Resources and Standards in Urban Schools

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Executive Summary

Do resources matter? This question remains controversial in the economics of education as many studies find no relationship between school resources and educational outcomes. Yet, improving educational performance, especially of 'hard to reach' children, is a key area for government policy. This is particularly the case in countries like the UK and the US where the fact that many adults have poor basic skills is frequently attributed to people being 'let down' by the education system.

In the UK, particular attention has been paid to schools in inner-city areas, where many pupils face problems of socio-economic deprivation and where there has been a concern about educational underachievement for many years. We study a flagship policy of the UK government – the Excellence in Cities (EiC) programme – which has been designed to address these problems. This enables us to consider not only whether this particular policy was successful, but also to contribute to the more general debate as to whether resources matter and in what circumstances. We look at the distributional impacts of resources in a way that is not addressed by much of the existing literature.

Excellence in Cities was launched in 1999 in over 400 secondary schools in England and since then progressively increased in coverage. It is now implemented in about a third of all secondary schools (over 1,000 schools). The policy involves allocating resources to Partnerships of Local Education Authorities (LEAs) and LEA maintained schools within their respective regions. Since there is considerable heterogeneity in the degree of disadvantage and school performance within LEAs, the policy does not cover every disadvantaged or poorly performing school in England and hence it is possible to find a comparison group of schools outside the policy. The three core strands of EiC are as follows: Learning Mentors, to help students overcome educational or behaviour problems; Learning Support Units, to provide short-term teaching and support programmes for difficult students; and a Gifted and Talented programme, to provide extra support for 5-10 per cent of pupils in each school. Other aspects of the EiC policy are the designation of particular schools as Specialist (i.e. in particular subjects) or Beacon (to disseminate good practice). Schools which are successful in their application for such status receive significant amounts of money. Finally, EiC also

involves the creation of City Learning Centres (to provide ICT facilities) and Education Action Zones (where there is an emphasis on the sharing of good practice).

We evaluate the average impact of EiC on educational attainment and attendance at school over time since its introduction in 1999. Thus, we assess the extent to which the whole range of activities carried out as a result of EiC funding led to an improvement in important educational outcomes. We focus on pupil-level attainment at age 14 (the end of Key Stage 3) and a measure of school attendance (the percentage of half days missed). We consider variation in the effect of the policy according to when it was introduced to different areas; time since its introduction; the level of disadvantage of the school (and of pupils of different abilities within these schools). Our methodology is based on a comparison between outcomes in schools where the EiC has been in place and schools in an appropriate comparison group before and after the policy was introduced. Specifically, we use a difference-in-differences approach that is combined with statistical matching.

Our results show a positive effect of EiC on pupil attainment in Mathematics (though not in English) and on school attendance. A simple assessment suggests that the policy is cost-effective – at least for more recent years. However, the effect of the policy is heterogeneous along a number of dimensions: it is stronger the longer the policy has been in place; for disadvantaged schools; for medium-high ability pupils within disadvantaged schools. Our results show that 'resources matter' but that it is difficult to help the 'hard-to-reach' using this level of resources (i.e. low ability children within disadvantaged schools). For such children, different and probably more intensive policy treatments may be required – ideally earlier in their schooling career.

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1 Introduction

Whether increasing resources matters for schooling outcomes, at all stages of the education sequence, remains controversial and at the heart of the education policy agenda of many countries. Part of the reason is the considerable interest in the difficult question of how to turn around schools that are not performing well. Part is the concern as to whether additional resources can be used to improve the outcomes of 'hard to reach' pupils who currently leave the education system with few or no educational qualifications. This is a particular problem in countries, like the UK and US, where there are long and sizable tails in the bottom end of the adult distribution of basic literacy and numeracy skills (OECD, 1995). The existence of large numbers of adults with poor basic skills in these countries (and the lack of them in other countries like Sweden or Germany) is frequently attributed to people being 'failed' or 'let down' by the education system.

This is all the more relevant, and of general concern, because by now a large body of research fails to find evidence that giving more money to schools matters (see Hanushek, 2003). Only a small minority of papers – including the rather specific Maimonides rule paper on class sizes in Israel (Angrist and Lavy, 1999) and the 'experimental' Tennessee STAR class size reduction papers (Krueger, 1999; Krueger and Whitmore, 2001) – conclude that increasing resources matters for improving educational standards.[1] And, even then, it is often argued that school inputs can only matter to a limited extent when compared to the impact of family background and the home environment.

Placed in this policy and research context, whether there is any scope for education policy to raise attainment in poorly performing schools becomes very important. This is true both for the individual pupils concerned and for the future of schools, especially if they become labelled as 'failing'. In English state schools in the 1990s, there were severe problems and a genuine need to raise standards, especially in inner city areas (LeGrand, 1993; Machin and Vignoles, 2005)[2]. Whilst the current UK government has a stated commitment to raise

[1] Recent DfES commissioned work of relevance includes Levacic *et al*. (2005).

[2] There are a number of aspects of poor performance or 'under-performance' that have been identified, which include both pupil and school-specific factors. For example, with regard to pupils, OFSTED (1993) identified underachievement that is evident even at an early age and substantial weaknesses in pupils' oral and written communications. The report also remarked that these problems were substantially more prevalent amongst

standards in all schools, it has also devoted specific attention to the educational performance of children attending inner city schools, especially in deprived areas. This has been justified in various ways, including the notion that education acquisition matters a lot for adult outcomes, with some implication that it may well matter even more in the future.[3]

In this paper we ask the question of whether additional school resources matter. In doing so, we look in some detail at distributional impacts of resources in a way not addressed by much of the work on school resources, which tends to be more stark in its focus on giving a yes/no answer to the question. The approach we follow is to study a flagship policy of the UK government – the Excellence in Cities (EiC) programme – with an aim to shed some light on whether education policies that provide additional resources (directly targeted at the lower end of the income and education distribution) can improve educational standards. EiC is a well publicised policy aimed specifically at alleviating underachievement in inner city schools within England. In this programme, schools in disadvantaged, mainly urban, areas of England were given extra resources to try to improve standards. We use a study of the effects of the programme to question whether such a resource based programme has scope to be useful in turning around the fortunes of badly performing schools in the inner cities.[4]

The perceived need to turn around the fortunes of schools in deprived inner city areas is certainly not unique to the UK. In the US, high profile policies include school vouchers and Charter schools. However, unlike in the US and other countries where the school system is highly decentralised, the state school system is run on a national basis in the UK (albeit with differences between England, Wales, Scotland and Northern Ireland). Hence there is scope for educational policies targeted at disadvantaged groups to be formulated and assessed in a much more systematic manner. This is because the policies themselves are designed with the national system in mind, trying at the same time to isolate areas where there are particular problems associated with poor educational outcomes. Of course, the target schools are in

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pupils attending inner city state schools. Moreover, lack of ambition during the school years was pinpointed in that many pupils seemed unconvinced of the value of continuing their studies beyond the compulsory school leaving age. At school level there were also significant problems. These included an insufficient pace and challenge in teaching, and poor arrangements for learning support. Furthermore, and unlike schools in other parts of the country, it appeared that weaknesses in particular schools were likely to be exacerbated by poor links between them and other schools.

[3] See, for example, the Excellence in Schools statement that 'the demands of the future will require that everyone succeeds in secondary education' (DfEE, 1997).

[4] See Machin *et al.* (2004) for some early findings on EiC.

economically and socially deprived areas, and hence we need to pay close attention to selection issues in implementing our modelling approach.

The success or otherwise of the Excellence in Cities policy is of interest in an international context for a number of reasons. Firstly, as discussed above, it is an example of a policy designed specifically for schools in disadvantaged areas – and this is also a concern for policy in other countries. Secondly, it is essentially a resource-based policy. As already noted, there are many examples of resource-based policies that have failed to have an impact on outcomes, which has led some to argue that such policies should be rejected in favour of incentive-based policies (Hanushek, 2003) whereas others argue that this conclusion is attributable to the poor quality of many evaluation studies (Krueger, 2003). Thirdly, the efficacy of area-based policies is of interest in other European countries. For example, a recent evaluation of such a policy in France could find no evidence for positive impacts on educational outcomes (Bénabou *et al.* 2005). Finally, it has been argued that the focus for policy should be in early childhood interventions since it is more difficult to improve an individual's abilities later in life (Carneiro and Heckman, 2003). As noted by Lavy and Schlosser (2005), the lack on evidence on the effectiveness of high-school interventions is particularly important given the debate over the relative merit of early versus late childhood intervention.[5]

The rest of the paper is structured as follows. In Section 2, we outline the salient features of the Excellence in Cities policy; in Section 3, we describe our data sources and then in Section 4 present a descriptive analysis of how outcome measures have evolved over time within schools exposed to EiC compared to other schools. In Section 5, we discuss the methodology – a difference-in-differences approach, which is combined with statistical matching. Then in Section 6, we present the results of the analysis – firstly, the overall impacts of the EiC policy on each outcome measure; and secondly a more detailed analysis for each EiC Phase where we examine how the effects of the policy vary over time; by the level of disadvantage in the school and for pupils of different abilities within these schools. In Section 7, we report the results of robustness tests where we examine whether the results reported in the differences-

[5] Their study is a notable exception. They evaluate the impact of remedial education of teenagers on achievement at high school and find strong evidence on the efficacy of augmenting instruction time for targeted students.

in-differences analysis could be attributed to the existence of pre-policy trends. In Section 8 we outline a simple Cost-Benefit Analysis, before concluding in Section 9.

2 Resources in English Schools and the Excellence in Cities Programme

Excellence in Cities was launched in 1999 in over 400 secondary schools in England and since then progressively increased in coverage. It is now implemented in about a third of all secondary schools (over 1,000 schools). A complementary policy aimed at encouraging participation in higher education (College) was introduced to a subset of these areas in 2001. Furthermore, since 2001, a similar programme has been introduced for primary schools in another subset of these areas (on a pilot basis).

In this paper, we evaluate the impact of the Excellence in Cities policy in secondary schools over the time since its introduction. It has been introduced in three main phases: Phase 1 areas, as from September 1999; Phase 2 areas, as from September 2000 and Phase 3 areas, as from September 2001. It was also introduced to a small number of schools in regions outside of these areas in September 2001 (Cluster 1) and 2002 (Cluster 2).[6]

The Excellence in Cities (EiC) policy involves allocating resources to Partnerships of Local Education Authorities (LEAs) and LEA maintained schools within their respective regions. There are 150 LEAs in England and within the areas chosen for the three main Phases of EiC policy, all LEA maintained schools were affected.[7] Since there is considerable heterogeneity in the degree of disadvantage and school performance within LEAs, the policy does not cover every disadvantaged or poorly performing school in England and hence it is possible to find a comparison group of schools outside the policy.

Resource allocations to 'Partnerships' within EiC (i.e. LEAs and their schools) were largely based on pupil numbers and the level of disadvantage in the LEA (as measured by the

[6] These Clusters are different from the main EiC Phases because the policy has not been targeted to all schools within a particular Local Education Authority but only to small clusters of primary and secondary schools within an area. There are only a small number of secondary schools in EiC Clusters.

[7] Local Education Authorities are responsible for the strategic management of local authority education services including planning the supply of school places, ensuring every child has access to a suitable school place, intervening where a school is failing its pupils and for allocating funding to schools.

percentage of pupils known to be eligible for free school meals). While there was some scope for discretion within Partnerships about how the funding was allocated to schools, Noden *et al.* (2001) show that criteria such as school size and the level of disadvantage of the school were important components of the decision. Hence there is heterogeneity in how much funding schools receive. This varies from £50 per pupil in the more advantaged schools (in terms of pupils' eligible for free school meals) to about £140 per pupil in the least advantaged schools. The average for all EiC schools is about £120 per pupil per year (about 4.4 per cent of overall per pupil expenditure). At the outset, this funding was to be allocated to specific strands, but over time schools have been allowed greater flexibility over how the funding is used.

The three core strands of EiC are as follows: Learning Mentors, to help students overcome educational or behaviour problems; Learning Support Units, to provide short-term teaching and support programmes for difficult students; and a Gifted and Talented programme, to provide extra support for 5-10 per cent of pupils in each school. Other aspects of the EiC policy are the designation of particular schools as Specialist (i.e. in particular subjects) or Beacon (to disseminate good practice). Schools which are successful in their application for such status receive significant amounts of money.[8] Finally, EiC also involves the creation of City Learning Centres (to provide ICT facilities) and Education Action Zones (where there is an emphasis on the sharing of good practice).

A complementary policy (Pupil Learning Credits) was introduced to a subset of the most disadvantaged schools (30 per cent of schools within EiC Phase 1 areas, about 230 schools) between September 2001 and September 2003. This involved further expenditure on pupils between the age of 11 and 14 years, where the aim was to provide additional learning opportunities for those whose social circumstances are particularly difficult. The funding per pupil was either £260 or £360 and schools had great flexibility over how it was used.[9]

In this paper, we evaluate the average impact of EiC on educational attainment and attendance at school over the time since its introduction in 1999. Thus, we assess the extent to which the whole range of activities carried out as a result of EiC funding led to an

[8] For example, if a school is approved for Specialist status, it receives £100,000 in capital funding and £123 per pupil for 4 years – or longer if it is subsequently re-designated as Specialist.
[9] We consider the combined effect of EiC with this policy where relevant.

improvement in important educational outcomes. We focus on pupil-level attainment at age 14 (the end of key stage 3)[10] and a measure of school-level attendance (the percentage of half days missed). We consider variation in the effect of the policy according to when it was introduced to different areas; time since its introduction; the level of disadvantage in the school (and on pupils of different abilities within these schools).

Our methodology is based on a comparison between outcomes in schools where the EiC policy has been in place and schools in an appropriate comparison group before and after the policy was introduced.

3 Data Description

In England, compulsory education is organised around four 'Key Stages' from the age of 5 to 16.[11] At the end of each 'Key Stage', pupils must sit national tests (which are externally set and marked). This analysis is based on national-level administrative records of pupil attainment and attendance pre-policy (1999) and post-policy from 2000 to 2003.[12] Attendance, or more specifically the percentage of half days missed, is only measured at school-level. Attainment in English and Mathematics is measured at age 14 and is available for every pupil in England in the National Pupil Database. The tests at age 14 mark the end of 'Key Stage 3' in the National Curriculum. In each subject, marks are given for various tests and then converted to a 'level' (on a scale of 2-8).[13] Each level is associated with a particular set of knowledge and skills, which is set out in the National Curriculum. The expected standard at age 14 is 'level 5' and this forms the basis of government targets. For 2004, the

[10] We focus on pupil outcomes at age 14 and not at age 16 because we do not have an early measure of ability (i.e. attainment at age 11) for the latter group over the time period relevant for this study.

[11] These are Key Stage 1 (at age 7); Key Stage 2 (at age 11 – the end of primary school); Key Stage 3 (at age 14) and Key Stage 4 (at age 16), when pupils undertake examinations for the General Certificate of Secondary Education (GCSEs).

[12] Years refer to the end of the school year, when tests take place. For example, 1999 refers to the 1998-1999 school year.

[13] In English, all students set the same tests. In Mathematics, pupils can be entered for one of four different set of tests (or tiers), which vary in their level of difficulty. The scoring system can change over time but the level received by the student is supposed to be time invariant.

target was that 75 per cent of 14 year olds reach level 5 or above in English and Mathematics.[14]

The first year of national pupil-level data that has been matched up with the pupil's prior attainment (at age 11) is in 1999 (i.e. the end of the school year 1998-99) - the pre-policy period for schools which have been longest in the EiC policy. These national data sets of pupil level attainment include the students' prior attainment, date of birth, gender and codes for the primary and secondary schools attended.[15] School-level variables were matched up with these school codes using the School Performance tables and information available in the LEA and School Information Service (LEASIS).[16] Further details of these data sets are contained in Table A1 of the Data Appendix. The set of explanatory variables used in this analysis are listed in the notes to Table 2. We include only 'non-special' schools that are LEA maintained in the analysis. This excludes schools that exist exclusively for students with special needs, all independent schools and City Technology Colleges.

Our analysis is based on a comparison of pupils in EiC schools with pupils in non-EiC schools before and after the policy was introduced. We start out by comparing EiC schools to all other LEA maintained schools in England. We then undertake a more in-depth analysis for schools within each Phase of EiC. The comparison group is then based on the results of propensity score matching in the pre-policy period (described below). First we present a simple descriptive analysis of the data.

4 Initial Descriptive Analysis

We consider the impact of the additional resources offered under the EiC programme on pupil achievement and on school attendance. The main outcome measures of interest are:

[14] The actual percentage of children reaching level 5 in 2004 was 71 per cent and 73 per cent in Key Stage 3 English and Mathematics respectively.
[15] Prior attainment is measured at Key Stage 2, when students were in primary school (at age 11).
[16] It was also necessary to change school codes in the various files where these had changed over the relevant time period.

i) the probability that students attain the expected standard of "level 5" or above in Key Stage 3 Mathematics and English respectively;

ii) at school level, the percentage of half days missed.

In Tables 1a-1c, we show the evolution over time of these outcome measures in EiC schools, each group of EiC schools (i.e. Phases 1-3, Clusters 1 and 2 – which entered the EiC policy at different times), and non-EiC schools. For each category, we show the change in the outcome measure between 1999 (i.e. before EiC had been introduced in Phase 1 schools) and the most recent year 2003. Then in the final column, we show the 'difference-in-differences' estimate (with associated standard errors in parentheses). This is based on the difference between the change over time in the outcome measure in the EiC schools (or the particular group of EiC schools) and that in the non-EiC schools.

It is evident from Table 1a-1c that if one compares all EiC schools to all non-EiC schools in each year the outcome measures are lower within EiC schools at each point in time. This reflects the relative disadvantage of EiC schools, which is why the policy was introduced in the first place.[17] Furthermore, there is heterogeneity within the group of EiC schools: schools designated under Phase 1 (together with the small number of schools in Cluster 1) have lower outcome measures than other schools. This also reflects their greater relative disadvantage. However, when one examines changes in the outcome measures over time, it is clear that schools in EiC areas have generally made greater progress than schools in non-EiC areas. Specifically, with regard to the percentage of pupils attaining level 5 or above in Mathematics and English, this has increased by 11.35 and 6.38 percentage points respectively in EiC schools and by 7.86 and 5.19 percentage points in non-EiC schools. Hence, EiC schools have made faster progress over the time since the policy was introduced. The 'difference-in-differences' estimate shows the relative improvement in EiC schools to have been 3.49 percentage points (i.e. 11.35-7.86) for Mathematics and 1.19 percentage points (i.e. 6.38-5.19) for English. Similarly, there has been a faster decline in the percentage of half days missed in EiC schools. The 'difference-in-difference' estimate shows a higher rate of improvement in EiC schools of about 1 percentage point. One can consider the 'difference-in-difference' estimate for each Phase of EiC in a similar way. In general terms, the rate of

[17] See Appendix Table A2 for summary statistics of schools by EiC Phase.

Table 1 Initial Descriptive Analysis

Table 1a. Percentage of students obtaining Level 5 or above in KS3 Mathematics

	Number of schools	1999	2000	2001	2002	2003	Change (1999-2003)	Diff-in-Diff (1999-2003)
All EiC	1009	53.17	56.59	58.8	60.06	64.52	11.35	3.49 (.3)
Phase 1	436	50.39	53.81	56.16	57.75	62.67	12.28	4.42 (.5)
Phase 2	310	54.98	58.83	61.21	62.36	66.72	11.74	3.88 (.5)
Phase 3	160	57.02	59.96	61.03	62.17	66.54	9.52	1.66 (.6)
Cluster 1	59	49.78	52.99	56.60	57.33	59.92	10.14	2.28 (1.0)
Cluster 2	44	56.93	59.22	61.34	61.31	65.10	8.17	0.31 (1.4)
All non-EiC	2148	67.40	69.88	71.13	71.93	75.26	7.86	

Table 1b. Percentage of students obtaining Level 5 or above in KS3 English

	Number of schools	1999	2000	2001	2002	2003	Change (1999-2003)	Diff-in-Diff (1999-2003)
All EiC	1009	57.36	57.80	59.26	61.28	63.74	6.38	1.19 (.5)
Phase 1	436	55.70	55.45	57.36	60.01	62.35	6.65	1.46 (.7)
Phase 2	310	58.11	58.75	61.35	62.56	65.20	7.09	1.90 (.8)
Phase 3	160	60.66	60.47	61.55	62.49	65.49	4.83	-.36 (1.0)
Cluster 1	59	54.31	53.26	54.27	59.00	61.74	7.43	2.24 (1.8)
Cluster 2	44	59.68	57.45	59.99	62.69	62.90	3.22	-1.97 (2.0)
All non-EiC	2148	67.86	68.40	69.04	70.82	73.05	5.19	

Table 1c. Percentage of half days missed (schools in School Performance Tables)

	Number of schools	1999	2000	2001	2002	2003	Change (1999-2003)	Diff-in-Diff (1999-2003)
All EiC	1002	10.48	10.10	10.28	9.84	9.07	-1.41	-.97 (.08)
Phase 1	433	10.68	10.30	10.44	9.96	9.09	-1.59	-1.15 (.12)
Phase 2	307	10.39	9.89	10.13	9.66	8.99	-1.40	-.96 (.16)
Phase 3	160	9.91	9.76	9.88	9.62	9.00	-.91	-.47 (.15)
Cluster 1	59	10.89	10.39	10.55	9.96	9.14	-1.75	-1.31 (.36)
Cluster 2	44	10.54	10.26	10.75	10.23	9.51	-1.03	-.59 (.28)
All non-EiC	2138	8.45	8.23	8.70	8.34	8.01	-.44	

Notes: Based on pupils in secondary schools in England. Standard errors in parentheses.

improvement has been higher in each group of EiC schools than other LEA maintained schools (with the exception of schools in Phase 3 and Cluster 2 for English).

Although these results are encouraging about the potential effect of EiC policy in bringing about these changes, it is important to remember that EiC and non-EiC schools have very different characteristics that may not be fully accounted for when using a linear difference-in-differences estimator. The methodological approach implemented below attempts to control for these characteristics in a way that enables us to infer the causal effect of EiC policy on these outcome measures.

5 Methodology

Basic difference-in-differences

Our modelling approach involves comparing pupil performance in 'treatment' schools (subject to the EiC policy) with schools in a comparison group, while attempting to take account of factors other than EiC that may explain any performance difference. The main modelling difficulty is in adequately dealing with such factors. A dynamic specification for pupil attainment, A, for pupil *i* in secondary school *s* in a particular time period *t* can be written as follows:

$$A_{ist} = \alpha_o + \beta EiC_s + \beta_q EiC_s * D_{t=q} + \gamma X_{ist} + \delta Z_{st} + \lambda A_{is,t-1} + \alpha_t + \varepsilon_{ist} \qquad (1)$$

where EiC is a school level dummy variable indicating whether the school is assigned to the EiC group of schools, X denotes pupil characteristics, Z is a set of school characteristics and ε is an error term. The α_t term is a set of year dummies, included to capture year on year differences in pupil attainment. The model also contains a lagged dependent variable measuring pupil attainment in an earlier time period, t-1 for the individual pupil. The main coefficient of interest is β_q on the variable $EiC_s*D_{t=q}$ where $D_{t=q}$ is one when the policy is effective in the school of child i.[18]

[18] Note that $D_{t=q}$ varies between schools in EiC since schools entered the policy in different time periods.

In our preferred specification we also generalise (1) by adding a full set of school fixed effects to control for unobservables at the school level. In this case all observable fixed school level characteristics (like the EiC_s indicator) drop out as we model within-school effects of EiC:

$$A_{ist} = \alpha_s + \beta_q EiC_s{*}D_{t=q} + \gamma X_{ist} + \delta Z_{st} + \lambda A_{is,t-1} + \alpha_t + \varepsilon_{ist} \qquad (2)$$

Heterogeneous impacts

One of the key questions is whether the effects differ by the level of deprivation of the school, the ability of the pupil and the length of exposure to the programme. We can provide some answers to this by interacting the term $EiC_s{*}D_{t=q}$ in equation (2) with the variables of interest. For example, we can estimate heterogeneous effects by dividing schools into categories depending on the phase of EiC to which they belong. To do so we amend equation (2) as follows:

$$A_{ist} = \alpha_s + \beta_{q1} EiC_s{*}D_{t=q}{*}Phase1 + \beta_{q2} EiC_s{*}D_{t=q}{*}Phase2 + \beta_{q3} EiC_s{*}D_{t=q}{*}Phase3 + \beta_{q4} EiC_s{*}D_{t=q}{*}Cluster1 + \beta_{q4} EiC_s{*}D_{t=q}{*}Cluster2 + \gamma X_{ist} + \delta Z_{st} + \lambda A_{is,t-1} + \alpha_t + \varepsilon_{ist} \qquad (3)$$

The analysis for absences is the same as that outlined above except that it is implemented at school-level, as pupil-level information on absences is not collected nationally.

Statistical matching

Some of the non-EiC schools can be quite different (on observable and unobservable dimensions) from the EiC schools. We thus include detailed controls for various school-level characteristics and prior attainment of pupils. This effectively balances the sample between the treatment (EiC) and the control schools. However, along the lines suggested in the matching literature we use the propensity score to eliminate schools from the treatment sample that do not compare well to any of the control schools (and vice versa). We then carry out the analysis on the subset of schools with sufficient common support in the treatment and control samples and allowing for school fixed effects to control for unobservables.[19] Excluded schools are those which are very different in the treatment and comparison groups on the basis of a whole range of pre-policy characteristics (as summarised in the propensity score). Further details of the approach are provided in the Data Appendix (Figures A1-A3). We apply this approach when analysing the effect of EiC within each EiC Phase below.

6 Estimating the Impact of EiC

Overall impact on pupil attainment

In Table 2a, regression results are reported, where the dependent variable is whether the student attains level 5 or above in Key Stage 3 Mathematics. In column 1, controls are included for EiC Phase and year; in column 2, additional controls are included for the pupil's prior attainment (at age 11), gender, primary school characteristics and (pre-policy) secondary school characteristics (i.e. equation 2a); in column 3, school fixed effects are also included (i.e. equation 2b). Columns 4 and 5 repeat the most detailed specification (column 3) for boys and girls respectively.

In columns 1 and 2, coefficients are reported for each EiC group (i.e. Phase 1, Phase 2 etc.). This should be interpreted at the time constant effect of belonging to that group of schools on the outcome measure. For example, in column 1, there is a coefficient of -.166 for Phase 1. The interpretation is that pupils who go to school in Phase 1 areas are less likely than other pupils to attain level 5 or above by 16.6 percentage points. This is also shown in the descriptive table (Table 1) and simply reflects the fact that schools in these areas are more disadvantaged. When pupil and school-level characteristics are included (in column 2), these coefficients become much smaller as measures of disadvantage (such as the percentage of pupils eligible to receive free school meals) are explicitly included in the model. These

[19] Heckman, Ichimura and Todd, 1997 demonstrate the importance of controlling for common support. Blundell *et al*, 2004, and Emmerson *et al*, 2004, also combine matching with difference-in-differences We conduct this exercise separately for schools within EiC Phase 1, Phase 2 and Phase 3. In each case, school characteristics from the relevant pre-policy school year are used to estimate the propensity score.

Table 2: Overall Impact on Pupil Attainment

Table 2a: Probability of attaining Level 5 or above in Mathematics
Full sample: (2003 and 1999)

	(1) Basic EiC*policy on; EiC; year dummies	(2) Controls for KS2, gender, secondary school characteristics (1999); primary school characteristics	(3) All controls and school fixed effects	(4) As (3) Boys only	(5) As (3) Girls only
Effect of EiC	.034	.019	.019	.018	.019
(EiC*policyon)	(.003)	(.002)	(.002)	(.003)	(.003)
Phase 1	-.166	-.028	--	--	--
	(.009)	(.007)			
Phase 2	-.122	-.028	--	--	--
	(.009)	(.007)			
Phase 3	-.113	-.024	--	--	--
	(.012)	(.007)			
Cluster 1	-.182	-.028	--	--	--
	(.023)	(.003)			
Cluster 2	-.12	-.029	--	--	--
	(.025)	(.009)			
Sample size	1122164	1122164	1122164	567991	554044
Number of schools	3157	3157	3157	3014	3030

Table 2b: by phase of EiC

	(1) Basic EiC*Phase* policy on; EiC; year dummies	(2) Controls for KS2, gender, secondary school characteristics (1999); primary school characteristics	(3) All controls and school fixed effects	(4) As (3) Boys only	(5) As (3) Girls only
Effect of EiC, Phase 1	.044	.027	.026	.027	.024
(EiC*Phase1*policyon)	(.005)	(.004)	(.004)	(.004)	(.004)
Effect of EiC, Phase 2	.039	.017	.016	.014	.018
(EiC*Phase2*policyon)	(.005)	(.004)	(.004)	(.005)	(.005)
Effect of EiC, Phase 3	.017	.010	.011	.010	.012
(EiC*Phase3*policyon)	(.006)	(.005)	(.005)	(.006)	(.006)
Effect of EiC, Cluster 1	.023	.014	.012	.004	.019
(EiC*Cluster1*policyon)	(.010)	(.008)	(.008)	(.010)	(.009)
Effect of EiC, Cluster 2	.003	.007	.008	.012	.005
(EiC*Cluster2*policyon)	(.014)	(.010)	(.009)	(.012)	(.011)
Sample size	1122164	1122164	1122164	567991	554044
Number of schools	3157	3157	3157	3014	3030

Notes: robust standard errors in parentheses (clustered on secondary schools). Specifications in (2)-(5) control for gender, prior attainment at age 11, a year dummy and a range of variables relevant to the pupil's secondary school and primary school: number of pupils; pupil-teacher ratio; percentage of pupils with special educational needs (with/without statement); percentage of pupils eligible for free school meals; percentage of non-white pupils; average performance of primary school (in terms of absences; attainment) at the time when it was attended by the pupil; average performance of secondary school in the pre-policy period (in terms of absences; attainment) dummies for the following: all boys school; all girls school; religious school; in rural area; sixth form (secondary); non-EiC Specialist School (secondary); grammar school (secondary); primary school type (infant; independent; special; other) ; missing value dummies; Interaction terms between fsm quartile of school, EiC status and prior attainment group of pupil (according to attainment in KS2 Mathematics).

coefficients drop out of the regression when school fixed effects are included (i.e. columns 3-5).

The coefficient of primary interest is EiC*policyon, which is the effect of being educated in an EiC school on attainment in Key Stage 3 Mathematics over a time period in which the EiC policy was in effect. In the simplest specification (column 1), the coefficient is .034, corresponding to the 'difference-in-differences' estimate in the descriptive table above (Table 1a).

It may be interpreted as follows: the effect of EiC was to increase the probability of attaining level 5 by 3.4 percentage points if one considers outcomes in the most recent year of the policy (2003) with the pre-policy year. Alternatively, one could say that EiC raised the percentage of pupils attaining level 5 or above by 3.4 percentage points.

However, this effect declines when one includes controls to reflect the fact that schools and pupils in EiC areas have different characteristics to those in non-EiC areas (although it does not make much difference whether or not one includes school fixed effects). Hence, controlling for characteristics the effect of the EiC policy is to increase the probability of attaining level 5 or above in Key Stage 3 Mathematics by 1.9 percentage points.[20] The effect is about the same for boys and girls.

In Table 2b, we allow separate effects for each Phase of EiC. In this case, larger effects are shown for schools that have been in the EiC Policy for longer. Thus, the most detailed specification (column 3), shows that EiC increased the probability of attaining level 5 or above by 2.6 percentage points in EiC Phase 1 schools; 1.6 percentage points in Phase 2 schools; 1.1 percentage points in Phase 3 schools; 1.2 percentage points in Cluster 1 schools; and not at all for the small group of schools that came into the EiC Policy in the last year (Cluster 2).

[20] We have examined other outcome measures to check whether EiC only helps to push pupils over the government target of level 5 or above. This is not the case. EiC increases the probability that the pupil attains level 4 or above by 1.1 percentage points in the most detailed specification. If we treat the dependent variable as continuous, the coefficient in the most detailed specification if .039. In terms of standard deviations, the interpretation is that EiC raised attainment by .022 standard deviations (.039/1.711).

Thus, these regressions suggest that the EiC policy has had a causal impact on raising attainment in Mathematics in schools exposed to the policy. However, when these regressions are run for attainment in English, no effects are found. The positive 'difference-in-differences' estimated reported in the descriptive table (Table 1) reduces to zero, once we account for the fact that pupils and schools in EiC and non-EiC areas have different characteristics.

Overall impact on school attendance

In Tables 3a and 3b, analogous results are presented to those described above except that in this case, the data is at school-level and the dependent variable is the percentage of half days missed. To estimate these regressions, all variables are averaged to school-level (see notes to Table 2 for a list of variables included in the controls).

As in the descriptive table (Table 1), the first column suggests that EiC policy led to a reduction in the percentage of half days missed by about 1 percentage point. Once controls are added, the regressions suggest that the effect is to reduce absences by .59 of a percentage point. Table 3b shows the effect of EiC on absences to vary by EiC Phase. The effect is larger in schools that have been in the EiC policy for longer. For the three main Phases of EiC (Phase 1-3), the effect is -.762, -.634 and -.349 respectively. For the smaller group of schools in EiC clusters, the effect is about -.56. Thus, as with attainment in Mathematics, the EiC policy seems to have been effective in reducing absences or alternatively, increasing pupil attendance.

Heterogeneity in the effect of EiC

The EiC programme does seem to have an effect on outcomes. In this sense increasing resources in a country such as the UK does seem to matter. We now wish to learn a bit more about who benefits most and how long it takes for such benefits to be felt.

Allocation of funding is partly based on the proportion of pupils in receipt of free school meals (as discussed in Section 2). First this means that the effect at the school level is likely to be lower for schools with less deprived pupils. However, it may well be that there are spillover effects from the funding so that more funding outweighs the increased number of pupils on free school meals (FSM).

Table 3: Overall Impact on School Attendance

Table 3a: School-level absences: % half days missed Full sample: (2003 and 1999)

	(1) Basic EiC; year dummies	(2) Controls for KS2, gender, secondary school characteristics (1999); primary school characteristics	(3) All controls and school fixed effects
Effect of EiC	-.954	-.523	-.590
	(.086)	(.12)	(.193)
Phase 1	2.132	-.638	--
	(.164)	(.265)	
Phase 2	1.933	-.605	--
	(.177)	(.260)	
Phase 3	1.697	-.598	--
	(.208)	(.267)	
Cluster 1	2.257	-.81	--
	(.417)	(.202)	
Cluster 2	2.270	-.373	--
	(.458)	(.317)	
Sample size	6043	6043	6043
Number of schools	3068	3068	3068

Table 3b: The effects of the EiC by phase of implementation

	(1) Basic EiC*Phase* policy on; EiC; year dummies	(2) Controls for KS2, gender, secondary school characteristics (1999); primary school characteristics	(3) All controls and school fixed effects
Effect of EiC, Phase 1	-1.16	-.70	-.762
	(.119)	(.146)	(.229)
Effect of EiC, Phase 2	-.968	-.524	-.634
	(.155)	(.157)	(.236)
Effect of EiC, Phase 3	-.482	-.216	-.349
	(.147)	(.173)	(.261)
Effect of EiC, Cluster 1	-1.31	-.620	-.561
	(.36)	(.297)	(.429)
Effect of EiC, Cluster 2	-.607	-.531	-.559
	(.282)	(.303)	(.448)
Sample size	6043	6043	6043
Number of schools	3068	3068	3068

Notes: See Table 2 for list of controls. They are computed as school-level averages. Standard errors are clustered by school.

As a result, comparing across levels of deprivation or across phases, while useful, does not tell us about whether extra resources matter more or less conditional on the overall level of deprivation. On the other hand, the comparisons relating to the effect of the programme over time in the same schools is informative about the importance of length of exposure and/or learning about how best to use the extra resources. Finally, we also compare the effects of the programme by pupil ability, as measured by achievement prior to the programme. This comparison can be informative about which type of pupil is likely to benefit most by the increased resources.

The category of disadvantage is defined by the ranking of the school in terms of the distribution of free school meals in the pre-policy year. Schools are divided into four quartiles of free school meals where the lowest quartile represents a school with a very low percentage of pupils eligible for free school meals and the highest quartile represents schools with a relatively high percentage of pupils eligible for free school meals. Pupil ability is defined by attainment at age 11 in Mathematics (i.e. the pupil's percentile ranking in the total Mathematics score at Key Stage 2). Specifically, students are divided into the following categories of 'ability': 'low' (0-33rd percentile); 'medium' (33rd - 66th percentile); 'high' (66th-100th percentile).[21] For each group of EiC schools (i.e. Phase 1, 2 and 3 respectively), we define a suitable set of control schools from non-EiC schools.[22] As explained in Section 5, this excludes schools in the EiC group that look very different from non-EiC schools (in terms of their observable characteristics) in the pre-policy year and vice versa. The difference-in-differences approach is then applied to the sub-sample of schools. We report results using the most detailed specification (i.e. equivalent to column 3 in Tables 2a and 2b).

In Table 4a, we show the effect of EiC policy in each year over the time since its introduction. There is a similarity between EiC Phases in that the policy had no impact in the first year after its introduction, but a significant, positive effect in the most recent year. For EiC Phase 1, the effect was close to 1 percentage point in the second and third year of the policy, and is 1.9 percentage points in the most recent year (more specifically, it led to an

[21] In Table A3 of the Data Appendix, we show the number of pupils/schools in these different categories in the most recent year of the EiC Policy (2003) for each EiC Phase.

[22] For Phase 1, the pre-policy year is 1999; for Phase 2 it is 2000 and for Phase 3 it is 2001.

increase in the probability of attaining level 5 or above in Key Stage 3 Mathematics by 1.9 percentage points). In EiC Phase 2, there was no significant effect of the policy in the second year of the scheme, but is about 1 percentage point in the most recent year. Similarly, the effect of EiC for pupils in Phase 3 schools is 1.1 percentage point in the most recent year. It is not surprising to see that EiC took time to have an effect on pupil outcomes. From survey work undertaken at the beginning of the evaluation, it was noted that 'for many Partnerships, the first year and some of the second year was a tooling up period, with resources not flowing to all EiC partner schools and Strands in an immediate or uniform manner'.[23]

In Table 4c, we report results broken down by the level of disadvantage in the school (proportion of pupils with FSM). There is a similar pattern across all EiC Phases: the effect of the EiC policy is stronger in schools that are relatively more disadvantaged according to this measure. Thus, significant positive effects of EiC policy (in 2003 relative to the pre-policy year) are found for schools in the highest quartile of free school meals in EiC Phases 1 and 2; and for schools in the second-highest quartile of free school meals in EiC Phase 3. There are no significant effects of the policy in any other category of school. According to these results, EiC increased the probability of attaining level 5 or above in more disadvantaged schools by 3.4, 2.0 and 2.4 percentage points in Phase 1, Phase 2 and Phase 3 areas respectively, if one compares the most recent year of the scheme (2003) with the pre-policy year. We have already noted that the funding allocation is partly based on the proportion of pupils in the school with free school meals. One should also remember that 30 percent of EiC schools within Phase 1 areas were also exposed to the Pupil Learning Credit policy from 2001 onwards (i.e potentially affecting outcomes in Phase 1 areas in 2002 and 2003). Almost all of these schools are within the group of most disadvantaged schools (i.e. the highest quartile of free school meals) and in fact, are the most disadvantaged schools of this group. Hence we should interpret the effect for EiC Phase 1 as the combined effect of EiC and PLC policy, which implies that the most deprived schools received increased funding more than proportionately to their increased numbers of pupils on FSM.

Finally, in Table 4d, we report the effects of EiC Policy for pupils of different abilities within each category of schools. For each EiC Phase, larger effects of the policy are found for pupils

[23] National Evaluation Consortium, (2001).

of high or medium ability than for those of lower ability – and are generally only found within more disadvantaged schools (i.e. schools in the highest or second-highest quartile of the distribution of free school meals).[24] For EiC Phase 1, the effect of EiC policy on high-ability pupils is to raise the probability of attaining level 5 by 4.8 percentage points in the most disadvantaged schools, and by 1.4 percentage points for those in the next category of disadvantage. The only other significant effects are observable for pupils of medium and low ability in the most disadvantaged category of schools, where EiC is shown to raise their probability of attaining level 5 or above by 3.3 percentage points and 2.6 percentage points respectively. A similar pattern of results is observed for all phases of the programme, as can be seen in the Table.

Table 4: Heterogeneity in the Effect of EiC Across Phases, Free School Meal Eligibility and Ability

Table 4a. Effects of EiC in each year (relative to pre-policy baseline in each case)

	(1) Phase 1 and non-EiC schools	(2) Phase 2 and non-EiC schools	(3) Phase 3 and non-EiC schools
Effect of EiC, 2000	.000	--	--
	(.003)		
Effect of EiC, 2001	.008	.005	--
	(.004)	(.003)	
Effect of EiC, 2002	.007	.005	-.001
	(.003)	(.003)	(.004)
Effect of EiC, 2003	.019	.010	.011
	(.004)	(.004)	(.005)
Sample size	1756923	1469496	931169
Number of schools	1868	1920	1563

Table 4b. Effects by Free School Meal Eligibility quartile
(2003 relative to pre-policy baseline)

	(1) Phase 1 and non-EiC schools	(2) Phase 2 and non-EiC schools	(3) Phase 3 and non-EiC schools
Effect of EiC, lowest FSM	-.018	-.011	.008
	(.013)	(.005)	(.008)
Effect of EiC, 2nd lowest FSM	-.000	.004	.008
	(.006)	(.008)	(.009)
Effect of EiC, 2nd highest FSM	.012	.004	.024
	(.007)	(.006)	(.007)
Effect of EiC, highest FSM	.034	.020	.001
	(.006)	(.006)	(.008)
Sample size	699245	727861	616354
Number of schools	1868	1919	1563

[24] The exception to this is schools in the 2nd quartile of free schools meals that are also in EiC Phase 3. In this case, an effect of EiC policy is found for high ability pupils.

Table 4c. Effects for ability group within each FSM quartile

	(1) Phase 1 and non-EiC schools	(2) Phase 2 and non-EiC schools	(3) Phase 3 and non-EiC schools
Effect of EiC, lowest FSM, low ability	-.012	.045	.053
	(.040)	(.038)	(.025)
Effect of EiC, lowest FSM, medium ability	-.016	-.037	-.015
	(.021)	(.016)	(.022)
Effect of EiC, lowest FSM, high ability	-.020	-.009	.007
	(.008)	(.004)	(.007)
Effect of EiC, 2nd lowest FSM, low ability	.016	.016	.006
	(.016)	(.018)	(.020)
Effect of EiC, 2nd lowest FSM, medium ability	-.006	-.002	.006
	(.012)	(.012)	(.016)
Effect of EiC, 2nd lowest FSM, high ability	-.005	.003	.017
	(.005)	(.005)	(.006)
Effect of EiC, 2nd highest FSM, low ability	.007	-.003	.022
	(.012)	(.010)	(.013)
Effect of EiC, 2nd highest FSM, medium ability	.016	.013	.035
	(.011)	(.010)	(.010)
Effect of EiC, 2nd highest FSM, high ability	.014	.008	.025
	(.006)	(.004)	(.005)
Effect of EiC, highest FSM, low ability	.026	.000	-.001
	(.008)	(.008)	(.012)
Effect of EiC, highest FSM, medium ability	.033	.042	-.013
	(.009)	(.011)	(.013)
Effect of EiC, highest FSM, high ability	.048	.034	.029
	(.005)	(.005)	(.006)
Sample size	699245	727861	616354
Number of schools	1868	1919	1563

Notes: only most detailed specification reported (i.e. as in column 3, Table 2). See notes to Table 2 for a list of control variables. Standard errors are clustered by school

These results carry two important messages: It is quite clear given these results that an increase in resources can lead to improvement in the performance of pupils in some of the most disadvantaged schools in the country. Perhaps what may seem disappointing, from a policy perspective is that the benefit is almost entirely concentrated among the higher ability pupils. Thus the recurring theme that success builds on success (Carneiro and Heckman, 2003; Currie, 2001) is seen again here. This points to the need for early intervention to improve early achievement so as not to create an "underclass" of pupils in deprived areas that cannot be reached by policy interventions in the later years of their schooling.

7 A Pre-Policy Robustness Test

The main methodological concern is the possibility that outcomes were trending upwards in EiC areas (and differentially to that in non-EiC areas) prior to the introduction of the EiC policy. If this were the case, it would undermine the argument that improvements have been the result of EiC policy itself (i.e. since standards were already improving before the policy was introduced). Unfortunately, we only have information on students' prior ability and primary school attended in EiC Phase 1 areas for one year prior to the EiC policy. However, we have information on the outcome measure back as far as 1997. This enables us to conduct the analysis (albeit using a much reduced set of control variables) pooling the years 1997 to 2003 and allowing the impact of EiC to vary by whether the policy was on or off. Similarly to Section 6, we estimate regressions for each EiC Phase separately for each matched sample of schools. We control for pupil gender, year and school fixed effects in addition to the EiC variables. Results are reported in Tables 5a and 5b. In the former, 'policy on' and 'policy off' years are aggregated for each EiC phase respectively. In the latter, the 'EiC effect' is reported in each year, where the 'policy-on' years are highlighted. In Table 5b, we also show the 'EiC effect' for Phase 2 and 3 when controlling for a full set of covariates for years in which this information is available (i.e. one 'policy-off' year for Phase 2; two 'policy-off' years for Phase 3).

Table 5: A Pre-Policy Robustness Check

Table 5a: Evaluating the 'EiC effect' for the 'policy-off' and 'policy-on' years

	Matched sample of EiC Phase 1 and non-EiC schools	Matched sample of EiC Phase 2 and non-EiC schools	Matched sample of EiC Phase 3 and non-EiC schools
'Effect' of EiC, policy-off	.011 (.004)	.007 (.004)	.009 (.005)
Effect of EiC, policy-on	.026 (.005)	.030 (.006)	.019 (.006)
Sample size	2414474	2503875	2100876
Number of schools	1868	1920	1563
P-value: EiC*policyoff versus EiC*policyon	.000	.000	.022

Table 5b: Evaluating the 'EiC effect' in each year. ('Policy-on' years are highlighted in bold)

	Matched sample of EiC Phase 1 and non-EiC schools	Matched sample of EiC Phase 2 and non-EiC schools	Matched sample of EiC Phase 2 and non-EiC schools	Matched sample of EiC Phase 3 and non-EiC schools	Matched sample of EiC Phase 3 and non-EiC schools
'Effect' of EiC, 1998	.012 (.004)	.001 (.004)	--	.004 (.005)	--
'Effect' of EiC, 1999	.010 (.005)	.003 (.005)	--	.007 (.006)	--
'Effect' of EiC, 2000	**.015** **(.005)**	.015 (.006)	.007 (.003)	.013 (.006)	.002 (.004)
'Effect' of EiC, 2001	**.025** **(.006)**	**.028** **(.006)**	**.012** **(.003)**	.013 (.006)	-.003 (.004)
Effect of EiC, 2002	**.026** **(.006)**	**.027** **(.006)**	**.012** **(.004)**	**.015** **(.006)**	**-.004** **(.005)**
Effect of EiC, 2003	**.039** **(.006)**	**.034** **(.006)**	**.016** **(.004)**	**.023** **(.007)**	**.008** **(.005)**
All controls	No	No	Yes	No	Yes
Sample size	2414474	2503875	1824868	2100876	1528535
Number of schools	1868	1920	1920	1563	1563

Notes: year dummies; school fixed effects and a control for pupil gender are also included.

Table 5a shows that the EiC effect is considerably larger in the 'policy-on' years than in the 'policy-off' years. One can easily reject the hypothesis that the coefficient on the 'policy-off' years is equal to that of the 'policy-on' years and hence there is clear evidence of an improvement in educational standards in the EiC period. Nonetheless, there is still a small positive coefficient for the EiC effect in the 'policy-off' years. Further information on this is provided in Table 5b, where the EiC effect is estimated in each year. This shows that the EiC effect is significantly larger from the second year of the EiC policy onwards in the case of Phase 1 and 3 and from the first year of the policy in the case of Phase 2. Furthermore, any pre-policy trends become less marked (in the case of Phase 2) or non-existent (in the case of Phase 3) when additional controls are included.[25]

Hence, this analysis suggests that the positive effects described in the previous section can mainly be attributed to the effect of the EiC policy.

8 Cost-Benefit Analysis

We have seen that the impact of EiC was to raise attainment in Mathematics (though not in English) and to increase pupil attendance. To conduct an accurate Cost-Benefit Analysis, one would need to know how such effects translate into a range of later outcomes – for example, further education, probability of employment, wages, crime. There is also a possibility that the increase in pupil attendance has had a contemporaneous impact on crime in local areas (a possibility we do not explore here). Ideally, one would want to follow the children affected by these particular policies (and comparison groups) as they progress through school and into the labour market.

In the absence of this information, we need an alternative way to estimate the potential cost-effectiveness of EiC policy. We have good information on the costs – the average is £120 per pupil per year. One relevant question is how much the average benefits in terms of exam attainment (i.e. Table 4a) would have to translate into higher wages for the policy to break-

[25] Note that the reason that coefficients in Table 5b, columns 3 and 5, are not the same as those reported in Table 4a, columns 2 and 3, is that the base year is different. 1999 is the base year in the case of Table 5b; the first pre-policy year is the base year in the case of Table 4a.

even. The average rate of return to a year of schooling is fairly well accepted to be about 8 per cent for the UK. Using the Family Resources Survey for England and Wales, we can obtain a wage profile (an average of weekly earnings by age, for all individuals). If pupils were to obtain the equivalent benefit of a whole year of education at age 14 and then started work at age 16, the lifetime benefit of this extra year is estimated to be about £20,000.[26]

For a pupil in EiC Phase 2, exposed to three years of EiC policy (i.e. pupils taking examinations in 2003), the average benefit of EiC is to increase attainment in Mathematics by 0.01 of a level (Table 4a). According to the National Curriculum a one level improvement corresponds to about 2 years of schooling. If this is true, the benefit of EiC is about 0.02 of a year of schooling (i.e. 0.01 x 2) – which comes to about £400 over the lifetime (i.e. 0.02 x £20,000). This is very similar to the cost of EiC policy (£120 x 3). Clearly, the benefit reduces if we average across subjects (since the policy had no effect on attainment in English). Furthermore the existence of a complementary resource-based policy in about half of the schools in EiC Phase 1 increases costs (from an average of about £360 per pupil over 3 years to about £700 per pupil)[27] and could fully account for the extra benefit (from 0.01 of a level in EiC Phase 2 to about 0.02 of a level in EiC Phase 1 in 2003). Costs of the policy exceed benefits if one looks at the early years of the policy in each EiC phase (where there seems to have been no impact on exam attainment). However, benefits exceed costs by a bigger margin if one considers pupils who only had been exposed to 2 years of the policy at a time when there is a positive impact on exam performance (i.e. Phase 3, 2003; Phase 1, 2001).

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[26] This is calculated based on the weekly earnings (E) of all individuals in the Family Resources Survey (2002/03) between the age of 16 and 64. The Net Present Value of an extra year of schooling at age 14 is calculated using the below formula. The discount rate (r) is 3.5% - the recommended discount rate in the UK HM Treasury Green Book (http://greenbook.treasury.gov.uk)

$$\sum_{t=2}^{50} \frac{E_t}{(1+r)^t} * 0.08 = NPV$$

[27] The Pupil Learning Credits Pilot Scheme (PLC) was introduced to about half of the schools in EiC Phase 1 areas in September 2001. The existence of this policy affects our interpretation of the EiC estimates in Phase 1 for 2002 and 2003 – benefits reflect the combined impact of EiC and PLC. The policy involved an extra £260 per pupil for most PLC schools and an extra £360 per pupil if the school had more than 50 per cent of pupils eligible to receive free school meals. Together with EiC, the average cost per pupil of these policies across all schools in EiC Phase 1 comes to about £291 per year in 2002 and 2003.

This very simple analysis suggests that EiC policy breaks even – at least for more recent cohorts – if improvement in Key Stage 3 results corresponds to years of schooling in the way suggested by the National Curriculum. Even if this is way off the mark, benefits of improved attendance at school and higher attainment at age 14 may lead to economic benefits in the short and long term that we do not observe – for example, increased probability of staying on at school beyond compulsory school-leaving, higher probability of employment, lower probability of turning to crime. We hope to return to these issues in later research.

9 Conclusion

The issue about whether giving more resources to schools can enhance pupil performance remains controversial. In this paper we look at the issue by means of studying a major UK policy initiative – the Excellence in Cities programme – which gave more money to disadvantaged schools with the clear aim to alleviate underachievement and raise standards in inner city schools in England. Since its introduction in September 1999, it has expanded to cover one-third of all secondary schools and related policies have been introduced to primary schools and to encourage participation in higher education.

We find that, over time, the extra resources offered by the EiC policy were effective in terms of improving Mathematics achievement and in increasing school attendance. However, the effect of the policy is highly heterogeneous for different schools and different groups of pupils within schools. The beneficial effect of the policy is apparent within disadvantaged schools, but not within advantaged schools. This may be on account of the deliberate distribution of resources towards more disadvantaged schools. Within these schools, pupils of medium to high ability are significantly more likely to benefit than 'hard to reach' lower ability children in terms of attainment in Mathematics. Moreover, a fairly crude Cost-Benefit Analysis suggests that, while the EiC policy had no return in the earlier years (and costs therefore exceeded benefits), it is likely to (at least) break-even for more recent cohorts. In fact, benefits from such a policy do not need to be particularly large to generate a return when the average cost of the policy is only £120 per pupil per year (although there is much variation around that number). The question for the future is whether such gains at Key Stage 3 and increases in pupil attendance at school manifest themselves in other outcomes such as further education, labour market performance and other social benefits such as crime reduction.

In conclusion, our findings show that additional resources can matter, and that education policies can help to turn around the fortunes of poorly performing inner city schools. But one needs to take a much more nuanced view than that adopted by much of the literature, where the focus is very much on offering a ‘yes or no’ answer to the question as to whether resources matter. Our estimates show the picture is simply more complex than this. Resource-based policies can show positive results, even when the resources expended are relatively modest, but the benefits that accrue are highly heterogeneous. Indeed, in the context in which we study this question, the extra resources seem less effective in securing achievement gains for ‘hard to reach’ children, for whom different (and probably more intensive and earlier) policy treatments may be required.

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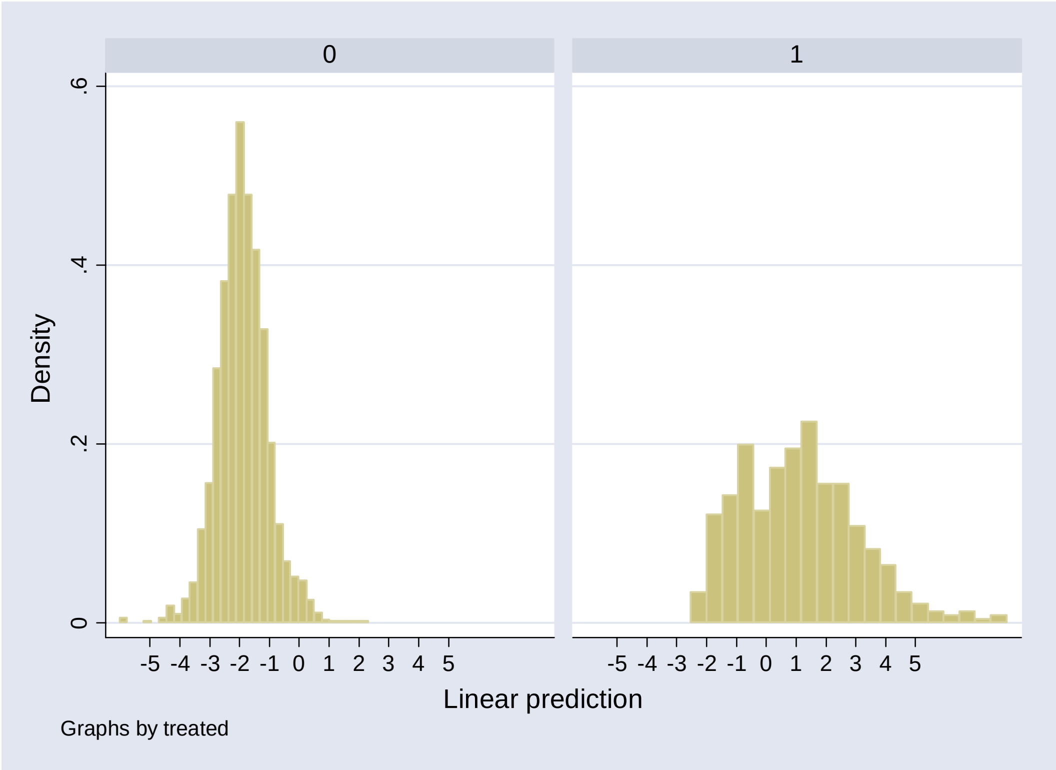
Data Appendix

Table A1: Data sources

Data source	Description
Pupil-level: KS2-KS3 matched data sets 1998/1999 to 2002/2003	National student records of primary and secondary school test results from the National Pupil Database. Detailed information available on pupil results at Secondary School (Key Stage 3) and Primary School (Key Stage 2). Also contains date of birth of student, gender, code for secondary and primary school attended.
School-level: LEASIS	The LEA and School Information Service (LEASIS). This contains annual data on all schools in England in Wales. Most school-level data for primary and secondary schools comes from this data source.
School Performance Tables	These annual tables exist for primary and secondary schools. The former contains school-level information on performance at Key Stage 2. The latter contains information on performance at GCSE/GNVQ.
'School change' file	This contains information on the old and new DfES numbers for schools where some change took place over the relevant time period (such as a school merger – but often simply administrative changes). All relevant changes were made to each individual data set before merging.

Figure A1: Propensity Scores For EiC Phase 1 and non-EiC schools



Selected for 'matching' specification:

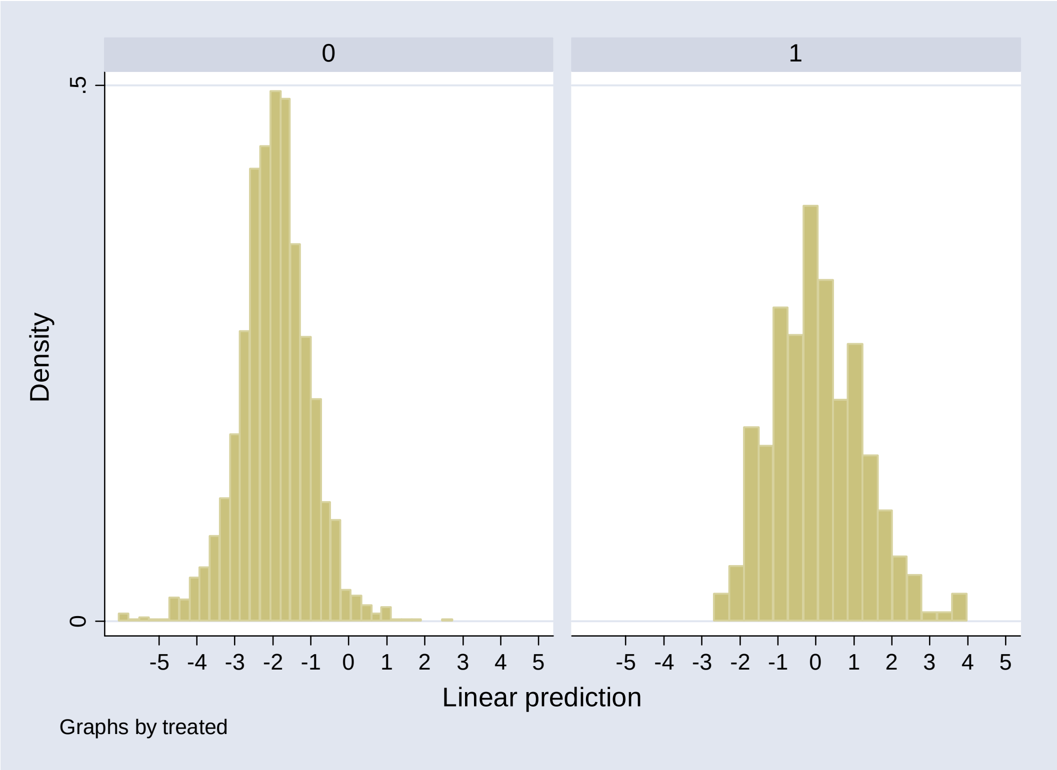
Schools with a predicted linear index of the propensity score between -2.53 and 2.32

(EiC schools: 319; Non-EiC schools: 1549)

Note:

The linear index of the propensity score is computed a regression of whether the school is in an EiC Phase 1 area (or a non-EiC area) on pre-policy school-level characteristics. The propensity score is illustrated for EiC Phase 1 and non-EiC schools respectively in Figure A1 above. EiC (non-EiC) schools are retained within the matched sample if they are within the same range of the propensity score as the non-EiC (EiC) schools. This amounts to trimming tails of the distribution.

Figure A2: Propensity Scores For EiC Phase 2 and non-EiC schools

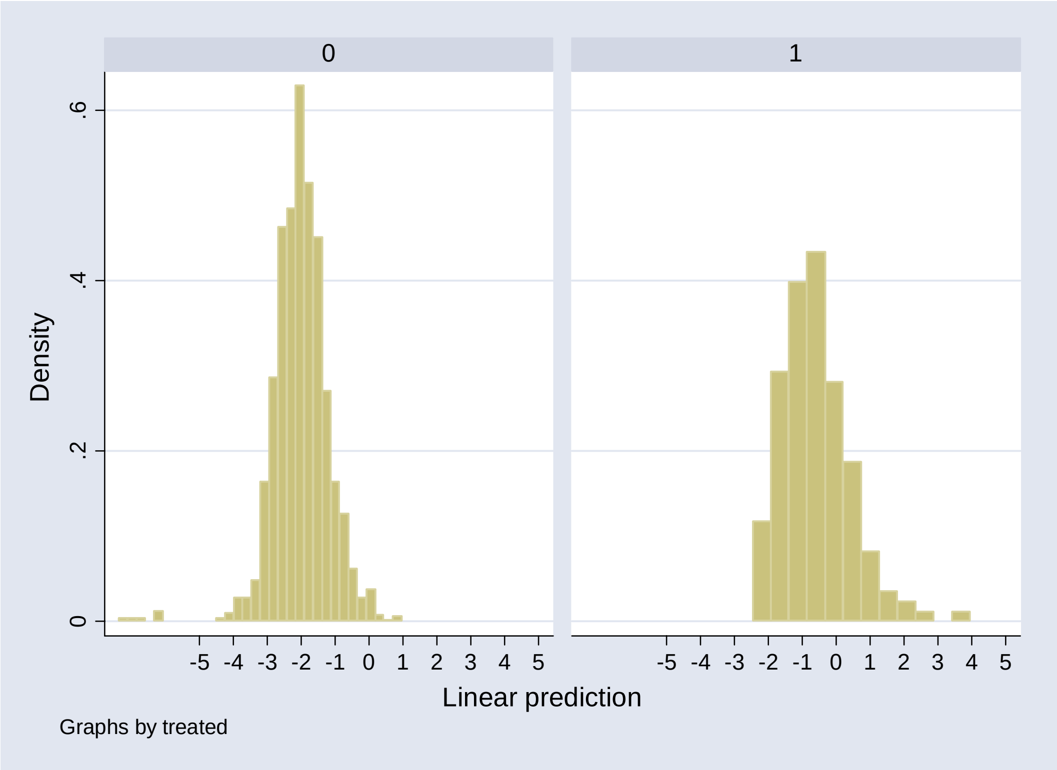


Selected for 'matching' specification:

Schools with a predicted linear index of the propensity score between -2.67 and 1.66

(EiC schools: 269; Non-EiC schools: 1651)

Figure A3: Propensity Scores For EiC Phase 3 and non-EiC schools



Selected for 'matching' specification:

Schools with a predicted linear index of the propensity score between -2.45 and .96

(EiC schools: 145; Non-EiC schools: 1418)

Table A2: School Characteristics by Phase of EiC in 1999

	All EiC	Phase 1	Phase 2	Phase 3	Cluster 1	Cluster 2	All non-EiC
Number of schools	1009	436	310	160	59	44	2148
Religious school	21.3	26.6	19.4	17.5	8.5	13.6	13.8
School has Sixth form	47.6	52.5	38.1	54.4	37.3	54.5	58.9
% Special Educational Needs, with statement	2.7 (2.0)	2.7 (2.0)	2.6 (2.0)	2.6 (1.7)	3.0 (2.2)	3.8 (2.9)	2.7 (2.2)
% Special Educational Needs, no statement	19.8 (11.6)	20.7 (12.0)	18.3 (10.3)	19.6 (12.0)	20.9 (13.3)	20.5 (11.0)	15.9 (9.4)
% eligible for Free School Meals	31.0 (17.1)	36.8 (19.0)	28.0 (14.2)	23.4 (12.5)	30.1 (15.7)	24.4 (12.8)	12.1 (8.8)
% non-white	24.0 (28.2)	34.0 (30.1)	13.2 (23.6)	21.3 (24.9)	22.2 (25.1)	12.6 (16.7)	5.7 (10.8)
Pupil-teacher ratio	16.5 (1.8)	16.4 (2.2)	16.6 (1.7)	16.8 (1.3)	16.4 (1.3)	16.1 (1.4)	17.0 (1.4)
Number of pupils	947 (328)	935 (341)	955 (327)	1030 (295)	797 (236)	916 (350)	925 (328)
Boys school	7.2	10.5	3.9	4.4	10.2	4.5	5.4
Girls school	9.8	15.6	4.5	5.6	13.6	0	6.0
Grammar school	2.6	1.8	2.9	1.3	8.5	4.5	6.4
% 5+ GCSE, A*-C	36.8 (19.2)	35.2 (19.8)	37.6 (17.9)	39.5 (17.0)	35.7 (24.5)	39.1 (21.6)	50.1 (20.0)
% 5+ GCSE, A*-G	86.8 (9.7)	85.9 (9.9)	87.2 (9.8)	89.1 (7.6)	85.7 (11.5)	87.0 (9.2)	92.2 (6.5)
% no passes at GCSE	6.0 (5.5)	6.2 (5.6)	5.9 (5.4)	5.3 (4.4)	6.3 (6.1)	7.3 (6.8)	3.6 (3.4)
Average GCSE score	33.5 (9.4)	32.8 (9.6)	33.7 (8.8)	34.9 (8.3)	32.5 (11.7)	34.7 (10.8)	39.6 (9.2)

Table A3: Number of pupils/schools within each category for EiC schools in 2003

EiC Phase	FSM quartile	Number of schools	Number of students	Students: low ability	Students: medium ability	Students: high ability	Students: missing ability
1	Low	24	4219	571	1057	2459	132
1	2nd lowest	41	8605	1975	2688	3809	133
1	2nd highest	68	14415	4540	4671	4927	277
1	highest	168	28870	11371	8870	6954	1675
2	Low	15	3160	358	812	1903	87
2	2nd lowest	30	6149	1355	1861	2809	124
2	2nd highest	88	18652	5503	6173	6509	467
2	highest	123	22899	9909	7149	5624	1117
3	Low	10	2012	315	508	1151	38
3	2nd lowest	22	4544	1023	1583	1881	57
3	2nd highest	49	10262	3463	3357	3190	252
3	highest	60	11432	4810	3500	2578	544

Note: The number of schools in each FSM quartile reflects the number of EiC schools (i.e. Phase 1, 2 or 3) in a particular quartile of the national free school meal distribution in 2003.