School management takeover, leadership change, and personnel policy*

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Abstract

Low-performing, high-poverty, public schools notoriously struggle to attract and retain good teachers. This paper studies a setting where independent organizations, including charities and businesses, take over the management of under-performing schools, while funding remains public. Exploiting the staggered expansion of English Sponsor-led academies since the early 2000s, we show that the Sponsor-led takeover leads to substantial changes in the teaching body and the school personnel policy. The probability that the Sponsor appoints a new headteacher doubles upon the takeover, with the new headteacher being, on average, better paid, and more likely to come from outstanding schools. The takeover also induces teacher sorting, with older and lower-achieving teachers leaving the school, and new teachers joining the Sponsor-led school from outstanding schools. Lastly, Sponsors substantially restructure teachers' rewarding scheme and abandon a pay scale entirely based on seniority, leading to a 10 percent increase in pay dispersion across equally experienced teachers.

JEL codes: I28; J13; J18.
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1 Introduction

While extensive literature shows that teachers are the most important input for students' outcomes (Rockoff 2004, Rivkin et al. 2005, Rothstein 2010, Chetty et al. 2014, Jackson 2018, Gibbons et al. 2021), one of the key challenges that disadvantaged, under-performing schools face is how to attract and retain high-quality teachers (Clotfelter et al. 2008, Lavy 2008, Glazerman et al. 2013, Springer et al. 2016). Governments around the world are increasingly experimenting different options to improve teacher recruitment and retention in hard-to-staff schools, including financial and career incentives (Swain et al. 2019, Benhenda 2020, Bobba et al. 2021, Morgan et al. 2023), or behavioral strategies (Ajzenman et al. 2020). This paper considers a context where educational charities, private businesses, successful schools or universities take over the management of low-performing, high-poverty, public schools, and studies how this change in management influences the headteacher selection, and teacher turnover, composition, and pay.

Over the last twenty years, English secondary schools have been allowed to acquire the status of charitable trusts called "academies" to gain autonomy from the local authority (LA) over major aspects of the school governance, such as the organization of the school curriculum, the structure of the school day and year, spending allocation, and teachers' pay and working conditions. What makes academies especially interesting to study is that the conversion process had been initially conceived as a remedial program for low-performing, disadvantaged schools (Eyles et al. 2018, Eyles and Machin 2019). When the Department for Education (DfE) identifies a struggling school, it matches it with a so-called *Sponsor*, an external, independent organization or individual interested in taking over the management of the school. Upon the DfE's approval of the conversion application, while funding remains public, the Sponsor takes the lead of the school by nominating a board of trustees, that becomes responsible for managing the school budget, hiring and paying the headteacher and teachers, and setting the school direction and ethos. For this reason, schools acquiring academy status through this route are called *Sponsor-led academies*, or *sponsored academies*.

By the school year 2022/23, 25 percent of all secondary schools have been converted to

sponsored academies.[1] Importantly, by now there is ample evidence that Sponsor-led academies have been effective at improving student achievement and educational attainment (Eyles et al. 2016, Andrews et al. 2017, Eyles et al. 2018, Eyles and Machin 2019). However, as in the case of charter schools in the US, it is still debated what the mechanisms behind these successful stories are (Adonis 2012, Angrist et al. 2013, Dobbie and Fryer Jr 2013, Fryer Jr 2014, Cohodes and Parham 2021, Silva et al. 2023). This paper focuses on the impact of these school management takeovers on the headteacher selection, teacher turnover, composition, and pay.

To study how the management change affects these outcomes, we combine school- and teacher-level panel data set spanning the entire period of academies' expansion, creating a rich matched employer-employee data set of schools and teachers. To identify causal effects, we adopt a difference-in-differences (DiD) strategy that compares the evolution of the outcomes of interest around the year of conversion (from 3 years before to two years after) in schools that experience the takeover in a certain year and schools that become sponsored academies a few years later. While we cannot argue that the timing of takeovers is random, treated and control schools are comparable along most dimensions before the takeover is initiated. Moreover, we perform several robustness checks to test the validity of our identification strategy, including controlling for local-authority specific time shocks, and using different conversion cohorts as control group.

Our results show that the Sponsor-led takeover leads to profound changes in the teaching body and the school personnel policy. First, the probability that the board of trustees appoints a new headteacher more than doubles the conversion year in treated vs. control schools, and, on average, it increases by 67 percent after the conversion period compared to the pre-takeover mean. This result echos the effect of changing school superintendent on the headteacher selection found in Lavy et al. (2023). Importantly, the new headteacher tends to be better paid (7 percent increase), and, three times more likely to come from an outstanding school (as certified by the independent inspection authority, the Office for Standards in Education, or OFSTED hereafter).

Second, the change in management generates a sorting effect that mimics the impact of

[1]The 2010 Academy Act also introduced the academy model in the primary sector. By the school year 2022/23, 10 percent of primary schools have been converted to sponsored academies.

performance-related pay contracts on employees' selection found in the personnel literature (Lazear 2000, Gielen et al. 2010, Leaver et al. 2021). Once the takeover is initiated, there is a large increase in teachers' separations, driven by older teachers and teachers who were less likely to be high-achievers in education. Moreover, once the takeover is completed, the share of teachers leaving the school drops by 7.5 percentage points (p.p.), or one third compared to the pre-conversion mean. In parallel, the school takeover leads to a 4 p.p. increase in the share of newly hired teachers, or 27 percent compared to the pre-conversion mean, with new teachers being twice as likely to be *Teach First* teachers - England's equivalent of *Teach for America* teachers - 70 percent more likely to come from an outstanding school, and 0.3 p.p. more likely to come from the same school as the new head (from a pre-conversion 0 probability). These dynamics suggest that the Sponsor-led takeover is accompanied by the injection of business-like ethos and practices that push away potentially worse-performing teachers and attract high-productive ones.

To investigate this hypothesis further, we study the impact of the takeover on teacher pay and find that Sponsors substantially restructure teachers' rewarding scheme. By running teacher-level regressions that control for teacher-fixed effects, on top of school and year fixed effects, we find that the new school governing body increases, on average, teachers' base pay, but reduces the use of additional payments that public schools traditionally give to teachers to top up their salary. In turn, average gross pay does not change but, importantly, pay dispersion across equally experienced/educated teachers increases by 10 percent after the takeover, which shows that the new management abandons a pay scale entirely based on seniority.

Finally, we find that, in just a few years, Sponsor-led schools are able to obtain outstanding scores by the independent inspection authority OFSTED. In particular, both the probability of having an outstanding performance in teaching and in management increase, respectively, by 5 and 15 percentage points, or 5 times compared to the pre-takeover mean, suggesting that Sponsors' new personnel policy may be key to explain the substantial improvement in pupils' outcomes brought about by sponsored academies (Lemos et al. 2021).[2]

[2]Eyles and Machin (2019) provide some preliminary evidence that the first sponsored academies, i.e. school takeovers taking place in the early 2000s, improved OFSTED performance, changed their headteacher and increased

These results contribute, first of all, to the studies analyzing the impact of management practices on student achievement. While a consolidated number of papers shows that management flexibility helps raise student achievement (Hoxby and Rockoff 2004, Bohlmark and Lindahl 2007, Hoxby and Murarka 2008, Clark 2009, Dobbie and Fryer Jr 2011, Dobbie and Fryer Jr 2015, Abdulkadiroğlu et al. 2016, Eyles et al. 2016, Eyles and Machin 2019, Dobbie and Fryer 2020, Cohodes et al. 2021), this literature is still debating about the mechanisms behind these positive effects (Dobbie and Fryer Jr 2013, Angrist et al. 2013, Fryer Jr 2014, Cohodes and Parham 2021). A few studies offer insightful descriptive analysis on the characteristics of teachers moving to charter schools (Baker and Dickerson 2006, Carruthers 2012), and Jackson (2012) studies the impact of charter schools on teacher quality in surrounding public schools. However, to the best of our knowledge, no comprehensive analysis exists on the causal impact of management flexibility on teacher turnover, sorting, and pay, and this paper aims to fill this gap. A related and growing literature provides descriptive and causal evidence that management quality matters for student performance, either by measuring managerial practices through headteacher interviews based on the World Management Survey methodology (see, for instance, Bloom et al. 2015, Lemos et al. 2021, Di Liberto et al. 2023), by estimating superintendent and principals' value-added (Coelli and Green 2012, Böhlmark et al. 2016, Grissom et al. 2021, Lavy et al. 2023), or by studying the impact of management training on pupil achievement (Fryer et al. 2017, Muralidharan and Singh 2020, Romero et al. 2022). Our paper complements these studies by measuring the impact of changing the school management on specific personnel policies, such as leadership selection and teacher pay policies.

Second and related to this, the paper speaks to the few but increasing number of papers that study the impact of pay policy reforms on teacher turnover and pay, and student performance (Hoxby 1996, Lovenheim and Willén 2019, Biasi 2021, Biasi et al. 2021, Willén 2021, Biasi and Sarsons 2022, Burgess et al. 2022, Hanushek et al. 2023). In a nutshell, this strand of the literature

the number of teachers. We substantially expand this analysis by covering the entire period of expansion of sponsored academies and using individual-level teachers' data, which allows us to study the impact of the school takeover on the headteacher characteristics, teacher turnover, sorting and pay. As for OFSTED, we look at overall effectiveness as well as performance in teaching and management.

finds that granting school districts (or schools) pay flexibility leads to changes in the composition of the teacher body, increased teacher retention, and an improvement in student performance. We complement these studies by focusing on the effect that a change in school management has on pay policies in disadvantaged, low-performing schools.

Third, this paper complements studies that analyze the impact of financial and non-financial incentives for teachers working in disadvantaged schools (Clotfelter et al. 2008, Lavy 2008, Glazerman et al. 2013, Springer et al. 2016, Swain et al. 2019, Ajzenman et al. 2020, Benhenda 2020, Bobba et al. 2021). Taken together, these studies show that both monetary bonuses and career-oriented incentives are effective at decreasing teacher turnover, but are often poorly targeted, have mixed effects on pupil achievement, and are costly to scale up. Relative to these studies, we analyze the impact of delegating the management of struggling secondary schools to external independent Sponsors. This policy has been scaled up nationally in the last 20 years. Whether these school takeovers help disadvantaged schools attract and retain high-quality teachers is a priori unclear, and this paper offers a first answer.[3]

Finally, by studying the effect of a drastic change in the management of struggling public schools, our paper relates to the broader literature analyzing the impact of public sector managers on employees' selection and productivity (McCormack et al. 2014, Rasul and Rogger 2018, Janke et al. 2019, Bandiera et al. 2021, Fenizia 2022).

The paper proceeds as follows. Section 2 describes the expansion of English Sponsor-led academies. Section 3 presents the data and summary statistics. Section 4 illustrates the identification strategy. Section 5 reports the empirical analysis of the impact of school takeovers on the headteacher selection, teacher turnover and composition, Sponsors' pay policy, and OFSTED performance. Section 6 discusses a series of robustness checks to validate our identification strategy. Section 7 presents the medium-term effects of the Sponsor-led takeovers. Section 8 concludes.

[3] A few related papers study the impact of small-scale interventions that subsidize private organizations to take over the management of public schools in the context of developing countries, finding mix effects on student performance (Romero et al. 2020, Barrera-Osorio et al. 2022, Romero and Sandefur 2022). Our paper complements these studies by considering a nation-wide program and focus on teacher selection and pay.

2 Institutional setting

In the school year 2022/2023, 25 percent of English secondary schools are so-called sponsored academies, that is independent state-funded schools that are usually conversions of low-performing, high-poverty schools. The idea of creating this institutional model emerged in the early 2000s, when a mounting consensus emerged in the English educational community that many secondary schools, and especially those located in poor urban neighborhoods, were failing to provide an adequate educational level to their pupils. To tackle this situation, the then Labour government opted for radically changing the management of low-performing schools. This idea was based on the small-scale experience of the 15 "City Technology Colleges" (CTCs), created at the end of the 1980s mostly as new independent state-funded schools, managed by businesses and geared towards science, mathematics, technology. Compared to CTCs, Blair's government decided to focus on existing failing, disadvantaged schools and envisaged a large-scale system whereby a broader set of Sponsor-managers, including private businesses, educational charities, but also universities or successful schools, would take over the management of the school from the Local Authority, while continuing to receive public funding directly from the State (Adonis 2012).

The school takeover works as follows (Cirin 2014, DfE 2016, DfE 2020). An organization or individual interested in taking over the management of a school submits an expression of interest to the DfE, where it has to demonstrate it has the skills and expertise to help schools improve. If approved, the DfE matches this so-called *Sponsor* with a low-performing school, usually located in the same area where the Sponsor operates. The takeover is completed once the Sponsor obtains the DfE's approval to convert the school into a charitable trust, a process that presumably takes more than an year to be completed. While data on the application process are only available for a subset of school conversions, Appendix Figure A.1 shows, indeed, that the median number of months to complete the takeover process is 17 months in these schools, which will be important to bear in mind to understand the timing of the takeover effect.

Upon conversion, the Sponsor nominates a board of trustees, usually composed of educational experts, that becomes the decision-making body of the trust. The conversion grants the

school board full autonomy from the LA in terms of the organization of the school curriculum, the structure of the school day and year, spending allocation, headteacher and teacher hiring, pay and working conditions. In exchange for these freedoms, the Sponsor needs to offer a long-term commitment to run the school and improve pupils' outcomes. Also, the Sponsor cannot set selective admission criteria, nor charge fees. Importantly, the converted school remains publicly funded, and the DfE also provides a one-off grant of around £400K on average to cover the costs of the conversion process.

Students already enrolled in the school are granted a place at the converted school. Similarly, teachers already employed at the school are guaranteed their job at the academy, and retain the pay and working conditions negotiated with the original school. However, the Sponsor-managed school can negotiate different pay and conditions for newly hired teachers. Finally, sponsor-managed schools are subjected to the same accountability mechanisms of LA-managed schools, including regular inspections by the independent authority OFSTED.

The first three school takeovers took place in the school year 2002/03. Over the following years, the program scaled up and by September 2010, 203 sponsored academies were running.

To boost school autonomy at every level of the educational system, the Academies Act, issued in May 2010 by the newly elected Conservative government, introduced a new and simplified conversion route in both the primary and secondary phases. In particular, schools willing to convert under this route did not have to find a Sponsor anymore, and for this reason, the new autonomous schools were simply named *converter academies*. Importantly, however, at both primary and secondary level, low-performing schools, and specifically, schools deemed "inadequate" by OFSTED had to follow the Sponsor route. As shown in Figure 1, by the school year 2022/23, 53 (29) percent of secondary (primary) schools have acquired the status of converter academy and 25 (10) percent have been converted into Sponsor-led academies.

This paper focuses on Sponsor-led academies for two reasons. First, the fact that Sponsors take over the management of under-performing, high-poverty schools makes this institutional model especially important to study from a policy point of view. Second, our analysis may help

understand to what extent the positive effects that sponsored academies have had on students' outcomes have been explained by the impact of the school takeover on the governance and personnel policy promoted by the Sponsor (Eyles et al. 2016, , Andrews et al. 2017, Eyles and Machin 2019).

3 Data and Summary Statistics

To study how a change in school management affects the headteacher selection and teacher turnover, composition, and pay, we built a unique individual-level teacher panel data set spanning the entire period of school takeovers, by combining the Database of Teacher Records (DTR) with the School Workforce Census (SWC). The DfE has used the DTR for the management of teachers' pension system since the early 1990s, and provides teachers' characteristics as of May of each school year. We have access to it from the school year 2001/02 to 2009/10. From the school year 2010/11 onward, the DfE has discontinued access to the DTR, but has made available to researchers the SWC, a teachers' census conducted every year in November that focuses on state-funded schools and is supplemented with information on teachers' qualifications, subject taught, and absences. The DfE has created a unique anonymized teacher identifier for this project that allows us to follow the same teacher across the two data sets. Both data sets provide consistent information on teachers' roles in the school (classroom teacher vs. headteacher), gender, age, full-time status, qualified teacher status, teachers' annual gross and base pay and additional payments. The SWC also provides data on teachers' hours worked, full-time equivalent (FTE) pay, and tenure. It further distinguishes between additional payments given for (i) teaching and learning responsibilities (TLR), (ii) teaching to special education needs (SEN) children, (iii) recruitment and retention pay (iv) other payments, with TLR payments usually representing the largest share of additional payments. Note also that, because tenure is only available in the SWC, we calculate experience as years elapsed since the acquisition of qualified teacher status, which normally takes place just before or after starting the teaching career. This information is missing or not reliable for around 2 percent of the sample.

Both data sets also provide a consistent school identifier that we use to match them with

school-level data. In particular, we merge the teacher data with publicly-available data extracted from "Get information about schools" (GIAS), a website managed by the DfE and covering all schools in England since the school year 2001/02. Among other things, GIAS provides key information on school phase, type, and LA identifiers, as well as information on pupils' characteristics, such as the share of students eligible for free school meal (FSM), the share of white British pupils, and the share of students whose English is their first language. We further supplement the resulting data set with: DfE data on schools' conversions, amalgamation and splits, which are crucial to follow a school overtime given that the school identifier changes when one of these events takes place; annual data on pupils' performance in standardized tests taking place at the end of high-school (11th grade) available from the school year 2005/06; official and standardized indicators of school quality, provided by the independent authority OFSTED, whose inspectors periodically visit schools and issue scores regarding several dimensions, such as overall effectiveness, and teaching and management quality; annual data on school resources and expenditure, also available from the school year 2005/06, and from 2010/11 for academies; annual data on median wages of individuals working in each LA from the Annual Population Survey (APS), available from the calendar year 2005.

Table 1 compares the characteristics of schools that never experience a sponsor-takeover over the period considered in this paper (Column 1), with the characteristics of schools that eventually convert to sponsored academies (Columns 2 and 3). We focus on the 600 academies that are conversions of pre-existing secondary schools for which we observe teachers' outcomes from at least 3 years before the takeover. Thus, we exclude the 17 takeovers that happen between the school years 2002/03 and 2004/05 for which we only observe two or fewer pre-conversion years.[4]

The table aims to introduce the reader to the identification strategy we adopt to study the effects of interest. Column 1 reports school and teacher characteristics of schools that have never been converted to Sponsor-led academies by 2018/19. The figures are averages (and standard de-

[4]Also, we do not consider newly created Sponsor-led academies, for which we would not have pre-treatment data (37 schools); we also exclude conversions from the CTCs which were already enjoying high autonomy (12 schools); finally we disregard conversions from private or special schools (10 schools), to focus on public mainstream secondary schools only.

viations) computed from 2002/03 to 2014/15. Column 2 reports the same characteristics computed for schools that experience a takeover between 2005/06 and 2015/16. These are the "cohorts" of school takeovers that we aim to include in our treatment group primarily because we can observe the outcomes of interest in these schools for at least three years before and two years after the conversion. The figures in Column 2 are calculated over the three years before the conversion of each of these cohorts of academies. Finally, Column 3 reports teacher and school characteristics over this same period, for cohorts of schools that experienced the takeover 4 years after each cohort of schools included in Column 2.

Two main facts emerge from Table 1. First, while schools that never experience a takeover over the period considered (Column 1) appear different from schools that eventually become Sponsor-led academies (Columns 2 and 3) along many dimensions, schools that eventually experience a takeover are much more similar to each other over the three years before schools in Column 2 are converted. Specifically, ever sponsor-managed schools have a (60-80 percent) larger proportion of pupils eligible for free school meals, a (20-40 percent) smaller proportion of pupils achieving a sufficient standard in grade-11 standardized exams (corresponding to 5 Cs), are (2-3 times) more likely to be classified as "requires improvements" or "inadequate" by OFSTED, are (6-10) more likely to be urban schools, and have a (6-7 percent) lower proportion of teachers with a master degree. The second important point emerging from this table is that, compared to later conversions, schools experiencing earlier takeovers tend to have fewer pupils and a larger share of teachers leaving the schools before their conversion. We will return to this in Section 5 to discuss to what extent these two factors could influence the timing of conversion.

4 Identification strategy

To identify the causal impact of the school management takeover on the headteacher selection and teacher turnover, composition, and pay, we focus on schools that eventually become Sponsor-led academies over the period considered, and adopt a difference-in-differences strategy that compares

the evolution of the outcomes of interest in schools that acquire academy status in a certain year and in schools that convert k years after. We will discuss below how we choose k in our main specification, and how we challenge this choice in the robustness check section. As for the treated cohorts, we consider school takeovers taking place from 2005/06 onwards, for which we have at least three pre-conversion years on the main outcomes of interest. Note that our estimation sample will comprise several pairs of treated and control groups. For instance, we will compare schools converting in 2005/06 to schools converting k years after, schools converting in 2010/11 to schools converting k years after, and so on. We can think about these pairs of conversions cohorts as being different sub-samples that we stack together in the final estimation sample.[5] This design implies that once a school is treated, we will not use it as control for schools converting in subsequent years. This allows us to avoid the risk of bias created by "forbidden comparisons" in the presence of dynamic treatment effects (Borusyak et al. 2021, Callaway and Sant'Anna 2021, Goodman-Bacon 2021, Sun and Abraham 2021, Baker et al. 2022). When studying school-level outcomes, our regression model looks as follows:

$$Y_{st} = \alpha_s + \theta_t + \beta\ SponsoredAcademy_{st} + X'_{st}\pi + u_{st} \quad (1)$$

where s stands for a school that acquires academy status in year c (treated group) or $c+k$ (control group). In the main specification, we choose t to go from $c-3$ to $c+2$. Y_{st} is the outcome of interest, which is either the probability that the school appoints a new headteacher, a measure of teacher turnover, as described below, teachers' characteristics such as gender, age, educational background, or experience, school expenditure, and pay dispersion, as defined later; α_s are θ_t are, respectively, school and school-year fixed effects; $SponsoredAcademy_{st}$ is a dummy variable equal to one in treated schools from the year the conversion takes place onwards; in our main specification we do not include further controls, but we will show that our results are practically unchanged when including, for instance, LA times year fixed effects to control for factors that vary

[5] Other studies that use this stacked difference-in-difference design include, for instance, Deshpande and Li 2019, Eyles and Machin 2019, Crema 2022.

over time at the LA level and could affect both a school conversion prospects and its outcomes, such as the share of academies in the LA, or the political party in power in the local authority. Finally, we will use heteroskedasticity-robust standard errors clustered at the school level.

To test the parallel-trend assumption and study the dynamic impact of the academy conversion on the outcomes of interest, we will present event-study estimates obtained by running the following dynamic specification:

$$Y_{st} = \alpha_s + \theta_t + \sum_{e=-3, e\neq 3}^{2} \beta_e (SponsoredAcademy_s * \mathbf{1}[t - c = e]) + X'_{it}\pi + u_{st}, \quad (2)$$

where c is the conversion year for the treatment group, e refers to the year relative to the conversion year, and $\mathbf{1}[t - c = e]$ is an indicator variable that takes value 1 when $t - c = e$ and 0 otherwise. In what follows, we will take the event year -3 as the reference period.

Finally, when studying the impact of the school takeover on teacher pay, we run teacher-level regressions that control for teacher-fixed effects, on top of school and year fixed effects:

$$Y_{ist} = \gamma_i + \alpha_s + \theta_t + \beta\ SponsoredAcademy_{st} + u_{ist}, \quad (3)$$

where Y_{ist} is the log of teachers' annual pay, and i is either an incumbent teacher, that is a teacher already employed at the school before the takeover, or a teacher hired from the takeover year onwards, as further explained in Section 5.3.

In our main specification, we choose as control group schools that experience a management takeover four years after the treated group. The main benefit of using the 4-year time window between treated and control cohorts is that it allows us to study dynamic effects of the takeover up to at least two years after the event (when control cohorts are still two years apart from converting). Moreover, while we cannot argue that the timing of takeovers is random, Table 1 shows that these two groups of schools are comparable in many dimensions. To further support the validity of our identification strategy and take into consideration that this choice could be considered arbitrary,

we will also show that our results are robust to changes in the conversion cohorts included in the control group.

5 Results

5.1 Leadership change

One of the key responsibilities that the academy board of trustees acquires is that of appointing the school headteacher. Figure 2 shows that the probability that the school nominates a new principal starts increasing in treated schools compared to control ones the year before the takeover is completed (+ 8 p.p.) . Note that, as explained in Section 2, in most cases the takeover has already started by then, which implies that the Sponsor has most likely already begun exerting its influence on personnel policies at that point. The probability that the school appoints a new headteacher then shoots up the year that the conversion has been completed, with a 35 p.p. increase, or more than two times compared to the pre-conversion mean. In turn, Table 2, Column 1, shows that, on average, the takeover increases the probability of appointing a new headteacher by 16 p.p., or 67 percent compared to the pre-takeover mean. Appendix Figure A.2 and Appendix Table A.1 further show that this effect is above all driven by an increase in the probability of hiring (promoting) a new head from a different school, and the likelihood of appointing a new head who previously worked in a different sector, with all these probabilities doubling compared to the pre-takeover mean. Importantly, Columns 2-10 of Table 2 show that the new headteacher tends to be slightly younger (2 percent increase), better paid (7 percent increase), and, respectively, 2 to 3 times more likely to come from a different LA and an outstanding school (as certified by OFSTED).[6]

[6]In on-going analysis, estimating teacher-level regressions with teacher and year fixed effects comparing teachers who become heads in academies vs. academies-to-be, we find that headteachers hired in sponsored academies obtain a 10 percent increase in their gross salary, which suggests that Sponsors use their pay flexibility to attract good headteachers.

5.2 Teacher sorting

Figure 3 presents event-study estimates obtained by running regression 2 on the (log of the) number of pupils enrolled in the school (Panel A), the (log of the) number of teachers (Panel B), the share of teachers leaving the school between one year and the next (Panel C), and the share of new teachers (Panel D). As anticipated in Section 3, treated schools experience a decline in students' and teachers' numbers compared to control schools in the two years prior to the takeover - a trend that is completely reversed as treated schools experience the takeover. While we cannot exclude that decline in students' and teachers' numbers may have influenced the timing of the takeover, it is also possible that they are at least partly caused by the takeover announcement. Two elements point in this direction. First, given that the median number of months to complete the takeover is 17 months (see Appendix Figure A.1), it is very likely that teachers and parents know about it in advance. Consistent with this, when extending the pre-conversion period by two years in Appendix Figure A.3, we see that teachers' (pupils) numbers only start diverging in treated and control schools two (three) years before the conversion. Second and most importantly, the dynamics of teacher turnover around the timing of the takeover generate a sorting effect, whereby plausibly worse teachers leave the school and higher-quality teacher join it after the Sponsor-led takeover.

In order, the event study in Figure 3, Panel C, shows that the downward trend in teachers' numbers is primarily due to an increase in separations, which spike between the pre-conversion year and the year the takeover is completed. Second, Panel D shows that the takeover leads to a stable and significant increase in the share of new hired teachers (an average increase of 4 p.p., or 27 percent compared to the pre-conversion mean - see Appendix Table A.2). Third, Table 3 shows that among teachers leaving the school from the year before the takeover onwards, teachers moving to another secondary school tend to be older and less likely to be high-achievers in education. Finally, Table 4 suggests that the Sponsor tends to hire teachers based on available signals of quality, as all new hires are more likely to be *Teach First* teachers and, new hires from other schools tend to come from outstanding schools themselves or even the same school as the new

head, while new teachers coming from outside the educational sector tend to be high-achievers in education. In turn, Appendix Table A.3 shows that this sorting effect changes the composition of the teaching body towards younger (2.5 percent increase) and less experienced teachers (5 percent increase), but also teachers who obtained top grades in education (20 percent increase), and are 70 percent more likely to come from an outstanding school and 0.3 p.p. more likely to come from the same school as the new head (from a pre-conversion 0 probability). In sum, these sorting patterns mimic the impact of pay-for-performance contracts on employees' selection found in the personnel literature, and suggest that the change in the school management is accompanied by the injection of business-like ethos and practices that pushes away low-performing teachers and attract high-quality teachers (Lazear 2000, Gielen et al. 2010, Leaver et al. 2021). The next section further explores this hypothesis by studying the impact of the school takeover on teacher pay.[7]

5.3 Teacher pay

While Sponsor-led academies are financed through public funding, as their predecessors, one of the key dimensions over which the Sponsor acquires autonomy concerns the allocation of resources. In particular, Sponsors may re-design teachers' reward policies and also set teachers' pay based on criteria other than seniority. To investigate these decisions, we analyze the impact of the takeovers on teachers' annual pay, pay dispersion, and school expenditure.

We first look at incumbent teachers, that is teachers who were already employed at the school the year before the takeover and are still in the school when the takeover takes place. We compare the evolution of their annual pay with that of teachers who, over those years, were employed at schools that only convert four years after the control group. We follow incumbent teachers from three years before the school takeover till two years afterwards, irrespective of whether they were

[7] In Appendix Figure A.4, we also show the evolution of pupils' characteristics and performance. As the number of pupils decline in the pre-takeover period, the share of FSM-eligible pupils increases by 1 percent on average, an effect that vanishes in the post-period - Eyles and Machin (2019) find instead that the share of FSM-eligible pupils decreases substantially among the early takeovers. Consistent with the results of Eyles and Machin (2019), we find that the takeover is accompanied by a 1 percent reduction in the share of white British students. In parallel, the share of pupils achieving a sufficient level of learning by the end of grade 11 significantly increases, an effect that starts in the year the takeover has been initiated.

already employed at the school before the event year -1, or after the conversion. In this respect, the β coefficient in regression 3 could be considered an intention-to-treat (ITT) estimate.

When considering newly hired teachers, we compare the pay dynamics of teachers hired both the year of the takeover and the year after in treated vs. control schools, from three years before the takeover to two years afterwards.[8]

To measure pay dispersion, we follow Biasi (2021) and first estimate a regression of teachers' annual base pay on gender, age, age squared, years of experience, experience squared, level of education, and school times school-year fixed effects.[9] We then take the standard deviation of the residuals from this regression, divide it by teachers' average annual base pay, and study the evolution of this variable at the school level.

Figure 4, Panel A, shows that the new school governing body increases, on average, teachers' base pay (+1.6 percent compared to the pre-takeover mean - see Table 5), but reduces the use of additional payments that public schools traditionally give to teachers to top up their salary (-1.4 percent compared to the pre-takeover mean). As a result, incumbent teachers' gross pay does not change on average after the takeover, but its composition shifts away from additional payments towards the contractual pay. Panel B shows that Sponsors adopt this new rewarding scheme for new teachers as well. Interestingly, they also seem to offer new hires an overall higher gross annual pay (+2.5 percent compared to their pre-entry mean - see Table 5), a result that is however not very robust across alternative specifications.

Lastly, Panel C shows that pay dispersion among equally experienced teachers increases after the takeover, which suggests that Sponsors use criteria other than experience to reward teachers.[10] In the context of Wisconsin, Biasi (2021) finds that the 2011 reform, which gave school districts the autonomy to redesign teacher pay schemes, has strengthened the link between teacher salary

[8]This implies that we observe teachers hired at time 0 from three years before to two years after this event. In contrast, we observe teachers hired the year after the conversion from four years before the hiring happens to one year afterwards. In the event-study specification, we create a lead "-3 or before" and a lag "1 year or after" to take this differential timing into account.

[9]To estimate this regression, we restrict the sample to full-time teachers to avoid capturing variations in hours worked.

[10]As shown in Appendix Table A.4, results change little when looking at dispersion in gross pay, or when considering only pay dispersion among incumbent teachers.

and value added. While we cannot construct teacher value-added measures with English data, Appendix Table A.5 shows that the returns to experience decrease in treated schools compared to control ones after the management takeover. Moreover, a survey conducted by the DfE in 2014 shows that 80 percent of secondary schools that had been converted to a Sponsor-led academy by then had changed their performance management system for teachers, by intensifying performance monitoring through both classroom observations and pupil progress and, crucially, by linking pay to performance (Cirin 2014). Considering all these elements together, it thus seems plausible that the increase in teacher pay dispersion is driven by the adoption of performance-related-pay policies.

To further understand how Sponsors manage the school resources, we exploit school expenditure data, available for schools takeovers taking place from 2010/11 onward. As explained in Section 2, Sponsors receive a one-off grant to cover the costs of the conversion. Appendix Figure A.5 and Table A.6 show indeed that, while the evolution of school funding is comparable in treated and control school before the takeover, school income increases by 10 percent the year of the takeover in converted schools, but rapidly reverses to the level of control schools over the following two years. In turn, school expenditure also increases but more gradually across the years following the takeover.[11] Importantly, Sponsors use their resources as follows: they strongly decrease expenditure on temporary staff, such as supply teachers or support staff, while using most of this money on non-teaching personnel, including the headteacher. In the conversion year, they also allocate some funding to other running costs, such as improving the school building. Importantly, and consistently with the fact that Sponsors merely restructure teachers' rewarding policies, expenditure on regular teachers does not change in treated schools compared to control schools after the takeover.

[11] An important caveat of these data is that they do not include capital spending, so that expenditure on a new building would not show up in these data, for instance, and anecdotally many Sponsor-led academies chose to move the school to a brand-new building (Adonis 2012).

5.4 OFSTED performance

Every three to five years - and more often if a school is under-performing, the independent authority OFSTED performs two-day-long school inspections to evaluate the school management, teaching quality, and the overall effectiveness of the school at providing an appropriate and safe learning environment for its pupils. On each dimension (overall effectiveness, teaching, and management quality), schools are rated on a scale of 4 scores, with 1 for outstanding, 2 for good, 3 for "requires improvement", and 4 for schools that are judged inadequate. Figure 5 shows the evolution of the likelihood of being deemed outstanding on each dimension in treated vs. control schools around the year of the takeover.[12] While there is no differential trend in these outcomes before treated schools experience the takeover, in just two years after this is completed, the likelihood of receiving an outstanding score for the school overall performance increases by up to 10 p.p., or, on average, 8 times compared to the pre-takeover mean (See Table 6). Importantly, both the probability of obtaining an outstanding score for teaching and management quality also increase by 5 times compared to the pre-takeover mean, suggesting that Sponsors' new personnel policy may be key to explain the substantial improvement in pupils' outcomes brought about by sponsored academies.

6 Robustness checks

In this section we perform two sets of robustness checks. First, we show that our results are robust to including further controls such as local-authority specific time shocks, or interaction terms between cohort dummies and, respectively, schools and school-year fixed effects. Second, we show that our results are practically unchanged when using different academy cohorts as control group. For the sake of space, we present all the robustness checks together in Figures 6, 7, and 8.[13]

Additional controls. We first augment our main specification with local-authority specific time shocks to take into account that school outcomes may be affected by events taking place at

[12] To estimate these event studies, we assign the score of the last inspection to years in which a school does not receive an inspection, while to estimate the average effect of the takeover we only use the years in which schools receive an inspection.

[13] The robustness checks on OFSTED performance are reported in Appendix Figure A.6.

the local-authority level, such as changes in the party in power in the local council. Our results are practically unchanged when adding these controls. Similarly, our results change little when interacting school and school-year fixed effects with cohort-specific fixed effects to take into account that a school could act as control in a sub-sample and become a treated school in a subsequent sub-sample. The only exceptions are the lagged effects on new teachers' base (gross) pay that, compared to the main specification, are insignificant when controlling for these sample interactions.

Different control group. In our main specification, we use as control group the cohort of schools that experiences a takeover four years after the treated cohorts. As this choice could be considered arbitrary, we test whether our results are robust to the use of a different control group. Specifically, we estimate alternative specifications where the control group consists of school cohorts experiencing the takeover, respectively, five or six years after the treated cohorts.[14] With the exception of new hires' gross annual pay and pay dispersion, the dynamic effects of the school takeover change little relative to our main specification (Figures 6 and 8). As for the effect on teacher sorting (Figure 7), these estimates are a bit more sensitive to the choice of the control group, especially when using further distant control cohorts. However, it is important to note that these control schools may be less comparable to the treated schools than cohorts experiencing the takeover closer to the treated group.

7 Medium-term effects

In our main specification, we only study dynamic effects of school takeovers until two years after this event takes place. In this section, we extend the horizon of analysis up to four years after the school takeover. To do this, we use as control group only cohorts that experience a takeover six years after the treated group, and exclude cohorts converting between 2013/14 and 2014/15 from

[14]Note that the estimation samples in these regressions differ slightly from the main sample: when using as control school cohorts that experience a takeover 5 (6) years after the treated cohort, we exclude the treated cohorts 2014/15 (and 2013/14) for which we do not have such a control group in our sample.

the treatment group, for which we would not have such a control group.[15] Interestingly, Figure 9 shows that the dynamic effects estimated over the first two years persist over a longer horizon. In particular, the positive trends in pupils' and teachers' numbers that the takeover activates continue over the following four years, with the dynamics in teachers' numbers driven both by a decrease in teachers' separations and a persistent increase in new hires. Figure 10 also shows that the restructuring of teachers' pay rewarding scheme promoted by the Sponsor appears to be a long-term decision. Similarly, even in the medium-term, pay dispersion among equally experienced teachers remains higher than in the pre-takeover period. Finally, Appendix Figure A.7 shows that OFSTED performance keeps improving over the four years after the takeover completion.

8 Conclusion

Disadvantaged, low-performing, public schools notoriously struggle to attract and retain high-quality teachers, and governments around the world are increasingly experimenting different options to improve teacher recruitment and retention in hard-to-staff schools (Clotfelter et al. 2008, Glazerman et al. 2013, Springer et al. 2016, Swain et al. 2019, Adonis 2012, Benhenda 2020, Bobba et al. 2021, Morgan et al. 2023). This paper studies a setting where educational charities, private businesses, successful schools or universities take over the management of under-performing, high-poverty schools, while funding remains public. Exploiting the staggered expansion of English Sponsor-led academies since the early 2000s, we show that the Sponsor-led takeover leads to substantial changes in the teaching body and the school personnel policy. First, upon the takeover, the probability that the Sponsor appoints a new headteacher doubles compared to the pre-takeover mean, with the new headteacher being, on average, better paid, and more likely to come from outstanding schools. The takeover also induces teacher sorting, with older and lower-achieving teachers leaving the school, and new teachers joining the Sponsor-led school from outstanding schools. Finally, Sponsors substantially restructure teachers' rewarding scheme and

[15] While using this control group allows us to analyze the takeover effects over a longer time frame, the drawback is that, as suggested in Section 6, these cohorts may be less comparable to treated cohorts than our main control group.

abandon a pay scale entirely based on seniority, leading to an increase in pay dispersion across equally experienced teachers.

To further understand these effects, we have now collected information from schools' websites and Wikipedia on the nature of each Sponsor. As shown in Figure A.8, we have classified Sponsors into six categories: educational charities, private business, religious organizations, schools' unions, universities, and Sponsors with a corporate structure, with the latter being characterized by the presence of a CEO, usually managing multiple schools, and a clear vision of expanding their trust to further schools. Interestingly, educational charities and Sponsors with a corporate structure have become the two most prevalent types of Sponsors by now, followed by schools' unions. By linking these data to the sensitive teacher-level data, we will now be able to test whether our main results are driven by specific types of Sponsors, or whether sponsored academies exploit their autonomy from the local authority to adopt a similar modus operandi, independent from the origin of the Sponsor.

To conclude, our analysis suggests that the policy of delegating the management of low-performing, high-poverty, public schools to external organizations helps leveling the playing field, as both the headteacher and teachers appointed by the new management are more likely to come from outstanding schools. An important avenue for future research is the analysis of spillover effects of school takeovers to nearby schools, as the expansion of Sponsor-led academies is likely to have increased competition for the best teachers (Jackson 2012).

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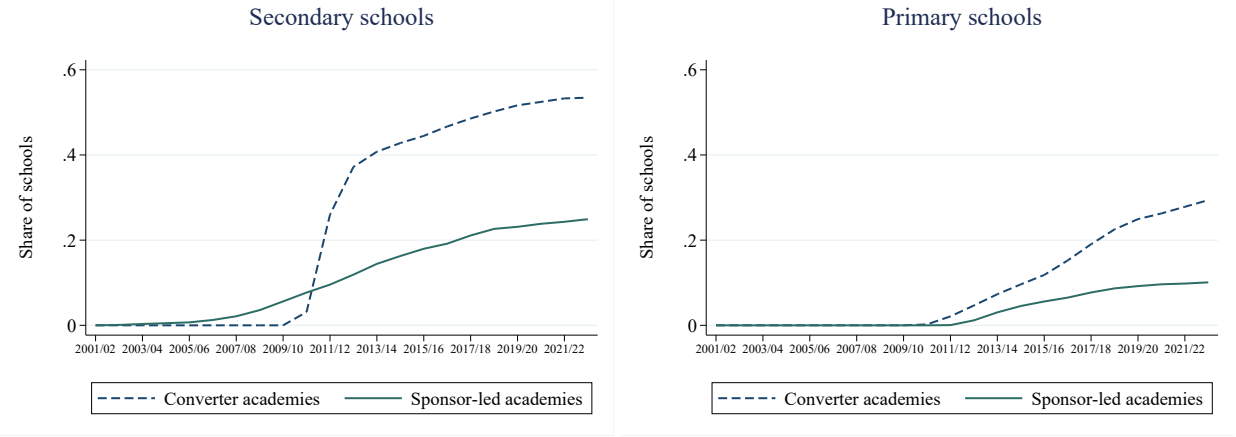
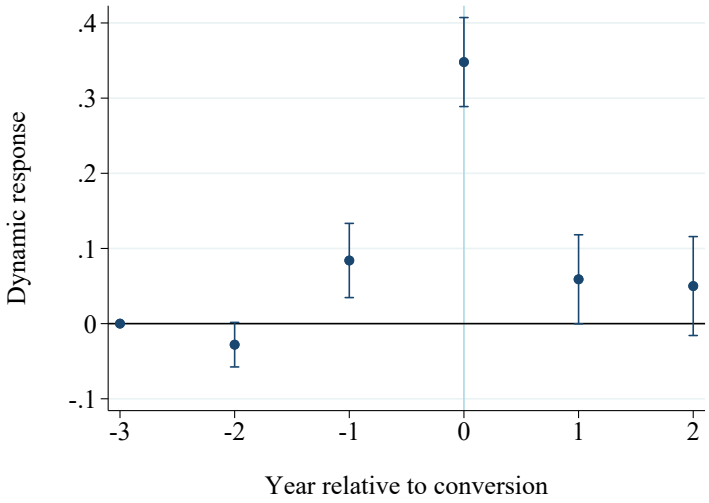
9 Graphs and Tables

Figure 1: Academies' expansion among English schools



Source: GIAS, 2001/02-2022/23.
Notes: These graphs present the expansion of academies over time in English secondary and primary schools.

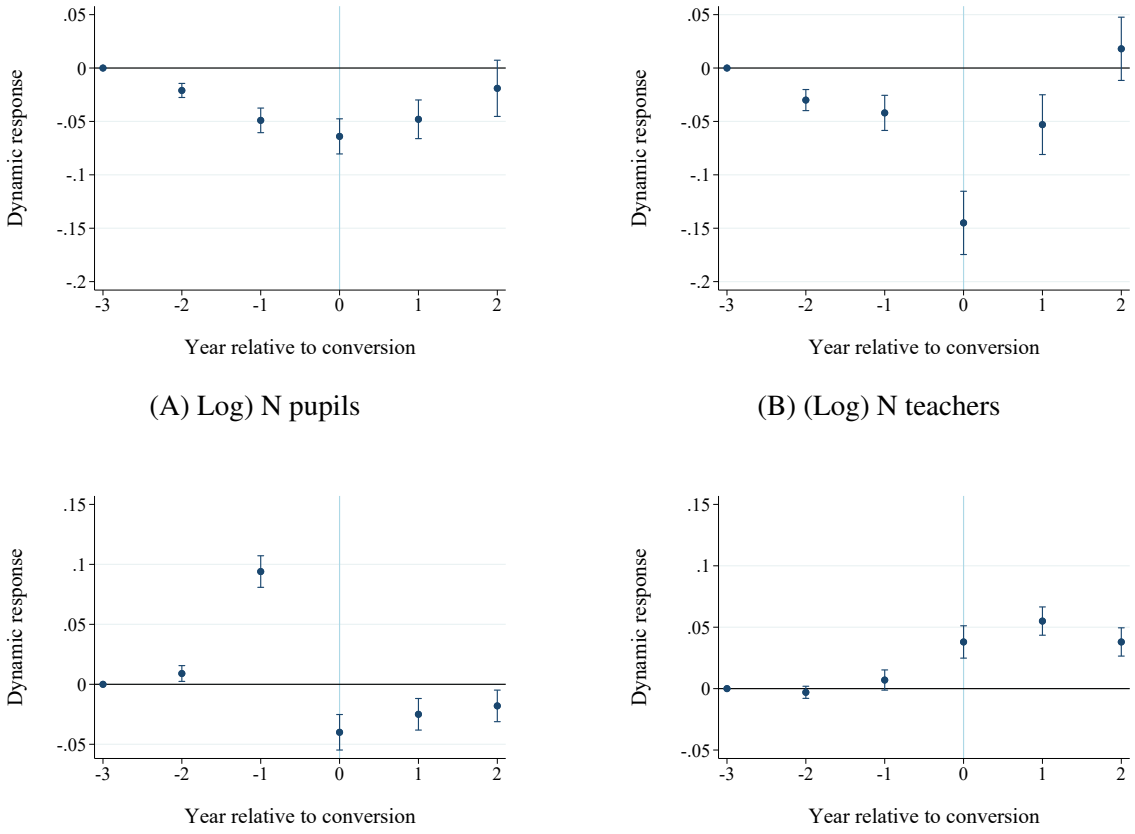
Figure 2: Probability of appointing a new headteacher



Source: DTR, 2001/02-2009/10, SWC, 2010/11-2018/19.

Notes: This graph presents the dynamic impact of the school management takeover on the probability that the school appoints a new headteacher, estimated by running regression 2. The estimation sample includes schools that convert between 2005/06 to 2014/15 (treated schools) and schools that convert four years after each treated conversion cohort (control schools). The estimation period includes the three years before the conversion of each treated school up to two years following this event. 90-percent confidence intervals are also reported.

Figure 3: Teacher turnover



(A) Log) N pupils

(B) (Log) N teachers

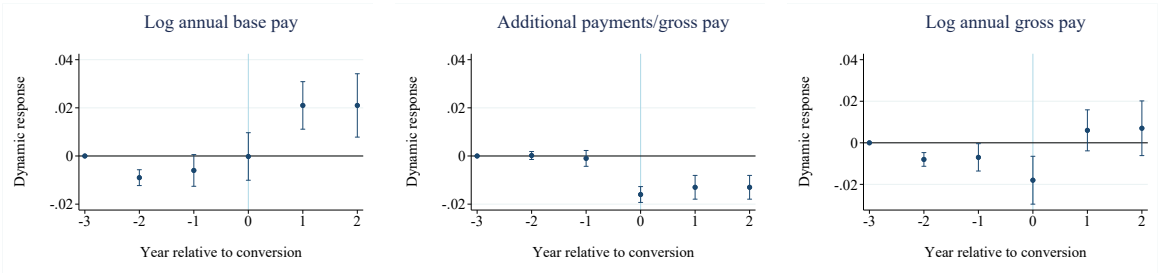
(C) Share of teachers leaving in t+1

(D) Share of new hires

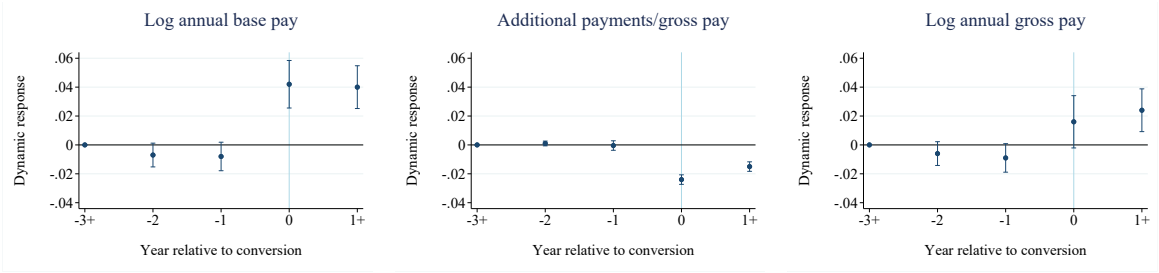
Source: DTR, 2001/02-2009/10, SWC, 2010/11-2018/19.

Notes: These graphs present the dynamic impact of the school management takeover on teacher turnover. These results are estimated by running regression 2 on the outcomes displayed in each graph. The estimation sample includes schools that convert between 2005/06 to 2014/15 (treated schools) and schools that convert four years after each treated conversion cohort (control schools). The estimation period includes the three years before the conversion of each treated school up to two years following this event. 90-percent confidence intervals are also reported.

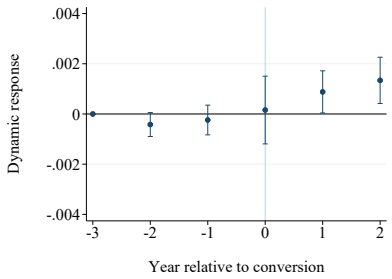
Figure 4: Teacher pay



(A) Incumbent teachers



(B) New teachers

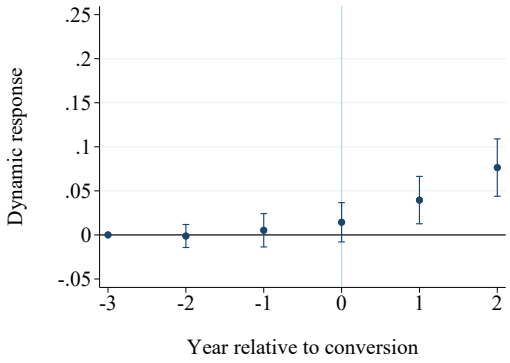


(C) Pay dispersion

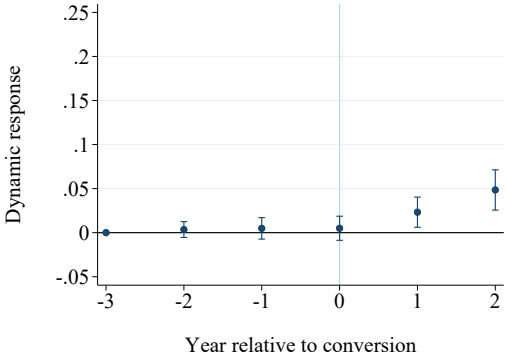
Source: DTR, 2001/02-2009/10, SWC, 2010/11-2018/19.

Notes: These graphs present the dynamic impact of the school management takeover on teachers' pay and pay dispersion. The results in Panels A and B are estimated by running the dynamic specification of regression 3 on the outcomes displayed in each graph. The Figure in Panel C is obtained by running regresion 2 on pay dispersion. The estimation sample includes schools that convert between 2005/06 to 2014/15 (treated schools) and schools that convert four years after each treated conversion cohort (control schools). The estimation period includes the three years before the conversion of each treated school up to two years following this event. 90-percent confidence intervals are also reported.

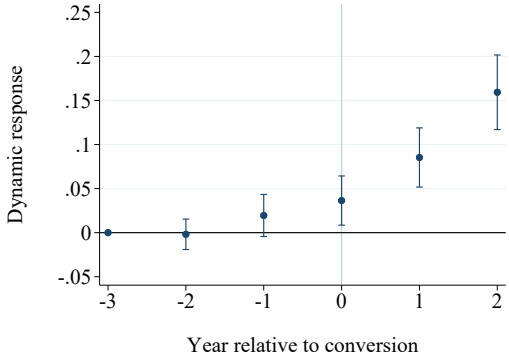
Figure 5: Performance in OFSTED inspections



(A) Outstanding



(B) Outstanding in teaching

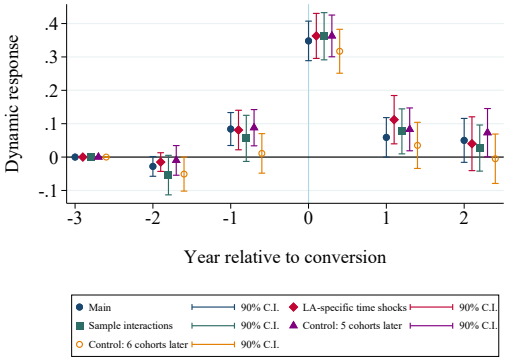


(C) Outstanding in management

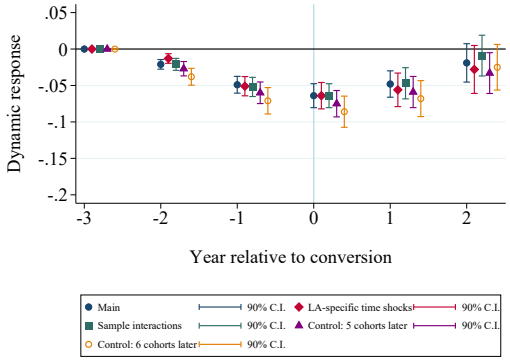
Source: DTR, 2005/06-2009/10, SWC, 2010/11-2018/19.

Notes: This graph presents the dynamic impact of the school management takeover on the probability of obtaining an outstanding score in OFSTED inspections, estimated by running regression 2. The estimation sample includes schools that convert between 2008/09 to 2014/15 (treated schools) and schools that convert four years after each treated conversion cohort (control schools). The estimation period includes the three years before the conversion of each treated school up to two years following this event. 90-percent confidence intervals are also reported.

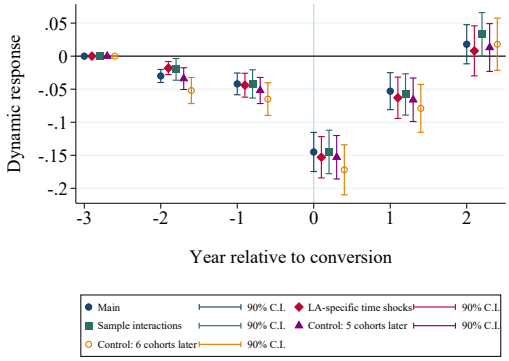
Figure 6: Leadership change and teacher turnover - robustness checks



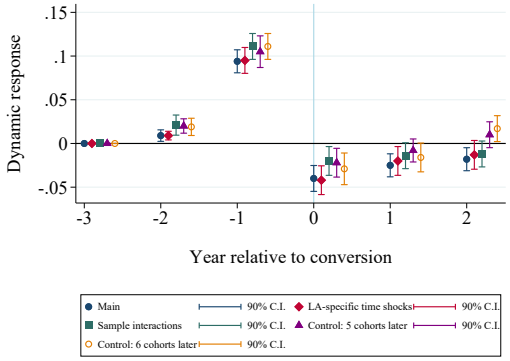
(A) New headteacher



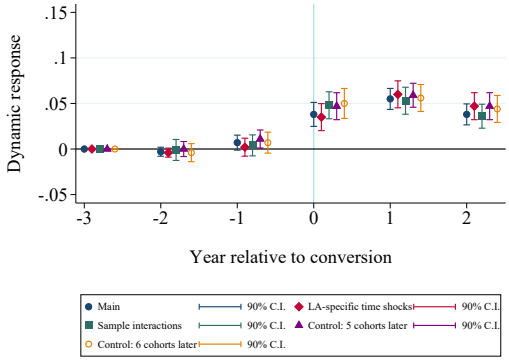
(B) (Log) N pupils



(C) (Log) N teachers



(D) Share of teachers leaving in t+1

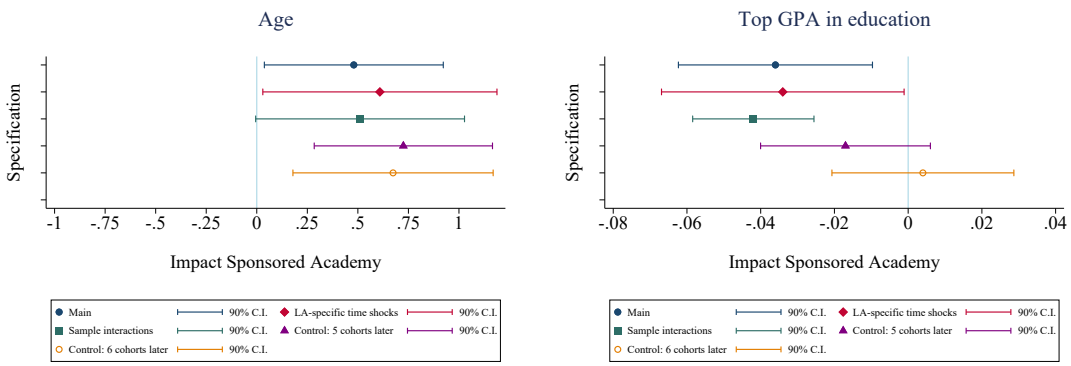


(E) Share of new hires

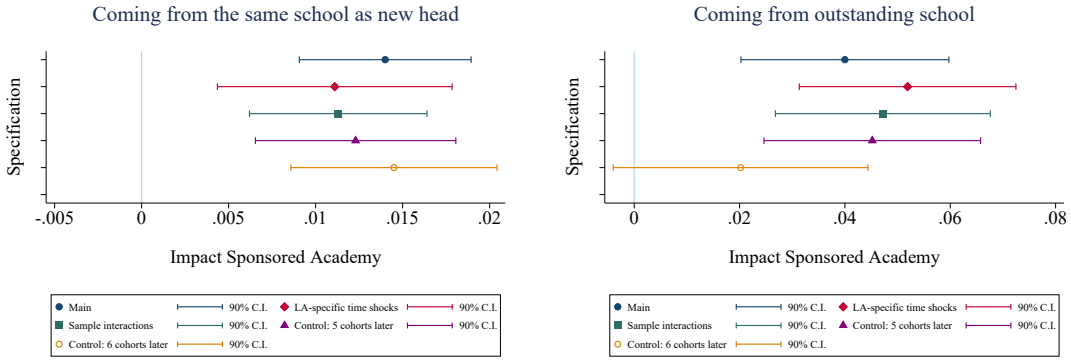
Source: DTR, 2001/02-2009/10, SWC, 2010/11-2018/19.

Notes: These graphs present a series of robustness checks on the dynamic impact of the school management takeover on the probability that the school appoints a new headteacher, and teacher turnover. The bars around the point estimates are 90-percent confidence intervals.

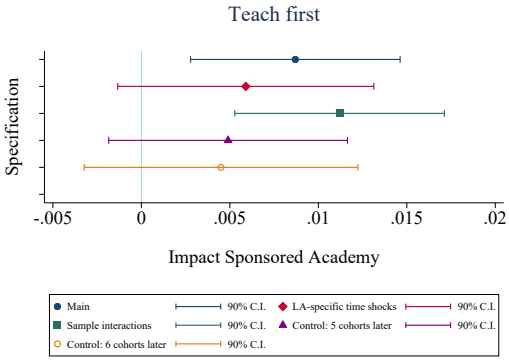
Figure 7: Teacher sorting - robustness checks



(A) Teachers leaving to other school



(B) Teachers hired from other school

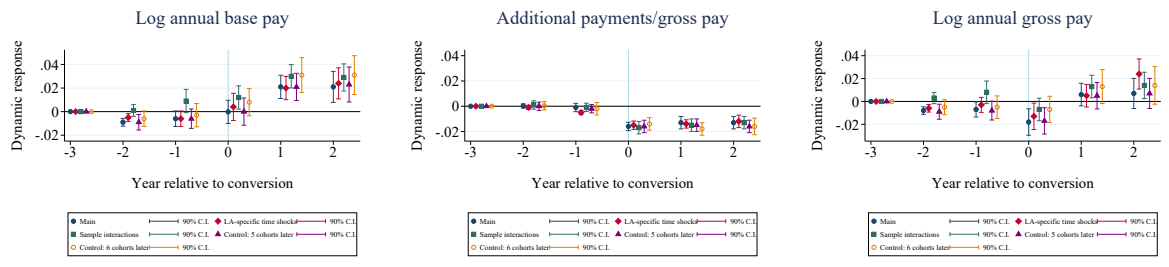


(C) All new teachers

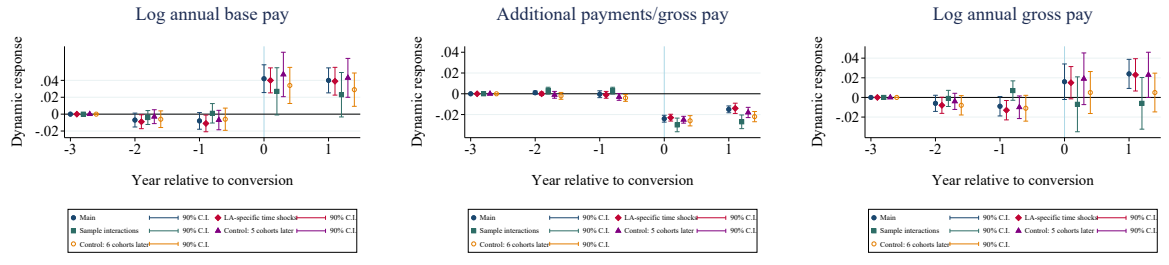
Source: DTR, 2001/02-2009/10, SWC, 2010/11-2018/19.

Notes: These graphs present a series of robustness checks on the average impact of the school management takeover on the characteristics of teachers leaving for another school and the characteristics of new teachers joining the academy. The bars around the point estimates are 90-percent confidence intervals.

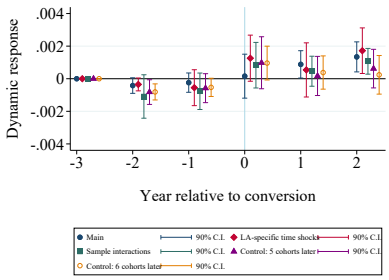
Figure 8: Teacher pay - robustness checks



(A) Incumbent teachers



(B) New teachers

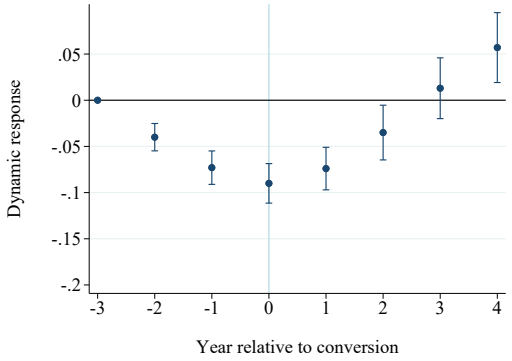


(C) Pay dispersion

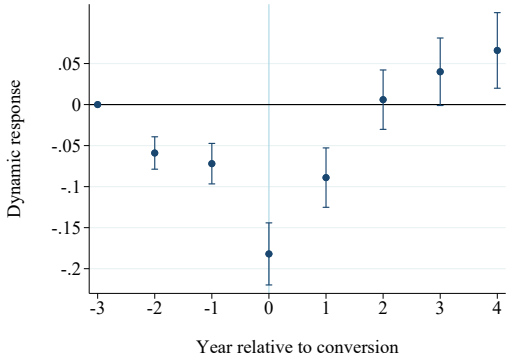
Source: DTR, 2001/02-2009/10, SWC, 2010/11-2018/19.

Notes: These graphs present a series of robustness checks on the dynamic impact of the school management takeover on teachers' pay and pay dispersion. The bars around the point estimates are 90-percent confidence intervals.

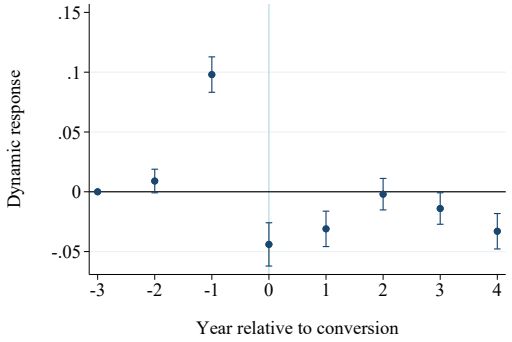
Figure 9: Teacher turnover - medium-term effects



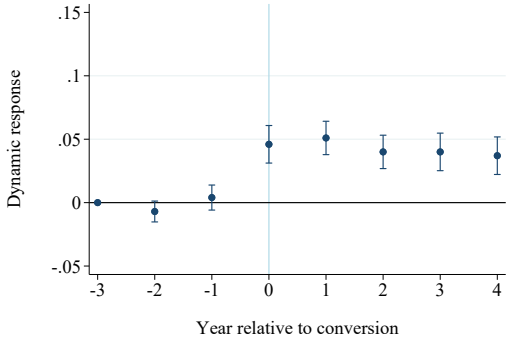
(A) (Log) N pupils



(B) (Log) N teachers



(C) Share of teachers leaving in t+1

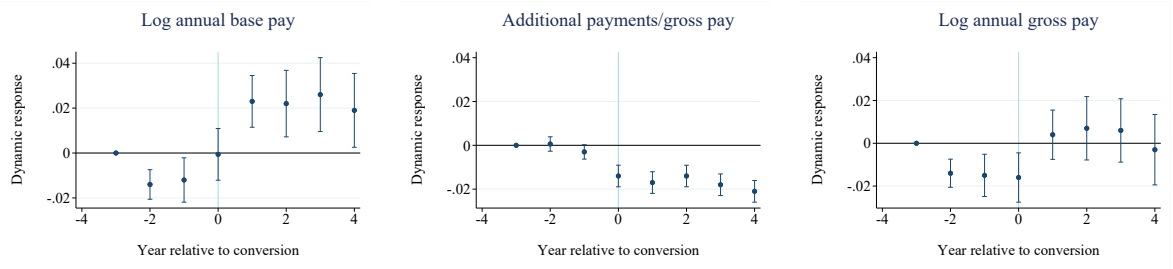


(D) Share of new hires

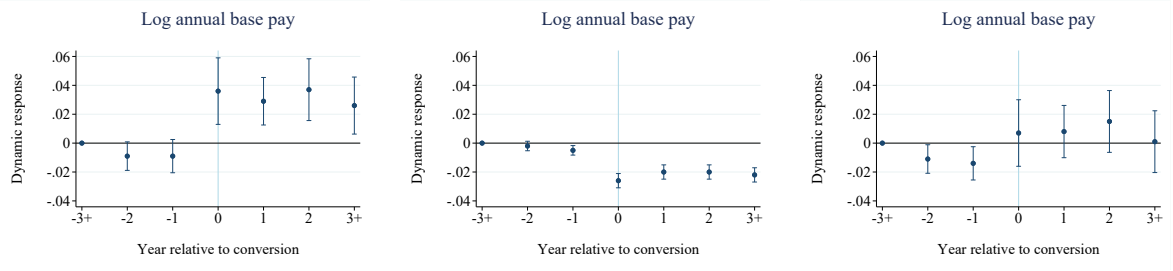
Source: DTR, 2001/02-2009/10, SWC, 2010/11-2018/19.

Notes: These graphs present the dynamic impact of the school management takeover on teacher turnover. These results are estimated by running regression 2 on the outcomes displayed in each graph. The estimation sample includes schools that convert between 2005/06 to 2012/13 (treated schools) and schools that convert six years after each treated conversion cohort (control schools). The estimation period includes the three years before the conversion of each treated school up to four years following this event. 90-percent confidence intervals are also reported.

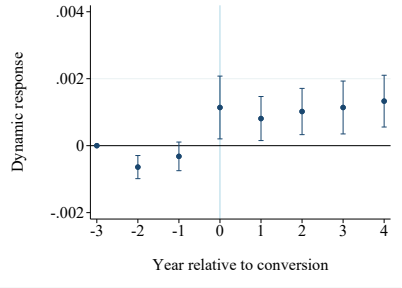
Figure 10: Teacher pay - medium-term effects



(A) Incumbent teachers



(B) New teachers



(C) Pay dispersion

Source: DTR, 2001/02-2009/10, SWC, 2010/11-2018/19.

Notes: These graphs present the dynamic impact of the school management takeover on teacher pay. These results are estimated by running the dynamic specification of regression 3 on the outcomes displayed in each graph. The estimation sample includes schools that convert between 2002/03 to 2012/13 (treated schools) and schools that convert six years after each treated conversion cohort (control schools). The estimation period includes the three years before the conversion of each treated school up to four years following this event. 90-percent confidence intervals are also reported.

Table 1: Summary statistics

	Never converted 2002/03 to 2014/15	Conversions btw 2005/06 to 2014/15 3 to 1 year before conversion of schools in Col 2	Conversions 4 years later
	(1)	(2)	(3)
School characteristics			
N pupils	1,016	927	1,045
	(394)	(354)	(377)
% FSM students	0.13	0.24	0.21
	(0.12)	(0.12)	(0.12)
% Students with 5 A*C	0.58	0.36	0.40
	(0.18)	(0.12)	(0.13)
% OFSTED low score	0.29	0.82	0.65
	(0.45)	(0.39)	(0.48)
% in High-earnings LA	0.51	0.45	0.43
	(0.50)	(0.50)	(0.50)
% in urban LA	0.84	0.92	0.89
	(0.37)	(0.27)	(0.31)
Teachers' characteristics			
N teachers	59	60	62
	(27)	(23)	(24)
Pupil-teacher ratio	17	15	17
	(4)	(3)	(4)
% New hires	0.15	0.15	0.15
	(0.09)	(0.08)	(0.09)
% Leaving in t+1	0.15	0.21	0.14
	(0.10)	(0.13)	(0.08)
% Female	0.62	0.61	0.60
	(0.09)	(0.07)	(0.07)
Age	40	40	39
	(3)	(2)	(2)
Experience	14	14	14
	(3)	(2)	(2)
% Master or above	0.67	0.62	0.63
	(0.10)	(0.10)	(0.10)
% Top GPA in edu	0.06	0.05	0.05
	(0.08)	(0.07)	(0.07)
% Part-time	0.15	0.12	0.11
	(0.09)	(0.07)	(0.08)
Annual basic pay	37,242	36,571	37,309
	(3,654)	(3,149)	(3,042)
Share additional payments	0.04	0.06	0.05
	(0.03)	(0.03)	(0.03)
N schools	2,700	386	517

Source: DTR, 2001/02-2009/10, SWC, 2010/11-2018/19.

Notes: This table presents summary statistics (mean and standard deviation) of school, pupils, and teachers' outcomes for three groups of schools. The first column refers to schools that never become sponsored academies throughout the period considered. The figures in Column 1 are calculated over the period 2002/03-2014/15. The second column refers to schools that become sponsored academies between 2005/06 and 2014/15, and the figures are calculated over the three years prior to the conversion year. The third column refers to schools that convert four years after the schools in Column 2, and the figures are calculated over the same period as in Column 2.

Table 2: New head and characteristics of the headteacher

		Headteacher characteristics								
	New head	Fem	Age	Years of experience	Master or above	Top GPA in education	Part-time	Log annual pay	Coming from other LA	Coming from outstanding school
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sponsored academy	0.162***	-0.039	-1.004***	-0.755	0.011	-0.018	-0.009	0.071**	0.135***	0.030***
	(0.026)	(0.030)	(0.415)	(0.474)	(0.029)	(0.030)	(0.007)	(0.014)	(0.017)	(0.010)
Observations	5,501	5,399	5,399	5,399	5,399	1,428	5,399	5,399	5,399	3,844
N Schools	600	599	599	599	599	261	599	599	599	556
School FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pre-SA Mean T	0.24	0.44	50	27	0.61	0.08	0.02	86,560	0.06	0.01
Pre-SA Mean C	0.25	0.40	50	28	0.62	0.05	0.01	89,337	0.09	0.01

Source: DTR, 2001/02-2008/09, SWC, 2010/11-2018/19.

Notes: This table presents the impact of the school management takeover on the probability of appointing a new headteacher and the characteristics of the headteacher. These results are estimated by running regression 1 on the outcomes displayed on top of each column. The estimation sample includes schools that experience a takeover between 2005/06 to 2014/15 (treated schools) and schools that experience this event four years after each treated conversion cohort (control schools). The estimation period includes the three years before the takeover of each treated school up to two years following this event. The estimation sample in Columns 2-10 includes only observations for which all main characteristics of the headteacher are available (98% of the sample). Information on teachers' GPA in education is only available for half of the teachers in the sample. Schools' OFSTED performance is available from the school year 2005/06.

*** p<0.01, ** p<0.05, * p<0.1.

Table 3: Characteristics of teachers who leave

	Fem	Age	Years of experience	Master or above	Top GPA in education	Teach First	Part-time	Log annual pay	Going to other LA	Going to outstanding school
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
To other school										
Sponsored academy	-0.023	0.480*	0.313	-0.019	-0.036**	0.003	-0.005	0.027***	- 0.024*	-0.013
	(0.015)	(0.269)	(0.271)	(0.014)	(0.016)	(0.004)	(0.010)	(0.010)	(0.013)	(0.011)
Observations	5149	5149	5149	5149	3834	5149	5149	5149	5149	4400
N Schools	600	600	600	600	600	600	600	600	600	580
Pre-SA Mean T	0.59	36	10	0.68	0.07	0.01	0.10	10.48	0.64	0.16
Pre-SA Mean C	0.58	35	9	0.68	0.07	0.01	0.10	10.46	0.65	0.15
To other sector										
Sponsored academy	0.011	-0.443	-0.224	-0.018	0.018	0.002	-0.022	0.022		
	(0.018)	(0.460)	(0.571)	(0.019)	(0.017)	(0.004)	(0.017)	(0.015)		
Observations	4045	4045	4045	4045	2780	4045	4045	4045		
N Schools	593	593	593	593	593	593	593	593		
Pre-SA Mean T	0.59	45	19	0.47	0.06	0.01	0.25	10.42		
Pre-SA Mean C	0.61	43	18	0.49	0.07	0.01	0.26	10.43		

Source: DTR, 2001/02-2009/10, SWC, 2010/11-2018/19.

Notes: This table presents the impact of the school management takeover on the characteristics of teachers who leave the school. Panel A refers to teachers leaving for other schools, Panel B to teachers leaving the educational sector or leaving for a school in a different phase of education. These results are estimated by running regression 1 on the outcomes displayed on top of each column. In this table, the year before the completion of the takeover is included in the treatment period. The estimation sample includes schools that experience a takeover between 2005/06 to 2014/15 (treated schools) and schools that experience this event four years after each treated conversion cohort (control schools). The estimation period includes the three years before the conversion of each treated school up to two years following this event. The variable "Top gpa in education" is only available for half of the teachers in the sample. Schools' OFSTED performance is available from the school year 2005/06.

*** p<0.01, ** p<0.05, * p<0.1.

Table 4: Characteristics of new hires

	Fem	Age	Years of experience	Master or above	Top GPA in education	Teach First	Part-time	Log annual pay	Same school as new head	Coming from other LA	Coming from outstanding school
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
From other school											
Sponsored academy	-0.005	0.128	0.194	-0.012	-0.007	0.007**	-0.001	0.053***	0.014***	0.021	0.040***
	(0.016)	(0.319)	(0.304)	(0.016)	(0.014)	(0.003)	(0.011)	(0.012)	(0.003)	(0.016)	(0.012)
Observations	5018	5018	5018	5018	3311	5018	5018	5018	5018	5018	4786
N Schools	600	600	600	600	600	600	600	600	600	600	580
Pre-SA Mean T	0.57	37	10	0.68	0.07	0.00	0.10	10.51	0.00	0.64	0.10
Pre-SA Mean C	0.57	37	10	0.66	0.04	0.01	0.10	10.52	0.00	0.65	0.09
From other sector											
Sponsored academy	0.002	0.141		0.002	0.016	0.019**	-0.035***	0.054***			
	(0.016)	(0.336)		(0.018)	(0.017)	(0.007)	(0.011)	(0.011)			
Observations	4672	4672		4672	3367	4672	4672	4672			
N Schools	599	599		599	574	599	599	599			
Pre-SA Mean T	0.65	31		0.61	0.07	0.03	0.11	10.10			
Pre-SA Mean C	0.65	31		0.65	0.08	0.01	0.11	10.12			

Source: DTR, 2001/02-2009/10, SWC, 2010/11-2018/19.

Notes: This table presents the impact of the school management takeover on the characteristics of new hired teachers. Panel A refers to teachers hired from other secondary schools, Panel B to teachers hired from outside the educational sector or schools in other phases of education. These results are estimated by running regression 1 on the outcomes displayed on top of each column. The estimation sample includes schools that experience a takeover between 2005/06 to 2014/15 (treated schools) and schools that experience this event four years after each treated conversion cohort (control schools). The estimation period includes the three years before the takeover of each treated school up to two years following this event. The variable "Top gpa in education" is only available for half of the teachers in the sample. Schools' OFSTED performance is available from the school year 2005/06.

*** p<0.01, ** p<0.05, * p<0.1.

Table 5: Teacher pay

	Incumbent teachers			New hires			
	Log base pay (1)	Additional payments /Gross pay (2)	Log gross pay (3)	Log base pay (4)	Additional payments /Gross pay (5)	Log gross pay (6)	Pay dispersion (7)
Sponsored academy	0.016***	-0.014***	0.001	0.047***	-0.018***	0.025***	0.00153***
	(0.004)	(0.002)	(0.004)	(0.008)	(0.012)	(0.008)	(0.00042)
Observations	232,906	232,906	232,906	39,001	39,001	39,001	5,501
Adjusted R^2	0.665	0.522	0.680	0.679	0.429	0.693	0.114
N Schools	595	595	595	596	596	596	600
N Teachers	35,470	35,470	35,470	8,508	8,508	8,508	
Year FE	✓	✓	✓	✓	✓	✓	✓
School FE	✓	✓	✓	✓	✓	✓	✓
Teacher FE	✓	✓	✓	✓	✓	✓	
Pre-SA Mean T	36,907	0.06	39,639	35,598	0.05	37,722	0.01
Pre-SA Mean C	37,866	0.05	39,989	35,478	0.04	37,087	0.01

Source: DTR, 2001/02-2008/09, SWC, 2010/11-2018/19.

Notes: This table presents the impact of the school management takeover on teachers' pay and pay dispersion. The results in Column 1-6 are estimated by running regression 3 on the outcomes displayed on top of each column. The results in Column 7 are estimated by running regression 1 on pay dispersion. The estimation sample includes schools that experience a takeover between 2005/06 to 2015/16 (treated schools) and schools that experience this event four years after each treated conversion cohort (control schools). The estimation period includes the three years before the takeover of each treated school up to two years following this event.

*** p<0.01, ** p<0.05, * p<0.1.

Table 6: OFSTED performance

	Outstanding (1)	Outstanding in teaching (2)	Outstanding in management (3)
Sponsored academy	0.080***	0.050***	0.142***
	(0.017)	(0.015)	(0.025)
Observations	1,689	1,689	1,689
Adjusted R^2	0.504	0.482	0.455
N Schools	543	543	543
Year FE	✓	✓	✓
School FE	✓	✓	✓
Pre-SA Mean T	0.01	0.01	0.03
Pre-SA Mean C	0.04	0.02	0.06

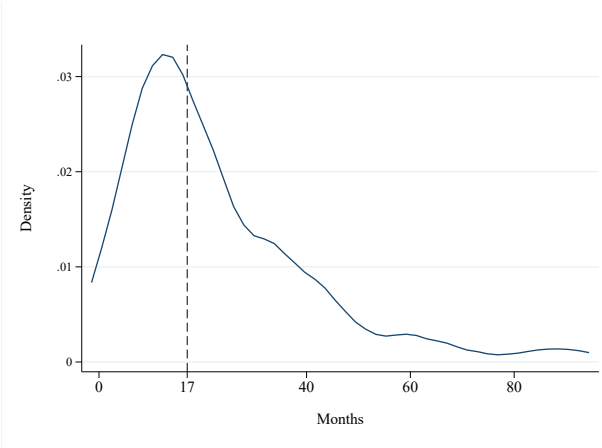
Source: OFSTED, 2005/06-2018/19.

Notes: This table presents the impact of the school management takeover on the probability that the school is deemed outstanding by OFSTED. These results are estimated by running regression 1 on the outcomes displayed on top of each column. The estimation sample includes schools that experience a takeover between 2008/09 to 2015/16 (treated schools) and schools that experience this event four years after each treated conversion cohort (control schools). The estimation period includes the years in which a school receives an OFSTED inspection between three years before the takeover of each treated school to two years following this event. All regressions include only the years in which schools receive an OFSTED inspection.

*** p<0.01, ** p<0.05, * p<0.1.

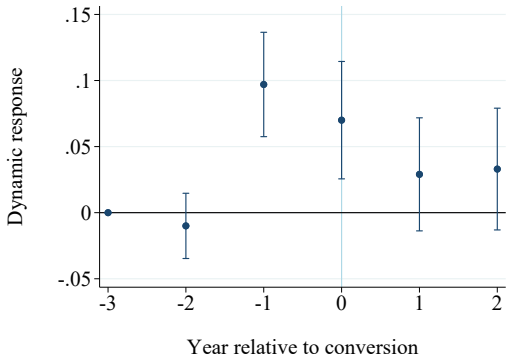
Appendix

Figure A.1: Months from application to conversion

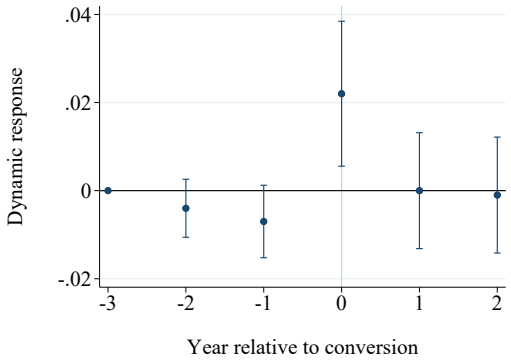


Source: GIAS, 2010/11-2018/19.
Notes: This graph reports the distribution of the number of months between the application date and the conversion date among the 20 percent of schools converting to sponsored academies after 2010/11 that have provided these data to the DfE.

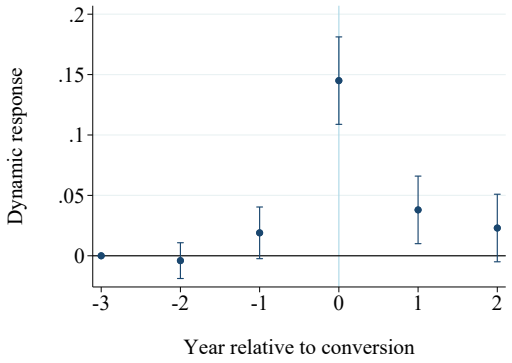
Figure A.2: Probability of appointing a new headteacher - where from



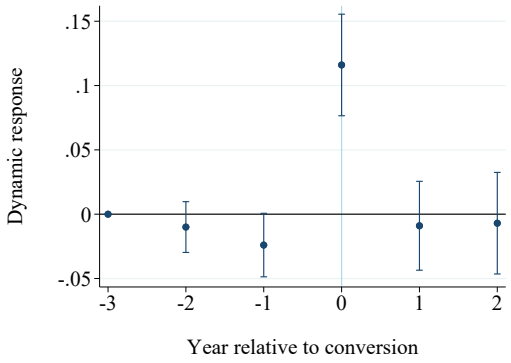
(A) New head promoted internally



(B) New head hired from other sector



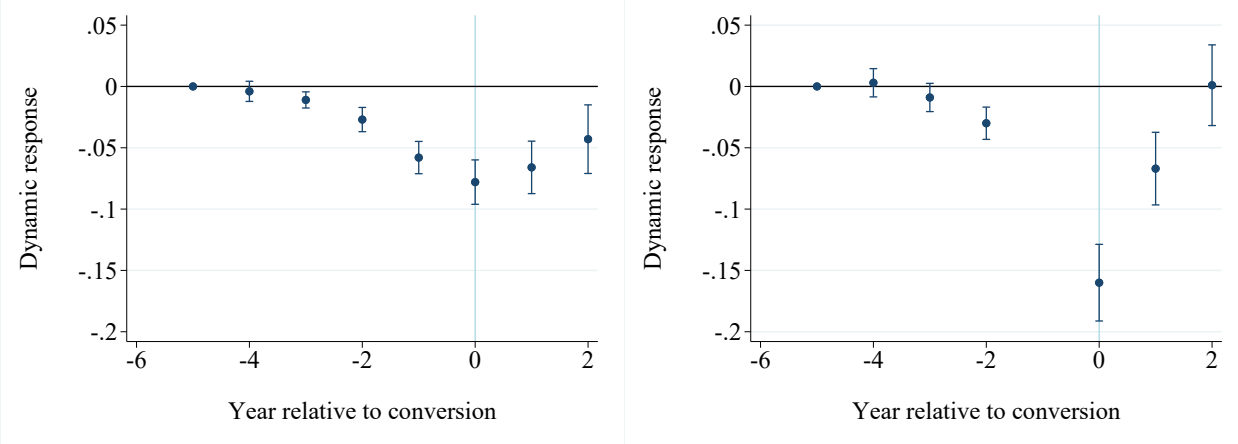
(C) New head hired from other school



(D) New head promoted from other school

Source: DTR, 2001/02-2009/10, SWC, 2010/11-2018/19.
Notes: These graphs present the dynamic impact of the school management takeover on the probability that the school changes head. These results are estimated by running regression 2 on the outcomes displayed in each graph. The estimation sample includes schools that convert between 2005/06 to 2014/15 (treated schools) and schools that convert four years after each treated conversion cohort (control schools). The estimation period includes the three years before the conversion of each treated school up to two years following this event. 90-percent confidence interval are also reported.

Figure A.3: Pupils' and teachers' numbers - longer pre-period

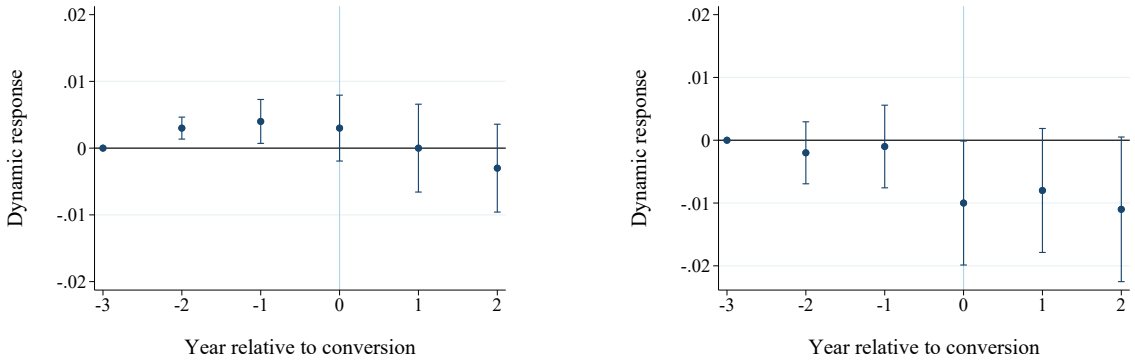


(A) Number of pupils

(B) Number of teachers

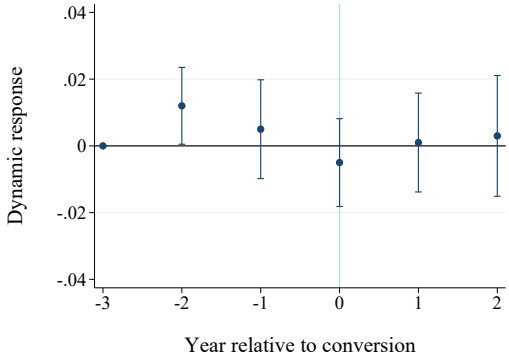
Source: DTR, 2001/02-2009/10, SWC, 2010/11-2018/19.
Notes: These graphs present the dynamic impact of the school management takeover on pupils' and teachers' numbers. These results are estimated by running regression 2 on the outcomes displayed in each graph. The estimation sample includes schools that convert between 2006/07 to 2014/15 (treated schools) and schools that convert four years after each treated conversion cohort (control schools). The estimation period includes the five years before the conversion of each treated school up to two years following this event. 90-percent confidence intervals are also reported.

Figure A.4: Pupils' characteristics and performance

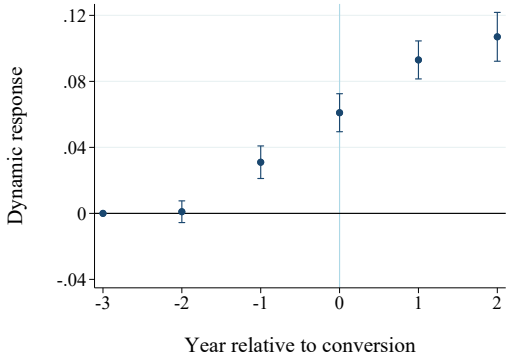


(A) Share FSM-eligible

(B) Share white British



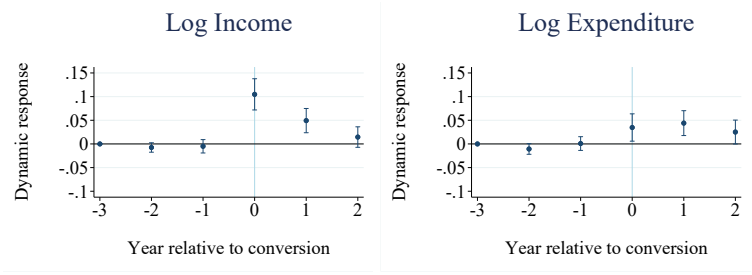
(C) Share English natives



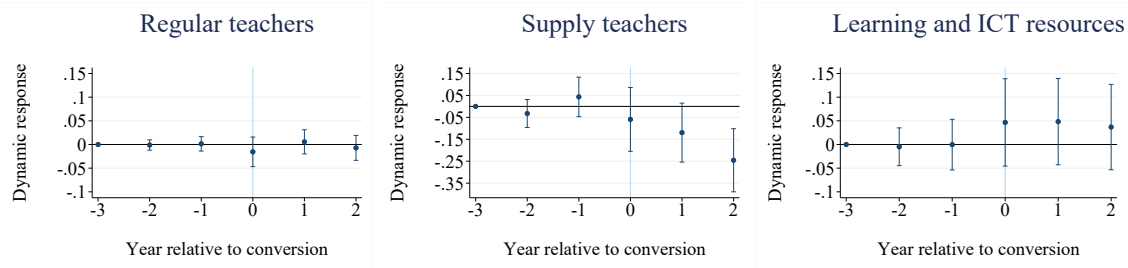
(D) Share 5 A*-C

Source: DTR, 2001/02-2009/10, SWC, 2010/11-2018/19.
Notes: These graphs present the dynamic impact of the school management takeover on pupils' characteristics and performance. These results are estimated by running regression 2 on the outcomes displayed in each graph. The estimation sample includes schools that convert between 200/07 to 2014/15 (treated schools) and schools that convert four years after each treated conversion cohort (control schools). The estimation period includes the five years before the conversion of each treated school up to two years following this event. 90-percent confidence intervals are also reported.

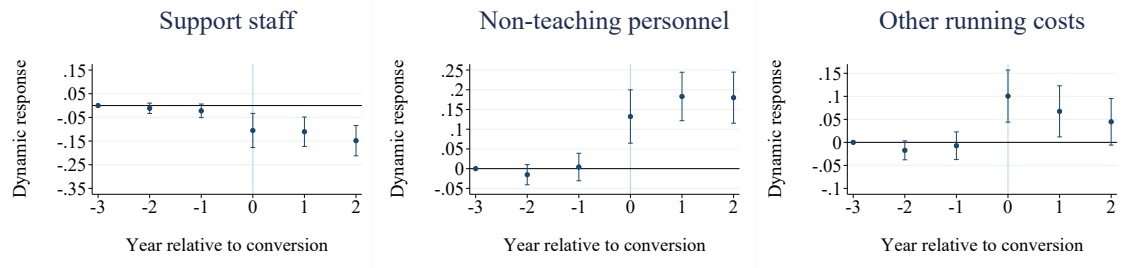
Figure A.5: School resources and expenditure



(A) Resources and expenditure



(B) Expenditure on teaching staff and educational resources

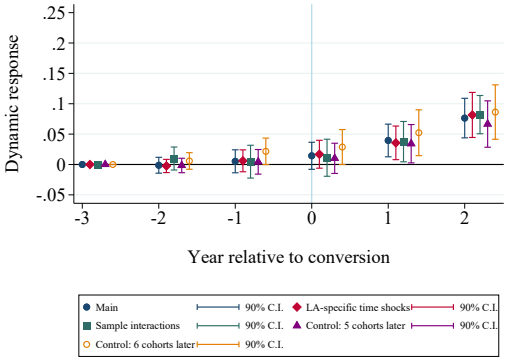


(C) Other expenditure

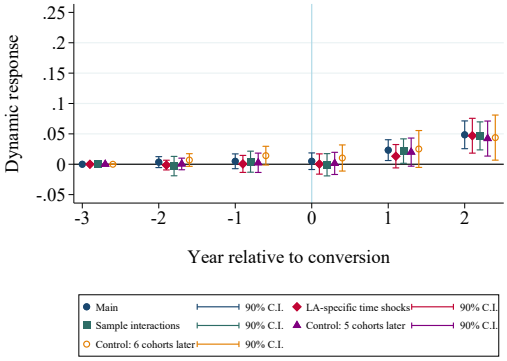
Source: SWC, 2010/11-2018/19.

Notes: These graphs present the dynamic impact of the school management takeover on school resources and expenditure. These results are estimated by running regression 2 on the outcomes displayed in each graph. The estimation sample includes schools that convert between 2010/11 to 2014/15 (treated schools) and schools that convert four years after each treated conversion cohort (control schools). The estimation period includes the three years before the conversion of each treated school up to two years following this event. 90-percent confidence intervals are also reported.

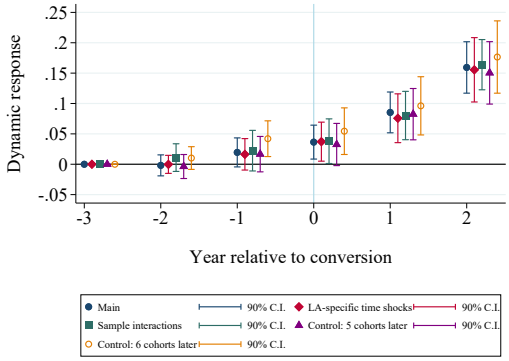
Figure A.6: Performance in OFSTED inspections - robustness checks



(A) Outstanding



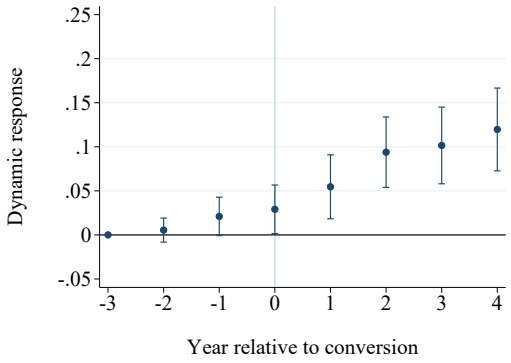
(B) Outstanding in teaching



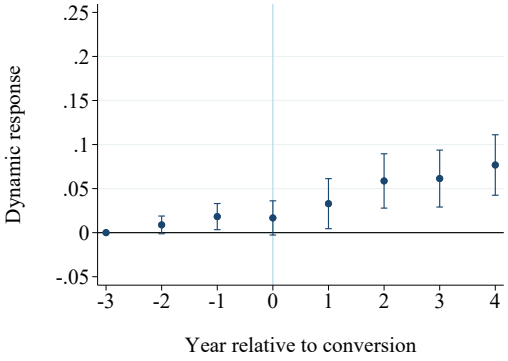
(C) Outstanding in management

Source: DTR, 2005/06-2009/10, SWC, 2010/11-2018/19.
Notes: This graph presents a series of robustness checks on the dynamic impact of the school management takeover on OFSTED performance. The bars around the point estimates are 90-percent confidence intervals.

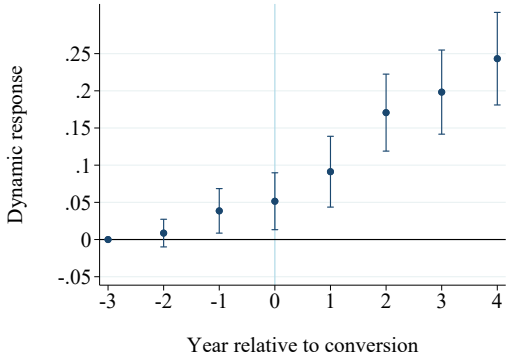
Figure A.7: Performance in OFSTED inspections - medium-term effects



(A) Outstanding



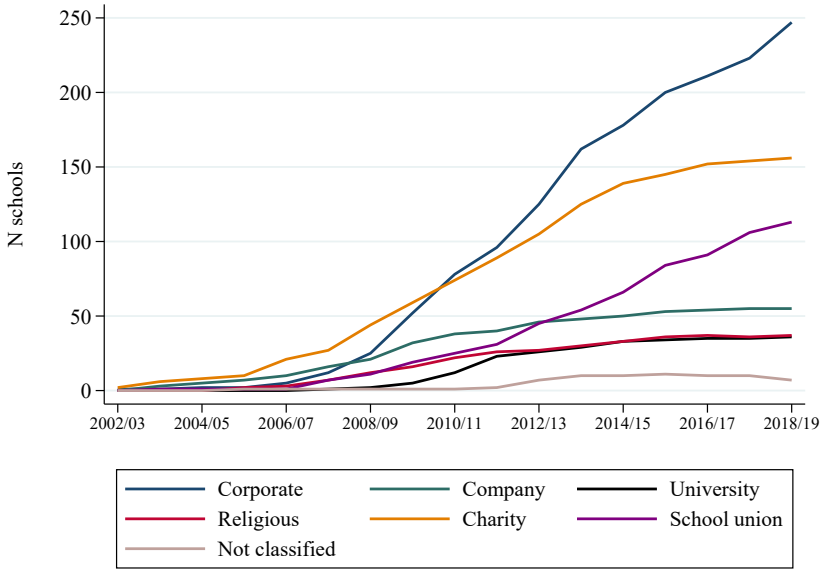
(B) Outstanding in teaching



(C) Outstanding in management

Source: DTR, 2005/06-2009/10, SWC, 2010/11-2018/19.
Notes: This graph presents the dynamic impact of the school management takeover on the probability of obtaining an outstanding score in OFSTED inspections, estimated by running regression 2. The estimation sample includes schools that convert between 2008/09 to 2012/13 (treated schools) and schools that convert six years after each treated conversion cohort (control schools). The estimation period includes the three years before the conversion of each treated school up to four years following this event. 90-percent confidence intervals are also reported.

Figure A.8: Sponsors' categories



Source: Data collected by the authors from schools' websites and Wikipedia.
Notes: This graph shows the distribution of Sponsors' types over time. We define as corporate those Sponsors who have appointed a CEO to manage multiple schools, and have usually the clear objective of expanding their trust to further schools.

Table A.1: New head - where from

	New head (1)	Promoted internally (2)	Hired from other school (3)	Promoted from other school (4)	Hired from other sector (5)
Sponsored academy	0.162***	0.009	0.077***	0.063***	0.014**
	(0.026)	(0.020)	(0.014)	(0.015)	(0.006)
Observations	5,501	5,501	5,501	5,501	5,501
Adjusted R^2	0.087	0.062	0.020	0.023	0.024
N Schools	600	600	600	600	600
Year FE	✓	✓	✓	✓	✓
School FE	✓	✓	✓	✓	✓
Pre-SA Mean T	0.24	0.15	0.04	0.06	0.01
Pre-SA Mean C	0.25	0.12	0.06	0.07	0.01

Source: DTR, 2001/02-2008/09, SWC, 2010/11-2018/19.

Notes: This table presents the impact of the school management takeover on the probability that the school changes head. These results are estimated by running regression 1 on the outcomes displayed on top of each column. The estimation sample includes schools that experience a takeover between 2005/06 to 2015/16 (treated schools) and schools that experience this event four years after each treated conversion cohort (control schools). The estimation period includes the three years before the takeover of each treated school up to two years following this event.

*** p<0.01, ** p<0.05, * p<0.1.

Table A.2: Teacher turnover

	Log N pupils (1)	Log N teachers (2)	Share teachers leaving in t+1 (3)	Share new hired teachers (4)
Sponsored academy	-0.021**	-0.053***	-0.075***	0.042***
	(0.009)	(0.014)	(0.006)	(0.005)
Observations	5,501	5,501	5,501	5,501
Adjusted R^2	0.902	0.816	0.319	0.377
N Schools	600	600	600	600
Year FE	✓	✓	✓	✓
School FE	✓	✓	✓	✓
Pre-SA Mean T	927	59	0.21	0.15
Pre-SA Mean C	1,043	60	0.14	0.16

Source: DTR, 2001/02-2008/09, SWC, 2010/11-2018/19.

Notes: This table presents the impact of the school management takeover on teacher turnover. These results are estimated by running regression 1 on the outcomes displayed on top of each column. These results are estimated by running regression 1 on the outcomes displayed on top of each column. The estimation sample includes schools that experience a takeover between 2005/06 to 2015/16 (treated schools) and schools that experience this event four years after each treated conversion cohort (control schools). The estimation period includes the three years before the takeover of each treated school up to two years following this event.

*** p<0.01, ** p<0.05, * p<0.1.

Table A.3: Teachers' characteristics

	Fem	Age	Years of experience	Master or above	Top GPA in education	Teach First	Part-time	Log annual pay	Same school as new head	Coming from other LA	Coming from outstanding school
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Sponsored academy	-0.005*	-0.790***	-0.652***	0.003	0.009**	0.006***	-0.013***	-0.002	0.003***	0.016***	0.007***
	(0.003)	(0.100)	(0.096)	(0.003)	(0.004)	(0.001)	(0.004)	(0.004)	(0.001)	(0.003)	(0.001)
Observations	5,501	5,501	5,501	5,501	5,497	5,501	5,501	5,501	5,501	5,501	4,722
N Schools	600	600	600	600	600	600	600	600	600	600	580
School FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pre-SA Mean T	0.61	40	14	0.61	0.05	0.01	0.12	10.57	0.00	0.05	0.01
Pre-SA Mean C	0.60	40	14	0.62	0.05	0.00	0.11	10.58	0.00	0.04	0.01

Source: DTR, 2001/02-2008/09, SWC, 2010/11-2018/19.

Notes: This table presents the impact of the school management takeover on teachers' characteristics. These results are estimated by running regression 1 on the outcomes displayed on top of each column. The estimation sample includes schools that experience a takeover between 2005/06 to 2014/15 (treated schools) and schools that experience this event four years after each treated conversion cohort (control schools). The estimation period includes the three years before the takeover of each treated school up to two years following this event. Information on teachers' GPA in education is only available for half of the teachers in the sample. Schools' OFSTED performance is available from the school year 2005/06.

*** p<0.01, ** p<0.05, * p<0.1.

Table A.4: Pay dispersion - alternative definitions

	All teachers		Incumbent teachers	
	Base pay (1)	Gross pay (2)	Base pay (3)	Gross pay (4)
Sponsored academy	0.00153***	0.00138***	0.00101***	0.00099***
	(0.00042)	(0.00040)	(0.00049)	(0.00047)
Observations	5,501	5,501	5,473	5,473
Adjusted R^2	0.114	0.118	0.096	0.095
N Schools	600	600	600	600
Year FE	✓	✓	✓	✓
School FE	✓	✓	✓	✓
Pre-SA Mean T	0.0147	0.0144	0.0147	0.0144
Pre-SA Mean C	0.0142	0.0141	0.0142	0.0141

Source: DTR, 2001/02-2008/09, SWC, 2010/11-2018/19.

Notes: This table presents the impact of the school management takeover on pay dispersion. The results are estimated by running regression 1 on different definitions of pay dispersion. The estimation sample includes schools that experience a takeover between 2005/06 to 2015/16 (treated schools) and schools that experience this event four years after each treated conversion cohort (control schools). The estimation period includes the three years before the takeover of each treated school up to two years following this event.

*** p<0.01, ** p<0.05, * p<0.1.

Table A.5: Returns to experience

	Log annual gross pay (1)	Additional payments /Gross pay (2)
Experience	0.01221***	0.0005***
	(0.0002)	(0.00004)
Experience*Treated	0.00049**	0.00023***
	(0.00022)	(0.00005)
Experience*Treated*Post	-0.00318***	-0.00064***
	(0.00020)	(0.00008)
Master+	0.04863***	0.00580***
	(0.00292)	(0.00081)
Master+*Treated	-0.02697***	-0.00202*
	(0.00356)	(0.00103)
Master+*Treated*Post	0.03904***	-0.00458***
	(0.00372)	(0.00134)
Observations	219,074	219,074
N Schools	595	595
N Teachers	33,893	33,893
School FE	✓	✓
Year FE	✓	✓

Source: DTR, 2001/02-2008/09, SWC, 2010/11-2018/19.

Notes: This table presents the impact of the school management takeover on the return to teachers' observable characteristics. The estimation sample includes schools that experience a takeover between 2005/06 to 2015/16 (treated schools) and schools that experience this event four years after each treated conversion cohort (control schools). The estimation period includes the three years before the takeover of each treated school up to two years following this event. In the sample of academies' incumbent teachers, information on years of experience is missing for 6 percent of teachers.

*** p<0.01, ** p<0.05, * p<0.1.

Table A.6: School resources and expenditure

	Log income (1)	Log expenditure (2)	Regular teachers (3)	Supply teachers (4)	Learning & ICT resources (5)	Support staff (6)	Non-teaching personnel (7)	Other running costs (8)
Sponsored academy	0.064***	0.039***	-0.005	-0.144**	0.046	-0.104***	0.168***	0.082***
	(0.011)	(0.010)	(0.011)	(0.058)	(0.040)	(0.028)	(0.027)	(0.022)
Observations	2,908	2,908	2,908	2,908	2,908	2,908	2,908	2,908
N Schools	504	504	504	504	504	504	504	504
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
School FE	✓	✓	✓	✓	✓	✓	✓	✓
Pre-SA Mean T	6,840	6,790	3,508	180	378	778	797	1,156
Pre-SA Mean C	6,400	6,299	3,365	154	368	675	736	1,016

Source: DfE, 2007/08-2018/19.

Notes: This table presents the impact of the school management takeover on school resources and expenditure. These results are estimated by running regression 1 on the outcomes displayed on top of each column. The estimation sample includes schools that experience a takeover between 2010/11 to 2015/16 (treated schools) and schools that experience this event four years after each treated conversion cohort (control schools). The estimation period includes the three years before the takeover of each treated school up to two years following this event.

*** p<0.01, ** p<0.05, * p<0.1.