WHAT IMPACT DOES SCHOOL SPENDING HAVE ON PUPIL ATTAINMENT?

A review of the recent literature

Key findings from the studies reviewed:

- There are only a few research studies on English data sophisticated enough to provide robust estimates of the impact of school spending on attainment. Although they do not specifically look at how the effect changes over time, the weight of evidence from these studies suggests that additional school resources positively influence attainment, although the effects are relatively modest at all Key Stages.

- The magnitude of the estimated effect varies significantly between studies, usually explained by the different methodologies that they employ. Overall, spending an extra £1,000 per pupil\(^1\) can over time boost pupils' attainment at GCSE, but only by a fraction of a grade. At Key Stage 2 estimated effects range from a few weeks of progress to up to a term's worth (in the most robust study).

- The majority of the evidence supports the idea that additional spending has a slightly greater impact on the attainment of FSM pupils than spending on other pupils.

- PISA evidence also supports the conclusion that spending can play an important role in educational achievement, although other factors explain the majority of the variation in PISA scores between countries.

- However, significant evidence gaps remain. Some could be filled by further research and the £136m provided to the Education Endowment Foundation over the next 10-15 years, to promote robust policy evaluation through random assignment methods, will help to fill these gaps.

Introduction

Establishing a robust, causal link between resources and attainment is difficult because of the need to control for a wide range of other factors that influence attainment and because school funding compensates disadvantaged areas, schools or students (who tend to have lower attainment) by providing extra resources. In particular, the ability to get underneath this natural characteristic of the system and uncover the underlying relationship between funding and attainment is crucial in identifying a causal link between the two.

There are only a few English studies sophisticated enough to provide robust estimates of the impact of school spending on attainment. These studies tend to use:

\(^1\) This is the metric commonly used in the literature to interpret the results of these studies. However, we should not attempt to scale up these effects for larger amounts of spending, as the evidence suggests that the attainment effects of extra spending are non-linear.
a) **Natural (i.e. random) variation of spending** in the system, which isn’t related to disadvantage. This helps to isolate the true causal effect of spending on attainment, as the effect different spending levels have on otherwise similar pupils/schools can be observed.

b) **Rich data sets** to control for other factors that drive educational outcomes (e.g. pupil and school characteristics, and some of the more recent studies control for the impact of a pupil’s family may have on their educational outcomes)

This review summarises these studies, as well as setting out some of the evidence gaps which exist in this field.

**Primary Schools**

Gibbons et al (2011) exploit differences in funding between schools on local authority boundaries in London, who face similar costs and pupil intakes, to assess whether attainment was causally affected by spending in the early to late 2000s (method a above). The strategy uses the fact the closely neighbouring schools with similar pupil intakes can receive markedly different levels of core funding if they are in different education authorities. Overall their approach is considered the most robust, as the variations in funding they observe are unrelated to the level of disadvantage between schools.

They find **higher funding does lead to higher student performance at end-of-Key-Stage-2 tests**: an additional £1,000 per student per year raises Key Stage 2 test scores by around 0.25 standard deviations. This effect translates into:

- Increasing each pupil’s attainment by about 1 point score (equivalent to about a term’s extra progress); or put another way

- Moving around one fifth of students in the 2011 cohort who were achieving Level 4 in maths up to Level 5 (about 47,000 pupils), and almost one-third of those at Level 3 in maths up to Level 4 (approx. 24,000 pupils).²

The other significant study is by Holmlund et al (2010). They also look at the relationship between expenditure and pupil attainment at the end of primary school, over a similar time period to Gibbons, et al (2011). Their strategy involves controlling for characteristics of pupils and schools and allowing for school-specific time trends in attainment (method b above).

Their results indicate a **positive – but much smaller – effect, roughly a fifth of the size found in Gibbons et al (2011)**: an increase in the expenditure per pupil of £1,000 leads to an increase in the Mathematics test score of 0.051 standard deviations, in English of 0.040 and in Science of 0.050.

Why are these results so different? There are two main explanations:

² Numbers taken from DfE (2011), Interim results for key stage 2 and 3 national curriculum assessments in England: academic year 2010 to 2011, DfE SFR 18/2011 (link). Note the “External Validity” caveat below, though. These figures are based on extrapolating from results based on a subset of pupils/schools who may not be representative.
1. The methodology is very different. The Gibbons et al. (2011) study has the stronger methodology: this ‘quasi-experimental’ approach is generally regarded as a better method for stripping out the effect of the compensatory characteristics of the funding system. Thus, we can be more confident that their results represent the true, causal link between spending and attainment.

2. The sample Gibbons et al (2011) use refers to schools in urban areas with many disadvantaged pupils, whereas Holmlund et al (2010) use all schools in England. In the Holmlund et al study, effect sizes were higher for disadvantaged children (by 50-100%).

Secondary Schools

Nicoletti and Rabe (2012) use a rich data set with a large number of variables to quantify the relationship between spending on education and test scores at 16. By comparing outcomes for siblings exposed to different levels of education expenditure, they find that a permanent £1000 increase in expenditure per student raises achievement by about 0.02 standard deviations. This translates into 0.2 GCSE points. As 6 points are needed for an improvement of one grade, and there are 8 grades (A*-G), these effects are small.

However this does not mean that spending is significantly less effective in secondary schools. The results in Nicoletti and Rabe (2012) are driven by the fact that they are comparing siblings, who 85% of the time will attend the same school, but in different years. Therefore, the study is effectively estimating the effect of marginal changes in expenditure from year to year within a school. The Nicoletti and Rabe paper is much more comparable (methodologically) to Holmlund et al (2010) (discussed above) which assesses primary school effects using the same data set. These two studies show the impact of resources on attainment are similar in primary and secondary schools.

Further work by Nicoletti and Rabe (2013a) suggests that an increase in expenditure per pupil of £1,000 could boost GCSE test scores in Mathematics, English, and Science by 3% of a standard deviation for those at the bottom of the attainment distribution. The effect is larger (9% of a standard deviation) for the most able pupils identified at Key Stage 2, but still represents only a small change in attainment.

Effect of additional spending on disadvantaged pupils’ attainment

The evaluation of the Pupil Premium found that it was too early to conclude whether its introduction has boosted FSM pupils’ attainment. However, English studies have consistently found that additional spending has a stronger effect for disadvantaged pupils than other pupils. For example Gibbons et al (2011) found an additional £1000 per year per primary pupil increased FSM pupil attainment at Key Stage 2 by 0.289 standard deviations (just over a term’s progress) compared to 0.222 standard deviations for non-FSM pupils (just under a term’s progress). The study controls for FSM which is correlated with low attainment

DfE (2013), Evaluation of the Pupil Premium, DFE- RR282

A similar picture is found in other studies such as Holmlund et al (2008), Jenkins et al (2006), and Levacic et al (2005) although the absolute size of the effects is smaller because of the different research methods discussed above.
Effects of different types of spending

Nicoletti and Rabe (2013b) also examined the effects of different types of spending on different groups in secondary school, rather than looking simply at the effect of ‘additional spending’. Their results suggest that:

- **Spending on teachers** has a positive effect on test scores for most groups of pupils studied, although unsurprisingly effects are small: A £1,000 increase in teaching spending per pupil is associated with between a 0.5% and 2.5% increase in standardised GCSE test scores in Mathematics, English, and Science.

- **Increased pupil-teacher ratios** have a small negative impact on pupils’ attainment. For most pupils a one pupil increase in the pupil-teacher ratio reduces standardised GCSE test score by 1%, rising to c. 2% for the lowest attaining 10 per cent of pupils.

- **Spending on education support staff** was found to positively affect the attainment of EAL, FSM, and Gifted and Talented pupils. A £1,000 increase in spending on education support staff would have increased EAL test scores by 12.4%, FSM scores by 7%, and Gifted and Talented scores by 11%.

- **Spending more on learning resources** (e.g. books, computers) in most cases positively affected attainment. Spending an extra £1,000 would have boosted the test scores of SEN pupils by 6.2%

Capital spending and pupil outcomes

Overall, there are fewer (robust) studies of the relationship between expenditure on school capital (buildings and places) and attainment than on revenue expenditure – both in the UK and internationally. The key evidence from the literature is as follows:

- Three studies by PwC (2000; 2003; 2010) found a small but statistically significant positive relationship between capital investment and pupil attainment (although there were weaknesses in the available datasets which restricted ability to include all inputs).

- On the issue of school places, a study of overcrowding in North Carolina (McMullen and Rouse, 2012) found a minor negative impact on reading scores but not on maths. Earlier work in New York (Rivera-Batiz and Marti, 1995) found that 2-9% fewer pupils passed maths and English tests in overcrowded schools, although the study did not control for pupil characteristics. Chan (2009) synthesised available evidence on use of temporary classrooms and found no negative impact on attainment (or other outcomes).

- There is a clear link between the condition of school buildings and levels of attainment. PwC (2007) concluded “Newer and better school buildings contribute to higher levels of pupil attainment” and there are studies from the US, Wales and Kuwait which support this conclusion. However, Higgins et al
(2005) noted that “a recurrent question is the extent to which the physical school, environment needs to be any more than adequate” and PwC agreed that positive effects are less certain where buildings improve from adequate to excellent. It seems reasonable to draw the lesson that spending on improving the condition of the worst schools will be the most effective.

**International evidence**

Evidence from PISA shows the level of education spending can have an impact on a nation’s educational performance – however it does not guarantee higher performance (OECD (2012)). Among wealthier economies, those that prioritise the quality of teachers over smaller classes tend to show better performance. According to the OECD, **levels of spending explain around a fifth of the variation in PISA results** – a sizeable amount. However, the impact is much less pronounced for high income countries.

**Evidence gaps**

Although the evidence shows that the level of resources available to primary and secondary schools does have an impact on their pupil attainment, a number of gaps in the evidence remain:

- **External Validity**: The analytical approach used by Gibbons et al is not easily applicable outside densely populated urban areas, so it is not possible to conclude for sure that the effects found in London primaries apply to all schools.

- **Non-linear effects**: Does the relationship between resources and attainment vary for smaller and larger variations in school spending? Gibbons et al (2011) suggest that their main results are driven by schools with larger differences in funding levels (up to £1,000 per pupil) but their ability to estimate exactly how much more funding really makes a difference to attainment is constrained by the data (i.e not enough schools with large variations).

- **Different types of spending**: While some studies (e.g. Nicoletti and Rabe (2013b) extend their analysis to investigate the attainment effects of different types of spending, these conclusions are tentative at this stage and this area would benefit from further work.

- **When, and who, to target**: The current evidence does not provide a clear view about whether it is better to target resources at primary or secondary phases, or at different types of pupils. The best studies all find significant, positive educational impact of spending that is consistently modest in size.

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6 Andreas Schleicher, the OECD’s Deputy Director for Education, and Special Advisor on Education Policy to the Secretary-General, writing for Reform in 2012.
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