CORPORATE FINANCE

Investment in school facilities and PFI – do they play a role in educational outcomes?

KPMG's Infrastructure Spotlight Report

ADVISORY

The debate starts here:

Does investment in schools improve educational attainment?

PFI v conventionally financed schools – which one delivers?

What are the implications for government?

What evidence supports the findings?

AUDIT ▪ TAX ▪ ADVISORY

We are very pleased to introduce KPMG's Infrastructure Spotlight Report which investigates the impact of investment in school building, and the use of private finance, on educational outcomes. Too often we find that these subjects produce opinion and assertion, so we are trying here to offer an objective analysis on the subject using available data.

The brief headline from the study is the suggestion that, overall, investment does lead to improved attainment. Furthermore, schools procured using private finance appear to achieve better educational outcomes more quickly than those procured conventionally.

We believe that this analysis is supported by the fullest body of evidence yet available. We hope that it serves as a stake in the ground for further studies and that it will begin to add to the quality of debate on these subjects.

It is important that this analysis is revisited and expanded in future years as more data becomes available to check whether these initial findings persist as more schools progress through the modernisation process. In the meantime, the analysis has, we believe, some important issues for government to consider in deciding how and when investment programmes in education should be financed. The results of this study are a useful backdrop for a key part of the current investment strategy in the UK. There is a key investment programme under way (BSF) of which at least half of the investment is being supplied through PFI.

Kai Rintala
Infrastructure Research Leader

Contents

Key insights: thought-provoking results

KPMG's Infrastructure Spotlight Report[1] is a study into the impact of school delivery systems on educational outcomes in England.

While caution needs to be exercised because of the limited sample size and the inherent volatility in educational attainment, the results of the study are thought-provoking. Using data supplied by the Department for Children, Schools and Families and English local authorities, the study demonstrates that investment in school facilities does indeed improve educational attainment.[2] Moreover, the study shows that, overall, schools procured through PFI[3] deliver better educational outcomes faster than those procured conventionally.[4]

The headline rate of improvement is 20 percent higher in PFI schools. The sample, while small in the light of volatility in educational attainment, did include every eligible PFI and conventionally financed state secondary school in England.

But that is only part of the story. When comparing only fully rebuilt[5] school facilities, the rate of improvement in PFI schools is 92 percent higher than in conventionally financed schools. Based on this analysis, there is a nine out of ten chance that if two schools, one PFI school and one conventionally financed, are fully rebuilt, the PFI school will improve educational outcomes faster.

The findings of this KPMG study should be read with caution. The first PFI school only opened in 2000, providing at the very best only six full years of PFI-specific attainment data. These results must, therefore, be seen as early findings and the analysis should be revisited in years to come. It is, nevertheless, important to note that this is the fullest body of evidence yet available anywhere in the world on this issue.

[1] KPMG's Infrastructure Spotlight Report draws on research conducted under the supervision of Graham Ive of the Bartlett School of Graduate Studies, UCL (University College London)

[2] Measured as the percentage of students obtaining 5 or more A* to C Grade GCSE results

[3] PFI is a form of Public Private Partnership (PPP)

[4] Conventional procurement is used as an umbrella term for design-bid-build, design-and-build and other non-project-finance-based procurement methods

[5] A fully rebuilt school is a school that has been reconstructed in its entirety either on the existing site or on a new site

Why this might be has not been examined and is a matter for conjecture. There could be different factors at play which might contribute. For example, one possible explanation for the superior performance of PFI might be a reduction in the amount of disruption caused by construction. Private sector partners in PFI schools have financial incentives to make the construction period[6] as short as possible in order to accelerate the start of payment for the school. Another possible factor could be the presence of private sector personnel within the premises. The facilities management contractor has an incentive to enforce and preserve the integrity of the school building, otherwise they may be exposed to financial penalties or additional costs. This might translate into a more sustainable environment conducive to improved attainment. Equally the removal of premises-related activities from teaching and school staff might also have a beneficial effect. There are likely to be other factors – some particular to the individual schools involved, some more generic – which could also be at play. This issue should, in our view, be examined in detail at a future point.

The findings of this KPMG study could have implications for government, whether central or local, in the United Kingdom and globally. For example, the UK Academies Programme might consider whether more thought needs to be given to the use of fully rebuilt PFI facilities. The Building Schools for the Future (BSF) Programme already uses PFI for the majority of fully rebuilt schools (excluding Academies).

[6] National Audit Office (2003) *PFI: Construction Performance*, HM Stationary Office, London

Introduction: building for the future

The last decade has seen the arrival of the Private Finance Initiative (PFI) and the Building Schools for the Future (BSF)[7] Programme into the schools space, promoting increased private sector involvement in the delivery of serviced educational accommodation.

Time and again questions have been raised as to whether PFI is a good policy and represents value for money for public projects.

It is only recently that adequate data has become available to start a meaningful analysis of what, if anything, PFI might bring to education. KPMG's Infrastructure Spotlight Report focuses on the effectiveness of the delivery system and asks: does investment in school projects improve educational outcomes and, further, does the use of PFI in these projects improve matters?

The evidence in this area has, in the past, been primarily anecdotal. There are tales of how new PFI schools have transformed the motivation of new learners. But there are other stories that are less complimentary. This KPMG study aspires to be objective and transparent in drawing on hard evidence in order to propel the debate towards a higher level of informed assessment.

The results outlined in the following pages of this report show that:

- At the renewed[8] schools included in the study educational attainment improved at a faster rate than in those that have not been renewed; the annual rate of improvement in renewed schools was 0.5 percentage points higher
- In renewed PFI schools educational attainment improved at a rate that was 20 percent faster than in renewed conventionally financed schools
- In fully rebuilt PFI schools educational attainment improved at a rate that was 92 percent faster than in fully rebuilt conventionally financed schools

The following sections explore these trends in greater detail, leading to a set of conclusions. A description of the methodology used to arrive at the above findings is summarised on the last pages of this report.

[7] BSF is a form of PPP

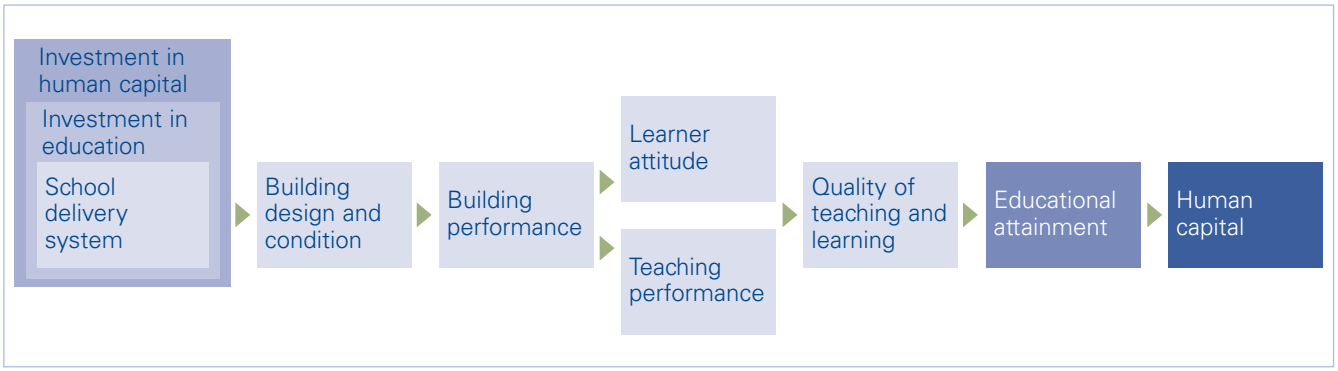
[8] A renewed school is a school that is more than 50 percent new (rebuilding, refurbishment and/or extension).

Human capital: investment essential

In the contemporary world, continual investment in human capital is essential. It yields improvements in productivity which in turn enhance national competitiveness.[9] Investment in education is investment in human capital.[10] Spending money on school buildings clearly falls under the umbrella of educational investment, and school facilities have an impact on the delivery of education.

Each school delivery system, such as design-and-build or PFI, is likely to have a specific impact on educational outcomes. Each delivery system has a set of incentives, financial or otherwise, and these incentives may produce differences. It is, therefore, not unreasonable to expect that it should matter in terms of attainment how (i.e. which delivery system) the investment in school buildings is made. Figure 1 below conceptualises the role of a school delivery system in the development of human capital.

Figure 1. Human capital and school delivery systems – a conceptual model



Source: KPMG LLP (UK) 2008

While there is no consistent, objective and agreed indicator used to measure the impact of investment in education, it is imperative to focus on what is important. That is, the outcome. Are learners able to realise their potential? It is also important to recognise that this can, at the very best, be assessed through a proxy measure. This study uses GCSE results as an indicator of educational attainment.

9 OECD *The appraisal of investments in educational facilities, programme on educational building*, France: OECD Publishing, 2000

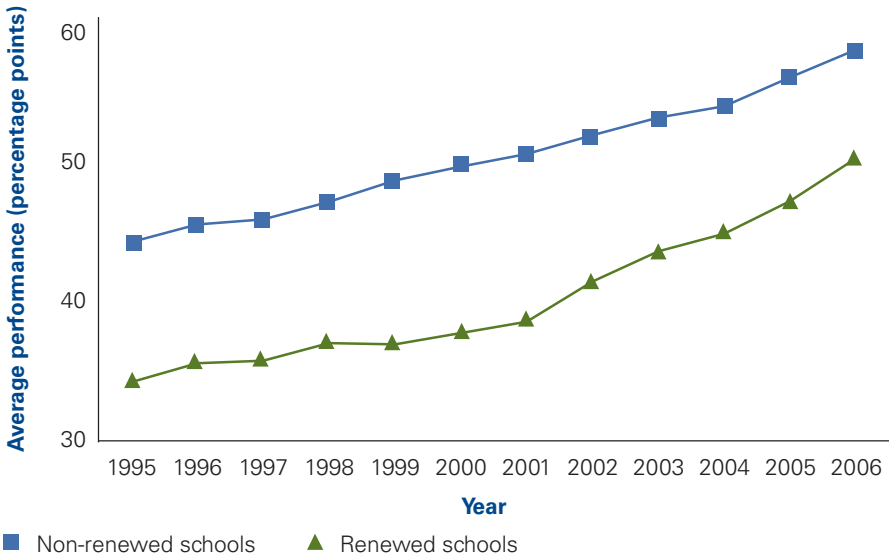
10 Please see the work of Nobel Laureates Gary Becker and Theodore Schultz.
- Becker, G.S. (1962), 'Investment in human capital: A theoretical analysis', *The Journal of Political Economy*, Vol. 70, No. 5, 'Part 2: Investment in Human Beings', pp. 9-49
- Schultz, T.W. (1971), *Investment in human capital: The role of education and of research*, New York, The Free Press

Whether to renew a school

This section considers whether the very act of renewing[11] a school, whatever the delivery system used, has an effect on educational attainment. Graph 1 and Table 1 below show the average performance of schools renewed and schools not renewed in England (remember, the sample includes every eligible state secondary school). The renewed schools in this data set include all schools that opened between 1995 and 2006.

Both Graph 1 and Table 1 show an upward trend in educational attainment, which is likely, in part, to be explained by growth in educational expenditure. The most important and interesting observation, however, is the narrowing performance gap between schools that were not renewed and those that were. By 2006 a gap of 12.8 percentage points in 2001 had narrowed to a gap of 8.1 percentage points: it had fallen by over a third in five years. This implies that new school facilities contribute towards educational attainment, especially as the sample includes every eligible state school in England, and if we are interpreting the figures correctly, the narrowing of the gap should continue to accelerate.

Graph 1. Educational attainment in renewed and non-renewed schools



NOTE: A possible explanation for the superior performance of non-renewed schools is that public funding for school renewal may be allocated to those with greatest need; this could be reflected in attainment levels.

Data source: Department for Children, Schools and Families
Analysis: KPMG LLP (UK) 2008

[11] A renewed school is more than 50 percent new (as a result of rebuilding, refurbishment and/or extension). A school is referred to as renewed as opposed to new because this KPMG study focuses on the difference in performance before and after renewal. New schools that, by definition, do not have an educational attainment history have been excluded from the analysis.

The attainment gap increased until 2001 but by 2006 it was at its narrowest. It is believed that this may be explained by the number of renewed schools in the data set. Between 1996 and 2001 the number goes from 4 to 65, but between 2002 and 2006 it increases dramatically from 83 to 262. This is likely to have stabilised the data and brought out a more reliable trend.

Table 1

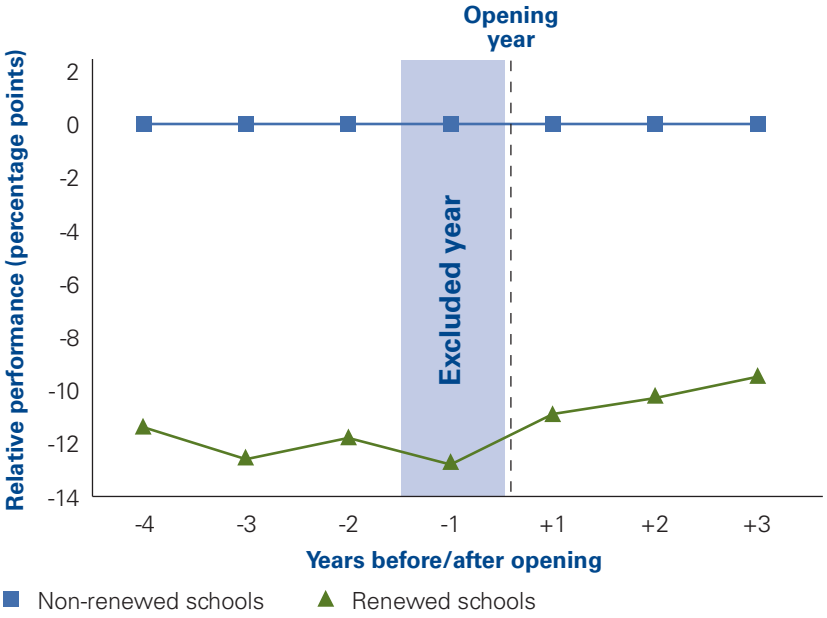
Average performance (percentage points)												
Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Non-renewed	44.7	46.1	46.5	47.9	49.6	50.7	51.7	53.2	54.6	55.5	57.8	60.0
Renewed	34.1	35.6	35.8	37.2	37.1	38.0	38.9	42.1	44.5	45.9	48.5	51.9
Performance gap	10.6	10.4	10.7	10.7	12.5	12.6	12.8	11.2	10.2	9.6	9.3	8.1

Data source: Department for Children, Schools and Families
Analysis: KPMG LLP (UK) 2008

A more sophisticated take

This section approaches in a more sophisticated manner, the question of whether renewing schools translates to better educational outcomes. Graph 2 below shows the average educational attainment for renewed schools relative to those not renewed for a seven-year period. In other words, it shows how much the performance of schools renewed lags behind those not renewed. The information is presented using the year that the renewed school facility opened as a point of reference.

Graph 2. Educational attainment in renewed schools relative to non-renewed schools



Note: As before, a possible explanation for the superior performance of non-renewed schools is that public funding for school renewal may be allocated to those with greatest need; this could be reflected in attainment levels.

Data source: Department for Children, Schools and Families
Analysis: KPMG LLP (UK) 2008

The year leading to reopening has been excluded from the analysis because it had the potential to distort[12] the findings. The average performance levels (relative to non-renewed schools) for three years before (the year immediately prior to reopening excluded) and the three years after opening were compared.

[12] Possible distortions include the negative 'construction period disruption' effect and the positive 'psychological' effect caused by the announcement of a forthcoming opening of the school in a renewed building (also known as the Hawthorn effect). Both effects were observed in the data for individual schools.

Table 2

Performance relative to non-renewed schools (percentage points)							
	Before renewal				After renewal		
Year	-4	-3	-2	-1	+1	+2	+3
Renewed schools	-11.4	-12.7	-11.8	-13.0	-10.9	-10.3	-9.3
Three-year average		-12.0		(excluded)		-10.2	
Relative improvement				1.8			
Annual rate of improvement				0.5			

Data source: Department for Children, Schools and Families
Analysis: KPMG LLP (UK) 2008

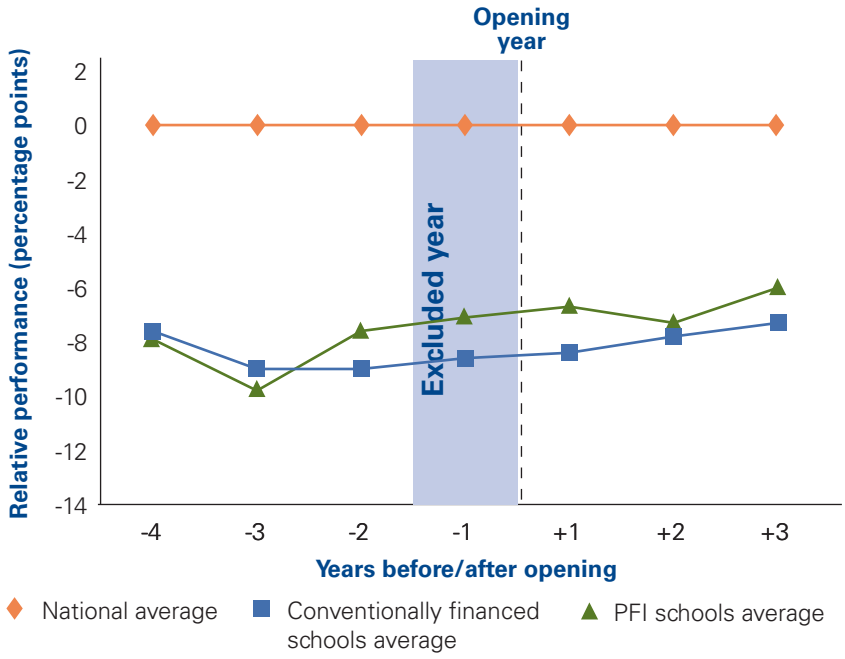
Table 2 shows that the performance of renewed schools improves from 12.0 percentage points below non-renewed schools to only 10.2 percentage points below. It is clear that within a four-year period, on average, renewed schools improved their performance 1.8 percentage points more than those not renewed. This translates to an annual rate of improvement of 0.5 percentage points.

Does it matter how school investment is financed?

Renewed schools

This section seeks to build an appreciation of the impact that PFI has on educational attainment. It shows that PFI schools improve attainment at a rate 20 percent faster than conventionally financed schools. Graph 3 below shows the performance of the two types of school relative to the national average.[13] The period presented covers four years before and three years after renewal.

Graph 3. Educational attainment in renewed PFI and conventionally financed schools relative to the national average



NOTE: Again, public funding for conventionally financed schools and PFI schools may be allocated to those with greatest need. This could explain the below national average performance of renewed schools.

Data source: Department for Children, Schools and Families
Analysis: KPMG LLP (UK) 2008

Graph 3 shows that in both PFI schools and conventionally financed schools improvement in attainment begins before the schools are rebuilt. This suggests perhaps that the impending renewal of a school has a positive psychological impact on learners' performance.

[13] The national average includes all secondary schools in England.

Table 3[14]

Performance relative to national average (percentage points) – conventionally financed schools							
	Before renewal				After renewal		
Year	**-4**	**-3**	**-2**	**-1**	**+1**	**+2**	**+3**
Renewed schools	-7.6	-9.0	-9.0	-8.5	-8.4	-7.8	-7.3
Three-year average		-8.5		(excluded)		-7.8	
Relative improvement				0.7			
Annual rate of improvement				0.2			
Annual rate of absolute improvement				1.4			

Performance relative to national average (percentage points) – PFI schools							
	Before renewal				After renewal		
Year	**-4**	**-3**	**-2**	**-1**	**+1**	**+2**	**+3**
Renewed schools	-8.0	-9.8	-7.6	-7.1	-6.7	-7.3	-6.0
Three-year average		-8.5		(excluded)		-6.7	
Relative improvement				1.8			
Annual rate of improvement				0.4			
Annual rate of absolute improvement				1.7			

Data source: Department for Children, Schools and Families
Analysis: KPMG LLP (UK) 2008

Table 3 above shows that the relative improvement from three years before to three years after (with a year excluded) is 0.7 percentage points in conventionally financed schools and 1.8 percentage points in PFI schools. Expressed as an annual rate of improvement, the numbers are 0.2 percentage points and 0.4 percentage points respectively.

The publicly available attainment data indicates that the rate of improvement in the national average over the last 12 years has been 1.3 percentage points per annum. The rates of relative improvement in PFI and conventionally financed schools are converted to rates of absolute improvement by adding the national average rate of improvement. This gives an absolute rate of annual improvement of 1.4 percentage points for conventionally financed schools and 1.7 percentage points for PFI schools. Thus, schools procured through PFI improve educational attainment, on average, at an annual rate 20 percent faster than those procured conventionally.

The finding that PFI schools improve performance more rapidly than conventionally financed schools cannot, however, be reliably used as a predictor of future performance. This is because statistical significance could not be established in the dataset of 91 conventionally financed schools and 52 PFI schools. This is believed to be due to the limited sample size, considering the large variance in the attainment data. The findings, nevertheless, do apply to every state secondary school in England eligible for this analysis.

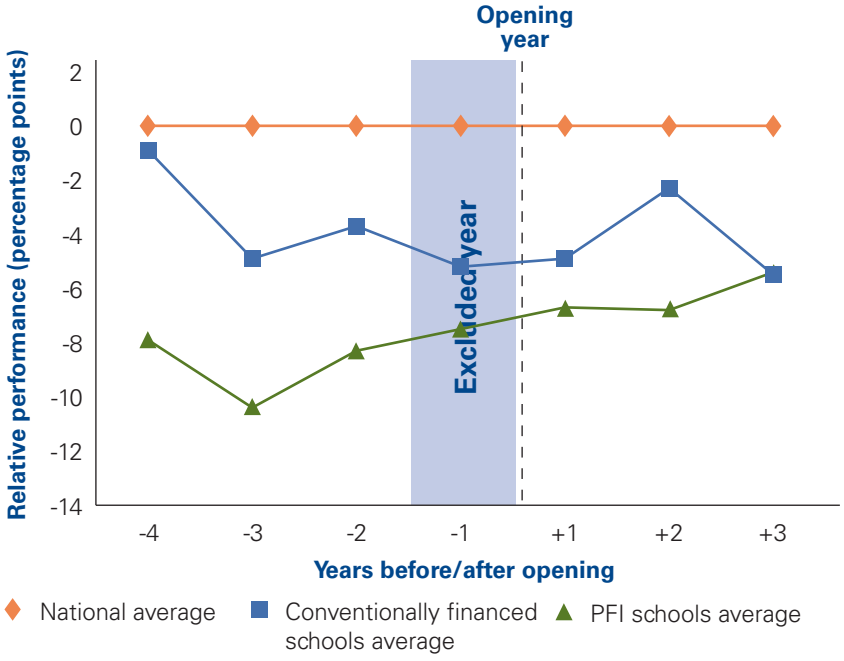
[14] Results presented throughout this document have been calculated using exact numbers. Their rounding for presentation explains why some calculations can appear erroneous.

Fully rebuilt schools

Here we consider the specific circumstances in which a particular delivery system is likely to be most effective. The same steps were followed for a sample of fully rebuilt schools as for the sample of renewed schools. The analysis illustrates that PFI improves performance at a rate 92 percent higher than conventional methods when schools are fully rebuilt.

Graph 4 below shows the performance of both PFI schools and conventionally financed schools relative to the national average. It is interesting to observe that the educational attainment in conventionally financed schools is declining before they are rebuilt. It would appear that investment in new school buildings slows the trend rate of decline.

Graph 4. Educational attainment in fully rebuilt PFI and conventionally financed schools relative to the national average



NOTE: Again, public funding for conventionally financed schools and PFI schools may be allocated to those with greatest need. This could explain the below national average performance of fully rebuilt schools.

Data source: Department for Children, Schools and Families
Analysis: KPMG LLP (UK) 2008

Table 4

Performance relative to national average (percentage points) – conventionally financed schools							
	Before renewal				After renewal		
Year	**-4**	**-3**	**-2**	**-1**	**+1**	**+2**	**+3**
Renewed schools	-0.9	-4.9	-3.7	-5.2	-4.9	-2.3	-5.5
Three-year average		-3.2		(excluded)		-4.3	
Relative improvement				-1.1			
Annual rate of improvement				-0.3			
Annual rate of absolute improvement				1.0			

Performance relative to national average (percentage points) – PFI schools							
	Before renewal				After renewal		
Year	**-4**	**-3**	**-2**	**-1**	**+1**	**+2**	**+3**
Renewed schools	-8.0	-10.4	-8.3	-7.5	-6.7	-6.8	-5.4
Three-year average		-8.9		(excluded)		-6.3	
Relative improvement				2.6			
Annual rate of improvement				0.6			
Annual rate of absolute improvement				1.9			

Data source: Department for Children, Schools and Families
Analysis: KPMG LLP (UK) 2008

Graph 4 on the previous page and Table 4 above also illustrate the rates of improvement for fully rebuilt schools. The conclusion that flows from Table 4 is that PFI schools improve performance at an annual rate that is 92 percent faster than that of conventionally financed schools (1.9 percentage points per annum v 1.0 percentage points per annum). This finding can be used as a predictor of future performance (there is a nine out of ten probability that this applies). It was possible to establish statistical significance as the variance of the GCSE results in this particular sample of 31 PFI schools and 24 conventionally financed schools was relatively small.

Final thoughts

KPMG's Infrastructure Spotlight Report has presented some interesting findings.

The analysis has shown that:

- In renewed schools educational outcomes improve more rapidly than in those schools that have not been subject to renewal
- Educational attainment improves at a rate 20 percent faster in renewed PFI schools than in renewed conventionally financed schools
- Educational performance improves at a rate 92 percent faster in fully rebuilt PFI schools than in fully rebuilt conventionally financed schools

The last of these findings is likely to be the most significant in terms of shaping public policy. This is because it could be used as a predictor of future performance. There is a nine out of ten chance that if two schools, one PFI school and one conventionally financed school, are fully rebuilt, the PFI school will improve its level of educational attainment more quickly. This implies that PFI might demand additional consideration as a procurement method for fully rebuilt schools. This applies especially to Academies as most other fully rebuilt BSF schools are already procured using PFI.

This KPMG study does, however, come with a cautionary note. Only six years of PFI-specific attainment data was available and used in this analysis. It is important, in our view, to repeat and expand the analysis at a suitable point in the future. Nevertheless, it has been notable that the evidence used in this study on an innovative delivery system in the schools space has an important role to play in clarifying the debate in the infrastructure arena.

How we did it

KPMG's Infrastructure Spotlight Report focused on the impact of school delivery systems on educational attainment.

The percentage of students obtaining five or more A* to C Grade GCSE results was used as a proxy for educational outcomes. It was acknowledged, however, that there were other indicators. The chosen indicators were believed to be the most used, understood and consistent over the analysis period. Furthermore, GCSE results are also widely publicised and freely available.

The attainment data was obtained from the Department for Children, Schools and Families website (www.dcsf.gov.uk/performancetables). This data set covered a period from 1994 to 2006.

The study looked at the school renewal data including:

- School type (i.e. PFI schools and conventionally financed schools)
- Date of opening
- Type of construction works undertaken (i.e. renewed, fully rebuilt and partially renewed schools)

The findings of this KPMG study were produced by following the steps outlined below.

External influences

A common concern was that external factors, such as student background, had a major influence on educational attainment. It was, therefore, not possible to draw conclusions on the influence of a delivery system without controlling for such external factors. The techniques used to ensure that valid conclusions could be drawn included the following:

- The sample used was the entire population of state secondary schools in England (apart from a small number of randomly distributed exclusions). This ensured that the findings remained representative of the population studied.
- The focus was on assessing the difference in performance in the same data set before and after renewal or full rebuild. This eliminated the impact of random external variables within the dataset. In other words, the same schools were studied before and after renewal/rebuild.
- The data was de-trended against national average. This minimised the impact of random external variables in different years of the time-series data.

Whether to renew a school

- A data set including 5,018 secondary schools was obtained.
- Special schools, independent schools and private schools, as well as a number of other schools, were excluded on the grounds of unavailability or inconsistency of data. This produced a data set of 2,876 secondary schools. Some unavailability and inconsistency was tolerated.
- The data was split into non-renewed schools (2,614); and renewed schools (262).
- A graph of the time-series data comparing educational attainment in renewed and non-renewed schools was drawn.

A more sophisticated take

- An additional notable exclusion was made to the previous dataset of 2,876. The 105 schools renewed between 1993 and 1997, as well as those between 2004 and 2006, were taken out of the dataset. This ensured that performance data for a minimum of four years before and three years after renewal was available for the analysis. This resulted in a data set of 2,771 secondary schools.

- The data was sorted into two categories: non-renewed schools (2,614); and renewed schools (157).
- The average performance in non-renewed schools was deducted from the performance of renewed schools. This allowed the performance of renewed schools to be expressed relative to those not renewed.
- The attainment data for the renewed schools was sorted in relation to the date of reopening.
- The year immediately before opening was excluded from further analysis due to the potential for distortions. These could include the negative 'construction period disruption' effect and the positive 'psychological' effect caused by the announcement of a forthcoming opening of the school in a renewed building (also known as the Hawthorn effect). Both effects were observed in the data for individual schools.
- The average relative performance was calculated for three years before opening (from year four before to year two before) and three years after opening. This was done in order to smooth the data and thus make attainment data less volatile.
- A t-test (analysis of variance) was carried out to test the statistical significance of the difference in performance before and after renewal.

Does it matter how school investment is financed?

Renewed schools

- Academies (14) were excluded from the renewed school data set as they are not representative of conventionally financed schools.
- The renewed schools were sorted into PFI schools (52) and conventionally financed schools (91).
- The data was de-trended by subtracting the national average from the time-series data. This allowed performance to be expressed relative to the national average.
- The data was re-sorted in relation to the date of reopening.
- The average relative performance for three years before (year immediately before excluded) and three years after reopening was calculated for both PFI schools and conventionally financed schools.
- A t-test (analysis of variance) was carried out to test whether the difference between the PFI school improvement and conventionally financed school improvement was statistically significant. A confidence level of 90 percent was used.

Rebuilt schools

- Partially renewed schools were excluded from the data set, leaving fully rebuilt PFI schools (31) and fully rebuilt conventionally financed schools (24).
- The analysis undertaken for renewed schools was repeated for fully rebuilt schools.

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We are currently advising on several BSF schemes. Our clients include public and private sector entities.

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Designed and produced by KPMG LLP (UK)'s Design Services

Publication name: PFI – KPMG Infrastructure Spotlight Report

Publication number: 310-991

Publication date: February 2008