Heterogeneous Effects of School Autonomy: The Case of English State Schools*

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Abstract

The 2010 reform of the UK education system gave schools the option to become academies, independent entities funded directly from the central government. Once converted, schools choose between remaining standalone academies or joining an academy chain. This paper investigates the possible heterogeneity arising from the adoption of alternative conversion models. Administrative records for primary school-age students before and after conversion allow us to shed light on this channel by using a grandfathering instrument for attending a converted school. We find that students in academy chains have better scores with respect to standalone academies. We use survey data to show that schools joining a chain are more likely to make changes related to managerial practices, whereas standalone academies favour changes related to educational practices.

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1 Introduction

In most countries, local or central governments manage primary and secondary schools and there is little room for schools' autonomy. As Eyles et al. (2016a) document, PISA data show that in most OECD countries schools did not experience significant changes in their level of autonomy in the last decade. However, England is one of the few exceptions.

Aiming at increasing efficiency by providing head teachers with direct control over their schools, since 2000, the government has been targeting low performing schools forcing them to convert into academies, term that indicates autonomous - or "independent" - publicly funded schools. In 2010 the conversion was further extended to high and good performing primary and secondary schools. Since then, the number of academies has massively increased (Figure 1).

Unlike other contexts in which autonomy is granted to specific types of schools, (e.g. charter schools in US and free schools in Sweden), England is a unique case study since it is progressively moving towards a fully decentralised system with the government aiming to full academisation of the system by 2022 (Department for Education, 2016d).

Over the recent years, the academic literature has attempted to test the efficiency of autonomous schools focusing on the impact of autonomy *per se* on student achievement. Conversely, very little has been said on the role played by school management in independent schools. However, managerial practices might be crucial to foster school performance and therefore explain disparities in the quality of education between schools (Bloom et al., 2015).

In this respect, England represents the ideal setting. Following the 2010 reform, schools that decide to convert on a voluntary basis - the so-called Converter academies - can convert as stand-alone academies, also called single-academy trusts (SATs), or join a multi-academy trust (MAT). The choice of SATs and MATs resulted in two distinct models of governance with different degrees of centralisation. On the one hand, independent stand-alone academies are now responsible of all governance functions. On the other hand, MATs are characterized by a centralised system in which there is a clear separation of roles between head-teachers and members of the trust, with the former focusing on running the schools while the latter carry out all managerial activities.

Following the introduction of academies, the public debate on school governance has focused on the potential risks faced by stand-alone academies, with the lack of capabilities of schools to carry out managerial functions being one. The main concern is that autonomy requires a body of expertise in managerial fields that traditional representatives of local governing bodies might not be endowed with. Indeed, as the program developed, policymakers have supported chains as an efficient way to foster schools' collaboration and reduce the educational gap (Francis et al., 2016). Along with it, the White Paper *Educational Excellence Everywhere* published by the Department for Education in 2016 states that MAT is the preferred model as collaboration allows schools to benefit from the most successful leaders and their expertise.

In this respect, this study represents the first empirical contribution that investigates models of governance in autonomous schools in England. The research question we address is whether different governance structures - chain and stand-alone academies - affect pupils' performance.

The current literature has two main gaps. First, while most studies focus on secondary schools, recent findings (Chetty et al., 2011; Heckman, 2006) show that the impact of early education choices persists in the long run. Therefore, education choices made in early stages might affect future labour market outcomes. Second, several studies has investigated the effects of schools' autonomy on achievement, whereas much less has been said on the role played by managerial practices. Our results extend the current literature by providing further evidence on the impact of autonomy on school performance in England; by highlighting the effect of different management practices in independent schools; and by providing possible mechanisms explaining disparities in performance among academies.

Our empirical strategy focuses on early Converter primary academies, defined as those schools converted in 2011 and 2012. At that time, schools were not yet aware that the whole system was to be shifted towards mass academisation. We estimate the effects of exposure to a MAT or SAT on student achievement at the end of primary school. We exploit variation within schools and across cohorts of students and compare cohorts of students within the same school before and after conversion.

This strategy has two important caveats. First, the school decision of converting in a SAT or MAT might be correlated with observable or unobservable characteristics affecting pupils performance. Second, students might join, as well as leave, academies after the conversion. We account for school selection into MATs or SATs by showing that the decision is not predicted by school observables. We instead deal with pupils' self-selection into academies by adopting an Instrumental Variable (IV) approach, using the school enrolment date to predict the number of years students spend in an academy. Furthermore, we perform a falsification test to show that our results are not confounded by pre-policy trends.

We find that schools belonging to chains improve student performance more than stand-alone academies. On average, one extra year of exposure to MATs with respect to SATs increases math and English test scores by about 0.04 standard deviation (σ), which corresponds to 0.8 and 0.4 points (about 1.2% of the average) respectively.

In addition, we find different effects depending on the year of conversion. Schools belonging to MATs and converted in 2011 seem to perform better over the first 3 years of exposure, while from the fourth year the difference between MATs and SATs disappears. The opposite occurs to 2012 converters, whose gains are increasing in the years of exposure. For the latter, after 3 years from conversion pupils improve math and English scores by $0.16-0.14\sigma$ (about $3.3-1.2$ points, or $4.6-3.8\%$ of the average) compared to those exposed to SATs. In particular, results for 2012 converters are driven by disadvantaged students, whose math and English test scores after 3 years of exposure improve by 0.26σ, corresponding to 5 and 2.3 points respectively (about 9% of the average).

Finally, we exploit unique survey data on changes introduced by academies to shed light on potential mechanisms underpinning our findings. Data show that after conversion SATs are more likely to implement school level changes, while MATs favour organisational level changes, such as replacing school leaders and reconstituting the governing body. Despite the absence of disaggregated data at school level, such figures suggest that managerial practices might play a key role in boosting pupils' achievement.

The paper is organised as follows: Section 2 presents the relevant literature; Section 3 presents the academy reform and discusses the different models of governance; Section 4 lays down the empirical strategy and possible threats to identification; Section 5 presents the results; in Section 6 we evaluate possible mechanisms behind our results; Section 7 concludes.

2 Related work

The recent literature in education has mostly focused on the effects of new types of schools on pupils' achievement. A significant number of studies have been conducted in the US, where, since the late 1990s, the government targeted low performing schools in deprived areas and forced them to become autonomous with the aim of implementing ad hoc policies to boost pupils' results, and consequently reducing the achievement gap among students. Similar to English academies, these new 'charter schools' are publicly funded but autonomous from local and central government. The majority of the literature on charter schools finds positive effects on pupils' achievements, especially for disadvantaged students (Hoxby and Murarka, 2009; Angrist et al., 2010; Abdulkadiroglu et al., 2011; Dobbie and Fryer, 2011; Angrist et al., 2013; Dobbie and Fryer, 2013). More recent works also look at long term effects, such as college attendance, and find positive effects on students who attended charter schools compared to those who did not (Dobbie and Fryer, 2015; Angrist et al., 2016). In order to deal with the endogenous sorting of students in charter schools, the aforementioned studies exploit the presence of lotteries that randomly assign students to charter schools (e.g. Angrist et al., 2010; Angrist et al., 2013), or IV approaches that exploit the presence of students in charter schools before they became charter schools (e.g. Abdulkadiroglu et al., 2011). We deal with the self-selection of students into and out of academies by adopting the latter approach.

In the Swedish context, Bohlmark and Lindahl (2015) investigate the 1992 voucher reform that encouraged the expansion of independent schools. Like US charter schools and English academies, Swedish independent schools are autonomous, but publicly funded schools. The study finds positive effects on students' performance. However, the effect is driven by the increase in school competition rather than the implementation of ad hoc practices.

Several studies have been conducted on early converter (2000-2010) English academies, and most of them look at the effect of conversion for secondary schools, those targeted first by the reform. By exploiting the presence of pupils in academies enrolled before the conversion took place, Eyles and Machin (2015) compare test scores of pupils attending academies with those of pupils enrolled in future academies, used as control group for early converters. The assumption is that schools that decide to convert are more likely to be similar in their observables and unobservable characteristics. Their study finds positive effects on pupils' performance and a more recent study (Eyles et al., 2016a) finds that the effects on schooling outcomes also persist in the medium run.

Our paper is related to a recent work by Eyles et al. (2017) that investigates the effect of conversion for primary schools. Similar to our approach, the study only looks at early converter primary schools but without distinguishing between Sponsor Led and Converter academies. Their identification strategy follows Eyles and Machin (2015), and the paper does not find effects.

Our paper differs in three aspects: first, we exclude from our sample poor performing schools forced to convert and focus only on Converter academies, as the reasons for converting between the two groups are significantly different. Second, we exploit variation within schools and across cohort of students before and after conversion and compare cohorts of students enrolled in schools converting in the same year, thus accounting for the potential endogeneity in the timing of conversion. Finally, we focus on academy performance by exploring the impact of governance on pupils' achievement.

In this respect, the success of US charter schools has encouraged the study of mechanisms behind the results, and a recent work by Dobbie and Fryer (2013) sheds light on the practices that most contribute to these schools' success. They find that traditional resources such as class size or teachers' qualification are not positively correlated with school effectiveness. Instead, factors such as teachers' feedback, tutoring, longer school time, and *ad hoc* practices targeting disadvantaged pupils are the most successful practices in charter schools.[1]

In the US, as well as in England, the main source of information on school practices is represented by survey data. Similar to Dobbie and Fryer (2013), Eyles and Machin (2015) find that changes in the management structure, together with changes in the curriculum, are the main factors underpinning pupils' improvement in secondary academies. Recently, Bloom et al. (2015) explore the determinants of autonomous schools' success in several countries, including academies in England. The study focuses on management practices (operations, monitoring, target setting, people management) and find that school management matters for schools' success. In particular, they highlight two key factors: stronger accountability of performance to an external body and high quality school leadership able to develop long-term strategies to reach higher standards. Similar to these studies, in section 6 we present survey data on the changes introduced by academies after conversion and provide possible mechanisms that may explain our results.

3 Institutional Setting

The English School System and the Academy Reform

Primary education in England is organised into two phases, Key Stage 1 (KS1) and Key Stage 2 (KS2). Children enter primary school in Reception year, when they are aged 5. KS1 runs from Reception year to year 2, when students are aged 7. KS2 runs from year 3, when students are aged 8, to year 6, when students are aged 11. State-funded schools are the majority and enrol

[1] See for instance the No Excuses approach introduced by charter schools in the US. Its success is mainly due to a substantial increase in instruction time compare to public schools, the adoption of a formal discipline system, and the provision of extra tutoring for poor performing students.

about 95% of all students (Department for Education, 2016*c*).

The Labour government introduced secondary school academies in 2000 through the Learning and Skills Act 2000, with the aim of improving performance by providing head teachers with direct control over their schools. Similarly to US charter schools, for the first 10 years the reform targeted only low performing secondary schools classified as inadequate by Ofsted inspections.[2]

The reform was then expanded to all primary and secondary schools by the coalition government in July 2010. Beside Sponsor Led academies, those schools forced to convert because under performing, Converter academies, for which the conversion is voluntary, appeared.

Since 2010 the academisation process grew dramatically. Indeed, according to the Department for Education (DfE), as of January 2018 $4,440$ out of $16,766$ primary schools have converted into academies.[3]

Academies are independent from local and central government and are non-profit charitable trusts. Similar to state-funded schools, they are entirely funded by the central government through the DfE. However, they are autonomous in aspects such as staffing (recruiting and paying teachers and staff, staffing structures, career development, discipline and performance management), provision of services (e.g. maintenance, HR, audit, legal services), setting the curriculum (with the exclusion of few subjects they are free to diverge from the traditional curriculum), and admission.[4] Unlike state-funded schools, academies have a board of directors that acts as a Trust and the trustees are legally, though not financially, accountable.

Table 1 shows the main characteristics of academies and state-funded primary schools. There are differences both in terms of pupils' intake and schools' characteristics. Academies display, on average, a lower percentage of free school meal (FSM) eligible pupils, students with special educational needs (SEN), and black students. More importantly, academies tend to perform better compared to state-funded schools. Panel B shows that pupils enrolled in academies have higher scores in both KS1 and KS2 tests and are more likely to reach the top level (Level 5) in both KS tests. As expected, early converter academies were also among the best performing

[2]Ofsted is the Office for Standards in Education, Children's Services and Skills and regularly carries out inspections in schools. Following a inspection, schools are graded from outstanding to inadequate.

[3]Last update available at: https://www.gov.uk/government/publications/open-academies-and-academy-projects-in-development. Official data regarding January 2018 are available upon request.

[4]Academies are free to set their own admission criteria subject to the guidelines stated in the Admission Code. A recent paper by Machin and Sandi (2018) investigates the exclusion of poorly performing pupils in academies. They find that the exclusion rate is higher in schools converted before 2010 compared to those converted in the second phase of the program (post-2010). In addition, they argue that such exclusion does not aim at boosting schools' performance, but it is, instead, the result of enforcing rigorous discipline codes.

schools in the country. Moreover, academies are significantly bigger and more likely to be community schools rather than faith-based institutions.

Multi-Academy and Single-Academy Trusts

Besides Sponsor Led and Converter academies, another important distinction arose after 2010. Together with the decision of converting, Converter academies can choose between converting in a stand-alone academy or joining a chain of academies. Such distinction resulted in two different models of governance. Stand-alone schools became SATs and the governing body remained almost unchanged compared to the traditional local governing body of state-funded schools. MATs, instead, have a single governing body that runs all the schools belonging to the chain. On average, MATs manage about 7 schools and they are more likely to be located in urban areas.[5]

The main distinction between the two categories concerns the structure of the governance. In MATs the trust is responsible for all the academies in the chain and there is no lead school within the cohort. Even if MATs are established by a single school, once formed, the governing body cannot give preferential treatment to any school within the chain. Schools belonging to the MAT share the same board of governors which takes up most of the tasks previously performed by the local governing body of the school. The presence of governors creates an additional tier of governance between foundation members and local governing bodies. In particular, foundation members belong to the trust and have ultimate control over the academy trust. The members appoint the board of governors, also called directors or trustees, that set the direction of the MAT, hold head-teachers accountable, and ensure financial probity. Members can also be part of the board of directors, although the Department for Education encourages MATs to have at least a majority of members that are independent from the board. The board is made up of at least three signatory members, the CEO, and two elected parents. No more than 20% of trustees can be persons associated to a LA (e.g. head-teachers of community schools, LA officers). Trustees can delegate some functions to the local governing body of single schools whose functions are now limited compared to local governing bodies of SATs. Indeed, the model introduced by MATs aims at removing pressures on local governing bodies, whose aim

[5]MATs can also vary in the type of school they include. Some consist of just primary or secondary schools, while some are just made up of faith schools. MATs can also be mixed and include both primary and secondary schools, as well as other more specialist schools (e.g. academies providing education for students with SEN specifically). In our sample the majority of schools belonging to the same MAT are also located in the same Local Authority.

is to focus on local representation and avoiding the recruitment of high skill governors for each single school (Grotberg and Lobb, 2015).

As a result, SATs stand for a decentralised system in which each single school provides the services, while MATs are based on a centralised system in which functions and operations are attributed to different actors along the "governance chain". In particular, managerial functions are carried out by the governors, whose knowledge of business practices is expected to be better than the one of school head-teachers. In this regard, Table 2 shows the distribution of roles within MATs. Notably, Trust Boards handle financial and legal compliance, senior appointments, and risk management, while schools mostly handle operational functions (e.g. school development plans, strategies, school staffing structures design), which in few cases are also carried out at regional level[6].

While right after the reform Converter academies were more likely to convert into stand-alone academies, Figure 1 shows that in recent years the proportion of schools belonging to MATs has significantly increased.

Table 1 shows the main characteristics of MATs and SATs. In terms of pupil characteristics Panel A shows that MATs have a higher share of FSM eligible, SEN, and black origin students. Panel B shows that students attending SATs have higher scores in both KS1 and KS2 tests. As expected, SATs are significantly better performing. Finally, Panel C shows that, on average, SATs have a higher number of pupils as well as a higher pupil-teacher ratio, while they have similar shares of qualified and non-qualified teachers.

4 Empirical Methodology and Identification

Data

We use data from the National Pupil Database (NPD), a unique and rich dataset containing information at pupil and school level in England. Within the NPD, the Pupil Level Annual School Census (PLASC) provides information at pupil level for all pupils attending state-funded schools in England from Reception to year 6 (the last year of primary school) during the academic year 2001/2002 and onwards. The dataset contains detailed demographic characteristics such as gender, ethnicity, language spoken at home, eligibility for FSM and SEN status, pupils'

[6]Regional clusters represent an further tier of Governance between schools and the Trust. As they grow in size, trusts might choose to decentralise some functions to regional hubs whose proximity to schools makes the management more efficient

area of residence, and school attended.

Pupil level data also contain information on students' achievements at the end of KS1 and KS2. Although at the end of KS1 students are assessed by their own teachers, results can still be considered a good proxy for pupils' performance at year 2. Indeed, they do not matter for students' progression onto KS2 and are not relevant for teachers or school accountability. As these assessments represent low-stake evaluations, teachers have no incentive other than that of providing a fair evaluation of a student's achievement. KS2 tests are instead standardised tests taken at the end of primary school (year 6). These are national tests in math and English, homogeneous across schools and marked by external markers, so that scores are comparable across schools. Students are also awarded a Level of attainment depending on the score they obtain, so that data provide both pupils' test score and Level for each test. Pupils can be awarded Level 3 to Level 5, with Level 5 being the highest level.[7] The final sample of students will consist of all pupils eligible for the test and for whom the test score is available.

We complement NPD data with information from the school census, which is available from the 2005/2006 academic year and provides information on schools (e.g. identifier, address, type), pupils, as well as teachers by category (e.g. qualified, non-qualified teachers and teaching assistants). We also link NPD data with Ofsted inspections' results from 2005 onwards, which are publicly available on the UK government website. Finally, the main source of information on academies is a database from the DfE (Edubase) that contains school level data on single and multi-academy trusts (time of conversion, date in which the school has joined a chain, type of support, trust's size).

The initial sample consists of all state-funded schools (and their students) appearing in the NPD from 2005 onwards. We keep converter academies whose conversion is between April 2011 and August 2012. Therefore, we exclude from our sample very early converter academies, namely those that converted in 2010.[8] As a result of this selection, the final sample consists of 486 schools and $211,688$ pupils over $2005-2015$.

[7] These levels are meant to capture the position of the student in the achievement distribution. Hence, students awarded Level 3 are students performing below expectations, those awarded Level 4 are students working at the expected level and Level 5 students are those performing above the average.

[8] This is because very early Converter were schools judged outstanding by Ofsted inspections, and in as such they represent a very selected subsample. There are 15 schools in total that converted in SATs or MATs in 2010.

Empirical Specifications

The empirical analysis investigates heterogeneous effects of conversion between stand-alone academies and academies in chains. In particular, we are interested in estimating the effects of exposure to MATs or SATs on KS2 test scores in math and English.

We compare schools that decide to convert in the same year to account for the potential endogeneity in the timing of conversion. We exclude state-funded schools from the sample and limit our analysis to students attending academies to avoid comparing schools whose unobservable characteristics may lead to ambiguous conclusions. Hence, we exploit variation within schools and across cohorts of students and compare cohorts of students within the same school who take KS2 tests after conversion with cohorts who took KS2 tests before conversion. We consider up to four years of exposure to an academy, which represent the length of the KS2 phase.

We estimate the following regression:

$$Y_{ist} = \alpha_1 + \gamma_1 D_{ist} + \beta_1 D_{ist} \cdot MAT_s + \theta_1 X_{ist} + \delta_s + \delta_t + v_{1ist} \quad (1)$$

where Y_{ist} is the KS2 score of pupil i enrolled in school s and taking the test in year t. Test scores are standardised by subject and year. D_{ist} is the number of years spent by each pupil in the academy. For schools converted in 2011 D_{ist} will take values from 0 to 4, while for those converted in 2012 D_{ist} will take values between 0 and 3. For all cohorts of pupils taking the test before the conversion year D_{ist} will have value 0. MAT is an indicator that takes value one if the school joined a chain and 0 otherwise. The coefficient of interest is β_1, representing the impact of being exposed to one additional year to an academy that joined a MAT with respect to a SAT. X_{ist} is a vector of pupil characteristics: it contains information on gender, ethnicity, FSM eligibility, SEN status, pupil attainment at KS1, and language spoken at home. Finally, we add school and time (year) fixed effects (γ_s and δ_t respectively). The time index t runs across cohorts of exam takers, with $t = 2005, \ldots, 2015$.

We also test whether the effect increases in the number of years of exposure. One may indeed worry that academies "teach to the test" that is, teachers train students attending the last year by focusing on KS2 test's subjects.[9] If that was the case we would not expect differential effects for different years of exposure.

[9] In the US for instance the establishment of accountability policies aimed at measuring school performance and improving student achievement led teachers and schools to focus specifically on high-stakes subjects, as documented by Klein et al. (2000) and Jacob (2005).

We therefore consider the following regression:

$$Y_{ist} = \alpha_2 + \gamma_2 D_{ist} + \sum_{k=1}^{4} \beta_{2k} \mathbb{1}(D_{ist} = k) \cdot MAT_s + \theta_2 X_{ist} + \delta_s + \delta_t + v_{2ist} \quad (2)$$

where we allow the returns to MAT exposure to vary depending on the total number of years a child spends in a MAT. These are captured by $\mathbb{1}(D_{ist} = k)$, which represents a set of indicator variables taking value 1 when the number of years a student has spent in an academy is equal to k, with $k = 1, 2, 3, 4$. Other variables follow the notation defined above.

Since both MAT_s and D_{ist} are endogenous choice variables, one should still be cautious in interpreting estimates of β_{2k} and γ_2 from equation (2). Indeed, on the one hand, the choice of the school to join a MAT might be correlated to school observables or unobservables, such as trends in the strength and composition of student cohorts. On the other hand, D_{ist} can be correlated to parents' decisions and timing of enrolment in an academy. We address these issues in the following two sections.

School Decisions and Intake

We start by addressing the school's decision concerning the model of conversion. In our context the determinants - observable and unobservable - of the conversion decision are irrelevant since we condition on schools that have already become academies. However, the decision to convert in a SAT or join a MAT could be correlated to pre-existing trends in school performance, characteristics, and intake.

We first test for the presence of pre-conversion trends by plotting the evolution of school and student characteristics over time by type of school. Figures 2 and 3 show a series of student and school characteristics considering academies that converted in 2011 and 2012 respectively. Each figure plots the fraction of students eligible for free school meals (Panel A), natives (Panel B), students with special needs (Panel C) and school enrolment (Panel D) for MATs, SATs and non-academies.[10] The characteristics follow a similar and parallel trend across different types of schools, so that we can rule out the presence of different pre-trends in student and school observables.

One may still be worried that schools intentionally choose the year of conversion depending on the strength of the cohort taking KS2 tests in the conversion year. This would then boost

[10] We include in the sample of non-academies only those located in LAs where there is at least one academy of our sample and that will never convert into academies.

KS2 results of the school independently on the year of exposure. We check for this by looking at each cohort's results at KS1. Figure 4 plots the evolution over time of KS1 assessments. Panels A1 and B1 show the fraction of students awarded Level 3 in math for schools that converted into academies in 2011 and 2012 respectively. Panels A2 and B2 plot the fraction of students awarded Level 3 in English. As before, the fraction of top students in MATs, SATs, and other schools follow a similar pattern, pointing to the absence of different pre-trends in school performance.

We the perform an additional test for the absence of pre-trends, focusing specifically on the school's decision of whether joining a MAT after conversion. We estimate the following regression, at school level:

$$MAT_s = \eta_0 + \eta_1 \Delta M_s + \eta_2 \Delta W_s + \psi_s \tag{3}$$

where MAT is a dummy taking value 1 if school s joins a MAT in 2011 or 2012, and 0 for SAT schools. ΔM_s is a vector of pre-conversion changes in school performance: it includes KS2 test scores and KS1 assessments by school teachers in math and English, as well as KS1 average point score. ΔW_s is a vector of changes in cohort composition before conversion and includes controls for gender, FSM eligibility, ethnicity, language spoken at home, SEN status, and grade enrolment.

The equation is estimated over the period $2009-2005$, using differences between 2009 and 2005 (Table 3, column (1)) as well as 2009 and 2007 (Table 3, column (2)) in school composition and performance.[11] Results show that none of the coefficients - with the exception of enrolment in column (1) - predict the decision to join a MAT.

Finally, we perform a falsification test in an event study framework to test whether our results may be driven by school unobservables or other pre-existing differences between MATs and SATs. We create a 'fake' conversion event for our main sample, assuming that schools have become academies before the actual time of conversion. Since we consider four years of exposure, we set the 'fake' policy event in 2007 and 2008 for schools that become academies in 2011 and 2012 respectively.

In this framework we consider equation (2) and add the correspondent of D_{ist} and $\mathbb{1}(D_{ist} = k) \cdot MAT_s$ for the 'fake' policy events. Figure 5 plots the series of estimates for KS2 math test scores

[11] Since 2010 is the last year before conversion, one could also estimate the same regressions over $2010-2005$. However, in 2010 part of schools boycotted the KS2 tests, and therefore we would not be able to estimate this regression for our final sample. Results considering this time window are similar and are available upon request.

(Panel A) and KS2 English test scores (Panel B).[12] For both subjects coefficients estimated before the event of conversion (set to zero) are small, never statistically different from zero, and do not follow any trend.[13] Overall, this leads us to exclude the existence of any pre-existing trends for schools in MATs that might confound our estimates.

Parental Decisions and Students' Selection

For what concerns parental choices, mobility is relatively high and tends to grow the closer we get to the last year of primary school. In the period we consider about 13% of students have changed school after entering KS2. Since students can change school at any point in time, every year the fraction of students who spent all previous years in the school will be mechanically lower. This implies that any estimate one would get with a naive OLS regression would not reflect the true impact of MATs. Indeed, one would not take into account that not all students taking KS2 tests have spent the same number of years in the school.

Additionally, it might be that schools that decide to convert into academies attract better students, so that the effects of being exposed to a MAT would be the result of self-selection of good students into a MAT or SAT. If selection is correlated to pupils' unobservable characteristics, equation (1) would provide biased estimates of the effect of exposure to a MAT.

In order to deal with endogenous self-selection of pupils into academies we exploit the fact that the enrolment decision made by parents happened years before the conversion. Since the 2010 reform could not be anticipated by parents, we can safely assume that enrolment in a MAT or SAT between 2007 and 2009 is orthogonal to the school's decision of converting.[14] Therefore, we consider only students who were already enrolled in the school before conversion. Since KS2 lasts four years, we can consider up to four years of treatment after the conversion takes place.

We exploit the same grandfathering instrument used by Abdulkadiroglu et al. (2011). Similarly to their identification strategy for US charter schools, we instrument the student status of being in an academy at the time of KS2 tests with a variable indicating whether the student

[12] Consistently with the results presented in Section 5, coefficients shown are 2SLS estimates that takes the endogenous sorting of students across schools into account.

[13] As explained in Section 4, our strategy compares cohorts of students within the same school who take KS2 tests after conversion with cohorts who took KS2 tests before conversion. This implies that as we move the conversion year back in time, our 'control' group will change. As far as the falsification test presented is concerned, the latter is represented by all students who have left an academy before 2007 (2008) for 2011 (2012) converters.

[14] As argued by Eyles et al. (2017), the proposal was first presented in April 2010 and implemented shortly afterwards.

was already enroled in the school before conversion. However, we are also interested in understanding whether the number of years one spends in an academy matters, so that we frame the problem in terms of years of exposure, as in equation (2). Since we know the enrolment date of students, we also know how many years they should have spent in the school.

We interact the instrument with an indicator variable (MAT) for whether the academy attended by the student participates in a MAT. This motivates the following first stage regressions:

$$D_{ist} = \alpha_3 + \gamma_3 \mathbb{1}(Z_{ist} > 0) + \sum_{k=1}^{4} \beta_{3k} \mathbb{1}(Z_{ist} = k) \cdot MAT_s + \theta_3 X_{ist} + \delta_s + \delta_t + v_{3ist} \tag{4}$$

$$D_{kist} \cdot MAT_s = \alpha_4 + \gamma_4 \mathbb{1}(Z_{ist} > 0) + \sum_{k=1}^{4} \beta_{4k} \mathbb{1}(Z_{ist} = k) \cdot MAT_s + \theta_4 X_{ist} + \delta_s + \delta_t + v_{4ist} \tag{5}$$

where Z_{ist} takes value 0 for those students who were not enroled in the academy before conversion; for all other students, Z_{ist} indicates the number of years a student has spent in the academy (up to 4 and 3 for schools converted in 2011 and 2012 respectively). $\mathbb{1}(Z_{ist} = k)$ is a set of indicator variables taking value 1 if the student was enroled in the academy before conversion and the number of years she spends is equal to k, with $k = 1,2,3,4$. Equation (5) is estimated separately for each indicator variable D_{kist}. Other variables follow the notation defined above.

Table 4 shows results from estimation of the set of equations (4) and (5). Column (1) shows the estimated γ_3 coefficient for equation (4); column (2) shows results for one year of exposure ($D_{1ist} = 1$), column (3) for two years ($D_{2ist} = 1$), column (4) for three years ($D_{3ist} = 1$) and column (5) for four years ($D_{4ist} = 1$).

The γ_3 coefficient represents the predicted number of years (about 0.31) that a child who was already enroled before conversion spends in an academy with respect to those who enrol into an academy after conversion. The other coefficients represent the fraction of students who have spent the full number of available years in the MAT (i.e. students who have not changed school) in each year after conversion. To exemplify, in column (1) if all students taking KS2 tests after one year had been in the MAT before conversion, β_1 would be equal to one. The coefficient is instead around 0.93, implying that 93% of students remain in the MAT after conversion for the last year of primary school. The coefficient in column (4) is instead around 0.85, implying that 85% of students remain in the academy post conversion for the last four years of primary school. Our estimates imply that within the sub-group of academies, mobility of students is relatively high, with 15% of them failing to spend the entire Key Stage 2 phase in the same school.[15]

5 Results

Panel A of Table 5 shows OLS estimates obtained from regression (1) for math and English test scores. The first row reports coefficients for years of exposure to a SAT. The second row shows instead the marginal gain for pupils exposed to one extra year of treatment in MATs compared to those in SATs. For math (column(3)) there is no effect of SATs on student achievement, while there is a positive effect of MATs. For English (column (6)), SATs seem to have a negative effect on test scores, while MATs still affect the latter positively. The most complete specifications in columns (3) and (6) suggest that one extra year of exposure to MATs improves pupils' test scores by 0.036σ and 0.028σ in math and English respectively (about $0.7-0.24$ points, or 1 to 0.7% of the average). These coefficients also show that if we considered a child's exposure to academies without taking into account the heterogeneity in governance models, we would find very small effects - and no effects at all for English - on a student's scores.[16]

Panel B shows OLS estimates obtained from regression 2. Column (3) shows the results for math test scores once controlling for school and time fixed effects. One extra year of exposure improves pupils' test scores by about 0.06σ (about 1.2 points), whereas for students with 4 years of exposure the gain is around 0.11σ (2.2 points). These estimates suggest that the improvement is increasing over time that is, the higher the number of years of exposure to a MAT, the higher the achievement compared to pupils enroled in SATs. A slightly different pattern can be observed for English test scores (column (6)). While pupils exposed to MATs perform better than those exposed to SATs, the pattern is slightly decreasing, and the magnitude of the coefficients is smaller (about 0.9 and 0.6 points for 1 and 4 years of exposure respectively).

Table 6 presents 2SLS estimates. Panel A displays the coefficients of the marginal gain of attending a MAT compared to SAT, showing that pupils enrolled in MATs obtain higher results in math and English tests compared to those enroled in SATs. Columns (3) and (6) suggest that one extra year of exposure to MATs increases the test scores in math and English by 0.04σ, or

[15]These estimates are in line with those obtained by Eyles et al. (2017), and follow the same pattern. They estimate a coefficient of about 96% after one year, and 87% after four years. However, beside the (slightly) different sample employed, the coefficient we identify is different because it effectively represents those who stayed in the same *MAT* school.

[16]Despite the different sample considered, this is consistent with the findings of Eyles and co-authors (2016b), who find no overall effect of primary academies on students achievement.

0.8 and 0.4 points respectively (about 1.2% of the average). Panel B shows gains broken down by years of exposure. As columns (3) and (6) suggest, the improvement in math and English test scores is positively correlated with years of exposure, with the increasing trend of the former being more pronounced, but only up to three years of exposure. Students with three years of exposure improve their test scores by about 0.11σ, or 2.2 and 1 points in math and English respectively. There are no effects for students with four years of exposure.

Overall these results would support the notion that MATs are more effective than SATs in raising student achievement. The improvement in KS2 test scores happens across the board, as the magnitude of the coefficients is similar for math and English. Since in the main specification (columns (3) and (6)) we always control for student's baseline achievement (proxied with KS1 scores) the effects can be interpreted in terms of progress made by the children. Finally, the mild gradient in the years of exposure shows that newly converted schools do not seem to "teach to the test", but rather the longer a child is exposed to an academy (up to three years), the larger her gain.

Heterogeneous effects by timing of conversion

In this section we investigate heterogeneous effects by year of conversion. Table 7 shows OLS (Panel A) and 2SLS (Panel B) estimates separately for academies converted in 2011 and 2012. Compared to the aggregate sample, the gain for students attending 2011 academies belonging to a chain is stronger in the first 2 years of conversion (Panel B, columns (1) and (3)). However, by the fourth year of exposure there are no statically significant differences between pupils enroled in MATs or SATs. Interestingly, while OLS and IV estimates are similar for the first two years of exposure, from the third year the OLS is positive and significant for pupils enroled in MATs. In other words, not accounting for later enrolment reinforces the gap between MATs and SATs, especially in the long-term exposure. This may be due to positive selection of students into MATs.

The results are different when we focus on academies that converted in 2012. While being exposed for one year to a MAT is not statistically different from being exposed to a SAT, starting from the second year the improvement of pupils enroled in chains is significantly higher, and increases alongside the number of years of exposure. In particular, columns (2) and (4) in Panel B suggest that after 3 years of exposure to academy, pupils enrolled in MATs improve their test scores by 0.16σ and 0.14σ (3.2 and 1.2 points, or $4.6-4\%$ of the average) in math and English respectively. OLS and 2SLS estimates, as for 2011 sample, start to differ mostly from the third year of exposure. Notably, the effects are higher when we account for late enrolment, which might suggests a negative selection of pupils into MATs after conversion.

The presence of heterogeneous effects given the timing of conversion suggests that 2011 and 2012 converters might have different characteristics. We consider this hypothesis in tables 8 and 9, which present school characteristics and Ofsted inspections respectively. Table 8 shows that schools converted in MATs in 2011 have a lower fraction of students with SEN, students eligible for FSM, and non-natives (Panel A), and a larger fraction of students awarded Level 5 in math and reading (Panel B). Schools in 2012 MATs tend to be smaller and more likely to be faith schools compared to those converted in 2011 but they are not different in teachers' composition (Panel C). Overall, this table does seem to suggest that schools that became academies in 2011 were substantially better than those that converted in 2012.

This is confirmed when we look at Ofsted ratings (Panel A, Table 9). 38% of schools that became academies in 2011 and joined a MAT were judged outstanding during the last Ofsted inspections carried out before the conversion. The figure decreases to 20% if we consider those converted in 2012. Schools that became academies and joined a MAT in 2011 were also more likely to be rated outstanding for the quality of teaching (30% versus 20%) and pupil's learning (32% versus 22%). The same pattern can be observed for SATs (Panel B).

Heterogeneous effects by socio-economic condition

We then investigate heterogeneous effects across pupils by focusing on FSM and SEN students. The reform, in fact, primarily aimed at reducing the educational gap between students with different socio-economic backgrounds. In addition, the achievement of disadvantaged students is one of the main dimensions that Ofsted takes into account in evaluating schools.

We restrict the sample to FSM and SEN students at the time of KS2 test. While FSM eligibility is a good proxy for family income, SEN status refers to students with learning difficulties, physical disabilities, and behavioural problems. We define these as disadvantaged students, and discuss here separate results considering academies converted in 2011 and 2012. Table 10 reports OLS (Panel A) and 2SLS results (Panel B) for 2011 and 2012 converters by subject and years of exposure.

Columns (1) and (3) of Panel B show that there are no statistically significant differences on disadvantaged students' performance between 2011 academies in MAT and SAT. Results for these early converters seem to be mainly driven by students who do not belong to these categories (columns (5) and (7)). Results are quite different when we look at the sample of academies converted in 2012. Columns (2) and (4) suggest that after 3 years of exposure disadvantaged students improve their math and English test scores by 0.26σ (about 5.7 and 2.5 points respectively, or 10% of the average) compared to similar students enrolled in SATs.

These results show that there is a large gain for disadvantaged students enroled in schools that became academies in 2012 and joined a MAT. Overall, this seems to suggest that exposure to MATs led to a decrease in the gap between advantaged and disadvantaged students. Once again, 2011 and 2012 converters exhibit a different pattern and - unlike the former - it seems the latter have targeted particularly pupils at the bottom of the distribution.

6 Possible Mechanisms

The evidence in the previous sections suggests that MATs have a positive impact on student achievement compared to SATs. In this section we explore possible mechanisms underpinning our findings focusing on the role played by the schools' leadership and managerial practices.

We first exploit a unique survey recently conducted by the DfE (Cirin, 2017) which contains schools converted into academies before February 2016. This is the first available information on MATs and SATs practices since their introduction. The sample includes 326 MATs and 542 SATs, both primary and secondary schools.

For the purpose of our study, we focus on the changes implemented by trusts after conversion. Table 11 shows that results differ quite significantly between chains and stand-alone academies. While SATs are more likely to make changes at school level, MATs are more likely to make organizational-level changes, mostly related to the reconstitution of governing body.

In particular, when asked to rank the 5 most important changes (Panel A) made after conversion, 60% of MATs mentioned changes in school leadership and reconstituting the governing body, compared to 22% and 31% of SATs. More than 50% of SATs, instead, mentioned changing the curriculum as one of the most important changes available. Interestingly, SATs also mention to have introduced activities to increase revenues (e.g. revenue generating activities, increasing the number of pupils on roll, and attracting pupils from different geographical area).

Panel B shows the most important change implemented after conversion. Once again MATs are more likely to mention changing school leadership (25%) and reconstituting the governing body (13%) as the most important change. More than 50% of SATs, instead, mention changing the curriculum (24%) and the procurement of services previously provided by the LA (27%).

Overall, these figures show that chains prioritised changes at the managerial level rather than focusing on traditional school level changes, such as changing the curriculum offered or school day length. Therefore, the implementation of different governance practices between MATs and SATs may explain the difference in performance after conversion. Similarly, Angrist et al. (2013) and Dobbie and Fryer (2013), after surveying a sample of charter schools in the US, find that traditional input measures, such as pupil to teacher ratio, per pupil expenditure, and hiring of high qualified teachers are not correlated with school effectiveness. More recently, Bloom et al. (2015) compare autonomous schools across countries to explore the most successful practices. They find that the success of autonomous schools is not linked to autonomy *per se*, but rather to school management, such as strong leadership and the presence of external governing bodies exercising strong accountability on schools' head-teachers.

Our results also uncover substantial heterogeneity in the effects, both across time and students' socio-economic conditions. While for 2011 converters the difference between early MATs and SATs is relatively small and disappears by the fourth year of exposure, for the 2012 sample we find the opposite. In the first year after conversion there are no differences between MATs and SATs, but from the second year of exposure SATs seem to performance significantly worse compared to schools in chains.

In order to identify possible mechanisms, we look at Ofsted inspections' grades regarding a school's management quality. This does seem to vary substantially across different waves of conversion. Considering MATs (Panel A, Table 9), schools that converted in 2011 have a larger probability of being rated outstanding for the management (41% versus 31% of those converted in 2012), for the effectiveness of the governing body (40% versus 22%), and for the leadership and management of teaching (30% versus 15%). Schools converted in 2012 seem instead weaker from a managerial perspective. This suggests that changes at the organisational level in schools with weak management might require time, thus potentially delaying the effects found for MATs (see Table 7). Additionally, as MATs may differ in their philosophy and managerial practices, 2011 and 2012 converters might have different incentives to join a MAT. For instance, a school interested in maintaining its independence may want to join younger MATs, whereas other schools may want to join chains with already established values.

Similarly, SATs converting in 2011 are more likely to be rated outstanding for the management, compared to the later converters. It might be plausible that, despite outstanding, 2011 SATs face some adjustment costs post-conversion compared to MATs, in which managerial functions are carried out by external governors. However, this seem to be the case only for early converter SATs. For those converted in 2012, whose management score is lower, there is no catch up with MATs. This may be considered further suggestive evidence on the importance of management practices. We hope to further investigate the matter as data on MAT practices become available.

7 Conclusion

While most of the previous literature has focused on the effectiveness of autonomous schools, this paper sheds light on potential mechanisms underpinning their success. We exploit a recent reform introduced in England that gave the possibility to become autonomous to all primary and secondary schools. Following the reform, the rapid expansion of chains of independent schools, the so called MATs, brought in a new model of governance characterised by the separation of roles and responsibilities along the governance chain. We explore whether schools belonging to chains - focusing on primary schools - have a positive impact on pupils' achievement compared to single academies.

We deal with the potential endogeneity of students' self-selection into schools by exploiting the fact that enrolment occurred prior to the reform and therefore prior to the decision of the school to become a SAT or join a MAT. Hence, we can safely argue that school conversion could not be anticipated by parents. We then compare math and English scores of students taking the test before and after the conversion within the same school.

Baseline results show that pupils exposed to schools belonging to chains perform better in both math and English. In particular, one extra year of exposure to a MAT compared to a SAT increases test scores by 0.04σ, which corresponds to about 0.8 and 0.4 points respectively. We then differentiate between schools converted in 2011 and schools converted in 2012. For the latter in particular, the improvement is increasing in the number of years and pupils who spend 3 years in a MAT gain by $0.16-0.14\sigma$ (about $3.3-1.2$ points, or $4.6-3.8\%$ of the average) compared to those exposed to SATs. Results are stronger for disadvantaged students enroled in 2012 converters.

While our results suggest that students enrolled in chains do improve their performance, less obvious is the mechanism underpinning our findings. Recent survey data collected from the DfE show that while SATs are more likely to make changes at the school level (e.g. changing the curriculum offered, introducing revenue generating activities, adding non-teaching positions), MATs are more likely to make changes related to managerial practices (e.g. reconstituting the governing body, changing the school leadership, creating formal networks between schools). The survey evidence, coupled with our results on achievement, suggest that interventions at the managerial level might improve school effectiveness and thereby student outcomes.

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Table 1. Descriptives

	All schools		Academies		MAT		SAT	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. Students								
Male	0.5084	0.4999	0.5080	0.4999	0.5103	0.4999	0.5058	0.5000
Eligible for free school meals (FSM)	0.1482	0.3553	0.1133	0.3169	0.1310	0.3375	0.0965	0.2952
White	0.8431	0.3637	0.8539	0.3533	0.8558	0.3513	0.8520	0.3551
Black	0.0361	0.1866	0.0298	0.1701	0.0318	0.1754	0.0280	0.1649
Native	0.8991	0.3011	0.9118	0.2836	0.9148	0.2792	0.9090	0.2876
With special educational needs (SEN)	0.2168	0.4121	0.1869	0.3898	0.2031	0.4023	0.1716	0.3770
Panel B. Scores								
KS1 math Level 3	0.2424	0.4285	0.2771	0.4476	0.2582	0.4377	0.2950	0.4560
KS1 reading Level 3	0.2835	0.4507	0.3208	0.4668	0.3006	0.4585	0.3399	0.4737
KS2 math Level 5	0.3793	0.4852	0.4452	0.4970	0.4211	0.4937	0.4679	0.4990
KS2 reading Level 5	0.4994	0.5000	0.5581	0.4966	0.5325	0.4989	0.5823	0.4932
KS2 math score	68.17	20.66	71.13	19.93	69.92	20.40	72.27	19.40
KS2 math score (FSM and SEN)	54.55	21.79	56.70	21.68	56.16	21.96	57.32	21.34
KS2 reading score	30.98	9.23	32.14	8.90	31.63	9.03	32.63	8.74
KS2 reading score (FSM and SEN)	24.68	9.62	25.60	9.54	25.48	9.61	25.74	9.46
Panel C. Schools								
Community	0.5597	0.4965	0.5967	0.4911	0.6789	0.4679	0.5125	0.5009
Voluntary Controlled	0.1772	0.3819	0.0967	0.2959	0.0854	0.2800	0.1083	0.3115
Voluntary Aided	0.2395	0.4268	0.1955	0.3970	0.1626	0.3698	0.2292	0.4212
KS2 grade enrolment	31.64	19.17	42.63	24.81	41.31	25.89	43.98	23.63
Pupil-teacher ratio	20.94	2.78	21.99	2.48	21.63	2.51	22.36	2.40
Percent qualified teachers	0.9727	0.0371	0.9640	0.0467	0.9644	0.0437	0.9637	0.0497
Percent non-qualified teachers	0.0210	0.0334	0.0273	0.0417	0.0259	0.0384	0.0288	0.0449
Number of schools	7,302		486		246		240	
Number of schools (2011)			259		120		139	
Number of schools (2012)			227		126		101	
Number of FSM and SEN students	706,080		55,259		29,542		25,717	
Number of students	2,466,682		211,688		102,855		108,833	

Note. The table presents summary statistics for non-academy schools (columns (1) and (2)), converter academies (columns (3) and (4)), MATs (columns (5) and (6)) and SATs (columns (7) and (8)). Schools considered in columns (1) and (2) include all state-funded schools in Local Authorities where there is at least one academy. Means and standard deviations are computed over the period 2005-2015.

Table 2. Location of responsibility in MATs

	Trust Board (1)	Regional/Cluster level (2)	School level (3)
Financial compliance	95%	4%	1%
Legal compliance	93%	4%	3%
Appointing headteachers/principals	91%	4%	5%
Managing risks	88%	5%	6%
Holding individual headteachers/principals to account	82%	8%	10%
Monitoring the performance of individual schools	73%	13%	15%
Human resources	72%	10%	18%
Allocating school budgets	70%	6%	24%
Directing school improvement support	62%	17%	21%
Setting academic targets	44%	12%	44%
Designing school staffing structures	31%	15%	54%
Setting individual school strategy/objectives	31%	8%	60%
School development action plans	9%	13%	78%

Note. The table presents the location of responsibility in multi-academy trusts (MATs) by Trust Board (column (1)), Regional/Cluster level (column (2)) and School level (column (3)). Source: Academy trust survey 2017. The sample of respondents contains 267 MATs and 436 SATs, both primary and secondary.

Table 3. Probability of joining a MAT

	4-year lag (1)	2-year lag (2)
KS2 English scores	0.045	0.018
	(0.028)	(0.029)
KS2 math scores	-0.023	0.017
	(0.028)	(0.030)
KS1 English points	0.020	-0.029
	(0.053)	(0.052)
KS1 math points	-0.044	-0.022
	(0.046)	(0.045)
KS1 Average Point Score	-0.026	-0.012
	(0.072)	(0.070)
Male students	-0.023	-0.017
	(0.023)	(0.025)
Students eligible for free school meals	0.004	0.009
	(0.023)	(0.024)
White students	0.030	0.003
	(0.023)	(0.025)
Black students	0.004	-0.038*
	(0.026)	(0.021)
Native students	0.011	0.013
	(0.025)	(0.024)
Students with special educational needs	0.001	-0.012
	(0.024)	(0.027)
KS2 grade enrolment	-0.047**	-0.021
	(0.023)	(0.022)
Number of schools	486	486
Observations	486	486

Note. The table shows regressions of an indicator variable taking value one for schools that have joined a MAT on changes in student and school characteristics. All independent variables are standardised to have zero mean and unit variance. The time period considered is 2009-2005. In column (1) changes are computed over 4 years (2009-2005), and in column (2) over 2 years (2009-2007). Results obtained for the period 2010-2005 are similar and are available upon request. Standard errors, shown in brackets, are clustered on schools. *** p<0.01, ** p<0.05, * p<0.1

Table 4. First stage regressions

	Years of exposure	Years of exposure to MAT			
		One	Two	Three	Four
	(1)	(2)	(3)	(4)	(5)
Enroled in academy before conversion	0.307***				
	(0.018)				
Predicted exposure to MAT:					
One year		0.932***			
		(0.005)			
Two years			0.935***		
			(0.005)		
Three years				0.862***	
				(0.016)	
Four years					0.848***
					(0.027)
Observations	211,688	211,688	211,688	211,688	211,688
Number of schools	486	486	486	486	486
Controls	Yes	Yes	Yes	Yes	Yes
School FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes

Note. The table shows first stage regressions of years of exposure to an academy (column (1)) and to a MAT (columns (2) to (5)) on an indicator variable that takes value 1 for students already enroled before conversion, and predicted exposure to a MAT. The sample includes all schools converted into academies in 2011 and 2012. All regressions include indicators for student characteristics (gender, free school meals eligibility, ethnicity, language spoken at home, special educational need status), student's average point score at KS1, school enrolment, and time and school fixed effects. Standard errors, shows in brackets, are clustered on schools. *** p<0.01, ** p<0.05, * p<0.1

Table 5. OLS regressions for academies converted in 2011 and 2012

	Math points			English points		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Marginal gain						
Years of Exposure	-0.010*	-0.022***	0.003	-0.007	-0.017***	-0.023**
	(0.006)	(0.005)	(0.010)	(0.006)	(0.005)	(0.010)
Years of Exposure to MAT	0.024**	0.036***	0.036***	0.020**	0.028***	0.028***
	(0.010)	(0.008)	(0.008)	(0.009)	(0.007)	(0.007)
Panel B. Gain by years of exposure						
Years of Exposure	-0.011*	-0.022***	0.012	-0.007	-0.017***	-0.004
	(0.006)	(0.005)	(0.011)	(0.006)	(0.005)	(0.011)
Years of Exposure to MAT:						
1 year	0.015	0.047**	0.058**	0.046**	0.075***	0.098***
	(0.022)	(0.019)	(0.025)	(0.020)	(0.017)	(0.023)
2 years	0.048*	0.086***	0.108***	0.053**	0.089***	0.096***
	(0.027)	(0.025)	(0.028)	(0.023)	(0.020)	(0.023)
3 years	0.058**	0.110***	0.113***	0.026	0.069***	0.081***
	(0.029)	(0.026)	(0.027)	(0.028)	(0.023)	(0.024)
4 years	0.125***	0.128***	0.107***	0.101**	0.096***	0.072**
	(0.038)	(0.035)	(0.036)	(0.040)	(0.034)	(0.035)
Observations	211,688	211,688	211,688	211,533	211,533	211,533
Controls	Yes	Yes	Yes	Yes	Yes	Yes
School FE	No	Yes	Yes	No	Yes	Yes
Time FE	No	No	Yes	No	No	Yes

Note. The table shows OLS regressions of KS2 math scores (columns (1) to (3)) and KS2 English scores (columns (4) to (6)) on years of exposure (Panel A) and years of exposure and four indicator variables for years of exposure to a MAT (Panel B). Outcome variables are standardised to have zero mean and unit variance. Both schools converted in 2011 and 2012 are considered. Columns (1) and (4) control for gender, free school meals eligibility, ethnicity, language spoken at home, special educational need status, student's average point score at KS1 and school enrolment. Columns (2) and (5) add school fixed effects; columns (3) and (6) add time fixed effects. Standard errors, shown in brackets, are clustered on schools. *** p<0.01, ** p<0.05, * p<0.1

Table 6. IV regressions for academies converted in 2011 and 2012

	Math points			English points		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Marginal gain						
Years of Exposure	0.003	-0.020***	0.111**	0.001	-0.020***	-0.009
	(0.007)	(0.007)	(0.046)	(0.007)	(0.007)	(0.044)
Years of Exposure to MAT	0.018*	0.042***	0.041***	0.021*	0.042***	0.041***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.010)	(0.010)
Panel B. Gain by years of exposure						
Years of Exposure	0.003	-0.020***	0.129***	0.001	-0.020***	0.013
	(0.007)	(0.007)	(0.047)	(0.007)	(0.007)	(0.045)
Years of Exposure to MAT:						
1 year	0.026	0.058***	0.065**	0.047**	0.078***	0.095***
	(0.023)	(0.021)	(0.027)	(0.021)	(0.019)	(0.025)
2 years	0.035	0.087***	0.103***	0.036	0.086***	0.076***
	(0.028)	(0.027)	(0.030)	(0.025)	(0.023)	(0.025)
3 years	0.054*	0.121***	0.117***	0.037	0.094***	0.106***
	(0.030)	(0.031)	(0.031)	(0.030)	(0.028)	(0.028)
4 years	0.061	0.105**	0.041	0.079*	0.102***	0.055
	(0.043)	(0.042)	(0.043)	(0.045)	(0.039)	(0.040)
Observations	211,688	211,688	211,688	211,533	211,533	211,533
Controls	Yes	Yes	Yes	Yes	Yes	Yes
School FE	No	Yes	Yes	No	Yes	Yes
Time FE	No	No	Yes	No	No	Yes

Note. The table shows 2SLS regressions of KS2 math scores (columns (1) to (3)) and KS2 English scores (columns (4) to (6)) on years of exposure (Panel A) and years of exposure and four indicator variables for years of exposure to a MAT (Panel B). Outcome variables are standardised to have zero mean and unit variance. Both schools converted in 2011 and 2012 are considered. Columns (1) and (4) control for gender, free school meals eligibility, ethnicity, language spoken at home, special educational need status, student's average point score at KS1 and school enrolment. Columns (2) and (5) add school fixed effects; columns (3) and (6) add time fixed effects. Standard errors, shown in brackets, are clustered on schools. *** p<0.01, ** p<0.05, * p<0.1

Table 7. OLS and IV regressions for academies by year of conversion

	Math points		English points	
	2011	2012	2011	2012
	(1)	(2)	(3)	(4)
Panel A. OLS				
Years of exposure	0.007	0.010	-0.004	-0.014
	(0.013)	(0.014)	(0.012)	(0.013)
Years of Exposure to a MAT:				
1 year	0.065**	0.059	0.126***	0.057*
	(0.031)	(0.037)	(0.030)	(0.031)
2 years	0.097**	0.128***	0.096***	0.091***
	(0.038)	(0.039)	(0.031)	(0.035)
3 years	0.101***	0.116***	0.086***	0.068*
	(0.037)	(0.038)	(0.032)	(0.035)
4 years	0.108***		0.076**	
	(0.039)		(0.037)	
Panel B. 2SLS				
Years of exposure	0.094*	0.060**	0.010	-0.006
	(0.056)	(0.030)	(0.056)	(0.030)
Years of Exposure to a MAT:				
1 year	0.064*	0.055	0.131***	0.042
	(0.033)	(0.040)	(0.034)	(0.035)
2 years	0.087**	0.108**	0.068**	0.073*
	(0.040)	(0.042)	(0.034)	(0.037)
3 years	0.074*	0.164***	0.074*	0.142***
	(0.043)	(0.045)	(0.038)	(0.041)
4 years	0.044		0.056	
	(0.045)		(0.042)	
Observations	118,600	93,088	118,578	92,955
Controls	Yes	Yes	Yes	Yes
School FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

Note. The table shows OLS (Panel A) and 2SLS regressions (Panel B) of KS2 math scores (columns (1) to (3)) and KS2 English scores (columns (4) to (6)) on years of exposure and four indicator variables for years of exposure to a MAT. Outcome variables are standardised to have zero mean and unit variance. Columns (1) and (3) consider schools converted in 2011; columns (2) and (4) consider schools converted in 2012.All columns control for gender, free school meals eligibility, ethnicity, language spoken at home, special educational need status, student's average point score at KS1, and school and time fixed effects. Standard errors, shown in brackets, are clustered on schools. *** p<0.01, ** p<0.05, * p<0.1

Table 8. Academy characteristics by year of conversion

	MAT		SAT	
	2011	2012	2011	2012
	(1)	(2)	(3)	(4)
Panel A. Students				
Male	0.5117	0.5088	0.5040	0.5087
Eligible for free school meals (FSM)	0.1262	0.1361	0.0896	0.1071
White	0.8690	0.8421	0.8735	0.8187
Black	0.0409	0.0223	0.0236	0.0348
Natives	0.9386	0.8901	0.9146	0.9004
With special educational needs (SEN)	0.1993	0.2070	0.1659	0.1805
Panel B. Scores				
KS1 math Level 3	0.2618	0.2546	0.3071	0.2762
KS1 reading Level 3	0.3081	0.2929	0.3473	0.3283
KS2 math Level 5	0.4427	0.3988	0.4793	0.4502
KS2 reading Level 5	0.5549	0.5093	0.5895	0.5712
KS2 math score	71.03	68.77	72.80	71.46
KS2 math score (FSM and SEN)	57.13	55.22	57.64	56.87
KS2 reading score	32.12	31.12	32.79	32.38
KS2 reading score (FSM and SEN)	25.98	24.99	25.78	25.68
Panel C. Schools				
Community schools	0.7333	0.6270	0.5108	0.5149
Voluntary Controlled schools	0.1167	0.0556	0.1007	0.1188
Voluntary Aided schools	0.0750	0.2460	0.2158	0.2475
KS2 grade enrolment	43.11	39.60	46.15	41.00
Pupil-teacher ratio	21.63	21.64	22.42	22.27
Percent qualified teachers	0.9616	0.9670	0.9604	0.9683
Percent non-qualified teachers	0.0295	0.0225	0.0326	0.0234
Number of schools	120	126	139	101
Number of FSM and SEN students	14,616	14,926	14,964	10,753
Number of students	52,399	50,456	66,201	42,632

Note. The table presents characteristics of schools converted as MATs in 2011 or 2012 (columns (1) and (2)) and schools converted as SATs in 2011 or 2012 (columns (3) and (4)). Means are computed over the period 2005-2015.

Table 9. Fraction of schools by Ofsted judgement and year of conversion

	Outstanding		Good		Satisfactory	
	2011	2012	2011	2012	2011	2012
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Multi-academy trusts (MAT)						
Overall grade	0.38	0.27	0.44	0.54	0.18	0.19
Behaviour and safety of pupils	0.54	0.37	0.41	0.60	0.05	0.03
Quality of teaching	0.30	0.20	0.53	0.62	0.17	0.18
Quality of pupils' learning	0.32	0.22	0.51	0.58	0.17	0.20
Quality of SEN pupils' learning	0.34	0.24	0.52	0.60	0.13	0.17
Pupils' attendance	0.13	0.17	0.56	0.46	0.31	0.37
Leadership and management	0.41	0.31	0.44	0.56	0.15	0.13
Effectiveness of Governing Body	0.40	0.22	0.46	0.57	0.13	0.21
Leadership and management of teaching	0.30	0.15	0.50	0.64	0.20	0.21
Panel B. Single-academy trusts (SAT)						
Overall grade	0.54	0.26	0.42	0.60	0.04	0.14
Behaviour and safety of pupils	0.70	0.50	0.29	0.49	0.01	0.01
Quality of teaching	0.45	0.19	0.53	0.67	0.03	0.14
Quality of pupils' learning	0.47	0.22	0.49	0.64	0.04	0.14
Quality of SEN pupils' learning	0.51	0.24	0.45	0.64	0.04	0.12
Pupils' attendance	0.30	0.25	0.54	0.48	0.17	0.28
Leadership and management	0.58	0.31	0.40	0.58	0.02	0.11
Effectiveness of Governing Body	0.46	0.22	0.46	0.60	0.08	0.18
Leadership and management of teaching	0.26	0.18	0.70	0.70	0.05	0.12

Note. The table shows the fraction of schools by Ofsted judgement and year of conversion. The sample includes schools that became academies between April 2011 and August 2012. Only Converter academies are considered. Panel A presents grades for multi-academy trusts (MATs) and Panel B for single-academy trusts (SATs). Columns (1) and (2) show the fraction of schools judged outstanding; columns (3) and (4) show the fraction of schools judged good; columns (5) and (6) show the fraction of schools judged satisfactory or inadequate. The table uses the last available Ofsted ranking before the conversion took place.

Table 10. OLS and IV regressions. Sample of FSM eligible and SEN students

	Disadvantaged students				Other students			
	Math		English		Math		English	
	2011	2012	2011	2012	2011	2012	2011	2012
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. OLS								
Years of exposure	0.027	0.021	0.018	-0.018	0.001	0.007	-0.006	-0.001
	(0.022)	(0.026)	(0.023)	(0.022)	(0.013)	(0.015)	(0.013)	(0.015)
Years of exposure to a MAT:								
1 year	0.060	0.109**	0.110**	0.120**	0.058*	0.029	0.112***	0.021
	(0.052)	(0.051)	(0.048)	(0.051)	(0.030)	(0.036)	(0.030)	(0.030)
2 years	0.071	0.254***	0.069	0.155***	0.098***	0.070*	0.091***	0.057*
	(0.057)	(0.062)	(0.053)	(0.056)	(0.037)	(0.037)	(0.030)	(0.034)
3 years	0.030	0.156**	-0.023	0.149**	0.112***	0.096***	0.099***	0.032
	(0.061)	(0.072)	(0.056)	(0.064)	(0.036)	(0.034)	(0.030)	(0.032)
4 years	0.045		-0.037		0.123***		0.101***	
	(0.068)		(0.069)		(0.037)		(0.034)	
Panel A. 2SLS								
Years of exposure	0.066	0.047	0.008	-0.045	0.118*	0.079**	0.033	0.041
	(0.064)	(0.048)	(0.066)	(0.042)	(0.065)	(0.032)	(0.064)	(0.033)
Years of exposure to a MAT:								
1 year	0.059	0.115**	0.108*	0.101	0.058*	0.023	0.125***	0.009
	(0.056)	(0.059)	(0.056)	(0.062)	(0.032)	(0.039)	(0.033)	(0.032)
2 years	0.074	0.244***	0.059	0.133**	0.087**	0.053	0.063*	0.044
	(0.064)	(0.070)	(0.059)	(0.064)	(0.038)	(0.039)	(0.033)	(0.035)
3 years	-0.018	0.267***	-0.026	0.264***	0.097**	0.127***	0.086**	0.087**
	(0.074)	(0.083)	(0.071)	(0.077)	(0.041)	(0.039)	(0.036)	(0.037)
4 years	-0.056		-0.055		0.072		0.080**	
	(0.078)		(0.076)		(0.044)		(0.040)	
Observations	29,580	25,679	29,416	25,430	89,020	67,409	89,162	67,525
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
School FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

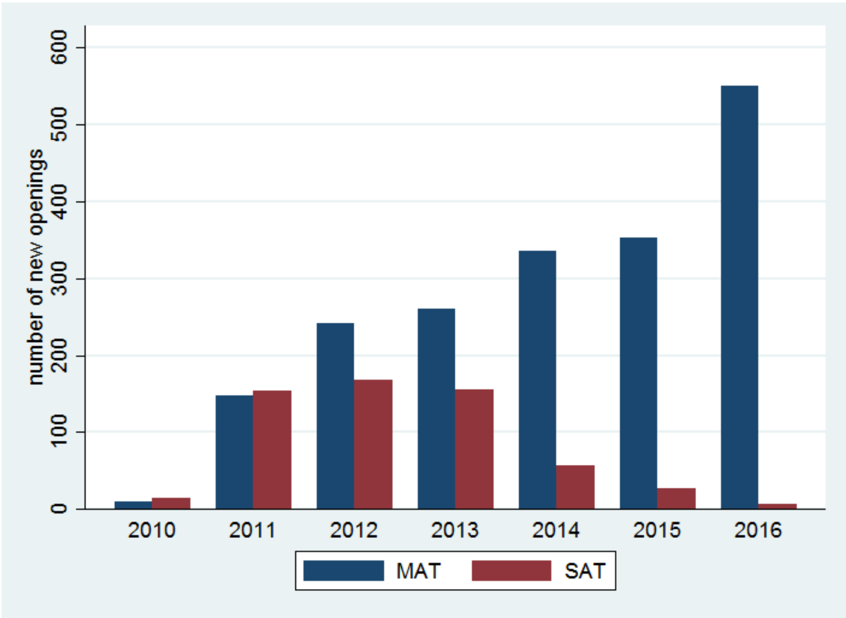
Note. The table shows OLS (Panel A) and 2SLS regressions (Panel B) of KS2 math scores (columns (1) to (4)) and KS2 English scores (columns (5) to (8)) on years of exposure and four indicator variables for years of exposure to a MAT by socio-economic condition of the child. Outcome variables are standardised to have zero mean and unit variance. Columns (1), (3), (5) and (7) present results for 2011 converter academies; columns (2), (4), (6) and (8) present results for 2012 converter academies. Disadvantaged children are defined as those eligible for free school meals or with special educational needs. Other students are those not included in these categories. All columns control for gender, ethnicity, language spoken at home, student's average point score at KS1, school enrolment, school and time fixed effects. Standard errors, shown in brackets, are clustered on schools. *** p<0.01, ** p<0.05, * p<0.1

Table 11. Most important changes introduced by MATs and SATs

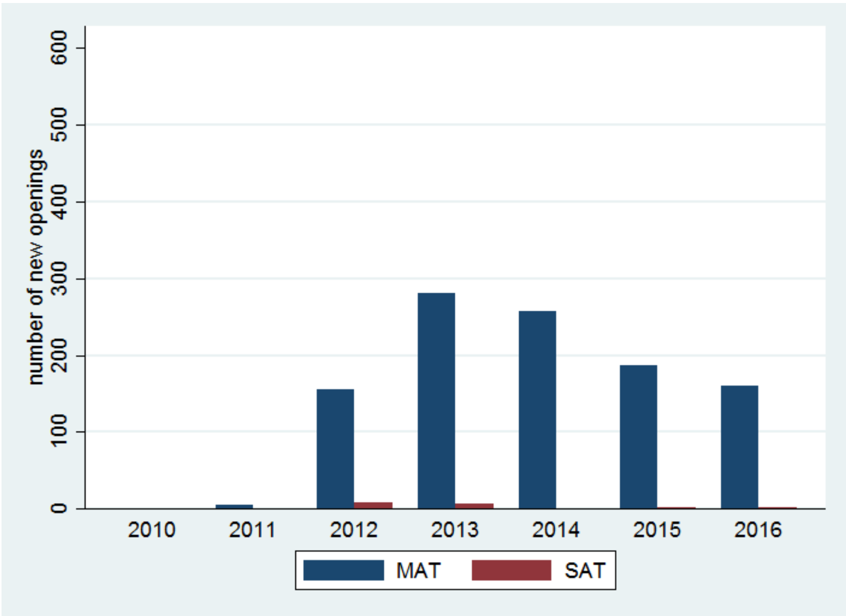
	Proportion of MATs (1)	Proportion of SATs (2)
Panel A. Top 5 most important changes		
Changing school leadership	60%	22%
Reconstituiting your governing body	60%	31%
Change the curriculum you offer	37%	59%
Changing the length of school terms	7%	11%
Increasing the number of pupils on roll	18%	30%
Introducing or increasing revenue-generating activities	28%	42%
Seeking to attract pupils from a different geographical area	3%	10%
Panel B. Most important change		
Introducing savings in back-office functions (e.g. HR, ICT, insurance...)	28%	10%
Changing school leadership	25%	4%
Reconstituting their governing body	13%	4%
Procuring services that were previously provided by the Local Authority	11%	27%
Changing the curriculum	10%	24%
Changing the performance management system for teachers	4%	2%
Changing the pattern of capital expenditure	3%	8%
Introducing or increased revenue-generating activities	1%	6%
Increasing the number of pupils on roll	1%	8%
Other changes	3%	5%

Note. Panel A presents the proportion of MATs and SATs that endorse a change as being one of the five most important available to them. The sample of respondents contains 267 MATs and 435 SATs, both primary and secondary. Panel B presents the most important change that MATs (column (1)) and SATs (column (2)) had the opportunity to undertake after conversion. The sample of respondents contains 267 MATs and 436 SATs, both primary and secondary. Other changes includes pay staff structure, admission criteria, hiring teachers without qualified teacher status (QTS), and seeking pupils from a different geographical area. Source: Academy trust survey 2017.

Figure 1. Yearly openings of academies



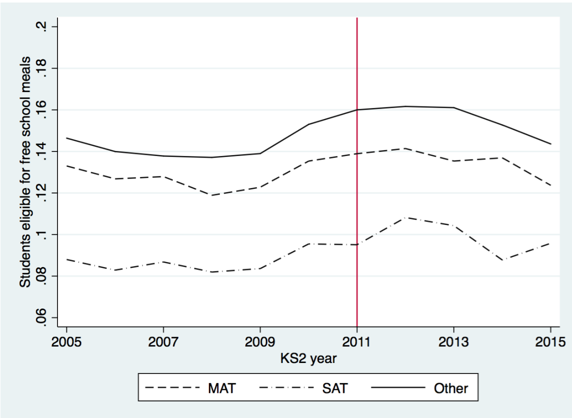
Panel A. Converter Academies



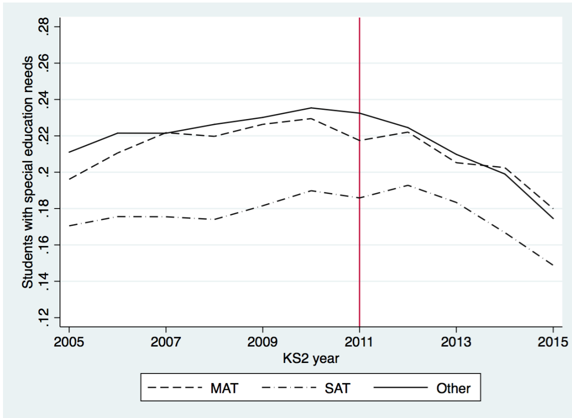
Panel B. Sponsor Led Academies

Note. The figure shows the number of openings of Converter (Panel A) and Sponsor Led (Panel B) academies by year of opening and academy status (MAT or SAT).

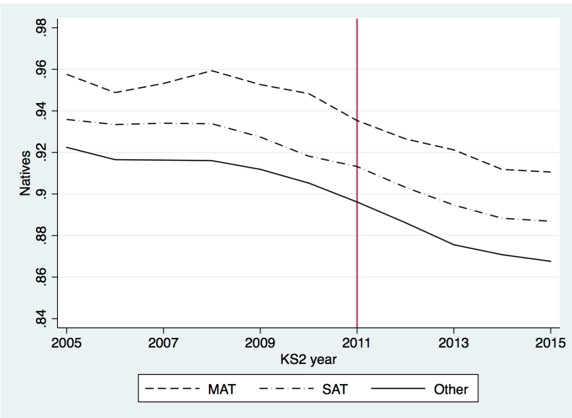
Figure 2. Student and School Characteristics for 2011 Academies



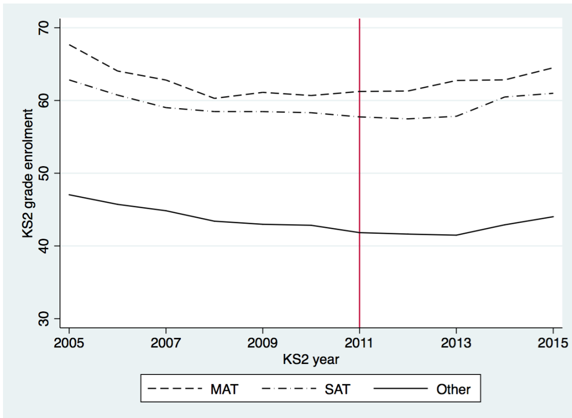
Panel A. Free school meals eligible



Panel B. Students with SEN



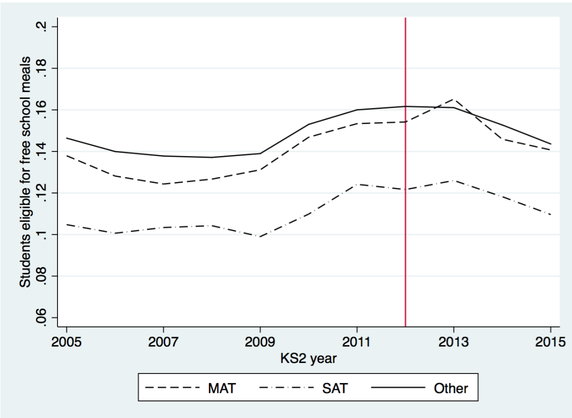
Panel C. English as first language



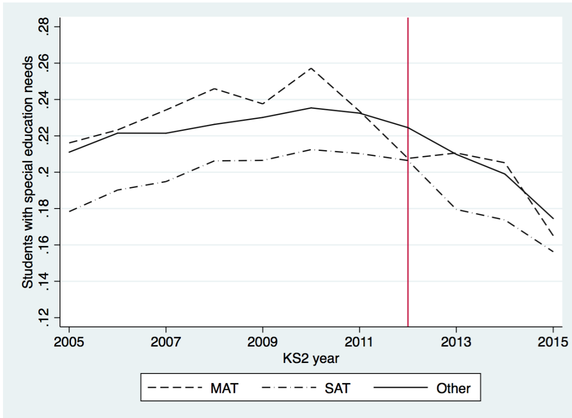
Panel D. School enrolment

Note. The figure shows student and school characteristics from 2005 to 2015 for multi-academy trusts (dashed line), single-academy trusts (dashed-dotted line) and schools that are not academies (solid line). Only schools converted in 2011 are considered. The red vertical line denotes the year of conversion. Panel A shows the fraction of students eligible for free school meals at the end of primary school; Panel B and C show the fraction of students with special educational needs and whose first language spoken at home is English respectively; Panel D shows KS2 grade enrolment.

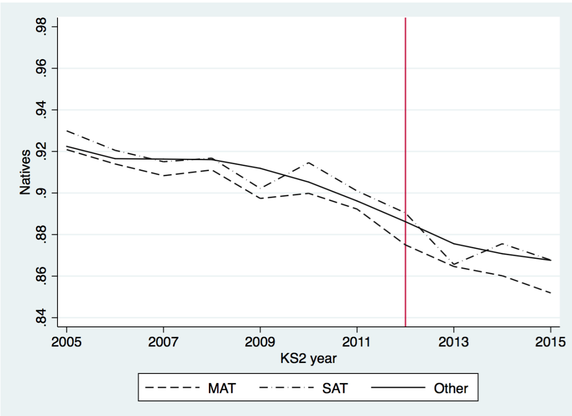
Figure 3. Student and School Characteristics for 2012 Academies



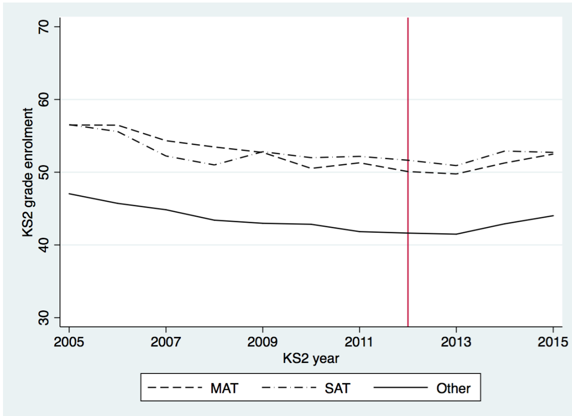
Panel A. Free school meals eligible



Panel B. Students with SEN



Panel C. English as first language

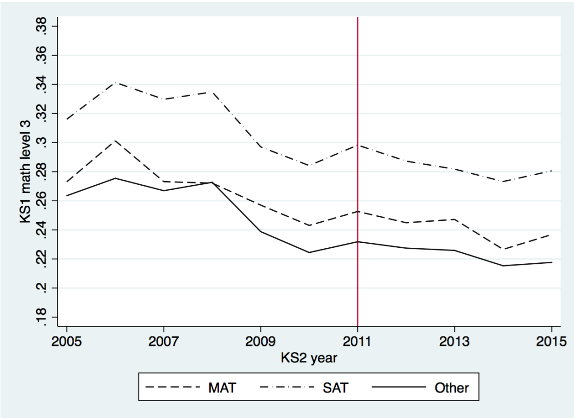


Panel D. School enrolment

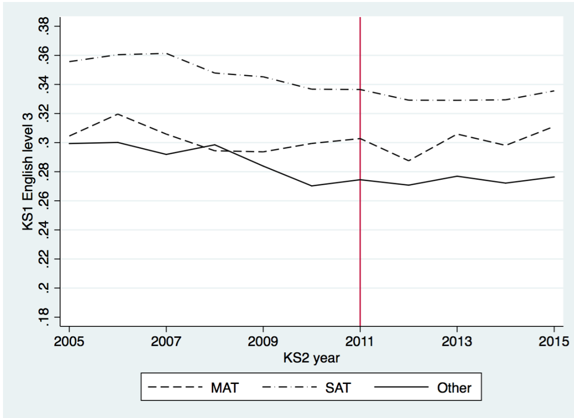
Note. The figure shows student and school characteristics from 2005 to 2015 for multi-academy trusts (dashed line), single-academy trusts (dashed-dotted line) and schools that are not academies (solid line). Only schools converted in 2012 are considered. The red vertical line denotes the year of conversion. Panel A shows the fraction of students eligible for free school meals at the end of primary school; Panel B and C show the fraction of students with special educational needs and whose first language spoken at home is English respectively; Panel D shows KS2 grade enrolment.

Figure 4. KS1 Teacher Assessments

A. 2011 Academies

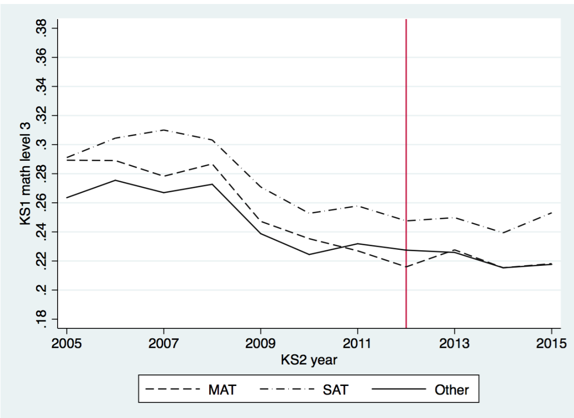


Panel 1. Math Level 3

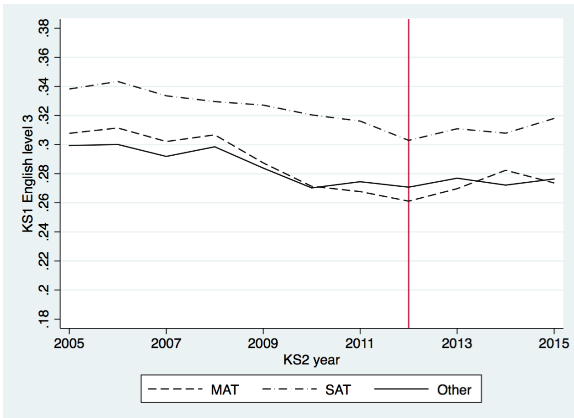


Panel 2. English Level 3

B. 2012 Academies



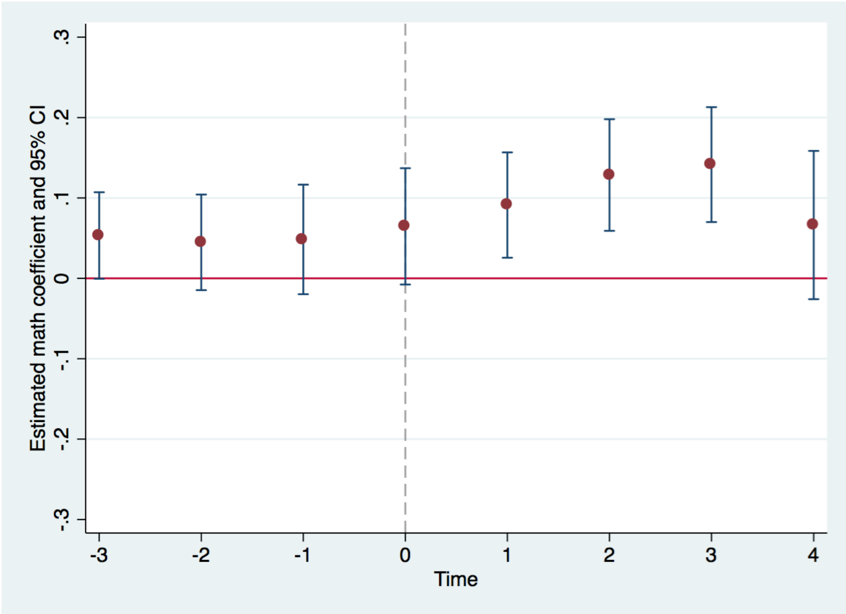
Panel 1. Math Level 3



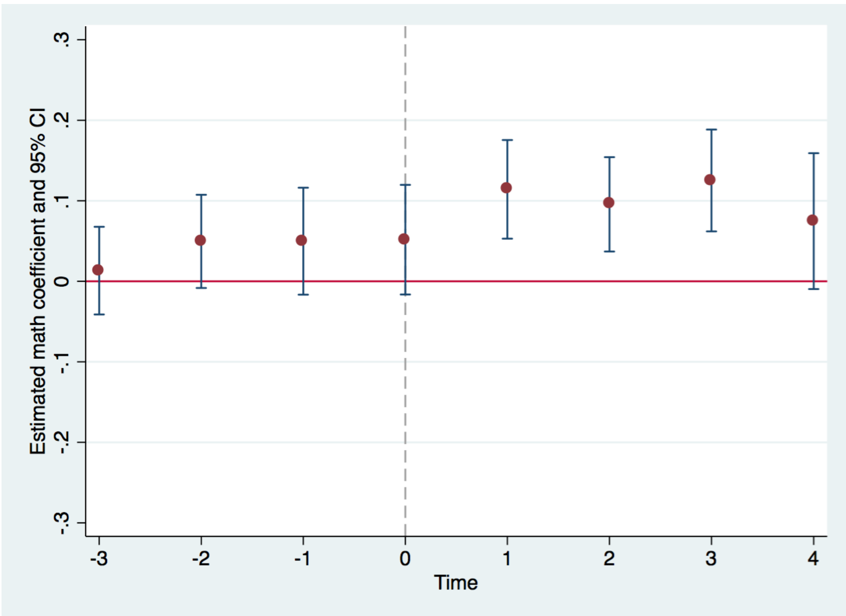
Panel 2. English Level 3

Note. The figure shows KS1 scores from 2005 to 2015 for multi-academy trusts (dashed line), single-academy trusts (dashed-dotted line) and schools that are not academies (solid line). Panel A and Panel B show KS1 scores for schools converted in 2011 and 2012 respectively. The red vertical line denotes the year of conversion. Figure 1 in each Panel shows the fraction of students awarded Level 3 in math in KS1 teacher assessments; Figure 2 in each Panel shows instead the fraction of students awarded Level 3 in English.

Figure 5. Falsification Test for Converter Academies



Panel A. Math



Panel B. English

Note. The figure plots a falsification test for math (Panel A) and English (Panel B). The coefficients are 2SLS estimates from a regression of KS2 scores on years of exposure. For each coefficient, the 95% confidence interval is shown. The treatment year is shifted back to 2007 and 2008 for 2011 and 2012 converters respectively.