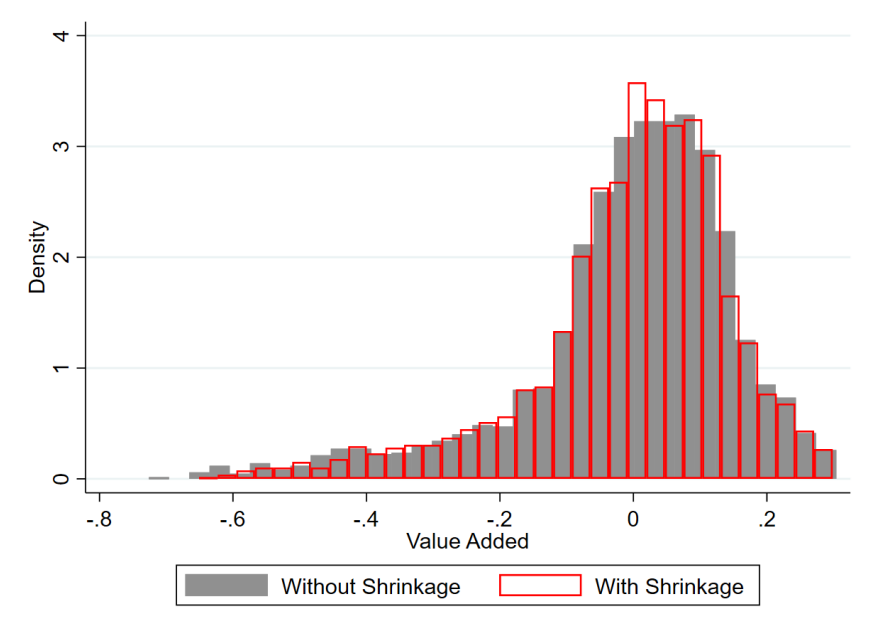


Figure B.1: Distribution of School Value-Added (with and without Shrinkage)

Notes: The gray bars denote the value-added estimates without shrinkage and the red outlined bars denote the value-added estimates with shrinkage. The standard deviation is 0.15 and 0.16 with and without shrinkage, respectively.

Table B.1: Correlation Between School Value-Added and Schools' Characteristics Pre-Reform

	School KS2 (1)	School KS3 (2)	School FSM (3)	Selective (4)
Covariance	0.218***	0.357***	-0.743***	0.078***
	(0.003)	(0.004)	(0.006)	(0.003)
Constant	0.497***	0.380***	0.625***	0.491***
	(0.001)	(0.002)	(0.001)	(0.001)
Observations	16,532	19,167	19,247	19,248
R-squared	0.313	0.251	0.482	0.027

Notes: This table contains the regression outcomes by regressing the school value-added measure (with shrinkage) onto various school characteristics. The characteristics are: (1) the average KS2 score of the current intake of year 7 students at school s, (2) the average KS3 achievement of the current intake of year 7 students at school s, (3) the proportion of students who qualify for a free school meal (low-SES) at school s, and (4) a dummy variable of whether school s is selective. *** denote significance at the 1 percent level, ** significance at the 5 percent level, and * significance at the 10 percent level.