Diversity, choice and the quasi-market: An empirical analysis of secondary education policy in England

Steve Bradley and Jim Taylor*

Department of Economics

Lancaster University

Lancaster LA1 4YX

jim.taylor@lancaster.ac.uk

steve.bradley@lancaster.ac.uk

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ABSTRACT

This paper investigates the extent to which exam performance at the end of compulsory education has been affected by three major education reforms: the introduction of a quasi-market following the Education Reform Act (1988); the specialist schools initiative introduced in 1994; and the Excellence in Cities programme introduced in 1999. We use panel data for all state-funded secondary schools in England over 1992-2006. Using a panel of schools for all state-funded secondary schools in England (1992-2006), we find that about one-third of the improvement in school exam scores is directly attributable to the combined effect of the education reforms. The distributional consequences of the policy, however, are estimated to have been favourable, with the greatest gains being achieved by schools with the highest proportion of pupils from poor families.

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I INTRODUCTION

Over recent decades, and in countries as diverse as Australia, Chile, India, New Zealand, Sweden, the US and the UK, governments have decentralised the provision of compulsory education in the hope of stimulating improvements in the educational attainment of pupils (Fiske and Ladd, 2000). The debate about the most appropriate method of providing education has a long history (Friedman, 1962) and has spurred a growing body of theoretical analyses (Bearse, Glomm and Ravikumar, 2000; Fernandez and Rogerson 1999; Hoxby, 1998, 1999; Nechyba, 2000; De Fraya, Oliveira and Zanchi, 2006). In addition, a large number of empirical analyses have been undertaken, particularly in the USA. In both the theoretical and empirical literature, the critical issue is the trade-off between efficiency and equity. Those who oppose a decentralised approach to educational provision argue that it will lead to an increase in socio-economic segregation and ultimately greater income inequality (Levin, 1991a, 1991b). It is also argued that the wider social benefits generated by education - such as citizenship, a deeper sense of community and knowledge spillovers - can only be internalised through centralised provision. In contrast, proponents of a decentralised system argue that decentralisation is more likely to lead to an increase in allocative and productive efficiency (Hoxby, 1996).

In the UK, the education policy agenda has manifested itself in a series of education reforms across the entire school sector, beginning with the Educational Reform Act of 1988, which sought to stimulate the creation of a quasi-market in primary and secondary education. At the heart of these reforms were measures to increase parental choice and increase competition for pupils between schools. As a consequence of these quasi-market reforms and other educational policies, expenditure on education has increased substantially since Labour came to power in 1997. At secondary school level, total real expenditure increased by 60% from £9.9b in 1997/8 to £15.8b in 2006/7, while real expenditure per FTE pupil has increased by over 50%, from £3206 in 1997/8 to £4836 in 2006/7 (at 2005/6 prices).[1]

Two expenditure based reforms have figured prominently in the secondary education sector in England. The specialist schools initiative was introduced in 1994 to increase the diversity of secondary education provision, thereby enhancing parental choice. In addition, in 1999 the Labour Government introduced the *Excellence in Cities Initiative* (EiC), which sought to improve the educational performance of pupils in secondary schools located in the

[1] See DCSF, *Annual Report 2007*, p102 and *Annual Report 2008*, p.150, annex N.

most disadvantaged urban areas. The key distinguishing feature of this policy initiative was to provide more resources to schools with a high proportion of pupils from poor families and to stimulate cooperation between schools, in the context of partnership agreements, by sharing good practice (Kendall *et al.* 2005; Machin, McNally and Meghir, 2007).

Several previous papers have investigated the effects of the quasi-market in secondary education in England on exam results, school efficiency and equality of educational opportunity (Bradley and Taylor, 2002, 2004; Bradley, Johnes and Millington, 2004). More recently, Taylor (2007) has estimated the impact of the specialist schools initiative on examination outcomes. In the present paper, we draw these previous strands of our research together to measure the impact of this trinity of education reforms on the change in exam performance in secondary schools over the period 1992-2006. Our focus is on the proportion of pupils who obtain five or more 'good' grades in the General Certificate of Secondary Education (GCSE) exams, which are taken by all pupils in England at age 16.[2] The proportion of pupils in England obtaining 'good' exam grades rose from 35.5% in 1992 to 58.3% in 2006, a dramatic improvement. Our aim is to answer three questions: First, what fraction of this improvement in exam performance can be attributed to the education reforms identified above? Second, which, if any, of the three major education reforms have had the greatest impact in raising exam performance in secondary schools? Third, have the reforms had any distributional consequences? For, instance, how do the effects of the education reforms vary by pupil composition in a school, such as family income and ethnicity?

To answer these questions we use a panel of secondary schools covering the period 1992-2006, which has the advantage that we can take a medium-term view of the effect of the quasi-market reforms, the EiC programme and the specialist schools initiative. Moreover, by incorporating all three policy initiatives into our analysis, we are able to get a better feel for the relative importance of each policy reform since the early 1990s through to 2006. From a technical point of view, using a panel of schools allows us to control for school-level unobserved heterogeneity and so reduce the bias caused by endogeneous school choice.

The rest of the paper is structured as follows. In section II, we briefly describe the education reforms that have led to the creation of the quasi-market in secondary education, the

[2] The GCSE exam is taken in approximately 8 to 10 subjects by pupils aged 15-16. Pupils undertake coursework and exams in most subjects and a 'good' grade is one in the range A*-C. The Government uses the proportion of pupils obtaining 5 or more A*-C grades in the GCSE exams as the benchmark for measuring a school's success. The GCSE is a standard, norm-based, examination taken by almost all pupils, and the eight pass grades range from A* to G. Grades A* to C are considered acceptable for entry to university, together with passes in more advanced examinations (A and AS levels) two years later.

specialist schools initiative and the EiC programme. A brief review of previous empirical studies is also provided. Section III introduces the data, identifies the determinants of school performance and presents our econometric methodology. Section IV discusses the results of a statistical analysis of changes in school performance over the period 1992-2006. Section V concludes.

II CHOICE AND COMPETITION IN SECONDARY EDUCATION

The introduction of a quasi-market in secondary education in England

Over the last twenty years, the provision of education in Britain has been radically transformed by a series of reforms, many of which stem from the Education Reform Act (1988). These reforms have led to the creation of a quasi-market in secondary education (Le Grand, 1991, 1993; Glennerster, 1991).[3] As a result, a centralised-state model of educational provision has been replaced by a more decentralised approach. The salient institutional features of the quasi-market in England's schools have been described in detail elsewhere (Bradley, Crouchley, Millington and Taylor 1998). The two main tenets of the decentralised approach are greater parental choice over the school attended by their child and an increase in competition for pupils between schools. Parents may be expected to take a school's exam performance into account, amongst other factors, in deciding on an appropriate school for their child, thus increasing *allocative* efficiency through greater choice.[4] [5]

Schools have an incentive to recruit pupils because funding is linked directly to pupil numbers, and allowing schools to determine their own allocation of funding was expected to result in greater *productive* efficiency. By allowing schools to compete for pupils, it was expected that educational performance would improve. Successful schools would thrive while unsuccessful schools would either close, become smaller or improve their own performance in response to competition. It is expected that schools are most likely to respond positively to competition from rival schools in the local quasi-market. Similarly, the greater the amount of choice available to parents in an education market place, reflected by the number of schools in the district, the stronger the competition effect should be.

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[3] Glennerster (1991) explains why the quasi-market is not a full market solution.

[4] Data from the Longitudinal Study of Young People in England (LSYPE) indicate that choice of secondary school is influenced primarily by family and friends (66%), a school's location (63%) and a school's exam performance (38%). Other less important factors are religious considerations (8%) and other characteristics of the school (7%). It is worth noting that 86% of parents indicated that their child went to their first-choice school.

[5] Information about each school's exam performance is provided by the annual publication of the *School Performance Tables*.

The sorting of pupils between schools and cream-skimming by 'good' schools could, however, have distributional consequences. Pupils from poorer families may increasingly become concentrated in the 'poor' (i.e. worst performing) schools whereas pupils from wealthier families become increasingly concentrated in 'good' schools. Cream-skimming by schools reinforces this process of segregation, insofar as schools which face an excess demand for places are more likely to 'select' those pupils with the best chance of being successful in national exams, thereby making the school more popular with potential entrants. In contrast, failing schools have little option but to accept less able pupils.

For the US, there is a growing body of evidence that examines the effect on school performance of competition between state-funded schools (Borland and Howsen, 1992) and competition between school districts (Blair and Staley, 1995; Marlow, 1997, 2000; Zanzig, 1997). Gibbons, Machin and Silva (2006) review this evidence and conclude that it is at best 'mixed'. Furthermore, there is still very little empirical evidence for the UK (Levacic and Hardman, 1998). Bradley *et al* (2000) tested to see if a quasi-market in the secondary education sector had been created, whereas Bradley, Johnes and Millington (2001) investigate the determinants of school efficiency. Both studies conclude that the greater the competition among schools, the larger the improvement in exam performance and efficiency. Moreover, 'good' schools have grown more rapidly and expanded their pupil capacity to accommodate the excess demand for places. However, both studies focused on a fairly brief time period (1992-98), and it is possible that the quasi-market has become more effective as schools have adapted their behaviour over a longer time period.

More recently, Gibbons, Machin and Silva (2006) have analysed the effect of choice and competition in the primary school sector within a 45km radius of Central London using pupil level data from the National Pupil Database. Choice and competition are measured by the number of schools in a district and the average distance between home and schools in the district. They find little evidence that choice and competition improve exam performance amongst English primary schools. Church schools do respond positively to competition, however, especially where their competitors are also church schools in more competitive markets. Moreover, the benefits of this competition are highest for pupils in church schools with a greater proportion of children from low-income families. The authors conclude that the effects of choice and competition in raising the exam performance of pupils in the primary school sector have not been substantial or widespread. These results also imply that choice and competition only have beneficial effects where there is heterogeneity amongst primary schools, in this case in terms of their religious background.

The specialist schools initiative – increasing diversity and choice

The second major education reform in the secondary school sector in England since the early 1990s has been the implementation of the specialist schools initiative. Specialist schools are state-maintained secondary schools with a designated subject specialism. Schools have an incentive to acquire specialist status because they receive a capital grant of £100,000 and extra funding of £129 per pupil for at least four subsequent years, thereby raising income per pupil by around 5% a year. The policy began with the designation of technology colleges in 1994 and the Government's aim is that all secondary schools in England will ultimately have specialist status (Levacic and Jenkins 2004). The objective is to improve exam performance through greater subject specialisation and hence greater choice. Moreover, since 2004, schools have been allowed to have two specialisms in any combination of subjects.[6]

There is conflicting evidence on the success of the specialist schools initiative. Evidence in support of a positive effect of specialist schools on exam performance is provided by Gorard (2002), Jesson (2002), Jesson and Crossley (2004) and OFSTED (2005). This has led the Government to argue that the programme has been extremely successful. This view has been challenged by the Education and Skills Committee of the House of Commons (House of Commons, 2003, p.4). Furthermore, Schagen and Goldstein (2002) have highlighted the methodological weaknesses of analyses that do not use multi-level modelling techniques and are especially critical of the school-level analyses conducted by the Specialist Schools Trust (see also Noden and Schagen, 2006). Taylor (2007) argues that previous research suffers from a serious weakness: no attempt has been made to investigate whether the switch to specialist status has been associated with a *subsequent change* in a school's performance over time.

Excellence in cities

The EiC programme was a major government policy which aimed to raise the standard of education for young people from disadvantaged backgrounds in urban schools. The policy was launched in 1999 and was initially targeted at 471 secondary schools in 25 local education authorities in the major cities of England. The programme was extended in 2000 (351 schools in phase 2) and again in 2001 (165 schools in phase 3), covering approximately

[6] In 2006/7, 10% of all maintained secondary schools had two specialisms. See the Standards Site at the Department of Children, Schools and Families (http://www.standards.dfes.gov.uk/specialistschools/). Acquiring a second specialism extends the period over which the extra funding per pupil is provided.

one third of all secondary schools which have been organised into 57 partnerships (Kendall *et al*. 2005).[7] The EiC aimed to diversify provision in secondary schools so that the needs of all pupils ('gifted and talented' as well as 'disadvantaged') were met in the context of cooperation between schools, organised through local partnerships.[8] The objectives of the programme were to improve educational performance by raising the motivation and expectations of pupils, improving the quality of teaching and changing school ethos through partnerships to encourage cooperation between schools.[9]

A DfES-funded evaluation of the EiC programme, based on both qualitative and quantitative methods, concluded that the programme created a positive ethos towards learning in the recipient schools, resulting in improved pupil motivation and behaviour, and also better attendance (Kendall *et al*., 2005). These changes are regarded as important for subsequent improvements in exam performance. Kendall *et al.* show that there was an almost immediate impact of the EiC programme but this was confined to attainment in maths at the end of Key Stage 3 for pupils in the most disadvantaged schools. In a quantitative analysis, Machin *et al*. (2004) estimate that the EiC programme increased the proportion of pupils moving up one grade by 3%, though much weaker effects were found for English than for maths. In a more recent paper, Machin *et al*. (2007) investigate the distributional effects of the EiC policy, focusing on exam outcomes at age 14 (i.e. Key Stage 3). They find that the EiC policy increased the probability of a pupil attaining level 5 or above in more disadvantaged schools by 3.4 percentage points for those schools in Phase 1, falling to 2.4 percentage points for Phase 3 schools. Similarly, larger effects are observed for pupils of high or medium ability within more disadvantaged schools. Insofar as the positive effects of the EiC programme disseminate throughout the school over time, we might expect an improvement in exam performance of pupils in participating schools. Furthermore, this effect should be stronger for phase 1 schools because there has been more time for good practice to be effective.

III. DATA AND METHODS

[7] Expenditure on the EiC programme rose from £24 million in 1999/2000 to £139 million in 2000/2001 and then to £386 million in 2005/2006. This represented approximately 4.3% of total local authority current expenditure on secondary schools, which was £9b million in 2000/2001. Total funding of the EiC programme during 1999-2006 has been around £1.7bn and the funding per pupil has been around £140 per pupil. See 'EiC 1999-2006' on the Standards Site, DCSF (http://www.standards.dcsf.gov.uk/sie/eic/).

[8] Specifically, the EiC programme established *learning mentors*, to provide support for students with educational and/or behavioural difficulties; *learning support units*, to provide short-term support for 'difficult to teach' pupils; and the *gifted and talented* programme. The latter has focused on the most able 5-10% of pupils.

[9] See *Excellence in Cities: The National Evaluation of a Policy to Raise Standards in Urban Schools 2000-2003* by Kendall *et al*. (2005) for a fuller discussion of the EiC programme.

The data

The two main data sources used in the present study are the *School Performance Tables*, published annually by the Department for Children, Schools and Families (DCSF, formerly the DfES) and the unpublished annual *Schools' Census*. The *School Performance Tables* contain information about the exam performance of pupils (at school level) in all maintained secondary schools in England. The *Schools' Census* provides information on, for example, admissions policy, gender mix, the number of teaching staff and support staff, the pupil-teacher ratio, the proportion of pupils eligible for free school meals or with special educational needs. Data from these two data sets are available from 1992 through 2006, thus providing a consistent time series for our analysis. Additional information about specialist schools and schools involved in the EiC programme was obtained from the DCSF.

As explained above, school performance is measured here by the proportion of pupils obtaining five or more GCSEs at grades A* to C, which are defined as 'good' exam grades.[10] This measure provides schools, parents and the government with a simple and readily understandable indicator of the exam performance of each school. Table 1 shows that there has been a sustained increase in the proportion of pupils obtaining 'good' exam grades. A primary advantage of this measure of exam performance is that it is available at school level from 1992 onwards, which means that it covers the entire period during which the government policies investigated in this paper have been in operation. It is particularly useful for estimating the impact of the specialist schools initiative and the EiC programme since both of these policies began after the start of the study period. We therefore have a pre-policy period that can be used as a control for estimating the post-policy effects.

Econometric methodology

Following Hanushek (1979, 1986) we estimate an education production function, which in its simplest form is as follows:

$$Y_s = f\,(PUP_s\,,\, FAM_s\,,\, NEIGH_s\,,\, SCH_s\,) + error_s \qquad (1)$$

where Y is an educational outcome of school *s* (e.g. exam results), PUP indexes observed pupil characteristics, FAM refers to the family background factors, NEIGH indicates

[10] The correlation between the proportion of pupils obtaining 5 or more GCSEs at grades A* to C and exam performance measured by the average number of points obtained per pupil (first made available in 1999) is 0.97.

neighbourhood influences and SCH represents a set of school inputs, such as the pupil-teacher ratio. Given our focus on the effects of education policy on educational outcomes, Eq.(1) can be extended to include policy variables:

$$Y_s = f\,(PUP_s\,,\, FAM_s\,,\, NEIGH_s\,,\, SCH_s\,,\, COMP_s\,,\, SPEC_s\,,\, EiC_s\,) + error_s \qquad (2)$$

Following the discussion in the previous section, three major policies directed at secondary schools are added to the model. The first is the competition between schools for pupils (COMP) which emerged from the creation of a quasi-market in education; the second is the specialist schools initiative (SPEC); and the third is the Excellence in Cities programme (EiC).

Finding an appropriate measure of the degree of competition facing each school is not clear cut. The most obvious measure is an index of the extent to which pupils are concentrated in a district's schools, such as the Herfindahl index.[11] Indices of concentration, however, are unlikely to be appropriate in the present context since they fail to capture the impact of *changes* in the competitive pressure facing schools over time. This is because measures of the concentration of pupils in a district's schools tend to be very stable over time (see Table 1) simply because very few schools close or merge. Furthermore, schools face a trade-off between recruiting more pupils for financial reasons and maintaining their exam performance to ensure their competitive edge in the education market place. Hence, schools may be expected to engage in cream-skimming, whereby even non-selective (comprehensive) schools exercise some control over their admissions by attracting pupils likely to perform well academically..

A measure of competition used in previous work (Bradley *et al* 2000), which more closely reflects the dynamic and quality aspects of competition between schools, is the *relative* exam performance of schools. To remain competitive in the local market for pupils, a school will strive to improve its own exam performance in line with improvements by its competitors. If a school's competitors are improving their exam scores at a faster rate than itself, the school is likely to suffer a decline in its share of the district's pupils. The primary variable driving a school's exam performance is therefore likely to be the exam performance of other schools in the same district. We consequently use the lagged mean exam score of all

[11] The Herfindahl index is the sum over all schools in a district of s_i^2, where s_i is each school's share of the district's pupils.

other schools in the same district as an indicator of the intensity of the competition for pupils facing individual schools. We also estimate the model using the lagged Herfindahl index as an alternative measure of competition in the regression analysis below.

The potential impact of the competition for pupils on a school's exam performance can also be investigated in other ways. First, an important feature of the quasi-market is parental choice of school. We address this by stratifying our data according to the number of schools in a district since parental choice is likely to be greater in districts with more schools. The district is used as the geographical education market since transport networks are important for secondary school pupils and these are based primarily on local authority districts.[12] Second, we also use the Herfindahl index to stratify districts according to the degree of market concentration faced by schools.

SPEC is a dummy variable which is unity for those years during which a school has specialist status and zero otherwise; and similarly for the EiC programme. Therefore, for both SPEC and EiC we observe when the policy was 'switched on'. As suggested earlier, the existence of specialist schools adds to the diversity of educational provision in a district and hence allows pupils to choose schools that better match their preferences and aptitudes. To the extent that this choice improves allocative efficiency, we expect SPEC to have a positive effect on educational outcomes. However, there may be variation in exam performance between schools with respect to the subject in which they choose to specialise. This could occur, for example, if there are variations between subjects in the availability of suitably qualified teachers, such as in science and maths, or perhaps because the extra funding has a greater impact per student in some subjects than in others. Ten subject specialisms are identified in our statistical analysis (see Table 2).

The extra funding provided under the EiC programme was designed primarily to improve educational outcomes for pupils from disadvantaged backgrounds in urban areas. The funding was provided to support cooperation between schools so that best practice could be diffused and the exam performance of 'poor' schools improved. It is therefore expected that the EiC variable will have a positive effect on the exam performance of schools, and these effects are likely to be larger the longer the school has been receiving such funding.

Estimation of Equation 2, however, will produce biased results arising from the endogeneity of covariates and the existence of unobserved heterogeneity (Mayston, 2007; De

[12] There are 366 local authority districts in England. We also investigate an alternative measure based on the number of other schools within a specific radius of each school, thus allowing competition between schools across district boundaries. See footnote 29 for details.

Fraya, Oliveira and Zanchi, 2006). The error term in Equation 2 will include the effects of unmeasured features of both the school (e.g. teacher quality and school ethos) and the pupil (e.g. motivation and innate ability). These unobserved variables are likely to be correlated with observed covariates, and in particular with SPEC and EiC. There is also likely to be a correlation between family background and the school covariates. For instance, schools with a high proportion of pupils from 'favourable' family backgrounds (e.g. parents with a keen interest in their child's education) are likely to find it easier to recruit 'good' teachers, leading to better educational performance. If schools with good exam results attract 'good' teachers, some of the school covariates will be endogenous. Ignoring these problems may lead to serious bias in the estimated coefficients of the school quality variables, such as the pupil / teacher ratio (Mayston, 2007).

We attempt to mitigate this bias by including a range of time-varying covariates at both school and district level in addition to school and district dummies. Our estimating equation is as follows:

$$Y_{sdt} = \alpha_s + \alpha_d + \gamma COMP_{s,t-n} + \eta SPEC_{s,t-n} + \delta EiC_{s,t-n} + \boldsymbol{X}_{st}\boldsymbol{\beta} + \boldsymbol{Z}_{dt}\boldsymbol{\theta} + \boldsymbol{T}_t\boldsymbol{\tau} + \varepsilon_{sdt} \qquad (3)$$

where:

Y = proportion of pupils achieving five or more A*-C grades in the GCSE exams (at age16)

COMP = proportion of pupils achieving five or more A*-C grades in the GCSE exams (at age 16) in all other schools in the same district

SPEC = 1 if school had a designated specialism in year t (policy-on) and zero otherwise (policy-off)

EiC = 1 if school was in an Excellence in Cities Partnership (policy-on) and zero otherwise (policy-off)

The coefficients α_s and α_d are school and district fixed effects, which will capture the impact of unobserved, time-invariant, school and district-level factors. The inclusion of school and district dummies should help to mitigate the potential bias on the estimated policy effects. The vectors ***X*** and ***Z*** are a set of time-varying school and district covariates respectively; and the vector ***T*** is a set of year dummies. The error term ε is assumed to be normally distributed.

The vector ***X*** includes the following time-varying school-level variables: the pupil / teacher ratio, the number of pupils on the school roll, the proportion of pupils eligible for free

school meals, the proportion with special needs and the proportion with English as their second language (see Table 1). The district level variables include the proportion of pupils eligible for free school meals in other schools in the same district, the pupil / teacher ratio and the change in pupil numbers. These district level variables are included to capture any shocks likely to impact on all schools. We note that there may be a problem arising from the endogeneity of the time-varying school-level controls, such as the pupil/teacher ratio and the number of pupils in a school, which might be expected to increase over time in schools that perform well compared to their competitor schools. This could give rise to bias in the estimated policy effects but it seems unlikely that the bias, if it exists, will be serious since school size does not normally change rapidly in the short to medium term due to capacity constraints in schools with a consistently good exam performance.

A further issue concerns the timing of the policy impacts. It seems likely that schools will react very quickly to increased competition from other schools in the same district since information about exam performance is readily available soon after the end of the school year. The impact of the specialist schools initiative and the EiC programme, however, is likely to be somewhat longer since their effect on exam results is likely to occur over several years. Longer time lags may therefore be appropriate for these two policy variables. The length of the lags is determined empirically in the results section below.

The model can be modified in two ways to provide more information about the potential policy effects. First, since the EiC programme was introduced in three stages (in phases 1, 2 and 3 in 1999, 2000 and 2001 respectively), it is possible to estimate the impact of each phase separately. Second, the effect of the specialist schools initiative on exam results can be estimated for ten distinct specialist subject areas (see Table 2).

IV. RESULTS

This section reports the estimated impact of the education reforms on exam performance.[13] We first estimate the individual impact of the three policy reforms. This is followed by estimates of their distributional. We do this by sub-dividing schools into groups according to the proportion eligible for free school meals, the proportion from ethnic minorities and the gender of a school's pupils. Finally, we investigate whether the reforms have had differential

[13] The results reported here are based on an unbalanced panel since data are not available for the entire time period for a minority of schools. We note, however, that the results change very little when we use a balanced panel (containing 2645 schools over the entire time period 1992-2006).

effects according to school choice (measured by the number of schools in each district) and also according to market concentration (as measured by the concentration of pupils in schools within each school district).

The effect of the education reforms on exam performance

In order to investigate the overall impact of the education reforms, we begin by regressing school exam performance on a set of year dummies in Model 1 (Table 3). This shows that the mean exam performance of all schools increased by 18 percentage points between 1994 and 2006. This serves as a benchmark for estimating the impact of the full range of variables specified in the previous section (see Equation 3 above). Models 2 and 3 differ only in so far as model 2 uses the Herfindahl index as the measure of competitiveness, whereas model 3 uses the lagged exam performance of other schools in the same district. Finally, model 4 estimates the impact of each of the three phases of the EiC programme and for each of the ten types of school specialism.

We note initially that several of the controls in models 2 to 4 are statistically significant. These include the proportion of pupils eligible for free school meals (both within the school and within the local authority district), the pupil / teacher ratio, school size and the proportion of pupils with special needs. The pupil / teacher ratio, the proportion of pupils eligible for free school meals and the proportion of special needs pupils are negatively related to exam performance, as expected. As in previous studies (Bradley and Taylor 1998), school size is found to be positively related to exam performance.[14]

In view of the likelihood that education policies have a lagged impact on a school's exam performance, we have experimented with policy lags of different length. As argued earlier, a one-year lag is probably appropriate for the competition variable since schools need to react quickly to improvements achieved by competing schools in the same catchment area if they are to maintain their competitiveness.[15] The impact lag on exam performance of the EiC and specialist schools policies, however, is likely to be somewhat longer. The estimated coefficient on the EiC policy variable, for example, is 0.20 with a zero time lag compared to 0.30 when we use a two-year lag (the difference is highly statistically significant). Since using further lags (up to four years) does not result in a statistically significant change in the estimated coefficient, we use a two-year lag in all of the regressions reported here.[16] A two-year time lag is also used for the specialist schools variable, though there is little difference between the estimated coefficients using different lags in this case.

[14] We note that excluding the time-varying school-level controls has very little effect on the estimated policy impacts.

[15] We note, however, that the estimated coefficient on the competition variable falls from 0.20 (se=0.012) to 0.13 (se=0.012) when the competition variable is lagged by two years rather than one year.

[16] A disadvantage of extending the lag is that the sample size falls by over 3,000 schools for each extra one-year lag.

Using the Herfindahl index (lagged one year) to measure competitiveness, we find a negative relationship as expected (see model 2), but the estimated coefficient is only marginally significant and indicates a very minor role for the impact of competitiveness on exam performance.[17] This result is not surprising, however, since the Herfindahl index is stable over time even within districts, which means that it does not (in this case) accurately track the extent to which schools are competing with each other for pupils following the introduction of a quasi-market. As argued in section III, the lagged exam performance of other schools in the same district is likely to provide a more sensitive measure of competitiveness than the Herfindahl index in a time-series analysis. Schools that do not keep pace with other schools in the same catchment area are likely to lose market share.

Replacing the Herfindahl index with the lagged exam performance of other schools in the same district as the measure of competitiveness facing each school (see model 3), we find that a one percentage point increase in the exam performance of other schools in the same district is associated with a 0.2 percentage point increase in the school's own exam performance. This suggests that competition between schools was associated with an improvement of 4 percentage points in the overall exam score during 1994-2006.[18]

The estimated coefficient on the EiC variable indicates that the programme has been associated with a 3 percentage point improvement in the exam performance of those schools participating in the programme. The estimated impact of the specialist schools initiative, however, appears to have been quite small, with the acquisition of specialist status being associated with an improvement in exam performance of just under 1 percentage point. Adding the impact of the three education reforms together, we estimate that they improved overall exam performance by nearly six percentage points during 1994-2006. Model 3 therefore indicates that around one-third of the improvement in exam results during 1994-2006 can be directly attributed to the three major education reforms. The regression results also indicate that the trend growth in average school size of around 200 pupils per school during the period was associated with a two percentage point improvement in exam results.[19]

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[17] A reduction in the Herfindahl index by one standard deviation is associated with an increase of less than one percentage point in the percent of pupils obtaining 5 or more A*-C grades.

[18] This estimate is obtained by multiplying the estimated coefficient on the lagged exam performance of all other schools in the district (0.20) by the change in the exam performance of all other schools in the district over the period 1993-2006 (20 percentage points).

[19] A potential problem arises in the interpretation of the estimated policy effects on the EiC and specialist schools variables since a minority of schools acquired EiC status and specialist school status simultaneously. Omitting those schools with coterminous policies (about 20% of the total by 2006), the estimated policy effects fall from 0.30 to 0.20 on the EiC variable and from 0.008 to 0.004 on the specialist schools variable. (Both new estimates are still highly statistically significant.) In addition, the estimated policy effects for each of the three policies are unaffected by the omission of each policy variable in turn.

The impact of two of the policy variables is investigated in more detail in Model 4. The EiC programme was phased in over three years and hence those in the first phase have received extra funding for longer and are expected to have experienced the greatest improvement in performance. On average, schools included in phase 1 (in the 1999/2000 school year) witnessed a 3.4 percentage point improvement in exam performance, whereas those schools in phases 2 and 3 exhibit a significantly smaller improvement (2.6 and 2.8 percentage points respectively).[20]

The specialist schools initiative can similarly be split into different specialisms in order to estimate the impact for each type of specialist school. When this is done, we find that the specialist schools initiative is significantly positively related to exam performance for only three of the ten specialisms (which accounted for 40% of all specialist schools in 2006). The impact on the exam performance of schools specialising in arts, business studies and technology is estimated to be 0.9, 1.8 and 2.2 percentage points respectively.

Since the impact of education policies may change over time, it is useful to estimate the policy effects over different time periods. Table 4 shows the estimated coefficients over consecutively longer time periods running from 1994-2000 through to 1994-2006. The estimated impact of competition policy on exam results is shown to increase steadily over time as the quasi-market evolved, as we would expect. A similar result is obtained for the EiC programme, which is also estimated to have had a stronger impact over time for each of the three phases of the policy. This is consistent with the view that increasing school resources to raise the performance of pupils from deprived family backgrounds is likely to take time to change behaviour and attitudes towards schooling, thereby improving educational outcomes.

By contrast, the specialist schools initiative appears to have become less effective over time, presumably because of the selective nature of the specialist schools initiative. In the earlier years of the programme, schools had to be seen to be performing well in order to be awarded specialist status, since poorly performing schools would be less likely to find sponsors to provide matched funding from the private sector.[21] As the scheme expanded to cover the majority of schools (see Table 1), the effectiveness of the policy is estimated to have declined. This decline in the estimated impact of the specialist schools initiative may therefore be a consequence not of a causal effect of the policy but of a change in the characteristics of schools gaining specialist status. Schools gaining specialist status before

[20] Machin, McNally and Meghir (2007) find that the impact of each phase of the EiC policy on Key Stage 3 results in maths gradually builds up over time.

[21] The matched funding requirement has been relaxed in recent years.

2001, for example, had a better average exam performance than non-specialist schools. After 2004, the reverse was the case. If schools with a poor exam performance were less likely to gain from acquiring specialist status than schools with a good exam performance, this compositional change could explain (at least in part) the decline in the estimated impact of the policy. The inclusion of variables such as the proportion of pupils eligible for free school meals to control for differences in the pupil composition of schools should, however, help to mitigate the influence of the compositional change on the estimated impact of the specialist schools initiative. At worst, it could be argued that the specialist schools policy may have been effective only for high performing schools.[22]

The distributional effects of the education reforms

In this section we analyse whether the education reforms have benefited some groups of pupils more than others. Specifically, we test for the effect of the reforms according to *family income, ethnicity* and *gender of admissions*. Since the analysis is conducted at school level and not at pupil level, the results reported here should be taken as indicative of the distributional consequences of the reforms. Further work at pupil level is required to obtain more robust estimates of the distributional consequences.

The distributional consequences of the three policies are estimated here by dividing schools into quintiles according to a specific characteristic, such as the proportion of pupils eligible for free school meals (as in Table 5). Using eligibility for free school meals as a proxy for family income, we find that none of the three policies is estimated to have had a significant impact on the exam performance of schools in the bottom quintile (indicating high average levels of family income for these schools). This contrasts with the estimated coefficients for schools in the other four quintiles of the proportion eligible for free school meals. The estimated coefficients are highly significant in the other four quintiles. Only in the case of the specialist schools initiative is there any evidence of a relationship between the policy impact and the proportion eligible for free school meals. The results in Table 5 suggest that the specialist schools initiative had a greater impact on schools with the highest proportion of pupils in low income families.

The estimated impact of the policy reforms obtained for schools with different proportions of pupils from poor families corresponds with the results obtained when schools are grouped according to the proportion of ethnic minority pupils. The impact of all three

[22] We thank one of the referees for suggesting this explanation to us.

policy reforms is estimated to be higher for schools with a high proportion of pupils from ethnic minorities (see Table 6). The estimated impact of the EiC programme, for example, is 2 percentage points for schools with less than 10% ethnic minority pupils compared to 3.6 percentage points for schools with more than 50% of its pupils from an ethnic minority. This result is not surprising since the EiC programme was aimed specifically at inner city schools with a high proportion of pupils from low income families.

The final distributional aspect of the benefits of the education reforms relates to gender differences in exam performance.[23] The model is estimated for three different types of school according to their gender admissions policy: boys-only, girls-only and co-educational schools (see Table 7). The most interesting, and perhaps most surprising, result is that single-sex schools benefited more from the EiC programme than did co-educational schools. This programme is estimated to have boosted exam performance by 4.6 and 6.2 percentage points in boys-only and girls-only schools respectively compared to only 2.7 percentage points in co-educational schools. Neither boys-only nor girls-only schools, however, are estimated to have benefited from the specialist schools initiative. [24]

Spatial variations in the effect of the policy reforms

The impact of the degree of competition and of parental choice on a school's attainment may be expected to vary between districts. Two measures are used here to capture these spatial disparities in competition and parental choice. The first is simply the number of schools in a district, which reflects the degree of choice available to parents. Dividing districts into categories according to the number of schools, we find that the estimated coefficient on the competition variable increases from 0.086 to 0.394 as we move from districts with less than five schools to districts with more than fifteen schools (see Table 8). Moreover, the estimated coefficient increases at an increasing rate. This result therefore supports the view that competition has been most effective in those districts where parental choice is greatest . [25]

[23] The factors underlying the evolution of the gender gap in exam results are investigated by Andrews *et al.* (2006), who argue that part of the explanation for the trend improvement in girls' exam results relative to boys was the switch to an examination system based more heavily on coursework from the late 1980s. There is evidence that girls prefer coursework and this could account for the increase in the gender gap as well as an improvement in results overall (Machin and McNally, 2005). See also Kingdom and Casson (2007a, 2007b).

[24] The proportion of boys-only and girls-only schools in an EiC partnership was 31% and 39% respectively. The gap in exam performance between non-EiC schools and EiC schools fell from 25.5 to 15.7 for boys-only schools, and from 21.9 to 12.7 for girls-only schools, between 2000 and 2006.

[25] A similar result is obtained when the number of schools within a radius of 7km of each school is used for dividing schools into groups instead of using the number of schools in the local authority district. The eastings and northings used to delineate the 7km radius for each school, and hence the number of other secondary schools within this radius, were obtained from the Postzon package.

The second measure of competition at district level is the Herfindahl index, which is inversely related to the degree of concentration of pupils in a district's schools. Dividing districts into categories according to the degree of concentration of a district's pupils, we find that the estimated coefficient on the competition variable increases from 0.096 in the quintile of schools with the highest concentration of pupils to 0.398 in the lowest. There is therefore strong evidence that the impact of competition on a school's exam performance is positively related to the degree of market concentration faced by schools within their catchment area.

The impact of the EiC policy is also estimated to vary according to the degree of competition faced by schools. Its impact is estimated to be lowest in districts where competition is high (i.e. a low concentration of pupils in a district's schools) and is estimated to be high in districts where potential competition is low. This result may be because the EiC programme depends on cooperation between schools and cooperation may be easier to achieve in districts with only a small number of schools involved in the programme.

We therefore conclude, from the results in Tables 8 and 9, that competition works best where choice is greatest, and cooperation works best where there are fewer schools to coordinate in a partnership arrangement such as the EiC policy.

V. CONCLUSION

This paper has investigated the impact on exam performance of three major education policies that have been introduced into England's secondary schools during the past two decades. Following the Education Reform Act (DES, 1988), a quasi-market was created in the early 1990s by providing schools with increasing control over their own resources and by linking each school's funding more directly to its intake of pupils. On the other side of the equation, parental choice of school has been considerably increased. Moreover, schools were increasingly differentiated by the specialist schools initiative, which began in 1994 with the designation of technology colleges. In addition to expanding the choice set to ten different specialisms in subsequent years (and more recently to a combination of any two specialisms), policy has become more heavily focused on schools in areas of severe deprivation through the Excellence in Cities programme.

This paper has attempted to estimate the effect of these three education policies on the exam performance of pupils at the end of compulsory education. Our main findings, which are based on a panel of all secondary schools in England (1992-2006), are as follows. First, the introduction of a quasi-market sought to increase competition between schools for pupils

and, in so doing, improve their exam performance. Our estimates suggest, however, that between 20% and 25% of the overall improvement in exam performance over the period 1992-2006 can be attributed specifically to the quasi-market reforms. This policy had a far bigger impact, however, in areas where competition is likely to be more intense and where parental choice is likely to be greater. The impact of competition was found to be substantially greater, for example, in districts which had the most schools and in districts with the lowest concentration of pupils in just a few schools (as measured by the Herfindahl index).

Second, the impact of the specialist schools initiative on exam performance is estimated to have been modest, improving exam performance by less than one percentage point for specialist schools as a whole. Some specialisms, however, are estimated to have had a bigger impact on exam performance than others, with the largest effects being for schools specialising in technology (2.2 percentage points) and in business studies (1.8 percentage points). No discernible effect could be detected for the majority of specialist schools, however, suggesting that a large proportion of the specialist schools funding yielded no significant improvement in exam performance.

Third, the Excellence in Cities programme is estimated to have had some success, insofar as it is estimated to have accounted for a 3 percentage point improvement in GCSE results for participating schools during 2000-06 (when exam results in England improved by 11 percentage points overall). The overall effect on exam performance has been relatively small, however, since it has been mainly restricted to schools in deprived urban areas.

Although the education reforms are estimated to have had only a moderate impact on exam performance in aggregate, there is convincing evidence that the impacts that did occur have been distributionally beneficial. Our estimates suggest that the increased competition had the greatest impact on exam performance in those schools with the most disadvantaged pupils. The same result was obtained for the specialist schools initiative, which also had its biggest impact in schools with the most disadvantaged pupils. Specifically, these two policies benefited those schools with the highest proportion of pupils from poor families and with the highest proportion of ethnic minority pupils. The schools benefiting most from the EiC programme were those with a high proportion of pupils from ethnic minorities. This result is not surprising since the aim of the EiC programme was to raise attainment in deprived urban areas. In fact, all three policies are estimated to have had a greater impact on schools with a high proportion of ethnic minority pupils.

The impact of the education reforms taken as a whole has therefore been moderate, with about one-third of the total improvement in exam performance being directly attributable to these three education reforms. The question therefore arises as to what factors account for the improvement in secondary school exam results not accounted for by the reforms to education policy considered in this paper. One possibility is that improvements to primary education have fed through into the secondary sector as a result of programmes such as the literacy and numeracy hour (see Machin and McNally, 2008). Other possible explanations for the 'unexplained' improvement in exam results are that pupils and teachers have worked harder or that schools have been managed more efficiently. It may also be the case that exams have become easier or that assessment methods have become less stringent. In other words, there may have been grade inflation. These issues need to be investigated more fully using pupil level data in future research.

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Table 1 Mean characteristics of schools, 1992-2006

	Exam results (% 5+ A*-C grades)	Pupils per teacher	Part-time / full-time staff	School size (number of pupils)	Pupils eligible for free school meals %	Pupils with special needs %	Pupils with English second language %	Schools with specialist status %	Schools in an EiC Partnership %	Concentration of pupils in schools within districts (Herfindahl index)
1992	35.5	15.3	19.2	819	17.1	1.3	0.7	0.0	0.0	0.126
1993	37.8	15.7	18.7	846	17.2	1.6	0.7	0.0	0.0	0.127
1994	39.9	15.8	19.4	868	18.5	1.9	0.7	1.2	0.0	0.126
1995	40.7	15.9	19.2	892	19.1	2.1	0.7	2.5	0.0	0.127
1996	42.1	16.2	19.7	901	19.4	2.3	0.7	4.6	0.0	0.127
1997	42.5	16.3	16.8	912	19.5	2.5	0.7	6.8	0.0	0.127
1998	43.8	16.5	20.0	922	18.8	2.7	0.8	9.5	0.0	0.128
1999	45.7	16.6	19.4	942	18.1	2.7	0.8	11.9	0.0	0.129
2000	47.0	17.0	15.1	968	17.5	2.1	0.8	15.7	13.5	0.129
2001	48.3	17.0	17.4	989	16.9	2.1	0.8	20.4	23.1	0.128
2002	49.9	16.9	17.8	1004	16.0	2.0	0.9	30.2	28.0	0.128
2003	51.7	17.0	14.5	1022	15.6	1.5	0.9	45.0	28.1	0.128
2004	52.9	17.0	16.5	1033	15.5	1.7	0.9	61.7	27.8	0.131
2005	55.6	16.7	16.6	1032	15.3	2.6	0.9	74.3	28.1	0.128
2006	58.3	16.6	16.6	1035	14.7	1.9	1.0	78.2	27.5	0.127

Note: The Herfindahl index is the sum over all schools in a district of s_i^2, where s_i is each school's proportion of the district's pupils.

TABLE 2 Number of schools in each specialism in 2006

Specialism	Year specialism introduced	Total in 2006	%
Technology	1994	585	19
Languages	1995	221	7
Arts	1997	421	14
Sport	1997	350	11
Business	2002	229	7
Engineering	2002	57	2
Maths	2002	225	7
Science	2002	303	10
Humanities	2004	72	2
Music	2004	27	1
None		588	19
Total		3078	100

Source: Standards Site, DCSF (http://www.standards.dfes.gov.uk/specialistschools/).

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TABLE 3 Estimated regressions

Explanatory variables	Dependent variable = proportion of pupils obtaining five or more A*-C grades			
	Model 1	Model 2	Model 3	Model 4
Competitiveness				
Herfindahl index		-0.078*		
		(0.033)		
Exam performance of other schools in district			0.195***	0.196***
			(0.012)	(0.012)
Excellence in Cities				
Excellence in Cities Partnership		0.036***	0.030***	
		(0.002)	(0.002)	
Excellence in Cities: phase 1 (1999/00)				0.034***
				(0.002)
Excellence in Cities: phase 2 (2000/01)				0.026***
				(0.003)
Excellence in Cities: phase 3 (2001/02)				0.028***
				(0.004)
Specialist status				
Specialist status		0.008***	0.008***	
		(0.001)	(0.001)	
Arts				0.009***
				(0.003)
Business studies & enterprise				0.018***
				(0.005)
Engineering				0.001
				(0.008)
Languages				-0.008**
				(0.003)
Maths				-0.007
				(0.004)
Science				-0.001
				(0.004)
Sport				-0.001
				(0.003)
Technology				0.022***
				(0.002)
Humanities				-0.012
				(0.015)
Music				-0.033
				(0.027)
School variables				
Pupil / teacher ratio		-0.001*	-0.001**	-0.001**
		(0.000)	(0.000)	(0.000)
Part-time / full-time teachers		0.001	0.002	0.002
		(0.005)	(0.004)	(0.004)
Pupils		0.009***	0.009***	0.009***
		(0.001)	(0.001)	(0.001)
Pupils squared		0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)
Proportion of pupils eligible for free school meals		-0.276***	-0.272***	-0.268***
		(0.011)	(0.011)	(0.011)

Table 3 cont'd

Proportion of pupils with special educational needs		-0.110*** (0.032)	-0.127*** (0.032)	-0.125*** (0.032)
Proportion of pupils with English as second language		0.074 (0.075)	0.021 (0.075)	0.031 (0.075)
District variables				
Proportion of pupils eligible for free school meals in other schools in district		-0.483*** (0.049)	-0.373*** (0.049)	-0.367*** (0.049)
Change in number of pupils in district		0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Pupil / teacher ratio in district		0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
1995	0.007 (0.005)	0.006*** (0.002)	0.002 (0.002)	0.002 (0.002)
1996	0.021*** (0.005)	0.021*** (0.002)	0.015*** (0.002)	0.015 (0.002)
1997	0.026*** (0.005)	0.024*** (0.002)	0.016*** (0.002)	0.015*** (0.002)
1998	0.038*** (0.005)	0.033*** (0.002)	0.023*** (0.002)	0.023*** (0.002)
1999	0.058*** (0.005)	0.049*** (0.002)	0.037*** (0.002)	0.036*** (0.002)
2000	0.070*** (0.005)	0.055*** (0.002)	0.039*** (0.002)	0.039*** (0.002)
2001	0.083*** (0.005)	0.063*** (0.002)	0.045*** (0.002)	0.044*** (0.002)
2002	0.100*** (0.005)	0.070*** (0.002)	0.050*** (0.002)	0.049*** (0.002)
2003	0.117*** (0.005)	0.080*** (0.002)	0.058*** (0.002)	0.057*** (0.002)
2004	0.129*** (0.005)	0.088*** (0.002)	0.063*** (0.002)	0.063*** (0.002)
2005	0.157*** (0.005)	0.115*** (0.002)	0.088*** (0.002)	0.088 (0.003)
2006	0.184*** (0.005)	0.124*** (0.002)	0.094*** (0.003)	0.095*** (0.003)
Constant	0.399*** (0.004)	0.964*** (0.096)	0.463*** (0.026)	0.459*** (0.026
School fixed effects	No	Yes	Yes	Yes
District fixed effects	No	Yes	Yes	Yes
R-squared	0.07	0.91	0.91	0.91
n	40320	39403	39403	39403

Note: ( ) = standard errors. *, **, *** = significant at 5%, 1% and 0.1% respectively. The two measures of competitiveness (the Herfindahl index and the exam performance of other schools in the same district) are lagged one year in all regressions. The two policy variables (the Excellence in Cities programme and the specialist schools initiative) are lagged two years in all regressions.

TABLE 4 Estimated policy impacts over time

Period	Competition between schools	Specialist schools programme	EiC phase 1: 1999/00	EiC phase 2: 2000/01	EiC phase 3: 2001/02
1994-2002	0.136***	0.015***	0.011***		
	(0.014)	(0.002)	(0.003)		
1994-2003	0.146***	0.018***	0.018***	0.016***	
	(0.013)	(0.002)	(0.002)	(0.004)	
1994-2004	0.158***	0.014***	0.025***	0.016***	0.011*
	(0.013)	(0.002)	(0.002)	(0.003)	(0.005)
1994-2005	0.175***	0.011***	0.032***	0.022***	0.021***
	(0.012)	(0.001)	(0.002)	(0.003)	(0.004)
1994-2006	0.234***	0.008***	0.034***	0.026***	0.028***
	(0.012)	(0.001)	(0.002)	(0.003)	(0.004)

Note: ( ) = standard errors. *, **, *** = significant at 5%, 1% and 0.1% respectively. The coefficients reported in this table are obtained from regressions which include all of the controls used in estimating models 2 to 4 in Table 3 above. The year dummies and the school and district fixed effects are also included.

TABLE 5 Estimated policy effects by proportion of pupils eligible for free school meals

Average % eligible for free school meals (1992-2006): by quintile	Competition between schools	Excellence in Cities Partnership	Specialist schools programme
Lowest % eligible for free meals ('rich kids')	-0.010	0.002	0.002
	(0.022)	(0.006)	(0.002)
Second quintile	0.141***	0.017**	0.009***
	(0.024)	(0.006)	(0.003)
Third quintile	0.234***	0.011**	0.010***
	(0.024)	(0.004)	(0.003)
Fourth quintile	0.216***	0.020***	0.018***
	(0.028)	(0.003)	(0.003)
Highest % eligible for free meals ('poor kids')	0.226***	0.011**	0.021***
	(0.031)	(0.004)	(0.004)

Note: ( ) = standard errors. *, **, *** = significant at 5%, 1% and 0.1% respectively. The coefficients reported in this table are obtained from regressions which include all of the controls used in estimating models 2 to 4 in Table 3 above. The year dummies and the school and district fixed effects are also included.

TABLE 6 Estimated policy effects by proportion of pupils in ethnic minority

Average % of pupils in ethnic minority (1992-2006): by quintile	Number of schools (2006)	Competition between schools	Excellence in Cities Partnership	Specialist schools programme
Under 10% ethnic minority pupils	2197	0.166***	0.020***	0.010***
		(0.013)	(0.002)	(0.001)
10% to 50% ethnic minority pupils	637	0.157***	0.029***	0.001
		(0.030)	(0.003)	(0.003)
Over 50% ethnic minority pupils	283	0.228***	0.036***	0.016***
		(0.042)	(0.005)	(0.005)

Note: ( ) = standard errors. *, **, *** = significant at 5%, 1% and 0.1% respectively. The coefficients reported in this table are obtained from regressions which include all of the controls used in estimating models 2 to 4 in Table 3 above. The year dummies and the school and district fixed effects are also included.

TABLE 7 Estimated policy effects by gender of admissions

Gender of pupils	Number of schools (2006)	Competition between schools	Excellence in Cities Partnership	Specialist schools programme
Boys only schools	180	0.161***	0.046***	-0.008
		(0.051)	(0.007)	(0.006)
Girls only schools	227	0.093*	0.062***	0.001
		(0.044)	(0.006)	(0.004)
Co-educational schools	2710	0.208***	0.027***	0.009***
		(0.012)	(0.002)	(0.001)

Note: ( ) = standard errors. *, **, *** = significant at 5%, 1% and 0.1% respectively. The coefficients reported in this table are obtained from regressions which include all of the controls used in estimating models 2 to 4 in Table 3 above. The year dummies and the school and district fixed effects are also included.

TABLE 8 Estimated policy effects by number of schools in district

Number of schools in district (2006)	Number of schools (2006)	Number of EiC Partnership schools (2006)	Number of specialist schools (2006)	Competition between schools	Excellence in Cities Partnership	Specialist schools programme
1 to 4	206	4	177	0.086***	-	-0.001
				(0.028)		(0.004)
5 to 7	827	6	696	0.118***	-	0.004
				(0.020)		(0.002)
8 to 10	652	108	497	0.159***	0.050***	0.005
				(0.027)	(0.004)	(0.003)
11 to 15	649	279	475	0.256***	0.021***	0.015**
				(0.029)	(0.003)	(0.003)
16 and over	719	460	549	0.394***	0.017***	0.009**
				(0.035)	(0.003)	(0.003)

Note: ( ) = standard errors. *, **, *** = significant at 5%, 1% and 0.1% respectively. There is no estimated coefficient for the EiC Partnership programme for districts with under eight schools since there were too few districts to obtain meaningful results. The coefficients reported in this table are obtained from regressions which include all of the controls used in estimating models 2 to 4 in Table 3 above. The year dummies and the school and district fixed effects are also included.

TABLE 9 Estimated policy effects by degree of concentration of pupils in schools within districts

Herfindahl index (average for 1992-2006 by quintile)	Competition between schools	Excellence in Cities Partnership	Specialist schools programme
Districts with lowest concentration of pupils	0.398***	0.016***	0.007*
	(0.036)	(0.003)	(0.003)
Second quintile	0.265***	0.020***	0.013***
	(0.031)	(0.003)	(0.003)
Third quintile	0.206***	0.036***	0.008**
	(0.029)	(0.004)	(0.003)
Fourth quintile	0.094***	0.056***	0.010***
	(0.027)	(0.008)	(0.003)
Districts with highest concentration of pupils	0.096***	0.034*	0.001
	(0.019)	(0.017)	(0.003)

Note: ( ) = standard errors. *, **, *** = significant at 5%, 1% and 0.1% respectively. The Herfindahl index is the sum over all schools in a district of s_i^2, where s_i is each school's proportion of the district's pupils. The coefficients reported in this table are obtained from regressions which include all of the controls used in estimating models 2 to 4 in Table 3 above. The year dummies and the school and district fixed effects are also included.

APPENDIX

Descriptive statistics: average for each variable 1993-2006

Variable	N	Mean	SD
Proportion of pupils obtaining 5 or more A*-C grades in the General Certificate of Secondary Education exams at age 16	43469	0.47	0.21
Pupil / teacher ratio	43514	16.50	1.65
Part-time / full-time teachers	43510	0.18	0.12
Number of pupils on school roll (in hundreds)	43513	9.54	3.33
Proportion of pupils eligible for free school meals	43514	0.17	0.15
Proportion of pupils with special educational needs	42986	0.02	0.02
Proportion of pupils with English as second language	43050	0.01	0.02
Proportion of pupils eligible for free school meals in other schools in district (lagged one year)	43504	0.16	0.10
Proportion of pupils obtaining 5 or more A*-C grades in other schools in same district	43425	0.47	0.11
Pupil / teacher ratio in district	43551	18.16	9.91
Change in number of pupils in district (in hundreds)	43602	1.75	11.51