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School Quality and Effectiveness

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School Quality and Effectiveness

Arnaud Chevalier, Peter Dolton and Ros Levacic*

2.1. Introduction: The British School Education System.

One of the most robust and consistent findings in educational research is that a child's educational attainment is greatly affected by its family background. A crucial issue for policy is whether schools have any effect on children's attainment or whether it is all determined by family background and personality traits. If schools are differentially effective then the school attended matters for children's educational attainment and can reinforce or counter family influences. Another motivation for research on school effectiveness is to discover the factors associated with more effective schools so as to spread these more widely.

The British state schooling system is centralised, with all pupils following a National Curriculum and sitting nationally set public examinations at age 7, 11, 14, 16, 17 and 18¹. In this system all teachers are paid using a national pay scale. Each school's budget is largely dependent on the number of pupils it has and this grant comes from the central government. However, it is administered by the Local Education Authorities (LEA), which may set their own educational priorities (financed by local taxation), thus variations in school funding between LEAs is possible (Figure 1). Furthermore, compensatory educational funding is given to geographical areas with a higher deprivation scores².

Various types of school co-exist in the UK. The distinction between the public and the private sector is clear. The private system of independent schools³ is relatively autonomous

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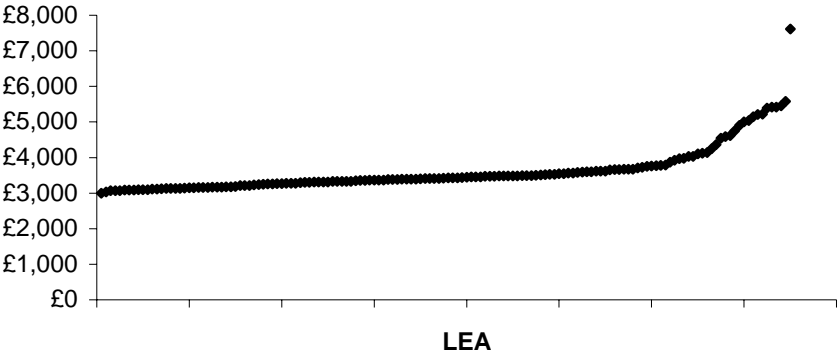
¹ These examinations are respectively Key Stage I, II, III, GCSE, AS and A2 examinations. The first three of these are taken in the core skills of English, Maths and Science. GCSE is usually taken in up to 10 subjects, AS level in 3-5 subjects and A2 in 2-3 subjects. See Mackinnon and Statham (1999) for full details.

² See Glennerster (2003b) for details of how schools are funded in the UK.

³ Some of these elite independent schools are confusingly called 'public schools'.

but broadly follows the National Curriculum. Such schools select, stream⁴ and teach by ability and are free to charge fees. Within the state sector, whilst 85% of schools are comprehensive, some local education authorities allow tracking of the pupils⁵. This is a remnant of the previous stratified system, where children used to be tested at age 11 (the 11-plus exam). Successful pupils would then carry on the academic track in grammar school typically up to the age of 18, while the others would go to a “secondary modern” school to follow a more vocational curriculum until they reached 16. Very few children were able to switch route after the age of 11. This stratification of education was mostly dismantled in the 1970s and replaced by a system where most children attend the same “comprehensive school” independently of academic aptitude⁶.

Figure 1: Per Pupil expenditure by LEA, England 2002/03



The last three decades have been an era of unprecedented changes in the UK education system. The most important reforms concern: the raising of the school leaving age from 15 to 16 (in 1972), the introduction of comprehensive schools (1976 Education Act); the complete overhaul of the age 16 school examination system with the abolition of CSEs and GCE O’levels and the introduction of GCSEs in 1986 (and first examined in 1988); the introduction of governing bodies for schools with parental representation (1980); the compulsory publication of school examination results. The reforms have changed the way schools function and, children are taught and examined.

⁴ The system of using differential teaching by ability – often in separate classes –, is usually called ‘streaming in the UK but is known as ‘tracking’ in the USA. We use these terms interchangeably.
⁵ The distribution of pupils in 1971 was 39% secondary, 36% comprehensive, 18% grammar, technical 7%. By 1991, the percentages were respectively 10, 85, 5, 0 (MacKinnon and Statham, 1999).
⁶ The 1976 Act required LEAs to introduce comprehensive schools in place of schools split by the 11 plus examination. This act was repealed in 1979 and to this day this has left us with some LEAs (a minority) in which selective state grammar schools still exist.

Perhaps the most radical changes in the education system came with the 1988 Education Reform Act, which introduced the National Curriculum. The National Curriculum is highly prescriptive in the form and content of subjects to be taught in schools; required Local Education Authorities (LEAs) to delegate financial management and the appointment of staff to the governing bodies of schools and allowed schools to opt out of LEA control altogether. Under these reforms schools got a better control of their budget and receive their funding directly from the central government. League tables (of school examination results) were introduced in order to inform parents who were granted greater flexibility in the choice of schools for their child, and as a way to increase competition between schools. Finally, to insure that competition would not lead to a reduction of quality, the Education Act of 1992 introduced the Office for Standards in Education. This administrative body had the responsibility of inspecting every school at least once every four years. During the Conservative government administrations (1979-1997) these reforms were introduced to create a quasi market in the provision of publicly funded education by granting more choice for pupils and parents and more accountability in the governing of the education process (see Glennerster (1991) for a review).

The pace of change and policy 'initiatives' in the education field under the Blair government has been relentless. Some of the more important recent changes in the education policy arena have introduced the notion of 'Beacon schools' which are models of good practice and encouraged the exchange of best practice between bad and good schools; launched the Excellence in Cities (EiC) program which aims to help inner city schools with their various disadvantages; facilitated the creation of specialist schools with particular subject strengths.

2.2 The Current Education Policy Environment.

In this section we review the educational policy environment and briefly discuss the main questions relating to the provision and utilisation of resources in schools. The setting for this discussion is the market led reforms which have characterised the UK education system in the last 15 years. So often policy decisions relating to education have been made on grounds of political ideology rather than hard evidence relating to what is most effective⁷. The move towards economic liberalism and a faith in the market mechanisms has guided much of recent educational reform in the UK. Now the predominant themes are

⁷ The most influential tracts on education reform have been written by policy advisors with a specific ideological view of the world. See Barber (1996), Tooley (2000) and Woodhead (2002)

accountability, autonomy and diversity. The 2001 government White Paper on schools emphasized the need for autonomy and diversity for schools – so that they ‘can take full responsibility for their mission’ and ‘cater significantly better for diverse requirements’⁸. The system is to be ‘underpinned by the mechanisms of accountability, inspection and intervention’⁹.

There are many key questions for education policy, which relate to schools. We introduce some of the most important in this section.

1. What is the role of the market as a resource allocation device in education? What has happened as a result of the market reforms in the provision of education in the UK? How well do quasi markets work within the state system of education? Does the state provide enough choice in its provision of public education and what is the scope for private provision? How well does market led reform provide appropriate incentives to individual agents in the education system? With the year on year rises in GCSE and A level pass rates there is an annual debate about whether standards in the public examinations have been falling and what are the consequences of this falling standards? Since it is clear that the government has decreed that standards must rise and that examinations scores are the yardsticks for this performance then it is no surprise that pass rates have risen – as these are largely under the control of the government. This makes it extremely difficult to assess whether there are genuinely more young people who are qualified or whether qualification inflation is taking place. These questions are addressed in section 2.3 of this chapter.
2. Recently boys have been performing worse in school than girls. This is a difficult issue to which we return in section 2.4 of this chapter.
3. Should the school curriculum be broader from age 16-18? There is a substantial body of opinion that the A level curriculum, taking only 3 subjects, is far too narrow. We will examine this debate in section 2.5.
4. Is there a reliable way to measure school quality and what is its effect on pupil outcomes? How do we measure teacher and school effectiveness and what is the evidence on the extent to which they matter? These issues are discussed in sections 2.6 and 2.7 of this chapter.

⁸ See p6 of DfES(2001).

⁹ See p6 of DfES(2001).

5. What are the central economic resource problems of public sector provision of education? Many of them revolve around the fact that education has multiple goals and multiple principals. We discuss this issue in some detail in section 2.8.
6. How do we make public sector schools accountable? How well has the publication of school league tables worked as an information device to facilitate the working of the quasi market in school places? Can schools be made to be responsive to parental views about standards and the shape of the curriculum? Can parents exercise effective choice for the education of their children within a state system of education – or are most of them simply constrained to what is available locally? Is the prospect for real parental choice different in different geographical areas? How do we resolve the problems of Inner London school provision where most parents wish to send their children to a select few schools, which are heavily over-subscribed? Does the exercising of choice in education inevitably lead to streaming and differential treatment of ability groups and could there be resulting important consequences for inequality?
7. Perhaps the most central question in the economics of education is whether there is a link between educational resources (and the quality of provision) and subsequent outcomes. Exactly what schooling resource policy promotes better pupil outcomes? Is it the case that smaller class size and more resources will necessarily produce higher attainment in pupils? Do pupils who receive a better school education eventually earn more in the labour market? These are the major policy questions for this chapter and we devote section 2.10 to 2.14 to different aspects of this debate.
8. One of the main characteristics of schools is whether they practise some form of selection. Private schools but also publicly funded grammar schools practice selection on financial and for the latter ability criteria. Accounting for the difference in pupils' intake do selective schools achieve better results? Evidence, reviewed in section 2.15 would also be informative on the effectiveness of streaming pupils in the classroom.

This array of issues together forms the heart of the educational provision debate in the UK (and many other countries too). Many of them are debated in detail in Adnett and Davies (2002). These authors focus on three key questions: Should resources be allocated away from unsuccessful schools? Does the increased use of incentives have to jeopardise co-operation? Is increased polarisation of educational standards between good schools and bad schools inevitable? The first of these questions is perhaps the most important. School league tables

exercise a punitive resource penalty on schools that perform badly via their resulting lower enrolments. However other policies designed to reward diversity and compensate inner city schools and those groups who are currently victims of ‘social exclusion’ like EiC and the ‘Social Inclusion’ initiative will provide more resources for many schools with lower performance. Hence there are clearly contradictory elements in present policies.

There are various other educational policy issues and debates which we will not examine – partly because of the paucity of evidence relating to them. Three of the most immediate and recurrent, which capture considerable media attention are:

1. What is the rationale for, and what have been the consequences of, greater devolution of management control to schools? What are the implications of this changing management for school governance?
2. What is causing the rising truancy epidemic, what are its long-term consequences and what can be done to alleviate the problem? The main policy response from government on this issue is to blame parents and seeks to make them more responsible for their child’s attendance at school – if necessary through fining parents whose children persistently absent themselves from school. It is unclear what the effects of this policy are.
3. Why is it the case that around 50% of school children leave school without 5 GCSE A-C passes - and even more shocking – why do around 25% of school children leave school with next to no qualifications? Government response to this issue has been to try to encourage a wider range of lower level and vocational qualifications. However employers and lower ability school leavers have been slow to embrace them.

2.3 Incentives and Quasi Markets in UK Schools.

There has been a major shift in the way in which public sector education has been provided in the UK over the last 20 years. The educational system has changed to one dominated by incentive structures and quasi markets. These changes have produced a revolution in state educational provision. The results and consequences so far have been mixed¹⁰. Indeed some of these quasi market reforms have had some unintended consequences.

The general aim of the 1988 Education Reform Act was to introduce a more competitive quasi-market approach to the allocation of resources in the education system. It

¹⁰ See Adnett and Davies (2002) for a description of the ‘market-led’ reforms in the UK.

introduced financial delegation to schools and this involved the introduction of ‘formula funding’ in which school income is based directly on pupil numbers. The Act insisted on the publication of school league tables and introduced the principle that parents had the right to send their children to any school they wished. The idea was that popular schools were allowed to expand without limit, and conversely unpopular schools, mostly in inner cities, would contract or even close. The principal of parental choice and devolved school funding linked directly to pupil numbers establishes the conditions under which – theoretically – a quasi market can operate. This approach was designed to provide teachers and schools with appropriate incentives for efficiency and effectiveness. Although living within its school budget does not provide the same incentives for employees as knowing that their efforts contribute to the profit ‘bottom line’ of a firm and their earnings.

One clear feature of the state education system in the UK is that there is a lack of competition. State schools in the UK, in many areas, operate essentially as a monopoly provider. Only around 7% of school children in the UK attend independent schools. Due to the scale of their fees, for most parents, these independent schools do not present a realistic alternative to state schools. It was this lack of competition that was part of the rationale for the 1988 Education Act. The central idea behind the creation of a quasi-market in state education is the theory that competition would provide the appropriate incentives to schools to become more efficient, which may in turn provide incentives for teachers to improve their performance. However, this naïve faith in the power of market forces must be tempered by the reality that multiple tasks and multiple agents weaken the power of such incentive structures.

Empirical evidence from the USA (Chubb and Moe (1990)) supports the view that decentralized schooling systems produce better results, measured in terms of educational outcomes. The 1988 Act also devolved the administrative and financial control of schools to their head teacher and governing body in which parents gained representation. Barlett (1993) reports that the effect of the reform has been a large shift in the distribution of resources between schools. Schools in the poorest inner-city areas have received reduced funding whilst funding has increased to schools in the more prosperous areas of the county. Likewise the appointment of proactive parent governors in middle class areas is straightforward but finding any parents willing to do the job in deprived areas is difficult. Overall the effect of the quasi-market reforms on educational outcomes and efficiency in the UK is hard to judge; not least because there are several initiatives acting on the market at the same time. Nevertheless there are some micro-econometric studies, which suggest that efficiency improvements can be

directly attributed to the quasi-market (Bradley et al 2001). Specifically the authors find that the schools with the best examination performance grow most quickly and that increased competition between schools has led to improved exam performance. However, similarly to the US experience (Hoxby, 1997) increased efficiency was associated with a greater segregation between schools, as measured by the proportion of children eligible for free school meals (Bradley and Taylor, 2002). In reality access to oversubscribed schools remains rationed with some selectivity and ‘cream skimming’ operating. This has been reflected by rising house prices in localities with the best performing schools (Gibbons and Machin (2003)¹¹.

Since 1995 the government has published school league tables of the results of all schools in the UK based on national examinations for pupils aged 7, 11, 14, 16, and 18. Some commentators, e.g. Glennerster (2002) have suggested that these results show how educational standards have improved in the UK over the last 6 years. Table 1 shows a remarkable rise in the performance of 14 year olds in the UK on Reading, Maths and Science. The proportion reaching the expected standard in Reading has risen from 49% in 1995 to 81% in 2001. In Maths the proportion has risen from 45% to 70% and Science from 70% to 87% over the same period. The questions one must ask about such statistics are:

- a) to what extent are these tests based on absolute standards, which have not been manipulated by a government who have declared, as if by decree, that educational standards will rise over the next 5 years? Alternatively, have the exams become easier or have the pupils improved their performance over time because of the predictable nature of the exams and rote learning?
- b) to what extent has there been misallocation of resources towards median and marginal pupils at the threshold of achievement levels in order to maximise the number of pupils passing thresholds?
- c) if the improvement has been real – is it really a treatment effect, which results directly from the operation of the quasi-market rather than a redirection of effort on literacy and numeracy in the curriculum?
- d) Are the long-term consequences of increasing marginal standards on narrowly focussed tests in maths and English valuable for long-term educational objectives like citizenship and transferable skills?

¹¹ Hedonic models estimating school quality are reviewed in section 2.14.

- e) Is it possible to reconcile these data with results from Gundlach et al (2001) who suggest that the UK along with OECD countries has experienced a dramatic fall in school productivity over the last 25 years?

Table 1: UK National Achievement Tests at Level 3 aged 14, % Reaching Expected Levels.

	1995	1996	1997	1998	1999	2000	2001
Reading	49	57	67	71	78	83	81
Maths	45	54	62	58	69	72	70
Science	70	62	69	69	79	85	87

Source: Glennerster (2001) Table 6.

2.4. Gender differences in educational attainment.

Gender differences in educational achievement have grabbed the attention of commentators. In recent years, females have been outperforming males at all levels of education in the UK from age seven up to university. These trends in favour of females are rather recent, and can also be observed in most OECD countries (Ono, 2002). The increasing gap in attainment in favour of women reflects a reduction of the discrimination towards women but also gender differences in the attitude towards education and other non-cognitive skills, such as attention, organisation, and the aptitude to seek help (Jacob, 2002).

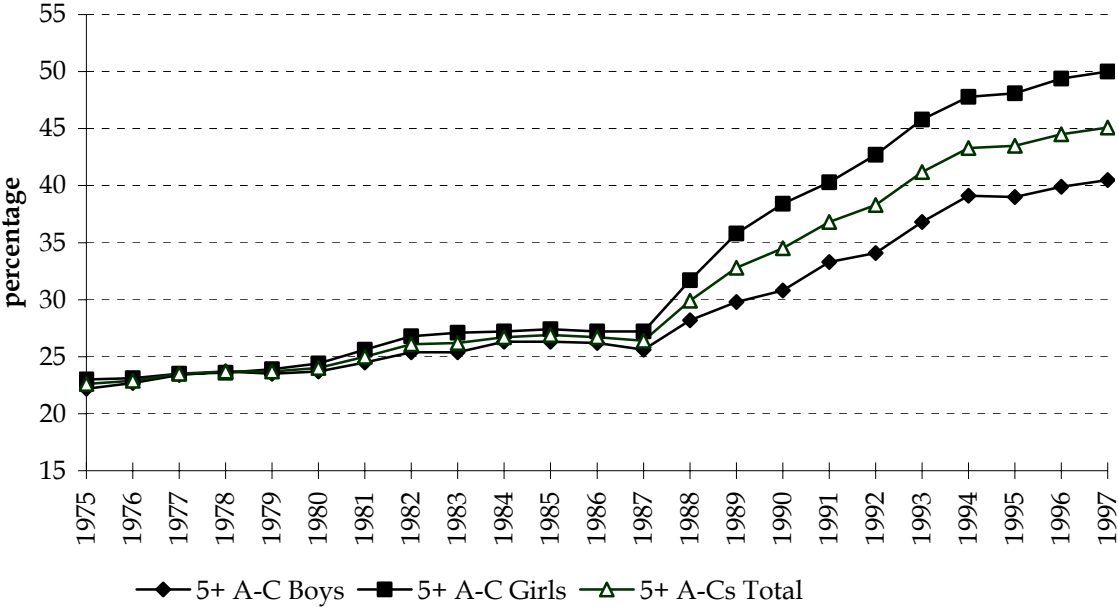
We use 'five or more grade A-C passes in GCSE or GCE/CSE at age 16' to measure academic success at school. This measure was traditionally the requirement for university entrance, but, in more recent years, has become one of the prime indicators of educational success for 16 years old. In particular, it features in the school performance tables and is a key statistic in government publications. Figure 2 reproduces the official data showing the proportion achieving this level of success in England since 1974. The most noticeable feature is the clear break in the series after 1987. Before 1987, the series appears to be growing slowly. There was then a staggering growth in the proportion with good examination performances, with 33 per cent reported in 1989 and 45 per cent by the end of the period. Whilst, boys and girls improved, the pace of improvement has been dramatically faster for girls. Girls were on average about 1.3 percentage points better than boys in the six years before 1988. This difference had quickly increased to six points in 1989 and was about nine points or more in the mid-1990s.

The dramatic change in performance would appear to be related to the replacement of O-levels by GCSEs. GCSEs differed from the earlier GCE/CSEs because they included an element of class-work and allocated marks on an absolute scale (thus abandoning the idea that a certain percentage of the population should get a particular grade). The change in the style of the examination may have produced a large improvement in results and this effect would have almost certainly continued over time as the teaching process adjusted to new system.

There were further innovations with the phased introduction of the National Curriculum and the publication of School Performance Tables.

Although main changes appear clear from the official statistics, it is not possible to construct a fully consistent series from these data because there is a major discontinuity in the series between 1988 and 1989. Dolton et al (1999) have dealt with the problem of comparability by fitting separate trend models by gender to the data before and after 1988. They then predict the performance in 1988 using estimates from the O-level period and from the GCSE period. The difference shows the effect of the introduction of GCSEs. This exercise suggests that boys have improved by an extra 1.6 percentage points while girls have improved by an extra 6.4 percentage points. These results indicate that there was a substantial increase for both sexes in the proportion of successful candidates following the introduction of GCSEs but that the gain for girls have been four times as great as that for boys.

Figure 2: Percentage with 5 or more A-Cs in England



Source: Table 1 of Statistics of Education 1997.

2.5. The Issue of Curriculum Breadth.

One of the continuing debates in the UK education system is how wide the curriculum should be in schools. Specifically policy makers often cast admiring glances across to the French system of the Baccalaureate and claim that such a system would be better for the UK. It would involve most students studying up to 7 subjects from age 15-18 instead of our 3 or 4 subjects. We have had numerous reviews of our education system and each comes down in

favour of changing to a system, which would have a wider curriculum at ages 16-18. Two important facts are often ignored in this debate. Firstly we have one of the widest curriculums anywhere in the world up to the age of 16 as most of our pupils study up to 10 subjects until this age. Second, and perhaps more important there is little evidence that a wider curriculum is economically rational. Dolton and Vignoles (2002b) find no return to studying a wider curriculum at 18 in subsequent earnings using a variety of different data sets. What is clear from their other work (Dolton and Vignoles (2002a)) is that there is a clear return from further study of Mathematics after the age of 16 even conditioning for all other educational choices and achievements. These findings should make us cautious in advocating reform of the curriculum to expand the number of subjects pupils study from age 16. In contrast it suggests that there is a real need to improve mathematics skills – perhaps to the exclusion of other subjects.

2.6. School effectiveness

School effectiveness is a relative concept. An effective school is defined as one in which students progress further than might be expected from consideration of its intake (Mortimore, 1991). In order to estimate the relative effectiveness of schools, researchers need data at pupil level on attainment at two points in time, as well as characteristics of the pupils and schools. These variables are sufficient for estimating a ‘basic’ school effectiveness model using multilevel modelling techniques that enables the variance in the attainment of pupils to be partitioned between pupils and school level. Only schools that have statistically significant differences in the size of their effect on attainment can be designated as ‘effective’ or ‘ineffective’ (Goldstein, 1997).

The same approach can be used to study classroom effectiveness under the condition that data on at least two parallel classes in each school is available. A comprehensive model of school effectiveness (Teddlie and Reynolds, 1999) includes also process factors at school and classroom level. School process factors relate to the school as an organisation and encompass its leadership, decision-making, staff-pupil and pupil-pupil relations, parental involvement, attitudes, expectations and norms. Process factors are also defined at class level and relate in particular to how the teaching is conducted and the interactions between teacher and pupils and pupils with each other. One of the aims of school effectiveness research is to identify school and class room processes that are not just related to school composition and pupil background but which have an independent effect on pupil attainment. This is a difficult

undertaking because of the difficulty of measuring processes and taking account of correlations between processes and between processes and school and pupil factors.

Studies of this 'comprehensive' model of school effectiveness are relatively rare because they require a large-scale longitudinal research design with intensive fieldwork. These studies have collected data on processes from interviews, surveys and detailed observation, particularly of teaching. Basic studies (those excluding process variables) are more numerous.

The two most influential studies on school effectiveness concluded that school matters. Rutter et al. (1979) - 12 inner London secondary schools over four years and Mortimore et al. (1988) - 50 inner London primary schools over three years - established that 'schools matter'. At primary level, after controlling for prior attainment and pupil factors, the school attended accounted for 9% of the variance in reading attainment after three years, and 11% of the variance in maths attainment. The maximum difference between the least and most effective schools was 25 points out of 100 in reading and 12 out of 50 in maths (Inner London Education Authority Research and Statistics Branch, 1986). A child from a manual working class family in the most effective school did as well as a middle class child in the least effective school. In secondary education, school accounted for 10% of the variance in attainment and pupil factors for 33%. The school effects identified as affecting effectiveness were similar to the list produced in the literature review by Sammons et al. (1995): head teacher's leadership, teachers' shared vision and goals; a learning environment, focus on teaching and learning, purposeful teaching, high expectations, positive reinforcement, monitoring progress, pupils' rights and responsibilities, home-school partnership, a learning organisation.

Later, 'basic' studies using national data sets with large school numbers have confirmed these results and found that schools account for between 5% -18% of the variance in attainment (Sammons, 1999). It is also found that after controlling for prior attainment and school composition measured in terms of eligibility for free school meals, pupils in all girls schools, denominational schools and specialist schools do slightly better at GCSE (Levacic, 2002; Schagen et al., 2002). These effects may be due to the processes associated with particular pupil compositions, which in turn are the result of selection into schools or may be due entirely to omitted pupil factors associated with the type of families choosing and being chosen by such schools.

Most but not all studies confirm that school are not differentially effective for different types of pupil ((Jesson and Gray, 1991; Smith and Tomlinson, 1989). Generally there is a

reasonable amount of stability in secondary school effects on overall outcomes and for basic skills in primary schools (Sammons, 1999) but less so for subjects at secondary schools, between which there tends to be greater variance indicating that the effectiveness of departments and teachers within schools is more variable than the total school effect ((Fitzgibbon, 1991; Sammons et al., 1997).

An important issue for investigation is whether the school effect is due to the aggregation of random class level effects or whether the school as an organisational unit exerts an influence through its leadership and climate on teaching and learning in classrooms. There are few UK studies on the class effect, especially at secondary school since this requires linking pupils to classes, which vary by subject. There is more UK evidence for primary schools, where the class-teacher link can be more easily made. For example, Blatchford et al. (2002) studies 368 Key Stage 1 classes in 220 schools in England and finds that for literacy 20% of variance is at school level, 21% at class level and the rest at pupil level after controlling for prior attainment and class size. For maths it was 15% and 22% respectively and 62% at pupil level. While ‘basic’ models of school effectiveness can, with class level data, identify the relative size of class level effects they cannot account for it without further evidence, in particular on teacher effectiveness.

2.7. Teacher effectiveness

Teacher effectiveness is defined in a similar way to school effectiveness and requires first accounting for the effects on pupils’ learning over which the teacher has no influence. It is the extent to which pupils’ attainment differs from that predicted by factors beyond the control of the teacher, such as pupils’ prior attainment, background characteristics, school and class compositional effects, and resourcing (e.g. class size, other adult support in class, teaching materials). The existence of differential teacher effects, which has strong anecdotal support, is confirmed by research (Luyten, 2003).

Given that differential teacher effects exist, the next question is how to account for them. There are two foci of inquiry: one is to investigate the practices of teachers in classrooms to identify approaches used by more and less effective teachers; the second is to examine the characteristics of the teachers themselves. From a resourcing perspective the characteristics of interest are cognitive ability, qualifications, experience and age – factors that are rewarded in the labour market. In this section we are concerned with the first focus, the second focus is commented in subsequent sections.

In the last 30 years, there have been a handful of major studies involving observations of teachers in classrooms over two or more years, which record aspects of their practice¹². These are then analysed with pupil progress measures and other pupil level data to find teaching approaches that are significantly related to pupil progress. These studies are all of primary pupils reflecting the fact that a single teacher teaches a primary class for all or most of their lessons. The findings of these studies are relatively consistent and have resulted in the advocacy of a set of ‘middle range’ strategies for teachers which are well discussed in books by Croll and Hastings (1996a) and Muijs and Reynolds (2001).

From the perspective of the economics of schooling the most interesting of the research findings concerns teacher-pupil interactions. The teacher typically spends 80% of her time in class interacting with pupils, however it is the time the pupil spends interacting with the teacher that appears to be key in determining the effectiveness of teaching. When a very high proportion of the teacher’s time is taken up with individual pupil interactions the time each pupil has to interact with the teacher can be as little as 2%. To be effective whole class teaching needs to engage the pupils by keeping them actively on task. The findings concerning the efficacy of whole class teaching (given that it still substantially less than 100%) ran counter to the popularity in the 1970s and 1980s of pupils working on their own using worksheets, often seated in groups but not interacting with each other to learn.

A more recent study of primary mathematics teaching (Muijs and Reynolds, 2000) supports both the existence of significant teacher effects and the positive effects on pupil of ‘direct teaching’. The study included 16 primary schools taking part in the Gatsby Mathematics Enhancement Programme, which promotes the use of direct teaching methods in mathematics, and 3, which were not. Teaching the whole class was not in itself effective, but was when done by a teacher using the set of effective approaches. Being taught by the most effective compared to least effective teachers contributed to between 11% and 25% of the predicted maths score depending on year group and test. Of the unexplained variance in attainment only between 0% and 9% was at teacher level, while a very high proportion of the explained variance in attainment (62% to 100%) was attributed to the fixed teacher variables. The research findings, coming the US in particular, concerning the efficacy of a set of teacher behaviours included in the ‘direct’ teaching approach have been influential in the creation of

¹² The studies are the ORACLE project in the 1970s (Galton and Simon, 1980), the Junior Years Study (ILEARSB, 1986) (the only one to nest a study of teacher effectiveness within a school effectiveness study), the ‘One in Five’ study (Croll and Moses, 1985); Primary Assessment, Curriculum and Experience Study (36 teachers over 4 years in 18 schools) (Pollard et al 1994).

the National Literacy and Numeracy Strategies, though these themselves were not extensively evaluated using experimental research designs.

To judge teacher effectiveness and support assessment of teachers for performance related pay, teachers deemed to be effective and other teachers were observed, responded to questionnaires and so did pupils and colleagues (DfEE, 2000). The effective teaching skills are not dissimilar to those found in previous academic research: high expectations, time on task, lesson flow, planning, methods and strategies, pupil management, time and resource management, assessment, homework. School climate encompasses clarity, order, standards, fairness, pupil participation, support and feelings of safety. These factors are consistent but more amplified than the strategies, which make up 'direct teaching'.

From an educational production perspective, it is to be expected that pupil progress is positively affected by the amount of time the pupil is actively engaged in learning. Indeed time on task is one of the factors found to be significant in teacher effectiveness studies. An important strategy is therefore to keep as many pupils as possible engaged in active learning concurrently and whole class direct teaching aims to achieve this. In this way the loss of teacher time in larger class can be offset by more effective whole class teaching. These aspects of the nature the production techniques for achieving learning provide a plausible explanation of the lack of consistent evidence that reducing class size improves learning outcomes (see below).

A recent review of US studies on teacher effectiveness (Wayne and Young, 2003) found 21 studies, which had an acceptable research design for inclusion in their review. Wayne and Youngs conclude:

The studies confirm that students learn more from teachers with certain characteristics. In the case of teachers' college ratings and test scores, positive relationships exist. In the case of degrees, coursework and certification findings have been inconclusive except in mathematics where high school students clearly learn more from teachers with certification in mathematics and course work related to mathematics p. 107).

2.8. The Economics of Public Sector School Provision.

Comparing schools requires some clear measure of school performance, which relies on student attainment as the main outcome measure. Many educational researchers have come to the conclusion that the 'student level gain score' (or value added) measure of student

performance between years is the most valid as it conditions out for the level of attainment prior to the period when the educational performance is observed.

There are other subtle ways in which the inputs and outputs of the education production process are difficult to observe. The raw material, or input, a teacher works with is highly variable. It is well known that the problems of teaching the same material to children from poor homes in deprived area is more difficult than teaching to motivated children from middle class homes. Even if one tries to measure 'value-added' in terms of improvement of exam scores these can be a distortion of the improvement in attainment as such a calculation assumes that other factors and their influence are fixed over time (typically family inputs are not fixed across homes). Another important limitation of naïve achievement gains models is that a pupil's learning may not be apparent until years after their schooling. Often the value of what is learnt by the pupil is not apparent, used or tested until several years after.

There is now widespread evidence that incentives work in education. The issue is designing incentives structures that are not subject to distortion or 'gaming'. The education production process is very reliant on teacher labour as the most important factor of production. In practice it is very difficult to write complete labour contracts in education to generate the appropriate incentives from teachers. To a large extent this is a principal-agent problem. However there are several extra dimensions to this problem in education.

The essential problem of public sector educational provision is that education is not a single output and any education system must have multiple goals. Dixit (2000) lists the multiple goals of public education as:

- 1) Imparting basic skills of literacy, mathematics and science for communication, reasoning, and calculation.
- 2) Fostering the emotional and physical growth of children.
- 3) Preparing students for work, by teaching them vocational skills and attitudes suitable for employment.
- 4) Preparing them for life, by teaching them skills of health and financial management.
- 5) Preparing them for society, by instilling ideals of citizenship and responsibility.
- 6) Helping them to overcome disadvantageous circumstances at home, including in many cases poor nutrition and poor study environments.
- 7) Providing an environment free from drugs and violence.

Hence the essential problem of education is how to direct effort in a multiple environment. Dixit suggests that although these goals are not mutually contradictory they do compete for resources. To this degree they are alternative outputs in the educational production process and teacher effort put into one of these objectives may detract wholly, or in part, from one or more of the other goals. The general result from the principal-agent literature is that the agent will have an incentive to divert effort away from the less accurately measured task. Hence it is shown that if the principal wishes the agent to allocate effort towards a task that is not easily measured then incentives on the measurable tasks must be weakened.

The second essential feature of any education system is that it has multiple principals. As a consequence the actions of any individual teacher (agent), could be affected by many other people (principals) who are in a position of influence. Most specifically the wishes of parents, head teachers, teacher unions, local or federal authorities, taxpayers, employers, religious and ethnic pressure groups, governors and even pupils may influence the actions and decisions of individual teachers. However, Dixit (1997) shows (under regularity conditions) that the existence of several principals makes the overall incentives for the agent much weaker. This weakening of incentives occurs because each principal will seek to divert the agent's effort to his most preferred dimension. Obviously the more principals that are involved with competing interests the more diluted will be the incentive structure for the agent.

2.9. Accountability in Schools.

In the UK, the system of accountability in school works through: the publication of school examination results, the (theoretical) right of parents to send their children to any state school, the presence of parent governors on school governing bodies, and regular school inspection by OFSTED to monitor standards.

What might be the consequences of this accountable public education system? To answer this we need to be more precise about what we mean by accountability. The concept of accountability is a difficult one. Fearon (1999) suggested that 'one person, A, (the agent) is accountable to another B (the principal), if two conditions are met. First, there is an understanding that A is obliged to act in some way on behalf of B. Second, B is empowered by some formal institution or perhaps informal rules to sanction or reward A for her activities or performance in this capacity.'

Any system of accountability should create incentives – although such incentives may not always have desirable consequences. It is unclear whether the mere publication of

information on standards in schools will provide an adequate incentive for efficient resource allocation. Surely a necessary (but not sufficient condition) for such efficiency, is that this accountability be directly linked to the power of consumers to choose alternative providers in a competitive market. Dolton (2002b) suggests that *effective accountability in education* necessitates:

- i) that the education system provides consumers with full information to make decisions.
- ii) that consumers have the power to influence the balance of priorities across the multiple goals of educational provision.
- iii) that the consumers have the means to choose alternative providers in a competitive or quasi-competitive environment
- iv) that any incentives which operate on education providers do not act to distort their incentives regarding their provision in ways which are counter to the wishes of consumers.

A definition of accountability which includes customers wishes relies on: being able to identify who these customers are; identifying correctly what their views are; aggregating their views into a consensus to establish what the ranking of priorities is; and then implementing these views effectively.

We also have to assume that the views of parents are responsible and representative of the whole customer base. Such an assumption may be unrealistically ideal. Aoki and Feiner (1996) discuss how the parents views which are more effectively heard are disproportionately those who live in affluent areas, are more highly educated and have higher status occupations. Such evidence means that establishing precisely who an educational system is accountable to, and what is the mechanism for the transmission of the influence, is important. Most concretely, are the customers for education the parents or the pupils? Undoubtedly the priorities of the pupils, if consulted, may be different to their parents.

At the heart of effective public service provision is the possibility of competition amongst providers. Unless there are alternative schools for parents to send their children to there is no incentive mechanism for each school to compete in the quasi market. Another problem with this model is if there are private schools outside the public sector. In the context of the present system where private and state schools co-exist, there is the 'exit and voice' (see Hirschman (1970)) issue. This problem is that there will not be an effective

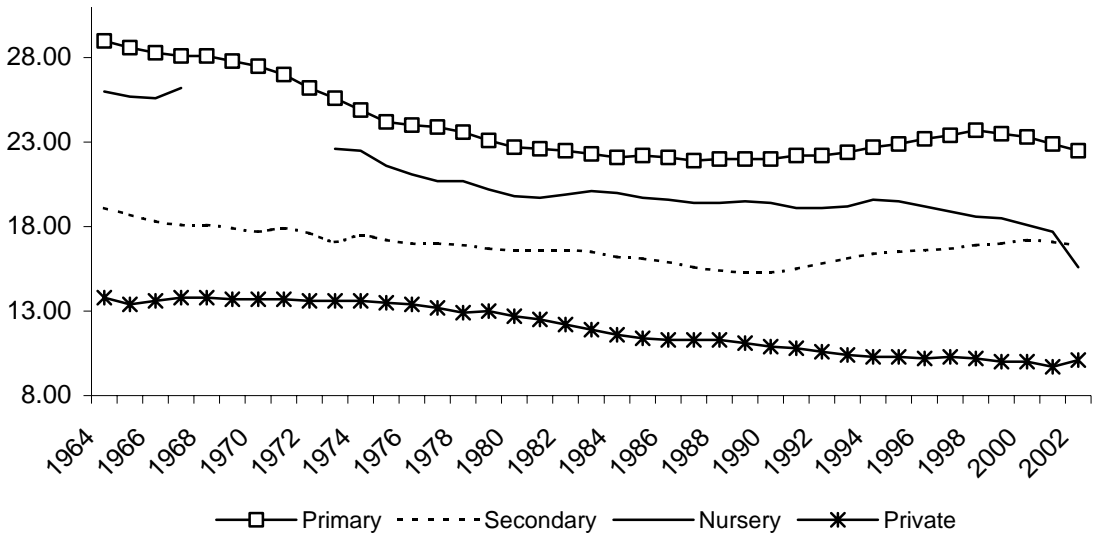
mechanism for change if the most influential parents choose to ‘exit’ from the state schools to the private schools rather than ‘voice’ their views in an attempt to change the state schools.

2.10. Class size evidence

Reductions in class size have the advantage of being visible, easily understood and easy (but costly) to implement and benefit from the broad support of parents. As an example of its popularity with parents, most private schools advertise their lower class size compared to state schools. Whilst most agents advocate smaller class sizes, there is little evidence that it benefits pupils. Pupil teacher ratios have fallen at all levels of schooling up to the early Nineties before increasing, concomitantly with the excess demand for teachers (see Figure 3).

Other components of school quality exist and most of the literature has concentrated on easily observable measures such as expenditure per-child, pupil/teacher ratio and teacher’s experience, qualification or pay. Since teachers’ salary are nationally determined on a pay scale with a yearly increment, variation in average teacher salary mostly reflects the teachers’ seniority rather than their quality or the local labour market conditions thus, our decision to focus on class size as a measure of school quality.

Figure 3: Evolution of the pupil-teacher ratio in England: 1964-2002



Source: Department for Education and Skills, www.dfes.gov.uk

2.11. Modeling school quality

Various strategies have been used to estimate educational quality effects¹³. The first and maybe more direct is to focus on measures of the pupil educational attainment. Alternatively, one may prefer capturing long term effects and estimate the impact of school quality on earnings. Let us define Y_i as the outcome of interest and Q_{is} as the measure of schooling quality. Model (1) imposes that quality produces the same shift in wages for all individuals over and above any effect that quality may have on schooling achievement (S_i). X_{is} is a vector of individual i and school s characteristics and may include ability, as in a value added model.

$$\text{Model 1:} \quad \ln Y_{is} = \beta Q_{is} + \gamma S_i + \rho X_{is} + \mu_{is}$$

Model (2) relaxes the assumption that the effect of quality on earnings is the same at all level of education, by including an interaction term between quality and schooling attainment.

$$\text{Model 2:} \quad \ln Y_{is} = \beta Q_{is} + \gamma S_i + \delta Q_{is}S_i + \rho X_{is} + \mu_{is}$$

Whilst allowing for heterogeneity in the effect of quality on earnings, Model 2 may still underestimate the effect of schooling quality if higher quality schooling induces pupils to remain in education longer. To capture the total effect of schooling quality on earnings, a simple reduced form model can be estimated.

$$\text{Model 3:} \quad \ln Y_{is} = \beta Q_{is} + \rho X_{is} + \mu_{is}$$

Model 3 is the most flexible model, but does not allow researchers to conclude on the origin of the quality effect.

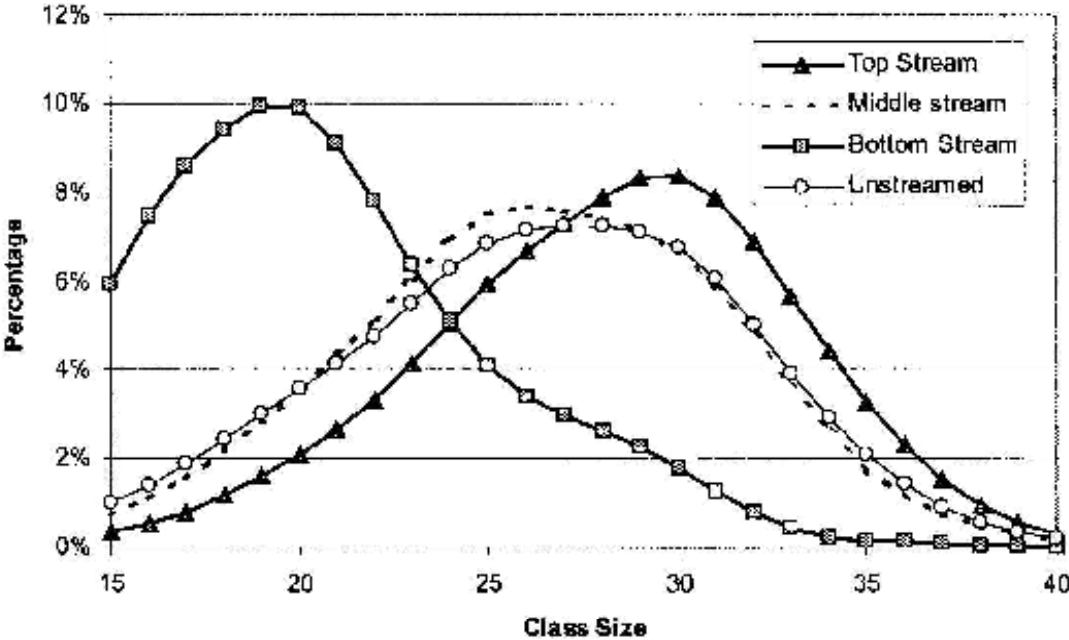
The main difficulty in estimating the effect of quality on schooling achievement or wages comes from the endogeneity of the schooling quality variables. Parents and schools take decisions regarding the school and class attended by the young person, so that quality is randomly allocated to a pupil. Schools may stream students and allocate students with more difficulties to smaller classes in order to prevent them disturbing more able pupils (as implied by Lazear, 2001) or to provide them with more teacher's attention. Iacovou (2002), reproduced in Figure 4, provides evidence that schools allocate lower ability individuals to sized classes thus, pupils in smaller classes may have lower achievement.

Figure 4 shows the distribution of class size in English at age 16 by ability stream. For schools not practicing streaming, the distribution of class size follows a normal distribution and the median size is around 28. For schools streaming by ability, the distributions are skewed and the median class size for pupils in the bottom stream is 20, but reaches 30 for

¹³ For a complete exposure of the difficulties in modelling quality effects, the interested reader is referred to Todd and Wolpin (2003) or Vignoles et al. (2000) for a UK review.

pupils in the top stream. A strategy to reduce endogeneity problems is to aggregate the quality data, to the school, LEA or even state level. The aggregation strategy may lead to biased estimates (Hanushek et al.,1996).

Figure 4: Distribution of Class size in English by Stream



Note: Source: Iacovou (2002)

2.12. Quality and educational performance

The British literature has mostly focused on the National Child Development Study (NCDS) a longitudinal survey of all the children born during the first week of March 1958. The NCDS contains a wealth of information on parental background, school characteristics but also ability.

A- School data

Rather than using individual data, school level data can be used to estimate the effect of quality on pupils’ achievements. Two early papers using this approach were Bee and Dolton (1985a and 1985b). These papers rely on a rich dataset on independent schools in the UK to provide evidence of resourcing effects in terms of pupil teacher ratios on school outputs, and costs and economies of scale effects. More recently, Graddy and Stevens (2003) constructed a sample consisting of 267 secondary private schools observed over the period 1988 to 1994. One advantage of a private school sample is that endogeneity due to parental choice is reduced since all have a high interest in the education of their children (mean annual fees are

about 40% of the median household income). Furthermore, whilst the private sector is heterogeneous, within schools students tend to be fairly homogenous. The authors focus on an elitist measure of achievement at 18: the proportion of A-grades at A-levels and estimate an elasticity of pupil-teacher ratio of 0.36. These results hold when school fixed effects are introduced and also within school.

Bradley and Taylor (1998) map school league tables with school characteristics for all secondary schools in England over the period 1992-1996. Pooling all data they find no effect for teaching staff characteristics (hours of support staff per pupil, percentage of qualified teachers and pupil/teacher ratio) either individually or jointly. When estimating the determinants in the improvement of the proportion of students reaching 5 GCSE at grades A* to C over the period, they estimate that an increase in the pupil/teacher ratio by one pupil, increases the performance of the school by 0.4 percentage point.

A drawback of school level data is the limited information available to control for pupil characteristics and the endogeneity of the quality measures. These problems can be reduced by including school fixed effects, but then it is unclear what the driving force of the change in quality over time are; for example, is the pupil-teacher ratio improving because pupils are disappointed with the school and leave it, or does it reflect a strategy of the school of recruiting more teachers? Keeping these caveats in mind, school level data provides some evidence of weak effects of quality on achievement.

B- Evidence based on individual data

Most studies rely on the NCDS and estimate the effect of school quality for England and Wales¹⁴, the exception being McVicar (2001) who uses a small survey of school leavers in Northern Ireland. Studies based on the NCDS generally claim that the richness of the data allows to control for parental characteristics, family, school and neighbourhood characteristics and thus reduces the endogeneity problem. This assumption is confirmed by Feinstein and Symons (1999). Using local authorities dummies to instrument pupil-teacher ratio they conclude that after including controls for family, school and neighbourhood background, the endogeneity bias of the pupil teacher ratio is not an issue when estimating its effect on test score.

¹⁴ Scotland and Northern Ireland are dropped in most studies including local information since local education authorities data for these provinces are not obtainable on a consistent basis. Differences between the Scottish and the English and Welsh education system would make National interpretation of the results problematic.

The UK studies confirm the overwhelming importance of prior attainment/ability and family background variables in determining educational attainment. Dearden et al. (2002) provide an extensive analysis on the effect of school quality on educational attainment, wages and wage growth. Their measure of quality is the pupil teacher ratio measured at the school level. They also control for the school type (selective private, selective public and single sex school), ability, using tests at age 7 and 11, and family background. School quality has no effect on qualification nor years of post-compulsory education (Harmon and Walker, 2000).

Rather than looking at the highest qualification obtained, Dustmann, Rajah and Van Soest (2003) estimate the effect of school quality on the probability of staying past compulsory schooling age and suggest that the effect may be non-linear. Contrary to the previous studies, Dustmann et al. find a significant effect of school quality on the staying on decision; increasing the teacher-pupil ratio by one standard deviation, leads to a decrease in the probability of staying on of 4 percentage points. Despite increasing the probability of staying on post-compulsory education, school quality has no effect on the numbers of O-levels taken. The effect of class size on participation in post-compulsory schooling is significant and tends to be stronger for boys¹⁵. However, it is dwarfed by the effect of school type. Attending a grammar or a private school increases the probability of staying on by 12 and 17 percentage points respectively.

Heterogeneity in the effect of pupil teacher ratio is also found by Mc Vicar (2001) in his study of the decision to stay on among Northern Ireland School Leavers (1993). Despite the small sample size and lack of controls for previous achievement¹⁶, McVicar reports that the pupil-teacher ratio has a counter-intuitive effect on the decision to follow the academic track but a significant negative effect on the choice of a vocational qualification. This suggests that the effect of school quality is non-linear and is more relevant for pupils with lower ability or a lower 'taste for schooling'. The effect of quality on taste for schooling is also supported by Dustmann et al. (2003). For males, reducing class size by one, reduces the probability of truancy by 2 percentage points. This result does not hold for women.

Accounting for the endogeneity of the pupil teacher ratio (using LEA dummies) but also parental interest in the child (using interest at age 7) and peer effects (LEA mean

¹⁵ For boys increasing the pupil/teacher ratio is also associated with an increase in the probability of joining a training scheme while for girls it leads to a higher proportion joining the labour force.

¹⁶ The lack of ability measure is compensated by the inclusion of school type dummies. Northern Ireland schools are characterised by segregation along ability and religion. While 5% in pupils in the Britain are in grammar schools, this proportion is 30% in NI. Children are tested at age 11 in order to enter a grammar school. This sorting provides some controls for previous ability. However, parents have also the choice of sending their child to schools of different type: schools can be Catholic, Protestant or non-religious. This choice affects the funding of the school, peer effect and potentially other characteristics observables or not of the schools.

characteristics), Feinstein and Symons (1996) find no significant differences from OLS estimates. For both English and Mathematics, the authors are unable to find a significant effect of the pupil-teacher ratio. Iacovou (2002) on the other hand, relying on the interaction between school size and school type, as an exogenous variable, estimate a reduced form model of the effect of class-size on reading achievement at age 7. Reducing class size by one pupil increases the reading score by 0.036 of a standard deviation. This is 50% larger than increasing maternal education by one year. Surprisingly, class size is found to have no effect on mathematical achievement at age 7. Iacovou suggests that the mathematical test at 7 may not capture mathematical ability since it is less correlated with mathematical achievement at age 11 and 16 than the age 7 reading test. But this could also indicate that the identification strategy is not valid. Also, the positive effect of class size on reading at age 7 is homogenous, and no difference can be found by gender or social background. Even more surprisingly, reduction in class size has similar effect for large (above 30 pupils) and small classes. The effect of class size fades and by age 11, having been in a smaller class at age 7 has no longer any significant effect on achievement.

Finally, relying on the Programme for International Student Assessment (PISA) for evidence of class size effects in secondary schools, Chevalier (2003) using teacher shortage and lack of physical space in the school as instruments for teacher ratio estimate the following effects: for men, decreasing the pupil teacher ratio by 10% (1.5 pupils at the mean) would increase test scores by 4 to 6 points (1% at the mean score). For women, the estimates are closer to zero and insignificant. The effect of teacher resources on test scores is not economically insignificant.

C Recent class size studies

Two recent class size studies have found this variable to be negatively and significantly related to pupil attainment in primary schools. Blatchford et al. (2002) using longitudinal data studied over 9000 children in the first three years of school (ages 4 to 7) in 368 classes in 220 schools in England. Two measures of output are used – a Literacy Baseline test and a specially developed test of numeracy (maths). Control variables are the prior attainment (baseline) tests in literacy and maths, child's term of entry to school, age, gender and eligibility for free school meals (an indicator of family poverty). Class size was recorded in each term and the average class size over the school year used as the appropriate measure. The methodology is notable for using multilevel modelling and for non-linear modelling of class size. In both literacy and maths there was a larger effect of smaller classes on low

achievers, whose achievement declined with class sizes up to 30. For high and middle attainers, there was little further negative impact of larger classes above 22¹⁷. The authors report that a decrease in class size of 10, at sizes below 25, was associated with a gain of about 1-year in the achievement of low attainers and of 5 months for other pupils. Preliminary analysis indicated that an increased number of adults in the class (e.g. teaching assistants) had no effect on attainment.

Dolton (2002a) is the first to attempt to isolate the disruptive element associated with the peer group effects in classes streamed by ability. By use of class list data he computes a proxy index variable for disruption using the number of pupils in that class with special educational needs. His results provide limited evidence from one school in which pupils are streamed for Match classes but not for English. He finds that without the disruptive index a pupil attainment equation has a counterintuitive sign on class size. However controlling for the disruption index, the smaller classes produce better pupil attainment (having conditioned for attendance, family background and other factors). This paper provides first limited evidence of the Lazear (2001) conjecture on the importance of peer group effects for educational production function mis-specification.

To conclude, studies in the UK find weak evidence that for younger children, smaller class sizes are associated with higher test scores but these effects are not permanent and disappear as the pupil ages. Smaller class size is associated with other positive outcomes. Pupils, especially boys, taught in smaller classes are less likely to truant and more likely to invest in post-compulsory schooling. The effect of school quality also appears to be non-linear with lower achievers benefiting the most.

2.13. Returns to school quality

While quality of schooling has little effect on educational achievement, it may have some long-term impact on labour market outcomes; if for example, the quality of schooling has a positive impact on non-cognitive skills. The US literature on the effect of school quality on wages has reported mixed results. Card and Krueger (1992) found large returns to schooling quality, measured at the State level, but these effects disappeared when relying on individual data regarding schooling quality (Betts, 1995)¹⁸.

¹⁷ Class sizes above 35 were not included in the study.

¹⁸ For recent surveys on American evidences on school quality effects see Krueger (2003) and Hanushek (2003).

A- Aggregated data

Little evidence exists in the UK that relates pupil labour market performance with the level of educational resources devoted to their education in financial terms, partly due to the lack of appropriate data. Replicating Card and Krueger (1992) using the NCDS, Campbell (2001) implements a two-stage strategy where returns to education at age 33 are estimated separately by LEA. In a second stage the estimated coefficients on the LEA dummies become the independent variable and are regressed on LEA characteristics reflecting school quality and the labour market. While the author reports variations in the returns to education by LEA, none of the measures of quality (pupil-teacher ratio, expenditure per pupil, teacher salary, proportion of pupils in Grammar or single sex schools) is significant. While quality of schooling differs between LEAs, as measured by disparity in wages, it is unclear which characteristics matter. Aggregate data are not informative about the mechanism by which the education production function can be improved.

Dolton et al. (1999) using the Youth Cohort Surveys (YCS) find that where Local Education Authority expenditure per pupil was higher, individuals were less likely to be unemployed on leaving school. Further work by Dolton et al. (2003) has suggested that school resources have stronger effects on school outcomes than labour market outcomes but that the latter are still evident.

B- Individual level data

The most recent and econometrically sophisticated studies from the UK have used the NCDS. At age 33 but not 23, school quality affect wages, however, these quality effects disappear when controlling for qualifications (Dearden et al. 2002, Dolton and Vignoles, 1999, Harmon and Walker, 2000)¹⁹. So schooling quality impact of wage growth but only through its effects on qualification obtained. For women, reducing pupil teacher ratio by 1 increases wages at 33 by 1%. This effect of attending a small class is stronger for low ability female.

Dustmann et al. (2003) contest the conclusion that pupil teacher ratio has no effect on adults' wages, and claim that this result is driven by the estimation strategy. Using a reduced form, as in the rest of the literature, they report negative but insignificant effect of the pupil teacher ratio on wages. However, a "structural model", where the effect of class size on the probability of staying on post-compulsory schooling and the impact of post-compulsory

¹⁹ The absence of positive effect at age 23 is an artefact: pupils in higher quality schools get more education and have therefore less work experience. Since the wage profile is steep early on, the reduced labour market experience of pupils in selective schools could negate any positive effect of school quality on earnings.

schooling on adult's wages are estimated separately, leads to more precise estimates. At age 33 and 42 and for both gender, increasing class size by one pupil reduces wages by 0.3%. A reduction of class size by 5 pupils has a mean present value of £3,800 (2003 prices). This estimate may be biased downwards by as much as 50% since Harmon and Walker (2000) have shown that returns to post-compulsory schooling are underestimated by 50% when estimated by OLS

In their structural model, Dustmann et al. (2003) impose the assumption that the class size effect on wages operates solely through the effect of class size on qualification. Dearden et al. (2002) test an alternative, where class size may affect attachment to the labour force. Rather than relying on the history of labour force participation, the author focus on a single point in time and do not find any effect of school quality on participation to the labour force at age 33.

To summarise this section on the returns to quality of education, most studies have found insignificant or a marginally positive effect of educational quality on earnings. As demonstrated by Dustmann et al., the lack of significance of the estimate may be due to modelling strategy. Dustmann et al. recommends using a structural model rather than the reduced form model. Also, evidence based on the NCDS may be dated. The educational system has changed compared to the one in place in the 1970s. Class sizes in primary schools were about 28 compared with 22 currently. Furthermore, the NCDS was the first cohort affected by the raising of the compulsory school leaving age, which means that the labour market would have been supply-constrained especially for individuals with low skills²⁰. Those who went to university were also affected by a macro-economic shock, as they reached the labour market in 1979, the first year of the recession. In the following three years, unemployment rose from 1 to 3 million. These two macro-economic shocks may have undermined any positive effect that school quality had on wages.

2.14. The Hedonic Model

The absence of clear quality effect may be due to researchers not focusing on the correct measures of quality. It is possible that quality of schooling is not directly observable to the researchers but that parents have better information. Parents' decision to dwell is affected by various characteristics of the neighbourhood; low crime, shopping, amenities, but in a system

²⁰ Nickell (1993) provide evidence that the number of school leavers during the academic year when the new school leaving age was implemented was half the usual number

where schools have a defined catchment area²¹, the quality of the local school is likely to be an important determinant. Hence, a hedonic property price model can be used to estimate the value that parents attach to school quality. Hedonic price models are extremely sensitive to omitted variable bias. Any unobserved amenity biases the estimate of the school effect. Also, some characteristics of the neighbourhood, peer effects for example, are endogenous to the school quality. Thus, instrumental variables are used to estimate the effect of school quality on house price. Two such studies are reviewed here, which value quality in primary schools (Gibbons and Machin, 2003) and secondary schools (Rosenthal, 2003) in England.

Gibbons and Machin use average price for four property types at the postcode level and compare adjacent postal sectors (to eliminate neighbourhood effect). The instruments for school quality are the school denomination (public or church based) and the age range covered. Accounting for endogeneity, the impact of school quality on the average house price doubles²². Increasing the average test score in the area by 5 percentage points adds 4.4% to the value of the average house in the South East and the North of England, and 2.7% in the South West of England.

Rosenthal (2003) maps individual data on individual house prices (from a nationally representative Building Society) to the nearest non-selective public school²³. This detailed dataset allows him to control for the dwelling characteristics and local area fixed effects. The instrument for school quality is whether the school was inspected for quality in the last two years²⁴. Rosenthal's estimates of the effect of school quality on house price are 1/10 of those found on primary school by Gibbons and Machin. Some of the difference may be due to parents valuing a primary school more since an early intervention has higher returns but part of the discrepancy between these two studies is likely to stem from differences in the data and modelling. While parents value school quality these studies do not allow us to put a precise value on school quality.

Additionally, Gibbons (2002) finds that pupils located in schools in higher income areas did significantly better than pupils in schools in less well off areas. However, once the specific characteristics of the area are taken into account (especially neighbourhood

²¹ Living within the catchment area of a school is not the only criteria used by school and may not guarantee a place at the school of choice, it nevertheless increases the odd substantially (see Gibbons and Machin, 2003 or Rosenthal, 2003 for a detailed description of the school selection process in England).

²² Gibbons and Machin (2003) suggest that omitted neighbourhood characteristics bias is not important and that, on the contrary, OLS are biased downwards because of the noise components of the school quality measure.

²³ Rosenthal (2003) discuss this issue in detail. To summarise, 15% of schools discriminate by ability, sex or religion and are omitted from the sample of schools used.

²⁴ Inspection is related to the school quality since schools prepare themselves when informed that an inspection is imminent but independent of the neighbourhood characteristics

composition and residential selection on prior school performance), the relationship between average incomes and school performance disappears. In other words, it is the characteristics of the people living in a particular area, not the incomes they earn, that determine school performance. Gibbons finds a wrongly signed negative relationship between number of teachers per pupil in schools and pupil attainments, even allowing for prior attainment, local area characteristics and other factors. However, allowing for lagged school performance, a weak significant positive effects from teacher inputs, and indeed from higher educational expenditure are estimated. However, these resource variables are not nearly as important as other variables, including location variables. The latter explain around five times as much of variance in primary school performance as do the resource variables. He also notes the small magnitude of the resource effects. A one standard deviation increase in the number of qualified teachers per 100 pupils (0.486 in 98/99) would increase average school performance by just around 1.3 percentage points and cost around £360 million. An additional expenditure of 10% per pupil would cost around £684 million, and generate an increase in average school performance of just 0.4 percentage points.

2.15. Selective schools

As in the US, returns to selective schools are controversial. For example, Dustmann et al. (2003) estimate that even after accounting for age 7 and 11 test performance and parental interest, pupils attending grammar or private schools obtain 0.8 more O-levels than pupils in comprehensive schools. Similarly, Dearden et al. (2002) estimate large financial returns for attending a selective school for men but not women. This premium subsists even when controlling for highest qualification obtained. For example, Naylor et al. (2002), estimate that university graduates who went to an independent school receive an earnings premium of 3% compared to other university graduates. This premium is driven by the top 20% schools and is positively related to the fees but not to observed measures of school quality.

Harmon and Walker (2000) dispute these findings and find that attending a grammar school only had a positive effect on earnings for individuals with low mathematical ability. While this sounds laudable it is rather suspicious that individuals with low math ability at age 7 would have passed the entrance exam for grammar school. This suggests that either math score at age 7 is not a good predictor of future math performance or that this estimate is biased by lack of common support. Additionally, the lack of effect of selective schooling on post-compulsory schooling attainment and wages may also relate to the controlling for peer

effects. Naylor et al. (2002) also found that the distribution of parental social class was a significant determinant of the independent school earning premium.

Since education at a more selective school is not random, Dearden et al. (2002) are concerned that their results may be driven by a lack of common support, and estimate by propensity score matching the effect on adult earnings of attending a selective school. Whilst 90% of the treated observations are matched, the estimates are rather imprecise: attending a selective school increased the wages at age 33 of males by 10% and females by 3.5% (Treatment on the treated).

In the UK, children attending selective schools in the Seventies appear to have later on in life more positive outcomes than their peers. Whether the positive effect of selective school is due to better teachers, a more efficient organisation of the school or simply a peer effect is an important issue that needs to be explored in order to improve schools all over the country. Accounting for initial ability and family background, grouping pupils by ability is associated with large positive effects. For example, Feinstein and Symons (1999) estimates that after accounting for the endogeneity of these variables, a better peer group, streaming or grammar school increases test scores in English at age 16 by 9%, 3.5% and 7% respectively.

2.16. Conclusions.

Although the market led reforms of the education system have – for the most part – worked well in the UK in terms of creating incentives in the system to improve performance in schools - there are clear signs of the problems they created. At the time of writing, changes in the formula funding schools have led to many schools being virtually bankrupt and left them with no choice but make some teachers redundant during the summer of 2003. In addition there are still large scale problems in the principle of ‘free choice’ in inner city areas, especially London. Clearly the incentive advantages of devolving decision making down to the level of the school are accompanied by problems which are yet to be solved.

What makes a school successful is still unclear. Whilst educationalists have pinpointed at school ethos and class room organization, economists have found mixed results for characteristics that are more easily observable. So far, at best, the pupil teacher ratio has been found to have a limited positive impact which is dwarfed by the effect of other school characteristics like selection. Before advocating that tracking should be implemented it would be desirable to assess the relative effect of pupils teacher ratio and selection, not only at the mean but for the whole population of pupils. Similarly, the characteristics that make a good teachers are not easily observable by researchers and do not include those that are used to

reward teachers. Parents may have better information regarding the quality of schools and teachers since there are some evidence that they are ready to pay a premium to dwell in the vicinity of a good school.

Finally, the overwhelming majority of research summarized here is based on the experience of the 1958 cohort when the British schooling system faced a different environment compared to most recent cohort. In order to estimate the current production function of schools, there is an urgent need for a linked pupil, teacher and school panel dataset with which researchers could disentangle the effect of peer group, class size and teacher quality. Such datasets have recently been created in other countries and will be becoming available in the UK in the near future.

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