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Education Interventions**

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*London School of Economics  
and IZA*

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IZA

P.O. Box 7240  
53072 Bonn  
Germany

Phone: +49-228-3894-0  
Fax: +49-228-3894-180  
E-mail: [iza@iza.org](mailto:iza@iza.org)

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## ABSTRACT

### Some Remarks on the Effectiveness of Primary Education Interventions<sup>\*</sup>

In this paper I survey the recent economics of education literature in order to identify which education policies can effectively improve the quality of primary schooling, as measured by pupil test-based achievements. Particular attention is devoted to the experience of England, a country which has made substantial investments over the past decade aimed at improving its primary education. Evidence suggests that broadly scoped resource-based programmes deliver less than more targeted policies. Additionally, a growing body of research shows that interventions that enhance choice and competition among education-service providers, and motivate teachers through pecuniary rewards, have some scope in raising education standards. I conclude my survey by discussing some broad concerns with modes of education provision centred on choice and competition, mainly pupil segregation along the lines of ability and family background.

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Corresponding author:

Olmo Silva  
Department of Geography and Environment  
London School of Economics  
Houghton Street  
London, WC2A 2AE  
United Kingdom  
E-mail: [o.silva@lse.ac.uk](mailto:o.silva@lse.ac.uk)

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## 1. Introduction

Schooling and education are central to policy debates in both developed and developing countries, and there are several reasons why human capital has become so prominent in both economic and political discussions. First, it is well recognised that education is one of the ‘best investments’ individuals can undertake. This claim is backed by an extensive literature on the private monetary returns to education, started by the seminal writings of Mincer (1974) and showing that schooling significantly raises individuals’ income and overall labour market prospects (see Card, 1999 for a review). Additionally, education is associated with other non-monetary individual benefits, such as better physical and mental health, lower involvement in crime and illicit activities, and longer life expectations (see among others Blanchflower and Oswald, 2004; Chevalier and Feinstein, 2006; Grossman, 2005; and Lochner and Moretti, 2004). Finally, the macro-economic literature has highlighted the importance of human-capital accumulation for the growth and development of a nation (see Barro, 1991; Krueger and Lindahl, 2001; and Van Reenen and Sianesi, 2003).

The prime focus of this paper will be on primary schooling in developed countries. While the case for improving the early stages of education in developing nations is an easy one to make (there is still a widespread lack of primary education coverage), it may seem far less obvious that much still needs to be done in order to improve primary education in developed countries, and that this matters for both individuals’ life-long learning and the economic development of their societies.

Generally speaking, recent macro-economic evidence (Hanushek and Woessmann, 2007) suggests that secondary and tertiary education are *not* the only forms of human capital that are relevant for the growth of countries. Rather, it is the interaction between higher levels of education and *core skills*, crystallised at the earliest stages of education, that plays a prominent role in improving one country’s economic prospects. To complement these arguments, there is abundant micro-economic evidence that core skills, such as literacy and numeracy, are best learnt

during the primary stages of education, and that there are very high returns in the labour market to these basic forms of expertise (Denny *et al.*, 2003; Machin and McNally, 2004; and Mercenaro *et al.*, 2007). Recent micro-based research also shows that early educational attainments are crucial determinants of future education outcomes, including the probability of dropping out of school and enrolling at university (Carneiro and Heckman, 2002; and Dearden *et al.*, 2004), and that interventions that target the earliest stages of education are in a better position to counterbalance the adverse effects of a poor family background and other forms of disadvantage on the learning of young individuals (Heckman, 2000).

Having made the case for the importance of primary education in general, the question is whether there is any scope for improvement in developed countries or if the margins for advancement are limited by the widespread mastery of core skills. Recent OECD (2005) evidence suggests that a lot can still be done: while a growing number of young students in OECD countries decide to stay-on beyond compulsory education, a large number of individuals (in the same cohort, as well as in older ones) are still lacking in basic numeric and literacy skills. For example, post-war UK has experienced a significant expansion in post-compulsory education (i.e. beyond the age of 16): according to OECD (2005), in 2003 about 40% of the population in the typical age cohort at this education stage graduated from tertiary education. The UK government has recently committed to further pushing this figure above 50%. Additionally, during the past two decades, age-16 achievements (end of compulsory secondary education) have substantially improved (McNally, 2007). Nevertheless, the UK is still cursed by a long tail of poor learners with many young (and not-so-young) individuals possessing inadequate basic skills. Machin and Vignoles (2006) report that in 1995 only 78% and 83% of the 16-25 year old cohorts had Level 2 IALS (International Adult Literacy Skills) numeric and literacy skills, respectively (where Level 2 is the minimum level required to ‘function’ in the labour market). While the situation has certainly improved over the last decade, thanks to large investments in primary education, more can be accomplished. Indeed, the UK still ranks in the bottom half of recent PISA (Programme

for International Student Assessment) international core skill assessments, measuring proficiency in mathematics, reading, science and problem solving (OCED, 2005). In a nutshell, this discussion suggests that, even for developed nations, there are still wide margins for enhancing individuals' core skills by improving the quality of primary schooling, and that this will be beneficial both to individuals, by boosting their future learning and labour market prospects, and their countries, by raising their productivity and the 'speed-limit' of economic growth.

In this paper I will review the most recent literature in the economics of education field in order to identify which policy interventions can effectively improve the quality of primary schooling, as measured by pupil test-based achievements. In doing so, I will mainly survey studies that focus on the earliest stages of education; however, for completeness or lack of alternatives, I will sometimes use evidence from research that focuses on secondary schooling. Additionally, I will concentrate on research that is 'methodologically sound', i.e. aimed at establishing causal relations between policy interventions and educational outcomes. Finally, particular attention will be devoted to the experience of England, a country which has made substantial investments over the past decade in order to improve its primary school system. England is also an ideal 'laboratory' since it has a long established tradition of administrative data collection and policy evaluation, which makes a rigorous assessment of educational interventions feasible.

In the first part of this research, I will review the evidence on the effectiveness of resource-based interventions, in particular policies aimed at reducing class-size and promoting the use of information and communication technologies (ICT) in schools. The latter have been championed by governments around the world as a way of modernising schools and teaching methods. A few remarkable examples include the United States, where major subsidies for internet and communications technologies were distributed to schools from 1998; Israel, which equipped most of its schools with computers starting from 1994; and the UK, where, starting from 2001, the government has emphasised the role of ICT investment in schools as "crucial to

our drive to raise standards” (Ruth Kelly, former secretary of state for education, speech to BETT, British Education Training and Technology, London 2005). To preview my conclusions, I find little evidence to support the overall effectiveness of broadly scoped resource-based interventions, although targeted programmes seem to deliver more in terms of pupil achievements.

Partly motivated by the inconclusive evidence on the general effectiveness of resource-based interventions, governments in many countries now favour market-oriented policies based on accountability, incentives and choice in education. Thus I will devote the second and longest part of this research to discussing the theoretical underpinnings of this debate and the related empirical findings. The evidence suggests that policies aimed at enhancing choice and competition among education-service providers and motivating teachers via pecuniary incentives have some scope in improving education standards. However, this might come at the cost of increased segregation of students along the lines of ability and family background.

The remainder of this paper is organised as follows. In Section 2, I review the literature on resource-based interventions. In Section 3, I present the theoretical arguments and the evidence on the benefits of accountability, choice and competition in education. In Section 4, I briefly discuss a related topic, namely the role of religious and private schooling. Section 5 reviews some of the concerns with modes of school provision centred on parental choice, such as teaching-to-the-test and pupil segregation. Finally, Section 6 provides some concluding remarks.

## **2. Resource-based Intervention: A Failure?**

*Does ‘money’ matter?*

Questions about the importance of resources have long animated the debate among economists in a variety of fields within the discipline. For example, scholars interested in entrepreneurship have long discussed whether lack of resources hinders business start-up and performance (Blanchflower and Oswald, 1998). Researchers interested in the determinants of happiness and

life-satisfaction have equally studied the link between income, pecuniary resources and individual well-being (Blanchflower and Oswald, 2004; and Frijters *et al.*, 2004). Similarly, economists in the field of education have heatedly debated about the importance of resources in schools and about the effectiveness of resource-based interventions. The apex of this academic argument is well epitomised in the *Economic Journal Features* issue of February 2003, where two eminent experts of the field, namely Eric Hanushek and Alan Krueger, present their contrasting views on the point (Hanushek, 2003; and Krueger, 2003)

The idea that ‘money’ (resources) matters in schools is partly rooted in a logical parallel between the production function of firms used in standard micro-economic theory and a human capital production function applied to education: in an overly simplified view, labour inputs (teachers’ time and teacher numbers), along with capital inputs used during classes (pens, tables, computers, etc), mechanically (but potentially with decreasing marginal returns) contribute to the production of educational attainments. Thus resources ‘fed into’ schools will be used to buy capital and labour inputs, and improve human capital formation.

Broadly defined resource-based programmes include a variety of policies such as interventions aimed at increasing general expenditure per pupil, extra-funding for administrative support and other facilities, investments in Information and Communication Technologies (ICT), increments of teacher salaries, and reduction of the class size, i.e. improvements in the pupil-to-teacher ratio. In fact, this last ‘experiment’ is the one which has received most of the attention in the debate on the use of resources in schools. One of the first studies on the topic, Angrist and Lavy (1999), uses discontinuities created by historical maximum class size rules in Israel (Maimonides’ Rule) to assess the causal impact of class size on pupil attainments. The authors’ estimates show that reducing class size induces a significant increase in test scores for older students (their fourth and fifth graders, age 9/10), but this is not true for younger pupils (third graders, age 8). Their methodology, exploiting identification based on maximum class size rules, has been replicated for several countries, including France (Piketty and Valdenaire, 2006),

Norway (Leuven *et al.*, 2006) and Denmark (Browning and Heinessen, 2007), with similarly mixed and discouraging findings.

In fact, Hanushek (2003) and Webbink (2005) survey a variety of studies to conclude that the international evidence provides little support for the general effectiveness of resource-based policies, and in particular interventions aimed at reducing the number of pupils in the class-room. To similar conclusions come Dearden *et al.* (2002) and Levacic and Vignoles (2002), who specifically address the issue of school resources, class size and educational outcomes in England. On the other hand, Krueger (2003) uses the STAR experiment, which nearly halved class size (from 22 to 12, on average) for young pupils in primary schools in very disadvantaged US communities, to show that aggressive and properly targeted ‘experiments’ aimed at reducing class size have significantly positive effects on the learning of students during early education years (though, admittedly, this advantage fades away at later school phases).

A more recent but similarly controversial example of the dispute surrounding the debate on resource-based interventions in schools regards the use of ICT as a teaching and learning device. Although governments around the world support the widespread use of ICT in education (see Introduction for some examples), economists are sceptical that computers in schools can really improve education standards. Once more, Angrist and Lavy (2002) were the first to try to establish the existence of a causal link between ICT spending in schools and pupil learning (for Israel). Their findings show that ‘computers in schools’ serve little purpose when the aim is to improve test-based achievements (across all education stages). Following their analysis, other studies have come to similarly discouraging conclusions: Fuchs and Woessmann (2004) using international data, Leuven *et al.* (2004) analysing Dutch evidence, and Goolsbee and Guryan (2005) and Rouse *et al.* (2004) studying the US experience, all find little compelling evidence that ICT spending and computers in schools are causally associated with faster rates of education progress. One remarkable exception is Machin *et al.* (2007b) who analyse the experience of primary schools in England between 1999 and 2003. The authors use a change in the rules

governing ICT funding across different school districts of England to devise an instrumental variable strategy and identify the causal impact of ICT expenditure on pupil outcomes. Their findings point to a positive and sizeable impact of ICT expenditure on primary school performance in English and science, though not in mathematics.

How can one reconcile this evidence with previous studies in the field that found no effect? The authors argue that, in the English case, it appears to be the joint effect of large increases in ICT funding (above 100%, i.e. a more than doubling of ICT funding in some areas) coupled with a fertile and motivated teaching background, which led to positive effects of ICT expenditure on educational performance. Additionally, the authors provide evidence that almost all English schools were fully equipped with internet access for the period under analysis, and that investments were targeted towards more effective areas, such as software improvements and teacher ICT training and support.

Overall, the discussion so far provides us with some important lessons on the effectiveness of resource-based interventions. First, it seems fair to conclude that ‘money’ does not *generally* matter; however, this is not equivalent to saying that it *never* matters or it *cannot* matter. Webbink (2005) comes to similar conclusions. Second, many of the surveyed studies assess the impact of ‘marginal’ changes in resources and funding. These might produce effects that are too small to be detected in the data. However, the STAR experiment discussed by Krueger (2003), which halved class size (50% reduction), and the English experience with ICT studied by Machin *et al.* (2007b), where funding for new technologies in schools doubled (100% increase), both show that large policy interventions can produce sizeable effects.<sup>1</sup> Finally, the results of the STAR programme also suggest that resource-based interventions might produce their best outcomes if they are *targeted* towards where there is real need. In fact, the STAR programme concentrated on inner-city schools, mainly enrolling pupils with ethnic minority

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<sup>1</sup> Importantly, while resource-based interventions may fail to produce large effects in developed countries where the marginal productivity of extra investment could be too small to be detected, this might not be the case in some under-resourced, over-crowded schools in developing nations.

backgrounds and severe learning disadvantages. In the next section, I specifically review some research on the effects of targeted policies.

### *More on Targeted Interventions*

Is there any additional evidence on the effectiveness of targeted resource-based interventions? To answer this question, I will draw on the recent English experience and report on two successful examples, namely ‘Excellence in Cities’ (EiC) and the ‘Literacy Hour’. The UK government has progressively moved towards policies that specifically target well-identified ‘troublesome’ aspects of the schooling system. Many interventions (on top of EiC and the ‘Literacy Hour’) are currently being piloted in some English schools, or rolled out in the most disadvantaged areas. These include the Education Action Zones (including both primary and secondary schools), and Sure Start (concentrating on pre-school years). For some of these programmes, a thorough evaluation still needs to be carried out; others are at too early stages for a proper assessment.

The first programme I will discuss is ‘Excellence in Cities’, which was launched in September 1999 with the aim of driving up standards in schools in major English cities. Although the programme initially focused on secondary schools, it was expanded to include primary institutions. As a result, over 1,300 secondary and 3,600 primary schools have been involved in the programme since it began. Machin *et al.* (2007a) provide a thorough description of its implementation at the secondary school level and an examination of the effects of EiC. The programme was essentially a resource-based intervention targeting schools in disadvantaged areas. Resource allocation to participant schools within EiC was mainly based on pupil numbers and level of disadvantage in the Local Education Authority (LEA) of the school. Funding varied from £50 per pupil in the best-off secondary schools to about £140 per pupil in the most disadvantaged schools, with an average of about £120 per pupil per year (about 4.4% of overall per pupil expenditure). Machin *et al.* (2007a) find that the extra resources channelled via the EiC programme had a positive impact on school attendance and performance in mathematics (though

not in English). Importantly, the authors also report a marked heterogeneity in the effectiveness of the policy, with the greatest impact in more disadvantaged schools and on the performance of middle and high ability students within these schools. They conclude that additional resources matter for children in the poorest secondary schools, particularly when building on a solid education or ability background.

Although this evidence is based on the experience of secondary schools covered by EiC, it provides some support for the notion that targeted resource-based interventions can produce positive effects on pupil learning. Unfortunately, a similarly broad and methodologically sound evaluation of the primary school strand of the EiC policy has not been carried out yet. However, an early study by Emmerson *et al.* (2004) reports findings that are consistent with those of Machin *et al.* (2007a): there are small but significantly positive effects on test scores at the end of primary school to be had from the EiC intervention. Once more, these are mainly concentrated among high ability pupils in the most disadvantaged schools.

Another interesting example of targeted intervention, based both on resources and teaching methods, is the 'Literacy Hour', implemented in English primary schools since 1996. This programme is described by Machin and McNally (2004), who evaluate the pilot implementation of the programme carried out in 1996-1998. The main rationale for this programme is to try to alleviate the very low levels of reading and writing skills held by children in many English primary schools, particularly in inner cities. The aim was to raise standards of literacy by improving the quality of teaching through more focused instruction and effective classroom management. The planned cost of the National Literacy Project (NLP) was £12.5 million over 5 years. Money was primarily used to fund local centres and literacy consultants in each participating Local Education Authority; however, schools also received some funding for teacher training and other resources. Machin and McNally (2004) estimate that for the first two years the 'Literacy Hour' cost around £25.52 per pupil per annum. The authors find larger increases in attainment in reading and writing during primary education for pupils exposed to the

‘Literacy Hour’, compared to pupils not exposed to it. Additionally, they find small positive effects from ‘treatment’ that persist up to age 16.<sup>2</sup>

In conclusion, the findings discussed so far provide some support for the arguments proposed in the previous section, namely that there are larger benefits to be expected from policies that specifically target disadvantaged groups or a lack of specific skills among pupils. Moreover, they show that improving primary education and strengthening individual core skills at early stages can have long lasting effects on pupil learning.

### **3. Accountability, Choice and Incentives: The Way Forward?**

#### *The Motivations*

Partly motivated by the inconclusive evidence on the general effectiveness of resource-based interventions, governments in many countries now favour market-oriented policies based on accountability and incentives and increased choice and competition among schools. But what are the main ‘ingredients’ of models of education provision centred on school choice and accountability? There are many theoretical accounts that focus on different aspects of the issue (e.g. Epple and Romano, 1998; Epple, Newlon and Romano, 2002; Glennester 1991; Nechyba, 2000, 2003); also, the arguments are often highly politicised and involve broad philosophical issues. However, here I will only deal with those aspects of the debate that are associated with potential productivity gains and improved test-based performance of schools.

Before moving to a discussion of the workings of education systems centred on school choice and accountability, it is interesting to note that the shift away from an education production function approach has occurred somewhat in parallel with the emergence of a ‘new way’ of approaching labour economics, i.e. personnel economics (see Lazear, 1995). This field

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<sup>2</sup> Since there are gender gaps in English performance (in favour of girls), the authors also consider whether the policy had a differential impact by gender. They find some evidence that at age 11 boys received a greater benefit than girls.

puts a more explicit emphasis on economic incentives within firms and organizations, and on individuals' rational economic responses to these. Among other issues, personnel economics has contributed to the study of team-work and the design of optimal team compensation and incentives. These issues have become extremely relevant in the context of the economics of education, where the role of pecuniary rewards for high-performing schools and teachers is widely debated.

### *The Arguments*

Accountability mechanisms lie at the heart of choice-oriented modes of schooling provision. In these settings, pupils in schools within a country (or state) are assessed on the basis of standardised, comparable and centrally-handled examinations. This allows parents and policy makers to identify failing schools and to impose sanctions and targets, or to undertake closure and restructuring. Crucially, within an accountability framework, standardised tests are generally made publicly available via school performance tables (league tables) to all potentially interested 'stake-holders', i.e. parents, practitioners and government analysts. This implies that schools are not only accountable to the state or local governments (usually the main fund-granting bodies), but more widely and directly to parents, who demand and 'shop around' for school quality (Tiebout, 1956). Overall, the ultimate scope of accountability systems is to gather and spread consistent and comparable information about school achievements and to allow parents and policy makers to monitor education progress and teaching staff performance.

Figlio and Page (2003) and Kane and Staiger (2001, 2002) describe some of the first accountability systems operating in the US. More recently, Rouse *et al.* (2007) provide evidence on how accountability has substantially changed instructional practices in public schools in Florida. As for the English experience, Glennester (1991) and Gorard *et al.* (2003) provide a detailed account of the system set in place by the Education Reform Act of 1988, leading to the publication of school performance tables from 1992. While traditionally neighbourhood-based,

the principle of choice has been extended to a greater or lesser extent in different areas of England over time, and the trend has continued recently with further expansion of choice being advocated in the policy debate. As a result, the current state-school system in England is a hybrid of a community-based model and a parental-choice setting.

Accountability alone may provide incentives for schools to improve their performance (Figlio and Rouse, 2005). This might occur because of ‘name-and-shame’ mechanisms, via disclosure of information that helps in rectifying market failures, or through specifically targeted interventions (Hanushek and Raymond, 2003). Additionally, accountability might raise teacher and pupil motivation, increase parental involvement in their child’s education and schooling, and improve teaching curriculum and pedagogy (Jacob, 2005). However, it is generally argued that accountability will produce most of its effects when coupled with mechanisms that: (1) increase parental choice (within the public sector, or between private and public education) and the competition among schools that this engenders; and (2) grant schools some ‘autonomy’ to restructure their governance and respond to the competitive pressures introduced by parental choice. LeGrand (1991, 1993), Machin and Vignoles (2005) and Burgess *et al.* (2006) present a general discussion of the English choice and competition experience. Hoxby (2004) gives a detailed analysis of the topic for the US.

To better understand these arguments, it is useful to highlight some of the features that characterise modes of schooling provision centred on *parental-choice*, as opposed to alternative *community-based* systems, in which only pupils living nearby the school or within the relevant jurisdiction (i.e. a ‘catchment area’) are allowed in and students attend their local schools.<sup>3</sup> First of all, the guiding principle for allocating students to schools in choice-based settings should be parental preference, regardless of where pupils live. This should allow ‘informed’ parents to choose the school that best suits their preferences, for example, one that maximises pupil learning

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<sup>3</sup> Note that under a community-based setting, resources are meant to be used to level differences in the ‘education playing field’ due to the sorting (stratification) of families with different backgrounds across residential neighbourhoods.

subject to travel costs. Second, resources should follow pupils (so that pupils are valuable ‘assets’ for schools), and funding should be closely linked to schools’ capacity to attract students. Third, schools should be granted some flexibility to experiment with different teaching methods (in order improve pupil learning) and to specialise so that they can cater for specific needs or tastes (still within a national framework, where subjects and levels of achievement at various ages are set and monitored centrally). Schools should also be given some autonomy to manage their teaching body in ways that improve performance and motivation, and to use personnel practices that facilitate the hiring and retaining of talented instructors and managers. Fourth (and related to the previous point), schools should be granted some flexibility to adjust pecuniary rewards so as to motivate highly-effective workers. Fifth, schools should be allowed to expand in order to accommodate extra demand for their services and choose their ‘optimal size’ (i.e. strike the right balance between the cost of teaching a larger pool of students and the benefit of exploiting internal economies of scale). Finally, new schools should be allowed in the ‘market’ if there is demand for their services, while underperforming schools should be allowed to fail and close.

Based on these principles, advocates of models of school provision centred on parental-choice argue that the system will lead to better schooling using standard efficiency arguments from economic theory. These fall into two categories: those based on the better matching of pupil needs and school provision; and those based on market discipline incentives. The first argument suggests that gains arise through the efficient allocation of pupils to schools according to personal tastes and pedagogic needs. If schools are allowed some freedom to differentiate, then pupils can choose the education-service provider that offers a teaching technology that educates them at least as effectively as under the alternative community-based system, in which pupils can only attend the local designated school. More efficient ‘matching’ of pupils and schools should lead to higher academic achievements. The second argument is based on competition among schools (within the public domain, or between public and private schools) and market-type incentives. If parents are given freedom to choose the school that they prefer and resources follow students,

‘good’ schools will attract more students and more resources, and will expand; whereas ‘bad’ schools will lose pupil roll, shrink and eventually close. In order to remain in the market and keep up with their competitors, schools will have to constantly monitor and improve teaching practices, thus raising educational attainments.

Notice that one important assumption is that schools are able to signal their overall quality to parents via test-performance, as summarised in performance tables, and that this drives enrolment patterns. While certainly many other aspects of school quality motivate parental choice of schooling, the evidence in Black (1999), Gibbons and Machin (2006), Kane, Staiger and Reigg (2005) on the effect of test scores on house prices suggests that average performance strongly influences parental residential choice in relation to school access. More recently, Gibbons and Silva (2008a) show that test-based measures of school quality tend to dominate parental perceptions of educational excellence.

It is interesting to highlight how the terminology used to describe school choice and competition is reminiscent of the jargon used in micro-economic theories of monopolistic competition. Parents are viewed as consumers with heterogeneous preferences, and there are many ‘sellers’ in the market, i.e. schools, that differentiate their services from those of their competitors to cater for specific demands. Crucial to these formalisations is the presence of low costs and no barriers to the entry and exit of producers, i.e. new schools should be allowed to open and poorly performing schools should be allowed to fail and exit the market. However, schools are not solely driven by profit motives and (unlike firms) they might not immediately close when underperforming, as this entails large physical and social capital losses. This implies that failing schools might survive for considerable time periods and enrol pupils from families that do not actively exercise their school choice opportunities. Competition might thus come at the cost of increased segregation of students along the lines of ability and family background, an issue to which I will return later in Section 5.

In defence of modes of education provision based on neighbourhood schools, it has been claimed that learning proceeds better in a stable environment, where teachers are not under undue competitive pressures and where there is lower search-based turnover, which may have detrimental effects on achievement (Hanushek, Kain and Rivkin, 2004; Gibbons and Telhaj, 2007). Moreover, schools could respond to an increase in competition by reducing costly effort and going down-market in order to serve only those with weak preferences for school performance (McMillan, 2004). Finally, total pupil travel distances could be greater when pupils do not automatically attend their closest neighbourhood school, with consequent detrimental effects on achievement because of lateness or absence.

Given these counterbalancing arguments, what does the available evidence suggest on the overall effects of school choice and competition on students' attainments? In the next Section, I try to provide an exhaustive answer to this question.

### *The Evidence*

During the past two decades, much has been written about the effects of school choice and competition on pupil achievement. In fact, over the years, various countries have adapted their institutional arrangements to accommodate greater freedom of choice for families and, implicitly or explicitly, greater competition between schools. Following different approaches, a substantial volume of quantitative evidence on the topic has been produced, particularly in the US context.

The first and most common approach is to explore the effects of implicit variation in the level of choice available in different public (state funded) school markets (see Hoxby, 2000a and Rothstein, 2006, for recent examples) to derive some indicators of market competitiveness, and then to measure the extent to which these are associated with pupil outcomes. One critical empirical problem here is the definition of the choice/competition indicators: in most research, the 'market' in which a school operates is broadly defined by the admissions district in which it is located, whilst the level of choice/competition is based on the number of schools that appear to be

available to any pupil in that district. Studies adopting this approach are mixed in their findings. Belfield and Levin (2003) suggest that “the gains from competition are modest in scope with respect to realistic changes in levels of competition”, and point out that many results are statistically insignificant. However, Hoxby (2000a) does find that pupils perform better in metropolitan areas where there seem to be more school choices. Importantly, in her work, the author assumes that choice is exercised through Tiebout-type mechanisms, that is via residential choice and by ‘voting with the feet’, rather than directly via school choice *conditional* on place of residence. Recently, the validity of her instrumental variable approach and the robustness of her results have been contested (Rothstein, 2006).

A second approach evaluates the effects of private schooling on public sector performance. More specifically this strand looks at the competitive ‘threat’ exerted by private schools, by measuring the effects of private education enrolment on state school performance, where the assumption is that private education generates competition for state schools (Hoxby, 1994, 2004). This strategy is complicated by the possibility that the location of private schools is endogenous to neighbourhood status, and that such schools are likely to skim off higher-achieving pupils from the state sector (Epple and Romano, 1998).

Finally, another body of research evaluates the impact of policy changes that introduce greater choice into geographically localised education markets. Cullen *et al.* (2003, 2005) find that students randomised into choice-enhancing initiatives in Chicago experience little academic benefit. On the other hand, recent work by Hoxby (Hoxby and Rockoff, 2004; Hoxby, 2003) finds benefits from choice-increasing programmes, as do Holmes *et al.* (2003) from school choice in North Carolina, and Lavy (2005a) from choice in school districts in Tel Aviv. Unfortunately, these findings are often difficult to generalise, given the highly localised and peculiar settings under analysis.

All in all, it is fair to say that the international and US evidence is voluminous, but mixed in its findings. Moreover, most research does not disentangle whether any benefits to be had from

modes of school provision centred on parental-choice occur because this improves the match of pupils with schools (i.e. a direct ‘choice effect’), or because this increases competitive pressures in the education market (i.e. an indirect ‘competition effect’).<sup>4</sup>

Evidence for England is much more limited, and mainly focused on secondary education. For example, Levacic (2004) finds that secondary school head-teachers’ self-reports of perceived competition are linked to school performance indicators. Also, Bradley *et al.* (2000) show a number of market-type effects in secondary education following admissions reforms in the late 1980s; for example, schools that performed better than their neighbours attracted more pupils. On the other hand, Clark (2005) reports that reforms that handed more power to secondary schools in the late 1980s only generated modest efficiency gains through competition effects.

Gibbons *et al.* (2007) is the first (pupil-level) analysis focusing on the effects of choice and competition on academic achievement in *primary* schools in England. Additionally, the authors explicitly try to disentangle whether any benefits to be had from choice-based settings occur because of a direct ‘choice effect’ (i.e. better matching of pupils with education-service providers), or because of increased competitive pressures faced by schools. Their empirical findings reveal no simple (ordinary least squares) association between measures of school choice and achievement, but a small positive link between measures of school competition and performance. However, this seems to be related to endogenous pupil sorting or school location, since instrumental variable estimates show that there are no general benefits to be had from increasing school competition across the board. Nevertheless, the authors find that state-schools with autonomous governance and admission procedures (so called ‘Voluntary Aided’ schools) respond positively to a greater degree of competition with other local schools: their students’ value-added attainment score improves by about 1.6 point for each additional competitors. This corresponds to about 16-19 weeks of progress in one of the core subjects, i.e. English or mathematics. To justify their findings, the authors argue that the institutional arrangements in

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<sup>4</sup> Bayer and McMillan (2005) is the only work which conceptually distinguishes these two ideas. Yet the authors’ structural modelling approach only allows the estimation of the effect of school competition.

‘autonomous’ Voluntary Aided schools are more conducive to a focused, competitive ethos in which the setting of targets and monitoring of performance are seen as a way to attract pupils through the promise of excellence. These findings lend some support to the arguments discussed above, namely that increased parental choice and school competition, coupled with some degree of school ‘autonomy’, can lead to an improvement in standards in education.

Note that this research paper is silent about the effects of the private sector ‘competitive threat’ on the performance of public-sector schools. In another recent piece, Gibbons and Silva (2008b) tackle this issue and find no evidence that a higher concentration of private education-service providers improves the performance of neighbouring public-sector schools in England.

*Inside the Black-Box of Choice and Competition: The Role of Incentives and Teachers*

Why does one find (or expect to find) that the benefits of choice and competition on pupil outcomes are more pronounced in schools that enjoy some degree of ‘autonomy’? This is not because institutions such as Voluntary Aided schools in England (or private schools in the US) are *on average* better than other standard state-schools (a claim to which I will return in the next section). Rather, it is because the institutional arrangements of these schools make them potentially more responsive to the incentives that market-oriented education reforms bring about.

To clarify this point, let us consider again the example of Voluntary Aided schools in England. The charity or foundation linked to the school has a ‘controlling majority’ within the Governing body, and therefore has a strong influence on the running of the school. Because Voluntary Aided schools are also directly responsible for their pupil admissions (and thus funding), it is more likely that strategies that promote educational excellence, such as the setting of targets and monitoring of performance mentioned earlier, will be used to attract pupils. Additionally, the charitable organisation which controls the Governing body of an ‘autonomous’ school is directly responsible for staff appointments, especially the hiring of teachers and head-

teachers. As a result, these schools will most likely try to attract high-quality personnel, by encouraging and financially rewarding outstanding teaching practices.<sup>5</sup>

These remarks highlight a very crucial point: at the heart of the choice and competition argument lies the assumption that school governors, head-masters and teachers respond to market-type incentives by raising effort and teaching quality, and that carefully designed financial incentives will attract and stimulate teaching and managerial ‘excellence’. But what is the evidence about the power of market and pecuniary incentives in stimulating effort, motivation and teaching quality?<sup>6</sup>

A small, but growing body of research on the functioning of the labour market for teachers (and head-teachers) has been produced over the past years. Using different methodologies and data, Dolton and van der Klaauw (1999), Hanushek *et al.* (2003b, 2003c), Murnane and Olson (1989, 1990) all show that individuals respond to (relative) wage incentives in their decision to start teaching or leave the occupation. Chevalier *et al.* (2007) confirm this finding for a longer time horizon (1960s to 1990s).

More to the point of incentives, teaching quality and pupil attainments, Hanushek *et al.* (2003b) and Lavy (2002, 2005b) show that teacher performance-related pay schemes have great potential for attracting effective teachers, improving their motivation and increasing pupils’ attainments. Clotfelter *et al.* (2006) report that a pecuniary bonus granted to qualified teachers in North Carolina greatly reduced their hazard of leaving high-poverty schools; this was especially pronounced for teachers with longer years of experience, usually associated with better pupil outcomes (Hanushek *et al.*, 2005). Along similar lines, Lazear (2003) argues that teacher pay

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<sup>5</sup> On the other hand, in other school types in England, there is often a greater need to balance the objective of high standards for high-achievers with appropriate education for children from diverse backgrounds, including those with English as an additional language and those with special educational needs. Additionally, numbers in undersubscribed non-autonomous schools, such as Community schools for which the Local Authority handles admissions centrally, are often topped up with pupils who could not be accommodated in their school of choice. This undoubtedly weakens the potential link between parental choice and school competition.

<sup>6</sup> An even more fundamental question relates to how we should measure teachers’ quality. Hanushek *et al.* (2005) show that there is substantial variation in the quality of instruction and that most of this heterogeneity occurs within (rather than between) schools. The authors also show that teacher quality appears to be unrelated to advanced degrees or certification. On the other hand, experience matters and crucially so in the first years in the profession.

compression in the US and Sweden has resulted in some adverse selection, with the highest quality teachers leaving the profession; the author further suggests that linking compensation to performance would result in improved teacher quality and school effectiveness. Recently, Besley and Machin (2008) suggest that financial incentives work well to retain ‘good’ head-teachers in secondary schools in England, and that there is a significant link between school ‘success’ and salaries granted to school masters. Similarly, Atkinson *et al.* (2007) find that monetary incentives in English secondary schools help in improving pupil achievements in national tests. Finally, Hoxby (2000b) provides direct evidence that school choice affects the teaching profession by increasing demand for staff with higher qualifications (especially in mathematics and science), and by requiring teachers to exert higher levels of efforts and greater independence.

Overall, this evidence suggests that teaching staff respond to pecuniary and market incentives aimed at increasing their effort and ‘output’ (i.e. learning). This establishes an important channel by which policies aimed at introducing competition and market-type incentives in the public-school sector can lead to improvements in the effectiveness of primary education.

#### **4. An Aside on the Effect of Attending an ‘Alternative’ School**

I have argued that schools that enjoy more freedom in their management practices and governance from central or local authorities are more likely to be responsive to market-type incentives induced by school competition and choice. In the US settings, these institutions are usually private, religiously affiliated schools; admission to these is mainly subject to paying fees, and a growing number of voucher programmes have been introduced to allow students from poor family backgrounds to opt-out of the state system and receive private education. In England, the setting is rather different. Only a very small share of students across all compulsory school years opt for private education; recent estimates put this figure at around 5-6%. However, within the state sector, some school types enjoy more ‘autonomy’ from the Local Education Authority than others. I have already described the case of Voluntary Aided school, normally religiously

affiliated institutions (mostly with Catholic or Church of England denominations); another example is the 'Foundation school' group, with an organisation similar to that of Voluntary Aided schools, but mainly not religiously affiliated.

However, while the discussion above suggests that these schools may improve their effectiveness when facing a competitive environment, it does *not* rule out that these schools might be worse when set in an isolated, monopolistic environment. Similarly, the arguments above do *not* suggest that these 'alternative' schools are on average of better quality, i.e. that pupils educated in these institutions perform on average better than their peers in standard state-schools *all other things being equal* (including the competitive pressures faced by the schools). Unfortunately, these issues are often confused in the policy debate. For example, evidence that pupils using vouchers to attend private schools perform better than comparable students in state-schools is often wrongly used to draw conclusions on the effectiveness of policies stimulating competition between public and private schools. Similarly 'spurious' inference is extrapolated from the average performance of students in Faith (state) schools in England, when in fact studies that compare the average performance of students across various school types are silent about the effects of school choice and competition.

What evidence is available on the relative performance of different school types? One body of research looks at whether pupils offered vouchers for access to the private sector perform better relative to those in public (state) schooling. Rouse (1998) studies the Milwaukee Parental Choice Programme, which provided vouchers to students with disadvantaged family backgrounds, enabling them to attend private non-religiously affiliated schools. The author finds that pupils selected by the programme to attend a private school performed better in mathematics, though not reading, compared to unsuccessful applicants. On the other hand, Mizala and Romaguera (2000) study a similar programme implemented in Chile, but find that pupils in subsidised private schools did not score better than comparable students in municipal schools. Similarly, Krueger and Zhu (2003) find that students randomised into a New York school

voucher programme did not experience significant test-score gains. Once more, it is worth emphasising that this approach cannot disentangle whether increased choice and competition are effective at raising standards, or whether schooling in the private sector offers advantages over state sector education. If it is the latter, then giving families more opportunity to gain entry to private schools (by vouchers or similar schemes) could lead to aggregate improvements in educational standards, but neither choice nor competition are directly responsible.

A related strand of research studies the effect of attending a Faith school, without this being subsidised by vouchers, but out of parental choice. Most of the early academic work on the topic has focussed on private Catholic schools in the US and has shown that attendance at a religious school raises pupil attainments, although there is variation across different demographic groups and depending on the outcome considered (e.g. test-scores vs. staying-on rates). However, researchers in the field have had to tackle a particularly troubling issue, namely that there is clearly non-random sorting of pupils into Faith schools (religious school attendance is correlated with unobserved pupil and family characteristics that are often educationally advantageous). Most approaches have tried to find an explicit source of random variation in the probability of Faith school attendance that is otherwise uncorrelated with educational attainment, and use it as an instrument. The first typical approach has used family religion as an instrument, on the basis that being Catholic is a strong determinant of attendance at a Catholic school (Noell, 1982; Evans and Schwab, 1995; Neal, 1997). Another approach has used instruments that measure the local ‘supply’ of Faith schooling and other area-demographic variables (Neal, 1997; Figlio and Stone, 1999). However, recent evidence in Altonji *et al.* (2002, 2005) is not supportive of any of the instruments commonly used. Given the weaknesses in the IV approach, some have tried other methods. Jepsen (2003) uses value-added models to control for pupil background characteristics and finds no impact of Catholic schools on test scores. Altonji *et al.* (2005) infer the degree of selection bias in the Catholic school effect from the extent of selection on observable pupil characteristics, and conclude that there is little evidence of an influence on test-scores.

For England, evidence on the performance benefits of Faith schools is fairly limited and mainly restricted to secondary education. Schagen *et al.* (2002) show that pupils in Faith secondary schools progress slightly faster in English, but not in mathematics and science. Benton *et al.* (2003) report that Faith secondary schools are associated with faster grade progression between age 11 and 13, and age 13 and 16, but this is confined to schools affiliated with non-mainstream Christian (i.e. not Catholic or Church of England) and Jewish denominations. However, neither of these studies take any steps to control for pupil background or otherwise deal with selection on unobservable characteristics that influence educational progress.

In a recent piece, Gibbons and Silva (2006b) study the effect of attending a Faith school on educational attainment progress during *primary* education in England. Their approach exploits access to information about pupils' place of residence, previous academic records and future (secondary) school choice to control carefully for factors that influence the propensity to attend Faith schools. Their results suggest that although Faith schools – especially the 'autonomous' Voluntary Aided state-schools mentioned above – tend to admit pupils with educationally advantageous backgrounds, there are no clear performance benefits that cannot be attributed to the sorting/selection of pupils likely to show the fastest progress into these schools. These findings reinforce the point made at the beginning of this section: comparing the average performance of students across various school types is *not* informative about the effects of school choice and competition. Indeed, in the English school setting, one finds that 'autonomous' schools tend to respond to market-type incentives by improving the performance of their pupils, although *on average* they do not perform better than other schools.<sup>7</sup>

## **5. Some Broad Concerns with Accountability, School Choice and Competition**

An analysis of school accountability, choice and competition would not be complete without a discussion of some of their drawbacks. Some of the criticisms belong to the 'school

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<sup>7</sup> This suggests that there is a tail of 'autonomous' schools in areas protected from competition who behave like 'monopolists' and that have on average worse performance than other school types.

effectiveness' domain; some, instead, revolve around distributional issues, mainly the segregation of pupils with different abilities and backgrounds into different schools. Although this paper mainly deals with efficiency in the provision of primary education, I will discuss some distributional concerns as they are prominent in the debate about the drawbacks of market-oriented reforms in education.

First, and in relation to the efficiency of learning, it has been argued that the publication of performance tables that summarise pupil and school performance into one single, well identified figure (say, age-11 school average SATS) has pushed teachers to focus on training students only to perform well in standardised and pre-identified tests, while penalising more broadly-scoped individualised learning. This problem is often referred to as teaching-to-the-test, and some evidence on its prevalence is discussed in Jacob (2005) and Lazear (2007). It is however worth emphasising that, during the primary stages of education, when learning concentrates on basic skills, teaching-to-the-test might be a lesser concern because there is less room for personalised learning and choice than at the secondary level. Additionally, Lazear (2007) analyses conditions under which high-stakes standardised testing, where pupils are assessed and rewarded for passing well-defined exams, maximises student learning. The author shows that standardised tests should be used when: (1) there are disproportionately many high-cost learners in the class (or school); and (2) monitoring of learning is very costly. The author argues that this situation is more likely to occur during primary education, in particular because young pupils are more difficult to educate (the marginal cost of learning is decreasing in the accumulation of general human capital) and to assess. Thus high-stakes predictable tests could be efficiency enhancing in primary education.

A related worry is that schools and teachers might try to 'game the system' or 'coach' only students that are most likely to perform well in standardised tests (or to achieve a given 'threshold' reported in league tables) in order to maximise school ratings. Indeed, Cullen and Redback (2006) find that schools exempt more poor-performing students from sitting their exams

when facing short-run incentives to improve performance. Similarly, Figlio and Getzler (2006) document that schools placed significantly more students from low socio-economic backgrounds into special education needs after the introduction of accountability mechanisms in Florida. As for England, Burgess *et al.* (2005) finds evidence consistent with the idea that accountability has diverted teachers' attention away from low ability pupils towards students most likely to achieve high marks and thus improve school rankings.

Another intriguing concern about accountability and choice has been brought forward by Kane and Staiger (2001, 2002). The authors argue that the volatility of average school test scores, which are at the heart of accountability systems, has not been fully appreciated by economists. In fact, there are two sources of 'imprecision' in measuring school quality on the basis of yearly standardised performance tables. One is idiosyncratic and related to one-time factors that may affect performance at a given school, in a given year, on the day of the test (the authors report the example of a dog barking in a nearby field). The second source is related to the year-to-year variation in the composition of pupils in a school, which affects test performance, but provides little information about the 'real' school effectiveness. This latter problem is more serious for primary schools than for secondaries, because of their relatively small size: the amount of variation due to idiosyncratic differences in the characteristics of pupils will be large relative to the total test-score variation between schools, making statements about relative quality and rank unreliable. These issues pose serious threats to accountability systems and school choice in general: pupil performance is used to reward, sanction and design incentives for teachers and other personnel; average performance is used by local and central governments to identify best practices and target interventions; performance table results are used by parents to assess school quality and inform their choice. The authors suggest that, when assessing one school's overall quality, more reliable indicators should be obtained by pooling together data over several years and across various outcomes.

However, the most overarching concern about school choice is that even if choice itself, or the competition it engenders, has the potential to boost pupil achievements, the gains may not be equally distributed and may come at the cost of increased segregation of pupils across schools. The argument is two-fold. On the one hand, better-off parents might be more effective at exploiting school choice and benefit from this to gain access to high-quality education, thus segregating students with the most disadvantaged backgrounds into ‘sink-schools’. This might occur because of different awareness of educational opportunities and familiarity with the education system, and because of travel costs (and time) involved in commuting to the school of choice when this is not the local institution, which might depend on family background and socio-economic characteristics. On the other hand, when high-stakes standardised exams are the focus of schools (in order to maximise reputation, roll and funding), schools might have incentives to cherry-pick students with the ‘right’ family background and those who are more promising in terms of future achievements (a practice called ‘cream-skimming’).

What does the available evidence suggest about the link between choice and segregation? The international literature is divided about whether choice and competition lead to increased pupil polarisation. US-based research is generally speaking more focused on the efficiency aspects of choice and competition. However, those few papers tackling the issue have produced mixed findings. For example, Hoxby (2003) generally argues that school competition is a “tide to lift all boats” and Hoxby (2000) shows that the racial heterogeneity of one student’s peer group is not affected by measures of school choice. Similarly, Hoxby (2004) provides evidence that enhanced school choice is *not* associated with more cream-skimming and segregation. On the other hand, Urquiola (2005) suggests that district availability of schools affects both district-level and school-level peer composition. Moreover, Rothstein (2004) and Smith and Meier (1995) show that parents value peers more than effective schools, and suggest that most choice based policies might produce their effects via sorting.

In contrast, much more research effort has been directed at understanding the effects of competition on segregation in England, although the focus is usually on secondary schools. Among others, Bradley et al. (2000), Bradley and Taylor (2002), Goldstein and Noden (2003), and Burgess et al. (2004) all suggest that increased competition and greater parental choice are associated with more polarization in English secondary schools. On the other hand, Gorard, Taylor and Fitz (2003) show that secondary schools became *less* socially segregated in the 1990s after the introduction of the market-oriented reforms during the late 1980s. Gibbons and Silva (2006a) are amongst the few to directly analyse this issue at the *primary* school level. The authors find that school competition tends to exacerbate polarisation of primary schools by student attainment. While not statistically significant, their estimates hint at fairly large impact of school-market competitiveness on stratification. In conclusion, the evidence suggests that, although there can be performance benefits from policy that promote competition in primary schooling markets, this may come at the cost of increased polarisation of pupils along the lines of ability and attainments.

Note, however, that when education provision follows an alternative based on neighbourhood-schooling, differences in community composition lead directly to disparities in terms of abilities and attitudes of pupils and resources at their disposal, including parental and social capital. Under these conditions, the outcomes of community-based systems can be highly inequitable since pupils in poor areas are more likely to attend schools with poor educational outcomes and harsh social environments, than pupils living in wealthier areas. Furthermore, parents who cannot exit unpopular schools via the admission system, i.e. exercising their choice, can exit the community by moving home, leading to what is known as stratification-by-mortgage.

Before concluding, it is worth mentioning that, aside from distributional considerations, stratification by ability of pupils across schools might have implications for the efficiency of primary education. This would be the case if there were strong peer effects (at the class or school level) and if these were highly non-linear. In fact, if peer-effects were significantly concave in

pupil ability, more ‘mixed’ classes (or schools) would imply that, while high ability students are not worse off in terms of their performance when mixed with low ability students, less-able pupils benefit from interaction with high ability ones.<sup>8</sup> Unfortunately, estimating the presence, the size and the shape of peer effects is particularly challenging from both the empirical and conceptual point of view (Manski, 1993), and the literature has not come to a consensus. Hanushek *et al.* (2003a) use a fixed-effects approach to estimate the magnitude of peer effects on primary school test performance in the US. The authors show that the average achievement of the peers has a small positive impact on students’ attainments and that this effect is roughly constant (linear) across quartiles of the school achievement distribution. To similar conclusions comes Hoxby (2002), who finds that students are influenced by the performance of their peers, where these effects are generally linear.

Some recent evidence for English schools is provided by Gibbons and Telhaj (2006) and Maurin *et al.* (2006). The former analyse secondary schools and document the existence of small (almost zero) effects of average peer achievement on pupils’ performance, finding no evidence of non-linearities. The latter, instead, focus on primary schools and exploit the fact that pupil month of birth is a strong predictor of age-11 achievements to derive an instrument for the strength of peer quality at the school-level. Their results suggest that peer effects in primary schools are significantly non-linear. However, it is difficult to disentangle whether peer influences occur through grades or directly via the age composition of the group in their setting.

All in all, it is fair to conclude that peer effects appear to exert a small and mainly linear effect on pupils’ performance. Thus concerns that school choice and competition exacerbate pupil stratification along the lines of ability and background find their strongest rationale in distributional considerations (as opposed to efficiency) and arguments that emphasise other aspects of pupils’ life not captured by test scores, such as social cohesion, tolerance and respect for differences.

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<sup>8</sup> In contrast, if peer effects are linear, ‘desegregating’ would decrease the variance of the overall performance without clear effects on average achievement.

## 6. Concluding Discussion

In this paper, I have surveyed the economics of education literature in order to identify which policies can effectively improve the quality of primary education. Relatively more emphasis has been put on the recent experience of England, a country which has made substantial investments over the past decade aimed at improving its primary school system.

My main conclusions suggested that broadly scoped resource-based interventions are not generally and convincingly effective in raising primary education standards. This finding is consistent with the conclusions of Levacic and Vignoles (2002), who critically assess the link between school resources and student outcomes in England. Nevertheless, I have also emphasised that targeted investments, which address problems in specific areas (such as inner-cities), provide extra support for pupils with learning disadvantages, or tackle a lack of skills in clearly identified subjects (such as literacy), deliver visible benefits. This holds in the case of the ‘Excellence in Cities’ programme (Machin *et al.*, 2007a) for example, and of the ‘Literacy Hour’ policy (Machin and McNally, 2004).

In my analysis, I have also suggested that market-oriented policies that introduce some elements of accountability, school choice and competition in the provision of education, and motivate teachers using pecuniary rewards, have some scope in improving the effectiveness of primary education. To be fair, the evidence on the topic is still mixed. Nevertheless, a growing number of papers suggest that competition-type incentives, coupled with some degree of ‘autonomy’ for schools from the local or central government, can be beneficial to the learning of primary school students.

The lack of general, unequivocal evidence that school choice and competition positively impact on pupil attainments could be signalling that market-oriented reforms simply do not generally work in education. On the other hand, there are reasons to believe that market-type incentives are not yet pervasive and fully ‘in motion’ in many areas of the education system. For

example, teacher and head-teacher salaries might still be too homogeneous and not sufficiently geared towards rewarding excellence. Additionally, parents might have too little say in what schools should deliver and how they should be managed. However, the most important limitation, at least in the current English setting, is that policies aimed at increasing school choice have been unable to sever the link between residential location and school attendance. Many schools still prioritise applications by proximity when over-subscribed, making a choice-based system a *de facto* catchment-area based setting. This certainly limits the potential benefits of choice and quasi-markets in education.

In the concluding part of this survey, I have also emphasised some important drawbacks of modes of school provision based on parental-choice, such as teaching-to-the-test. However, the most prevailing concern with choice-based settings is that, even if wider school choice boosts some pupils' achievements, these benefits may come at the cost of increased between-school segregation and gains may not be equally distributed across society. Although Hoxby (2003) claims that competition is a "tide to lift all boats", it might be too early to judge. In fact, the evidence I have surveyed suggests that competition among schools may be associated to increased segregation of pupils with different abilities and backgrounds into different schools.

How could this be mitigated? One extreme and rather simplistic answer is to simply let poor-performing schools fail and close, such that there won't be any 'sink-schools' into which pupils from poorer backgrounds can be segregated. While this solution could be efficient in the long-run, it might not be viable in the short run. Schools (unlike firms) do not operate solely on profit-motives; moreover, they cannot easily close, as this results in large physical and social capital losses. This implies that failing schools might survive for considerable time periods and continue to enrol pupils from more disadvantaged families that do not actively exercise their school choice options. This might further worsen the segregation of students with different backgrounds into different schools.

Advocates of choice and competition have proposed other solutions, which seem more practical. For example, if increased polarisation is related to a lack of parental awareness of education opportunities, the publication of better information about school quality and activities, the organisation of open-days in schools and more pervasive efforts aimed at involving parents in education could help in redressing the situation. Similarly, if choice is constrained by transport costs, the introduction of transport vouchers might help parents with the most disadvantageous conditions. On the other hand, if segregation is linked to schools selecting only the most promising students ('cream-skimming'), financial incentives might work the best. That is, *more* resources (than under the current setting) should be attached to pupils from disadvantaged backgrounds and/or with learning difficulties and the portability of 'money' for these students across schools should be *strengthened*. This would provide direct incentives for schools to enrol these students, as well as set-up structures that cater for their special needs and improve their learning (since this would presumably show up in performance tables and contribute to the school's reputation).

Finally, given the emphasis on schools that has dominated the recent policy debate and motivated this chapter, I believe it is worth concluding with a cautionary remark. Kane and Staiger (2002) report that for the US less than 16% of the variance of pupil achievement is between schools, and can therefore be roughly attributed to differences in school quality. Using English school census data for several cohorts, I have come to similar conclusions: at most 14% of the variation in pupil achievement at the end of primary education is between schools. This figure is very similar (16%) when using value-added measures of performance between ages of 7 and 11 to account for some sorting of students with different abilities and backgrounds into different schools. On the other hand, differences in residential neighbourhoods (as measured by postcode 'fixed-effects') can account for up to 60% of the variance in pupil attainment at the end of primary education. Given the strong link between family resources and residential sorting, these differences mainly pick up disparities in family background. In fact, Kramarz *et al.* (2007)

use econometric techniques to decompose pupil attainments at the end of primary education in England into various ‘components’ and find that family background accounts for most of the variation in students’ test-score performance. Put in different terms, this evidence suggests that families (and neighbourhoods) play a dominant role in determining pupil educational attainments, whereas the role that schools have in closing educational gaps seems somewhat limited. Overall, it seems that the most promising education interventions would try to identify the most ‘hard-to-reach’ students and address not only what goes on when they are at school, but more broadly tackle the disadvantages that these students carry with them when they come to school.

## References

- Altonji, J., T. Elder and C. Taber (2002): "An evaluation of instrumental variable strategies for estimating the effects of Catholic schools", NBER WP 9358.
- Altonji, G., T. Elder and C. Taber (2005): "Selection on observed and unobserved variables: Assessing the effectiveness of Catholic schools", *Journal of Political Economy*, vol. 113.
- Angrist, J. and V. Lavy (1999): "Using Maimonides' Rule to Estimate the Effect of Class Size on Scholastic Achievement", *Quarterly Journal of Economics*, My 1999.
- Angrist, J. and V. Lavy (2002): "New Evidence on Classroom Computers and Learning", *Economic Journal*, 112 (October).
- Atkinson, A., Burgess, S., B. Croxson, P. Gregg, C. Propper, H. Slater and D. Wilson (2007): "Evaluating the Impact of Performance-related Pay for Teachers in England", mimeo, University of Bristol.
- Barro, R.J. (1991): "Economic Growth in a Cross Section of Countries", *Quarterly Journal of Economics*, 106(2).
- Bayer, P. and R. McMillan (2005): "Choice and Competition in Local School Markets", NBER WP 11802.
- Belfield, C., and H. Levin (2003): "The Effects of Competition between Schools on Educational Outcomes: A review for the United States", *Review of Educational Research*, 72(2), 279-341.
- Benton, T., D. Hutchinson, I. Schagen and E. Scott (2003): "Study of the Performance of Maintained Secondary Schools in England", National Foundation for Educational Research (NFER) WP.
- Besley, T. and S. Machin (2008): "Are Public Sector CEOs Different? Leadership Wages and Performance in Schools", mimeo, London School of Economics.
- Black, S. (1999): "Do Better Schools Matter? Parental Valuation of Elementary Education", *Quarterly Journal of Economics*, 114.
- Blanchflower, D. and A. Oswald (1998): "What Makes An Entrepreneur?", *Journal of Labor Economics*, 16(1), 26-60.
- Blanchflower, D. and A. Oswald (2004): "Wellbeing over time in Britain and the USA", *Journal of Public Economics*, vol. 88.
- Bradley, S., R. Crouchley, J. Millington, and J. Taylor (2000): "Testing for Quasi-Market Forces in Secondary Education", *Oxford Bulletin of Economics and Statistics*, 62(3), 357-90.
- Bradley, S. and J. Taylor (2002): "The effect of the quasi-market on the efficiency-equity trade-off in the secondary school sector", *Bulletin of Economic Research*, 54, 295-314.
- Browning, M and E. Heinessen (2007): "Class Size, Teacher Hours and Educational Attainments", *Scandinavian Journal of Economics*, 109(2), 415-438.
- Burgess, S., A. Briggs, B. McConnell and H. Slater (2006): "School choice in England: Background Facts", Centre for Market and Public Organisation WP 06/159.
- Burgess, S., B. McConnell, C. Propper, D. Wilson (2004): "Sorting and Choice in English Secondary Schools", Centre for Market and Public Organisation WP 04/111.
- Burgess, S., C. Propper, H. Slater and D. Wilson (2005): "Who Wins and Who Loses from School Accountability? The Distribution of Educational Gains in English Secondary Schools", Centre for Market and Public Organisation WP 05/128.
- Card, D. (1999): "The Causal Effect of Education on Earnings", in O. Ashenfelter and D. Card, Eds., *Handbook of Labor Economics*, Volume 3A. Amsterdam: Elsevier.
- Carneiro, P. and J. Heckman (2002): "The Evidence on Credit Constraints in Post-Secondary Schooling", *Economic Journal*, 112.

- Chevalier, A., Dolton, P. and S. McIntosh (2007): "Recruiting and Retaining Teachers in the UK: An Analysis of Graduate Occupation Choice from the 1960s to the 1990s", *Economica*, 74, 69-96.
- Chevalier, A and L. Feinstein (2006): "Sheepskin or Prozac: The Causal Effect of Education on Mental Health", Centre for the Economics of Education Discussion Paper 0071.
- Clark, D. (2005): "Politics, Markets and Schools: Quasi-Experimental Evidence on the Impact of Autonomy and Competition from a Truly Revolutionary UK Reform", mimeo, University of California, Berkeley, US.
- Clotfelter, C., E. Glennie, H. Ladd and J. Vidgor (2006): "Would Higher Salaries Keep Teachers in High-Poverty Schools? Evidence from a Policy Intervention in North Carolina", NBER WP 12285.
- Cullen, J., B. Jacob and S. Levitt (2003): "The Effect of School Choice On Student Outcomes: Evidence From Randomized Lotteries", NBER WP 10113.
- Cullen, J., B Jacob and S. Levitt (2005): "The Impact of School Choice on Student Outcomes: An Analysis of the Chicago Public Schools", *Journal of Public Economics*, 89(5-6), 729-60.
- Cullen, J. and R. Redback (2006): "Tinkering Toward Acoolades: School Gaming Under a Performance Accountability System", in T.J. Gronberg and D.W. Jansen (eds.), IMPROVING SCHOOL ACCOUNTABILITY: CHECK-UPS OR CHOICE?, *Advances in Applied Microeconomics*, Vol.14, Elsevier.
- Dearden, L., J. Ferri and C. Meghir (2002): "The Effect of School Quality on Educational Attainment and Wages", *Review of Economics and Statistics*, 84(1), 1-20.
- Dearden, L., L. McGranaham and B. Sianesi (2004): "The Role of Credit Constraints in Educational Choices: Evidence from NCDS and BCS70", Centre for the Economics of Education Discussion Paper 0048.
- Denny, K., C. Harmon and V. O'Sullivan (2003): "Education, Earnings and Skills: A Multi-Country Comparison", IFS WP 04/08.
- Dolton, P and H. van der Klaauw (1999): "The Turnover of Teachers: A Competing Risk Explanation", *Review of Economics and Statistics*, 81(3), 543-552.
- Emmerson, C., C. Frayne, S. McNally and P. Pelkonen (2004): "Economic Evaluation of Excellence in Primary Schools", Report to the Department for Education and Skills, UK.
- Epple, D. and R. Romano (1998): "Competition between Public and Private Schools: Vouchers and Peer Effects", *American Economic Review*, 88, 33-62.
- Epple, D., E. Newlon and R. Romano (2002): "Ability Tracking, School Competition, and the Distribution of Economic Benefits", *Journal of Public Economics*, 83, 1-48.
- Evans, W. and R. Schwab (1995): "Finishing high school and starting college: Do Catholic schools make a difference?", *Quarterly Journal of Economics*, 110, 941-974.
- Figlio, D. and L. Getzler (2006): "Accountability, Ability and Disability: Gaming The System?", in T.J. Gronberg and D.W. Jansen (eds.), IMPROVING SCHOOL ACCOUNTABILITY: CHECK-UPS OR CHOICE?, *Advances in Applied Microeconomics*, Vol.14, Elsevier.
- Figlio, D. and M. Page (2003): "Chan School Choice and School Accountability Successfully Coexist?", in C. Hoxby, ed. *The Economics of School Choice*, University of Chicago Press, Chicago.
- Figlio, D. and C. Rouse (2005): "Do Accountability and Voucher Threats Improve Low-Performing Schools?", NBER WP 11597.
- Figlio, D. and J. Stone (1999): "School choice and student performance: Are private schools really better?", *Research on Labour Economics*, 18, 115-140.
- Frijters, P., M. Shields and J.Haisken-DeNew (2004): "Money does matter! Evidence from increasing real incomes in East Germany following reunification", *American Economic Review*, 94(3), 730-741.
- Fuchs, T. and Woessmann, L. (2004): "Computers and Student Learning: Bivariate and Multivariate Evidence on the Availability and Use of Computers at Home and at School", CESifo WP 1321.

- Gibbons, S. and S. Machin (2006): "Paying for Primary Schools: Admissions Constraints, School Popularity or Congestion", *Economic Journal*, 116.
- Gibbons, S., S. Machin and O. Silva (2007): "Choice, Competition and Pupil Achievement", *Journal of the European Economic Association*, forthcoming.
- Gibbons, S. and O. Silva (2006a): "Competition and Accessibility in School Markets: Empirical Analysis Using Boundary Discontinuities", in T.J. Gronberg and D.W. Jansen (eds.), *IMPROVING SCHOOL ACCOUNTABILITY: CHECK-UPS OR CHOICE?*, *Advances in Applied Microeconomics*, Vol.14, Elsevier.
- Gibbons, S. and O. Silva (2006b): "Faith Primary Schools: Better Schools or Better Pupils?" Centre for the Economics of Education Discussion Paper 0072.
- Gibbons, S. and O. Silva (2008a): "School Quality, Child Wellbeing and Parents' Satisfaction", mimeo, London School of Economics.
- Gibbons, S. and O. Silva (2008b): "Urban Density and Pupil Achievement", *Journal of Urban Economics*, 63, 631-650.
- Gibbons, S. and S. Telhaj (2007): "Mobility and School Disruption", Centre for the Economics of Education Discussion Paper 0083.
- Gibbons, S. and S. Telhaj (2006): "Peer effects and pupil attainment: Evidence from Secondary school transition", Centre Centre for the Economics of Education Discussion Paper 0063.
- Glennerster, H. (1991): "Quasi-Markets for Education", *Economic Journal*, 101.
- Goldstein, H. and P. Noden (2003): "Modelling social segregation", *Oxford Review of Education*, 29(2), 225-237.
- Goolsbee, A. and J. Guryan (2005): "The Impact of Internet Subsidies in Public Schools", *Review of Economics and Statistics*, forthcoming.
- Gorard, S., C. Taylor and J. Fitz (2003): *Schools, Markets and Choice Policies*, Routledge Farmer, London.
- Grossman M. (2005): "Education and Non Market Outcomes", Chapter 10 in the 'Handbook of the Economics of Education', E. Hanushek and F. Welch (eds.), North Holland, Amsterdam.
- Hanushek, E. (2003): "The Failure of Input-Based Policies", *Economic Journal*, 113.
- Hanushek, E., J. Kain, J. Markman and S. Rivkin (2003): "Does Peer Ability Affect Student Achievement?", *Journal of Applied Econometrics*, 18.
- Hanushek, E., J. Kain, D. O'Brien and S. Rivkin (2005): "The market for teacher quality", NBER WP 11154.
- Hanushek, E., J. Kain and S. Rivkin (2003a): "How to improve the supply of high quality teachers", *Brooking Papers on Education Policy*.
- E. Hanushek, J. Kain and S. Rivkin (2003b): "Why public schools lose teachers", *Journal of Human Resources*, forthcoming.
- Hanushek, E., J. Kain and S. G. Rivkin (2004): "Disruption versus Tiebout improvement: the costs and benefits of switching schools", *Journal of Public Economics*, 88, 1721-1746.
- Hanushek, E. and M. Rayomond (2003): "The Effect of School Accountability Systems on the Level and Distribution of Student Achievement", *Journal of the European Economic Association*, forthcoming.
- Hanushek, E. and L. Woessmann (2007): "The Role of School Improvement in Economic Development", NBER WP 12832.
- Heckman, J. (2000): "Policies to Foster Human Capital," *Research in Economics*, 54(1).
- Holmes, G., J. DeSimone and N. Rupp (2003): "Does School Choice Increase School Quality?", NBER WP 9683.
- Hoxby, C. (1994): "Do Private Schools Provide Competition for Public Schools?", NBER WP 4978.

- Hoxby, C. (2000a): “Does Competition Among Public Schools Benefit Students and Taxpayers?”, *American Economic Review*, 90(5).
- Hoxby, C. (2002): “Peer Effects in the Classroom: Learning from Gender and Race Variation” NBER WP 7867.
- Hoxby, C. (2003): “School Choice and School Productivity (Or, Could School Choice be a Rising Tide that Lifts All Boats?)”, in C. Hoxby (ed.), *The Economics of School Choice*, University of Chicago Press, Chicago.
- Hoxby, C. (2004): “School Choice and School Competition: Evidence from the United States”, *Swedish Economic Policy Review*, 10(2).
- Hoxby, C. (2000b): “Would School Choice Change the Teaching Profession?”, NBER WP 7866.
- Hoxby, C., and J. Rockoff (2004): “The Impact of Charter Schools on Student Achievement”, HIER WP.
- Jacob, B. (2005): “Accountability, Incentives and Behavior: Evidence from School Reform in Chicago.” *Journal of Public Economics*. 89(5-6): 761-796.
- Jepsen, C. (2003): “The effectiveness of Catholic Primary schooling”, *Journal of Human Resources*, 38, 928-941.
- Kane, T. and D. Staiger (2001): “Improving School Accountability Measures” NBER WP 8156.
- Kane, T. and D. Staiger (2002): “Volatility in School Test Scores and Implications for Test-Based Accountability Systems”, *Brookings Papers on Education Policy*.
- Kane, T., D. Staiger and S. Reigg (2005): “School quality, neighbourhoods and housing prices: The impacts of school desegregation”, NBER WP 11347.
- Kramarz, F., S. Machin and A. Ouazad (2007): “What Makes a Grade? The Respective Contribution of Pupils, Schools and Peers in Achievement in English Primary Education”, mimeo, London School of Economics.
- Krueger, A. (2003): “Economic Consideration and Class Size”, *Economic Journal*, 113.
- Krueger, A. and M. Lindahl (2001): “Education for Growth: Why and For Whom?”, *Journal of Economic Literature*, vol. 39(4).
- Krueger, A. and P. Zhu (2003): “Another Look at the New York City School Voucher Experiment”, NBER WP 9418.
- Lavy (2002): “Evaluating the Effect of Teachers’ Performance Incentives on Pupils’ Achievements”, *Journal of Political Economy*, 110(6), 1286-1317.
- Lavy, V. (2005a): “From Forced Bussing to Free Choice in Public Schools: Individual and General Equilibrium Effects”, mimeo, Hebrew University, Israel.
- Lavy, V. (2005b): “Performance pay and teachers’ effort, productivity and grading ethics”, mimeo, Hebrew University of Jerusalem.
- Lazear, E. (1995): *Personnel Economics*, Cambridge: MIT Press.
- Lazear, E. (2003): “Teacher Incentives”, *Swedish Economic Policy Review*, 10.
- Lazear, E. (2007): “Speeding, Tax Fraud and Teaching to the Test”, *Quarterly Journal of Economics*, forthcoming.
- Le Grand, J. (1991): *Equity and choice*, London, Harper Collins.
- Le Grand, J. (1993): *Quasi-markets and social policy*, London, Macmillan.
- Leuven, E., H. Oosterbeek and M. Rønning (2006): “Quasi-experimental estimates of the effect of class size on achievement in Norway”, mimeo, University of Amsterdam.
- Leuven, E., M. Lindahl, H. Oosterbeek, and D. Webbink (2004): “The Effect of Extra Funding for Disadvantaged Pupils on Achievement”, IZA DP, 1122.

- Levacic, R. (2004): "Competition and the Performance of English Secondary Schools: Further Evidence", *Education Economics*, 12(2), 177-93.
- Levacic, R. and A. Vignoles (2002): "Researching the Links between School Resources and Student Outcomes in the UK: A Review of Issues and Evidence", *Education Economics*, 10(3), 313-331.
- Lochner, L. and E. Moretti (2004): "The Effects of Education on Criminal Activity: Evidence from Prison Inmates, Arrests and Self-Reports", *American Economic Review*, 94, 155-189.
- Machin, S. and S. McNally (2004): "The Literacy Hour", Centre for the Economics of Education Discussion Paper 0043.
- Machin, S., S. McNally and C. Meghir (2007a): "Resources and Standards in Urban Schools", Centre for the Economics of Education Discussion Paper 0076.
- Machin, S., S. McNally and O. Silva (2007b): "New Technology in Schools: Is There a Payoff?", *Economic Journal*, forthcoming in July 2007 Issue.
- Machin, S. and A. Vignoles (2005): *What's the Good of Education?*, Princeton University Press.
- Machin, S. and A. Vignoles (2006): "Education Policy in the UK", Centre for the Economics of Education Discussion Paper 0057.
- Manski, C. (1993): "Identification of Endogenous Social Effects: The Reflection Problem", *Review of Economic Studies*, vol. 60(3), pp. 531-42.
- Maurin, E., S. McNally, A. Ouazad (2006): "Peer-Effects in English Primary Schools", mimeo, London School of Economics.
- McMillan, R. (2004): "Competition, Incentives and Public School Productivity", *Journal of Public Economics*, 88, 1871-1892.
- McNally, S. (2007): "Education, Education, Education: The Evidence on School Standards, Parental Choice and Staying-on", *Policy Analysis*, Centre for Economic Performance, London School of Economics.
- Mercenaro Gutierrez, O., A. de Coulon and A. Vignoles (2007): "The Value of Basic Skills in the British Labour Market", Centre for the Economics of Education Discussion Paper 0077.
- Mincer, J. (1974): *Schooling, Earnings and Experience*, New York, Columbia University Press.
- Mizala, A., and P. Romaguera (2000): "School Performance and Choice: The Chilean Experience", *Journal of Human Resources*, 35, 392-417.
- Neal, D. (1997): "The effects of Catholic Secondary schooling on educational achievement", *Journal of Labour Economics*, 15.
- Nechyba, T. (2000): "Mobility, Targeting and Private School Vouchers", *American Economic Review*, 90, 130-46.
- Nechyba, T. (2003), "School Finance, Spatial Income Segregation and the Nature of Communities", *Journal of Urban Economics*, 54, 61-88.
- Noell, J. (1982): "Public and Private Schools: A Reanalysis of 'Public and Private Schools'", *Sociology of Education*, 56, 12-132.
- OECD, Organization for Economic Cooperation and Development (2005): *Education at Glance*, 2005 Edition.
- Piketty, T. and M. Valdenaire (2006): "L'impact de la taille des classes sur la réussite scolaire dans les écoles, collèges et lycées français : Estimations à partir du panel primaire 1997 et du panel secondaire 1995", Paris: Ministère de l'éducation nationale, Les Dossiers n°173, 153p.
- Rothstein, J. (2006): "Does Competition Among Public Schools Benefit Students and Taxpayers? A Comment on Hoxby (2000)", *American Economic Review*, forthcoming.

- Rothstein, J. (2006): "Good Principals or Good Peers: Parental Valuation of School Characteristics, Tiebout Equilibrium, and the Incentive Effects of Competition Among Jurisdictions", *American Economic Review*, vol. 96.
- Rouse, C. (1998): "Private School Vouchers and Student Achievement: An Evaluation of the Milwaukee Parental Choice Program", *Quarterly Journal of Economics*, 113, 553-602.
- Rouse, C., J. Hannaway, D. Goldhaber and D. Figlio (2007): "Feeling the Heat? How Low-Performing Schools Respond to Voucher and Accountability Pressure", mimeo, Princeton University.
- Rouse, C., A. Krueger, and L. Markman (2004): "Putting Computerized Instruction to the Test: A Randomized Evaluation of a 'Scientifically-Based' Reading Program", NBER WP 10315.
- Schagen, S., D. Davies, P. Rudd and I. Schagen (2002): "The impact of specialist and faith schools on performance", LGA Educational Research Programme Report 28, Slough, NFER.
- Smith, B. and K. Meier (1995): "Public Choice: Markets and the Demand for Quality Education", *Political Research Quarterly*, 48, 461-478.
- Tiebout, C. (1956): "A Pure Theory of Local Expenditures." *Journal of Political Economy*, 64(5), 416-424.
- Urquiola, M. (2005): "Does school choice lead to sorting? Evidence from Tiebout variation", *American Economic Review*, 95(4), 1310-1326.
- Van Reenen, J. and B. Sianesi (2003): "Education and Economic Growth: A review of the literature", *Journal of Economic Surveys*, vol. 17(2), 157-200.
- Webbink, D. (2005): "Causal Effects in Education", *Journal of Economic Surveys*, 19(4), 535-560.