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Working Paper

Private Finance Initiative (PFI) school procurement

Analysis of a DTI survey of English Local Authorities

JOHN DAVIES & ASAD GHANI

DTI

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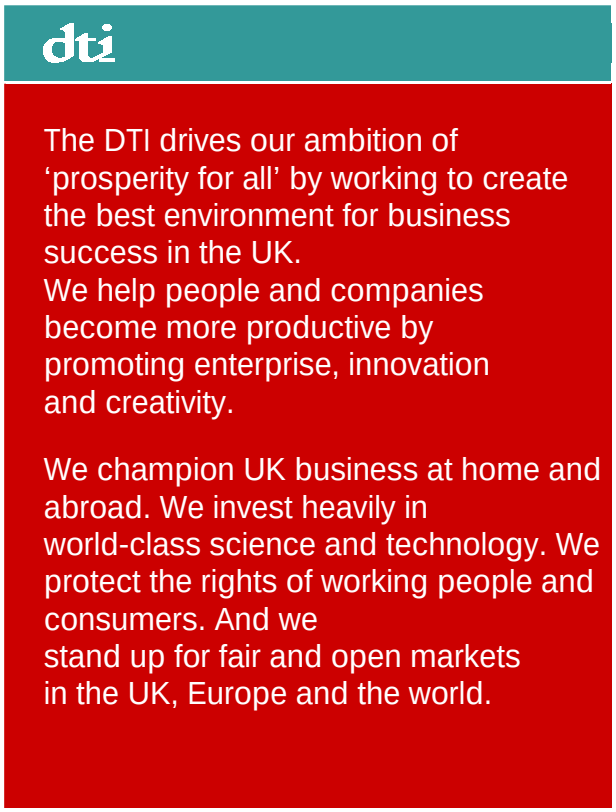


The views expressed in this working paper **(URN: 06/897)** are those of the authors and should not be treated as Government policy. We welcome feedback, and comments should be sent to: john.1.davies@dti.gsi.gov.uk

Executive summary

Private Finance Initiatives (PFIs) are a form of public sector procurement introduced in 1992. In a PFI the undertaking private consortium raises the finance and designs and delivers the project, which is defined by an output specification, for a predefined payment stream from the Government. PFIs are often (although not exclusively) used for the procurement of construction projects such as hospitals, roads and schools. They usually involve a long-term commitment from the consortium to maintain the project for a period of usually 15-30 years after construction and extensive risk transfer to the private sector. This has not traditionally been a feature of public procurement, and accordingly it is has been suggested that PFIs have required substantial external advice to be bought in by the public sector.

As little is known about the determinants of these advisor costs the DTI undertook a voluntary survey of 58 English Local Authorities who had procured PFI school projects, which allowed this and a number of other aspects of PFI procurement to be examined. Replies were received from 28 of the Authorities.

The survey returns covered 90 PFI schools (62 secondary 28 primary) procured by the Authorities between 1996 and 2002. The most common PFI was for 1 school only and covered 1000-2000 students, however there were also a number of larger projects. The average project had a cost (NPV of the unitary payment stream[1]) of £44 million, although the modal project cost was somewhat lower at £15-25 million.

The external advisor costs in the survey were on average around £600,000, which was 2% of the unitary payment. Financial advice usually constituted the highest percentage of the advisor costs, followed by legal and technical advice.

Analysis of the survey returns found that the costs of the PFI projects were closely related to the number of students/schools involved in a project and whether it was new build or refurbishment. There was also evidence that larger projects had longer construction times, and that the price of PFI schools has increased over time due to rising construction prices.

In contrast the external advisor costs incurred by the Local Authorities were not nearly as clearly related to the project details. This was the case with the total external advisor costs and also its component costs e.g. legal and financial costs. For the most part the advisor costs did not appear to be closely related to the duration of procurement and there was no clear cut link between the size of a project and their magnitude. There was some evidence that the financial advisor costs might be related to the duration of procurement, but it was not particularly strong. The survey found no evidence that the advisor costs incurred in the projects have fallen over time.

It seems likely that either no clear relationship between advisor costs and the project specification exists, or that it exists but is not sufficiently strong that we can pick it up in the data we reviewed. The sample size is relatively small, and there are the associated difficulties of a voluntary survey. Another possibility is that advisor costs are determined by factors that we can't directly measure in the survey. The qualitative responses to the survey questions indicated that respondents felt that the external advisor costs related mainly to planning issues and the lack of experience of the Local Authorities/level of in-house expertise. It seems plausible that these factors fluctuate from area to area, explaining why we are unable to understand the variation in these costs using the project specifications.

[1] Throughout this document the unitary payment will always be in NPV terms.

As the magnitude of advisor costs seem to be unrelated to the size of the project, this implies that on average the advisor cost per school/per student would fall for larger projects. However given the substantial variation in the advisor costs it is not possible to guarantee that this would be true for any particular project.

The number of bidders for the PFI projects fell over the survey time frame. This effect was more pronounced at the pre-qualified bidder stage than the invitation to negotiate (ITN) phase. The fall in the numbers seems likely to be due to substantial interest in the first wave of PFIs and spare capacity in the construction market at the time.

The net benefit[2] and risk transfer of PFIs was found to increase with the size of the project, although when expressed as a percentage of the unitary payment there was no obvious trend. The more risk a project transferred the higher its net benefit, with the net benefit usually being around half of the risk transferred.

Amongst the policy questions raised by this research are: the extent to which employing external advisors is more efficient than carrying out the work in house, the degree to which there are benefits from centralising procurement expertise and the possible benefits of training courses. It is intended that these will be studied through in-depth follow up interviews with survey participants. Future work will also focus on the costs that the private sector incurred whilst carrying out the projects.

[2] The difference between the risk adjusted public sector comparator (PSC) and the NPV of the unitary payment.

Private Finance Initiative (PFI) school procurement
Analysis of a DTI survey of English Local Authorities

Report Structure

Introduction

1. Background

This analysis aims to improve understanding of the transaction costs of Private Finance Initiatives (PFIs). PFIs are a common way of procuring schools in the UK and are also used extensively in the procurement of hospitals, roads and other services. They were introduced by the Conservative Government in 1992 and their use has expanded under the current Labour Government. In a PFI the design, finance and maintenance of a project are all provided by the undertaking private consortium (in some cases it may be a subset of the 3). PFIs are typically run on a 15 to 30 year contract, with the consortium being paid back in instalments, conditional on performance. On expiry of the contract, ownership of the project's assets usually reverts back to the public sector. PFIs are often used for procuring new buildings, but can also be undertaken for refurbishments and service provision.

PFIs long-term contracts require a substantial amount of pre-planning, and it is felt that accordingly their procurement may involve large transaction costs. These costs often take the form of payments to external advisors/consultants, as many Local Authorities are new to PFI procurement and so may require extensive advice.

This analysis is based on 28 responses to a voluntary survey of 58 English Local Authorities who procured PFI schools since 1995. The full set of survey questions is given in Appendix 4.

2. Methodology

The survey returns contain information on a number of aspects of project procurement:

The type of projects: How many schools were procured, primary/secondary split, the number of students, how long construction took and whether the work was new build or refurbishment.

Projects costs and benefits: What was the cost of the project under PFI (the unitary payment), the value of the Public Sector Comparator (PSC), how much risk was transferred and the net benefit.

The procurement process: How long it took, how many bidders there were, the number of people in the procurement team, their previous PFI experience and the hours they worked on the project.

The external advisor costs (EACs): Their size and type.

Qualitative information: Some survey questions asked respondents to give qualitative answers, and summaries of responses to these are given throughout the text.

There is no model that integrates all this information in a single framework, so the analysis will examine the relationships that exist between different aspects of procurement, rather than being driven by any theory as such. We will lay out the possible factors that determine areas of interest, and then analyse whether there is a corresponding relationship in the data. A number of the questions addressed are listed below:

1. **What explains the length of a project's construction period? (Section 4)**

2. **What drives the project cost (the unitary payment)? (Section 5)**

3. **Is the duration of procurement related to the size of the project? (Section 6)**

4. **Is there any trend in the number of PFI bidders over time? (Section 6)**

5. **How large are the external advisor costs? (Section 7)**

6. **What is the distribution between the different types of advisor cost? (Section 7)**

7. **What determines the external advisor costs? (Section 7)**

3. Statistical issues

This section covers statistical issues with the survey returns. More specific points on the regression analysis of the returns are given in Appendix 2.

Sample size

The survey sample consisted of Local Authorities that had undertaken a PFI schools project between 1996-2002. Authorities with ongoing procurement were excluded, to avoid causing them disruption. In October 2004, surveys were sent out to the 48 English Local Authorities that met this criterion, 22 responded (a 46% response rate). Additionally there were 6 responses from 10 pilot surveys sent out prior to the main survey. These covered some of the areas from the main survey, such as the external advisor costs.

The returns cover a range of Local Authorities around the country and include projects of various degrees of size and refurbishment. As the survey was conducted on a confidential basis individual Authorities will not be named.

Although 28 (22 main survey, 6 pilot) survey returns is a good response rate for a voluntary survey of 58 (48 main survey, 10 pilot), this is still quite a small number of observations. Indeed as most respondents did not answer all the questions (Appendix 1 gives the response rate to individual questions), the statistics presented are nearly always based on fewer than 28 observations. As a result, although the returns cover a range of Local Authorities around the country, it is not possible to guarantee that results from the survey are completely representative.

Selection bias

Any voluntary survey faces the risk of selection bias, in that those who choose not to reply (either by not returning the survey, or by not answering certain questions) may do so for similar reasons. For example, in this survey it may be that non-respondents had procurement problems that they were unwilling to discuss. However this is just one of many potential reasons for non-response and it would be speculative and unfair to classify non-respondents without further information. That the survey returns are not necessarily a completely random sample must nevertheless be born in mind.

In the case of non-response to individual survey questions, selection bias seems less likely to be a problem. This is because the questions, which had a low response rate, were often those where there seemed to be a lot of variation in how Local Authorities recorded the information. Questions that are not directly compatible with Local Authority records are less likely to be answered. Risk transfer information, which had a particularly low response rate, is an example of this; one Local Authority had 13 different categories of risk transferred whilst the survey only had 4.

Errors/ambiguity in survey responses

Some of the answers in the survey responses were incorrect e.g. the external advisor costs given were greater than the unitary payment, the unitary payment was an implausibly large number etc. When such problems were discovered, attempts were made to find supplementary information (either from the outline business case or a direct query to the Local Authority) to revise the answer. Despite this checking process, it is possible that errors still remain. Statistics which are not officially defined, such as the advisor costs, may be more subject to errors than those which are (the PSC, the unitary payment, school number etc).

In some instances answers to questions, whilst not obviously wrong were ambiguous. In this case judgements had to be made as to what the respondent intended by their answer.

Inflation

The projects' start dates are spread between 1996 and 2002, so it is probable that costs have been affected by inflation. Ideally with the two main types of cost in the survey: the unitary payment and the external advisor costs, dedicated price indices would exist to deflate for these effects. Unfortunately things are not so simple.

For the external advisor costs no official price index exists, although the Office for National Statistics (ONS) is working on one for business services, and using professional earnings data as a deflator would be misleading as earnings usually grow faster than inflation, thus overstating the level of inflation in the industry. We have opted to use the quarterly GDP deflator to deflate the data (base year 2002). This is not ideal as national inflation measures are not necessarily representative of the rate of growth of advisor costs.

With the unitary payments (and the projects' risk transfers and benefits) the data was deflated using the index for private commercial construction output prices (base year 2000). A complicating factor is that construction output price increases may well vary substantially across the country, so using a national aggregate measure is potentially misleading.

Charts and descriptive statistics in this report are based on raw data unless otherwise stated. When start dates have been absent this has sometimes resulted in reduced sample sizes. All regressions have been run on both raw and deflated data, with the results displayed in Appendix 3.

Statistics and analysis

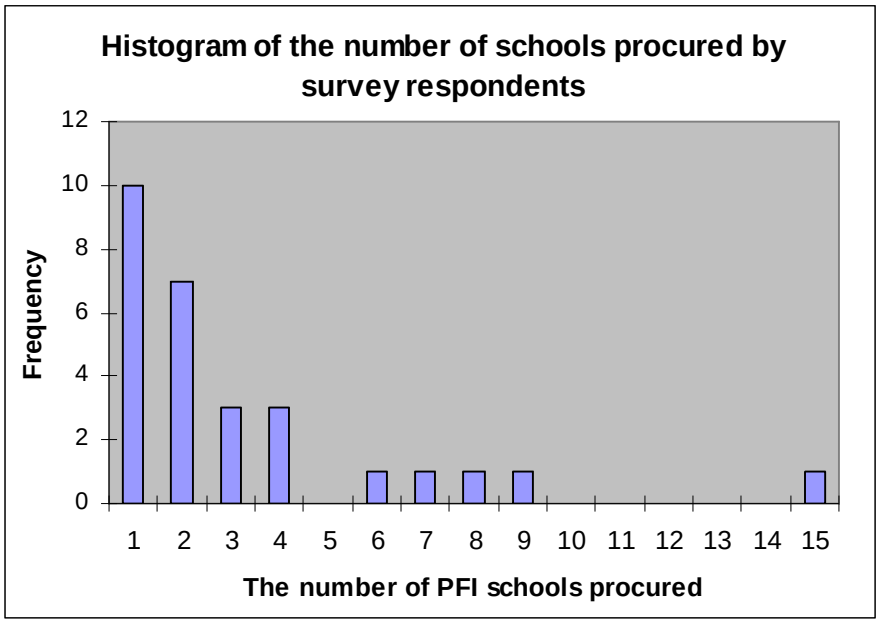
4. Type of projects

The number of schools procured

The 28 Local Authorities that responded procured a total of 90 schools between them, with the number of schools varying across the projects.

Figure 1 gives a histogram of the numbers of schools that the Local Authorities procured in their projects.

Figure 1



In the sample there was one project that had far more schools than the rest, but the most common project was for one school only.

The balance between primary and secondary schools

Of the 90 schools procured, approximately two thirds were secondary schools[3] (62 secondary, 28 primary). Primary schools were relatively concentrated with (61%) of the 28 coming from just three Local Authorities and approximately half of the Authorities (15) procuring none at all.

In some cases the responses were at the individual school level, whilst in others the results were aggregated. Despite aggregation it is still possible to see that the primary schools in the survey are smaller, by plotting a project's average number of students per school against the proportion of its schools that are primary. See Figure 2.

[3] Secondary schools have been taken to include sixth form colleges.

Figure 2

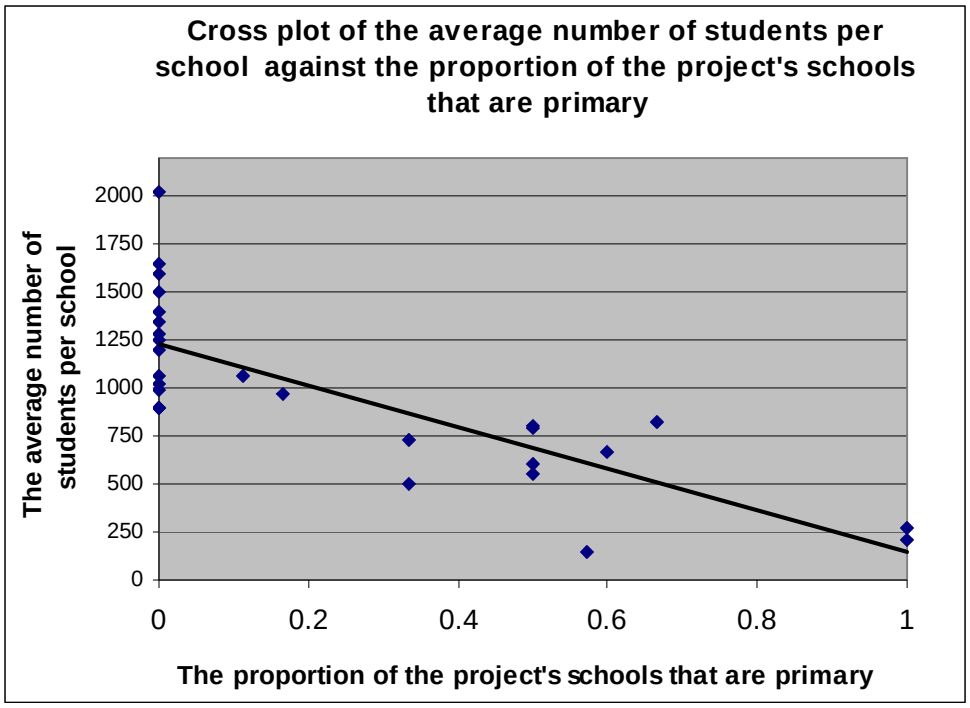
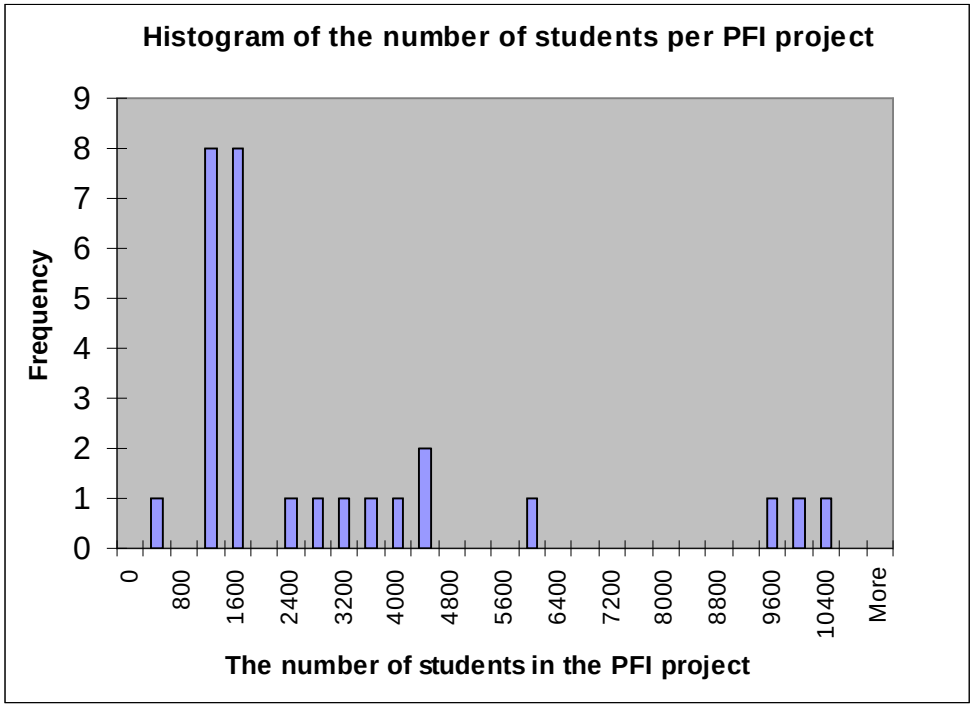


Figure 2 shows that the higher the proportion of primary schools in a project, the lower the average number of students per school, implying that primary schools have fewer pupils. This is a well-known fact, but it is good to see the data confirm it.

The number of students per project

Figure 3



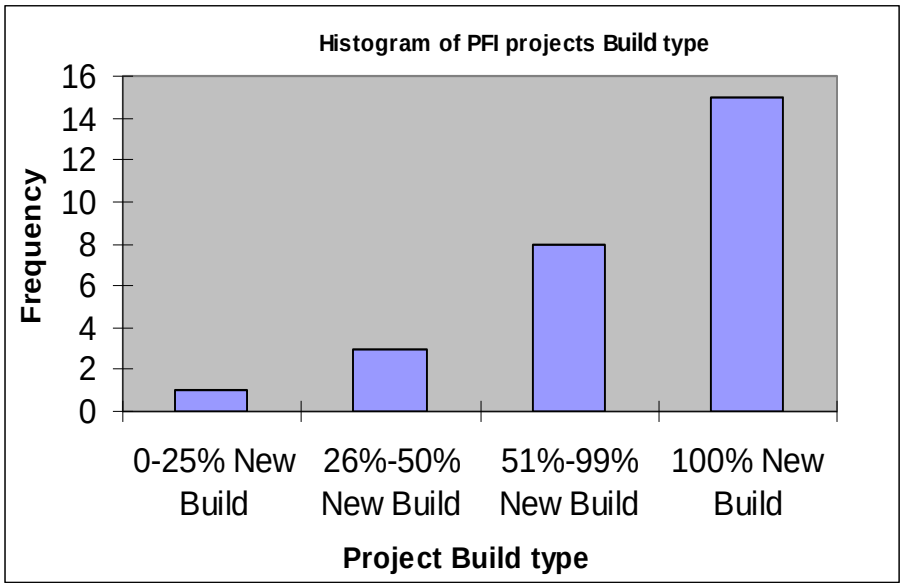
Most projects in the returns had between 1000 and 2000 students. However there were three large projects of around 10,000 students each and a number of projects spread in the 2000-7000 student range. Two of the three 10,000 students projects

involved fewer than 10 schools and were exclusively secondary. The other 10,000 students project had 15 schools but was a mixture of primary and secondary.

The mix of new build and refurbishment

Figure 4 shows the distribution between new build and refurbishment amongst respondents. Most returns covered new build projects. There is some subjectivity in classifying projects that aren't 100% new build, so the results should be treated with a degree of caution.

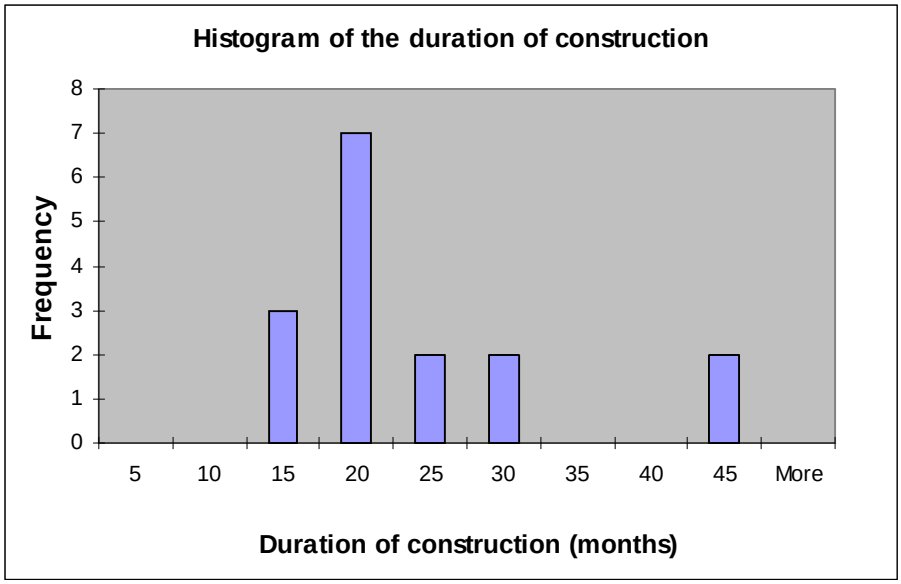
Figure 4



The length of construction time

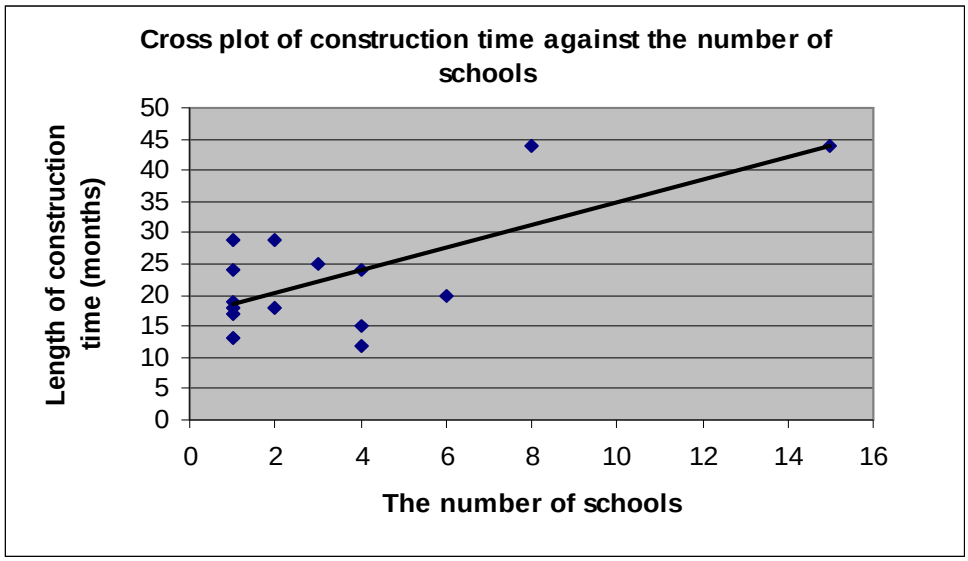
Figure 5 gives the distribution of construction times from the 16 survey respondents that provided information.

Figure 5



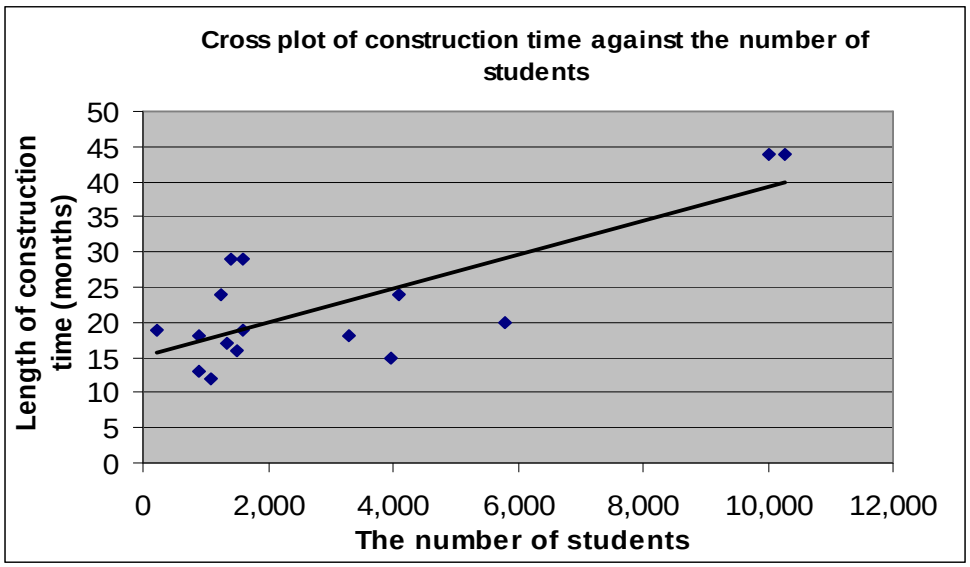
The average construction time was 23 months and the standard deviation was 10 months. Intuitively this should be closely related to the number of schools that were procured, and indeed when we plot the two (Figure 6) a positive correlation is observed.

Figure 6



A clear outlier is the project which had the joint longest construction period but which involved nearly half the number of schools as its construction time equivalent (8 and 15 schools respectively). This is probably due to the 15 schools project having a high proportion of primary schools whilst the 8 schools project was 100% secondary and therefore involved larger schools. This can be seen by using the number of students instead of the number of schools on the x-axis.

Figure 7



From Figure 7 we can see that the two Local Authorities, despite procuring different numbers of schools had similar numbers of students and a similar length of construction time. Although the relationship between the number of students and the duration of construction appears to be quite close, the robustness is uncertain as, due to the small number of large projects, these two Local Authorities determine the slope of the line of best fit.

A further complication on large projects is that the length of construction time is open to interpretation. If a project's schools' construction periods overlap then the total duration of project construction may be less than the hours worked on the project. Alternatively the opposite may apply if school construction periods are separated.

Where construction delays occurred Local Authorities were asked to provide responses as to the reasons, some of which are given in the box[4] below:

Qualitative perspective

Reasons for delays in construction:
(This did not apply to most Authorities, as in general projects were completed on time.)

1. Planning constraints affecting deliveries.
2. Poor contractor performance.
3. Delay in financial close.
4. Change from Adaption to New build.
5. Construction works were started with insufficient information.
6. Incomplete drawings, the design needing to be revisited.
6. Payment difficulties and disputes with sub-contractors.

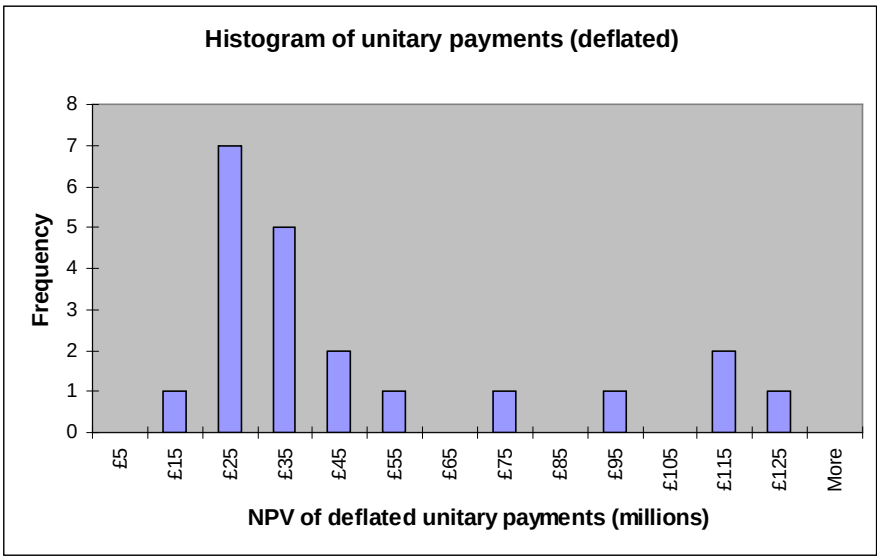
[4] In this and the case of other qualitative replies from survey respondents we have often summarised the original comments rather than provided a direct quote.

5. Projects costs and benefits:

An assessment of the project costs and their determinants

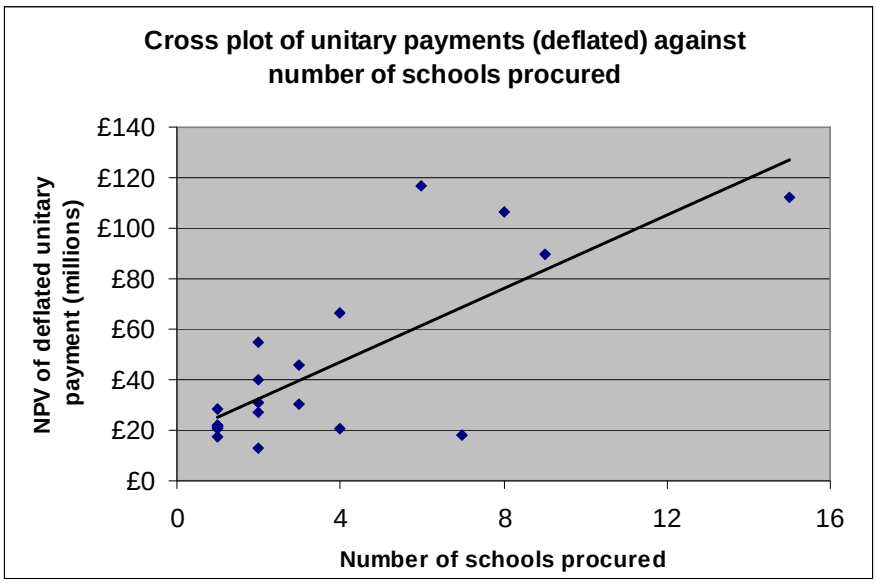
Figure 8 is a histogram of the NPV of the projects unitary payments. It has been put into real terms using the price index for private commercial construction output. The projects range in cost from around £12 million to £117 million. The modal project cost was in the £15-£25 million range, whilst the average project cost was £44 million (The difference reflecting the skewness of the distribution). These figures are based on 21 responses.

Figure 8



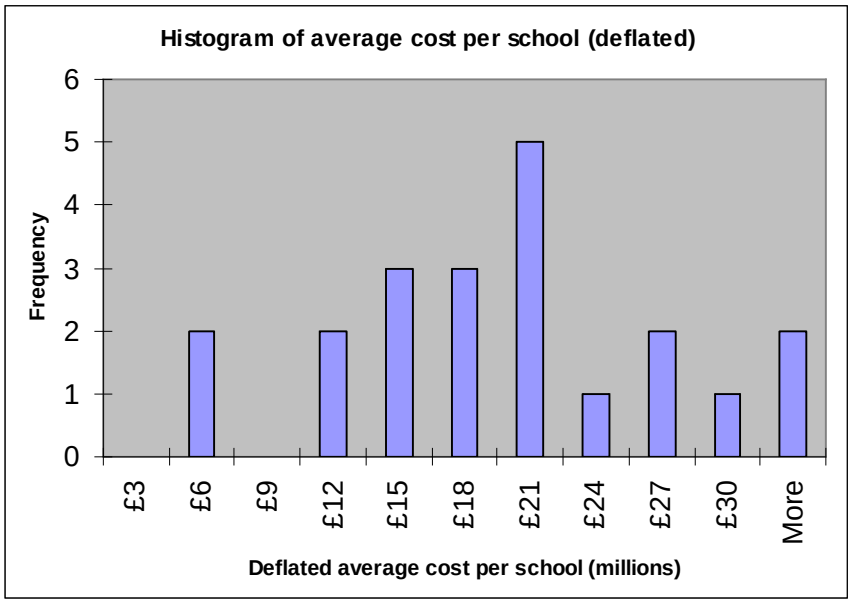
Unsurprisingly much of the dispersion is due to Local Authorities procuring different numbers of schools. If we plot the NPV of the unitary payment in real terms against the number of schools procured (Figure 9) then there is a clear positive relation, albeit with some outliers: the most expensive project in our sample involved less than half the number of schools as the next most expensive. In part this is due to other factors that we are not controlling for e.g. the 15 school project was 51-99% new build as opposed to 100%, the primary secondary school mix etc. It is possible that the slope of the trend line in Figure 9 is skewed downwards by the Local Authorities that procured relatively large numbers of schools, of which a high proportion were smaller primary schools. The low cost project with 7 schools is an example of this, as is the 15 schools project.

Figure 9



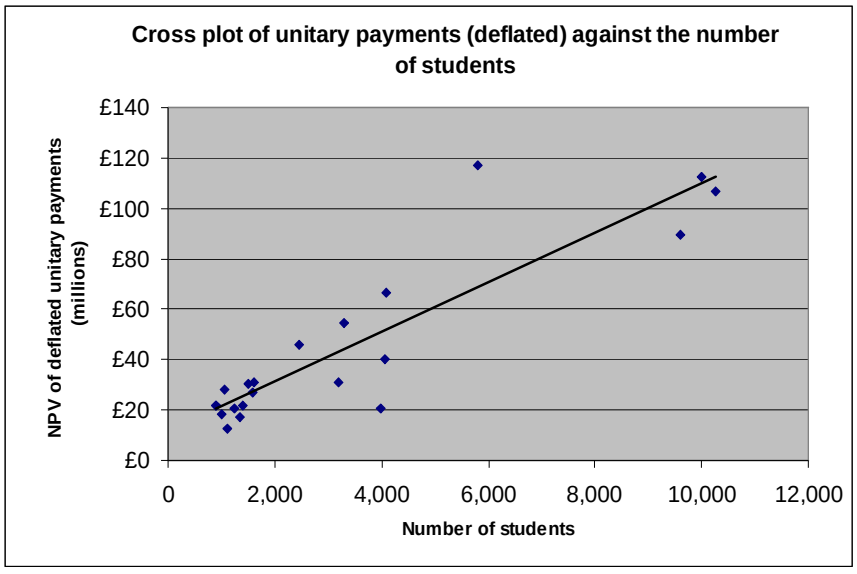
Given the positive relationship between the number of schools procured and the unitary payment, dividing the unitary payment by the number of schools, gives a distribution of average costs per school that is more symmetric than the cost distribution.

Figure 10



Plotting the NPV of the unitary payment against the number of students in the project (Figure 11), we see that there is a strong positive relationship between the two. The three projects with the largest numbers of students also had relatively similar unitary payments. Though again the most expensive project (6 schools, 6000 students) is an outlier, and although the fit looks good, the spread around the 4000 students mark is large, ranging from £20m to £63m.

Figure 11



Having examined these relationships graphically we now conduct a regression analysis of the determinants of the unitary payments. This allows us to control for the effects on costs of multiple aspects of projects.

Regression analysis of project costs

In this section we discuss the explanatory variables used to understand the determinants of PFI project costs in a regression analysis. Results from the analysis are then interpreted. Issues involved with regression analysis of the sample are laid out in Appendix 2. Although we present only one regression, a number of other specifications were estimated.

Explanatory variables

Table 1: Correlations between variables

	Procurement start date	*London dummy*	*NPV of the unitary payment*	*Number of students*	*Number of schools*	*Type of Build*	*Duration of procurement*
Procurement start date	1.0						
London dummy	0.2	1.0					
NPV of the unitary payment	0.2	0.1	1.0				
Number of students	0.0	0.1	0.9	1.0			
Number of schools	0.0	-0.2	0.8	0.8	1.0		
Type of Build	0.1	-0.2	-0.5	-0.7	-0.4	1.0	
Duration of procurement	-0.2	0.2	0.1	0.2	0.0	-0.3	1.0

Correlations greater in absolute value than 0.5 have been shaded. Sample size (17)[5]

As can be seen in Table 1 variables relating to the project size (the unitary payment, the number of schools, the number of students) are all positively correlated with one another. The type of build is negatively correlated with the other size variables, although this effect reduces when we use fewer variables and have a larger sample. None of the other variables are particularly strongly correlated.

Project size effect

We only want one variable to capture the effect of project size on the unitary payment, as otherwise this will be split across the number of students and the number of schools and hence hard to distinguish[6]. In this, and other regressions, the number of students is used to capture the project size effect, due to its stronger correlation with the unitary payment.

The stronger correlation is probably due to the number of schools being a slightly misleading scale variable as it does not take account of the primary/secondary school mix, which is captured indirectly by the number of students. Analysing primary and secondary school effects in separate explanatory variables is complicated by the primary schools in the sample being largely concentrated in 3 Local Authorities, making it difficult to disentangle primary school effects from project specific effects.

Type of build

This variable is used to see whether a project being new build or refurbishment had any effect on its cost. In the survey it is indexed 1 to 4, where 1 is 0-25% new build and 4 is 100% new build.

Procurement start date

This allows us to control for any effects that vary over time such as inflation, changes in PFI procedures etc.

[5]The correlation coefficients are only calculated on the survey returns where we have complete information on the variables listed.
[6] The multicollinearity problem, see Appendix 2.

London effect

A dummy variable[7] for London is included to see whether there were any effects from a project being procured in London as opposed to elsewhere in the country.

The following regression equation was estimated:

NPV of the unitary payment = a + b_1(Number of students)+ b_2(Type of build) + b_3(Procurement start date) + b_4(London dummy)

Regression results

Regression Statistics	
Multiple R	0.93
R Square	0.86
Adjusted R Square	0.82
Standard Error	16098690.60
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	2.36139E+16	5.9E+15	22.7786	3.15456E-06
Residual	15	3.88752E+15	2.6E+14		
Total	19	2.75014E+16			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-531343612	210803427	-2.521	0.024	-980660757	-82026467
Number of students	12684	1660	7.643	0.000	9147	16221
Type of Build	16788062	5941978	2.825	0.013	4123029	29453095
Procurement start date	13150	5937	2.215	0.043	495	25805
London Dummy	-1420681	8912241	-0.159	0.875	-20416684	17575322

Interpretation

The overall fit of the equation is good with an R^2 of 86% and all explanatory variables (the London dummy excepted) statistically significant. The findings are not particularly surprising, and in decreasing order of statistical confidence are as follows:

1. **The more students in the project the larger the unitary payment.**

This result is highly statistically significant (p value < 0.000) and is very intuitive. We have already seen that projects with more students have longer construction periods and hence probably cost more.

2. **The higher the proportion of new build in the project the larger the unitary payment.**

Presumably new build involves more work, though it is sometimes argued that refurbishments are more difficult to carry out. It may be that the cost per unit of refurbishment is higher, but that refurbishments involve fewer units and hence can in aggregate have a lower cost than new build.

[7] A dummy variable is a variable that takes the value 1 when an object has a certain discrete characteristic (such as being in London) but which is otherwise 0.

3. **The size of the unitary payment increased over time.**

This is probably due to rising construction prices. When the same regression specification is run on unitary payments deflated by the inflation rate for private commercial construction (See Appendix 3 for the results) the procurement start date became insignificant, but otherwise the results are largely unchanged. As the deflator is a national aggregate measure that does not allow us to control for local variation in prices this is not complete proof, but is suggestive.

4. **Procuring a project in London does not affect the unitary payment**

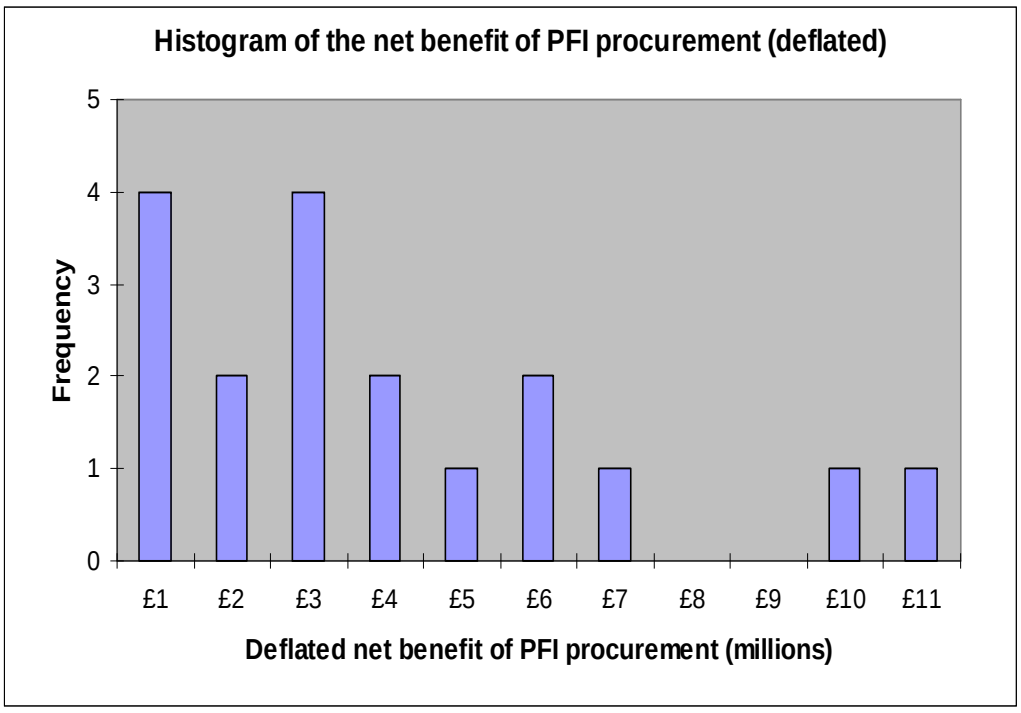
We can't reject the hypothesis that procuring a project in London as opposed to elsewhere in England has no effect on the project costs. However this may be due to not having many London projects in the sample. Alternatively as the companies that bid for PFIs operate all over the UK there may be a degree of price equalisation when bidding for jobs around the country.

Benefits and Risk transfer

The net benefit of a PFI is the difference between the risk adjusted public sector comparator (PSC) and the NPV of the unitary payment. The risk adjusted PSC is equal to the estimate of the cost of the project carried out by the public sector plus the net risk that has been transferred to the private sector in the PFI. Projects should not be carried out as PFIs unless they can show a positive net benefit.

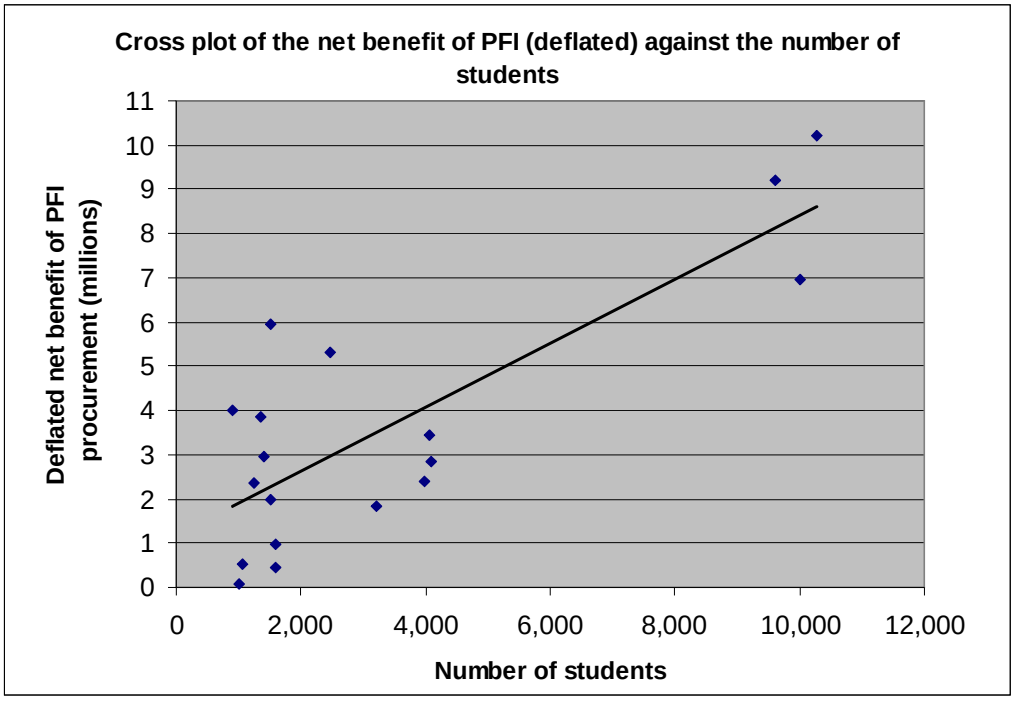
Figure 12 shows the distribution of the net benefits from the PFI projects in the survey returns (real terms).

Figure 12



The net benefit of these PFIs appears to be strongly related to the number of students, with the three projects that involved the largest numbers of students also having the largest net benefits. This can be seen from Figure 13, which plots the net benefit of the PFI projects against their number of students.

Figure 13



If we plot the benefit of PFI procurement against the risk transferred in the PFI (Figure 14) we see that there is also a strong positive relationship between the two, suggesting that larger projects transfer more risk. Although the benefit from PFI is usually less than the risk transferred. An explanation for this is that contractors want compensation for risk bearing and face a higher cost of capital than the public sector. For further discussion of this issue in a microeconomic framework see Davies (2006).

Figure 14

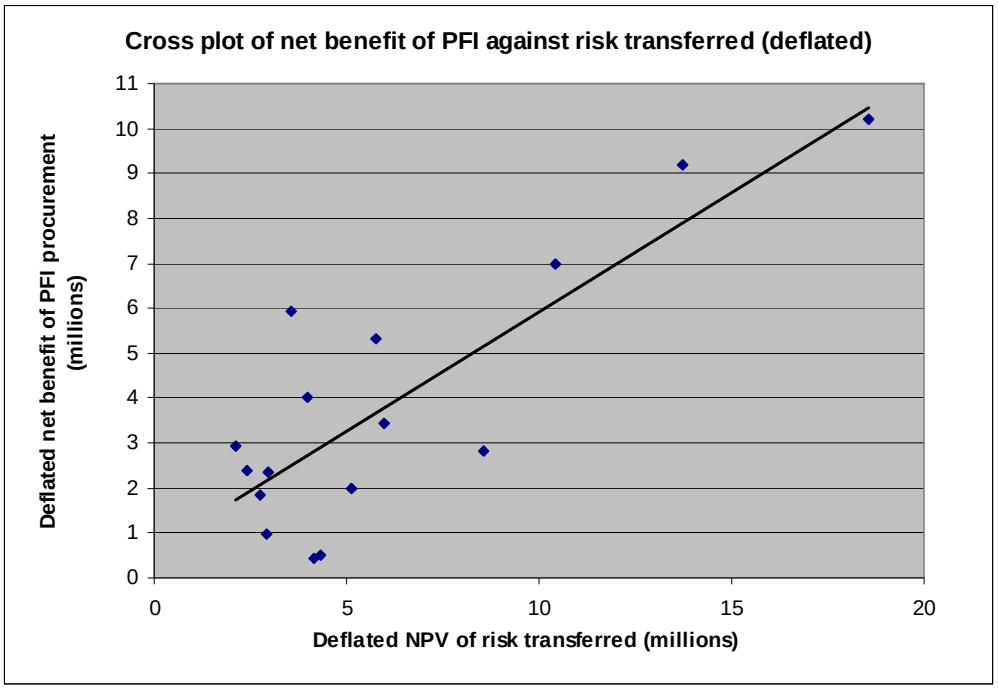
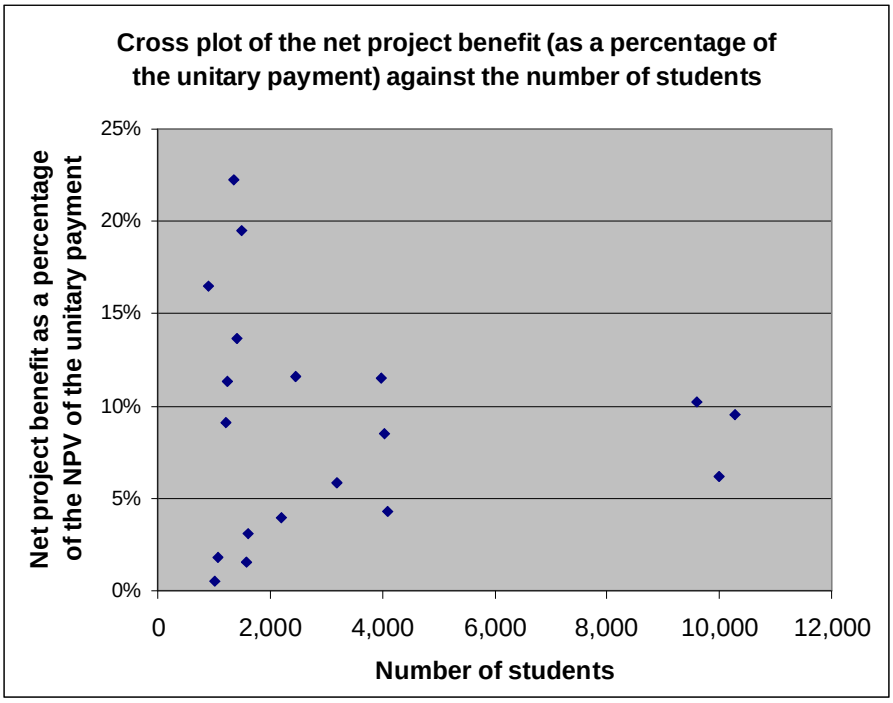


Figure 15 plots the net benefit of the PFI procurement as a percentage of the unitary payment against the number of students in the project. There does not appear to be any clear trend between the two.

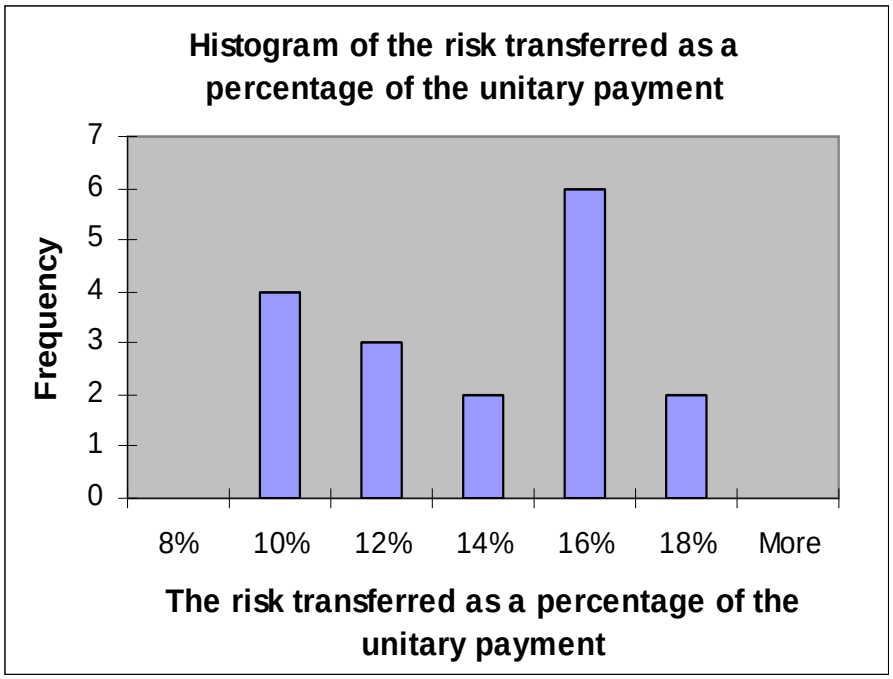
Figure 15



Risk transfers

The response rate to the question on how much risk in aggregate was transferred was not particularly high (18 Local Authorities). The risk transferred in PFI varied between 8% and 19% across the projects where these questions were answered.

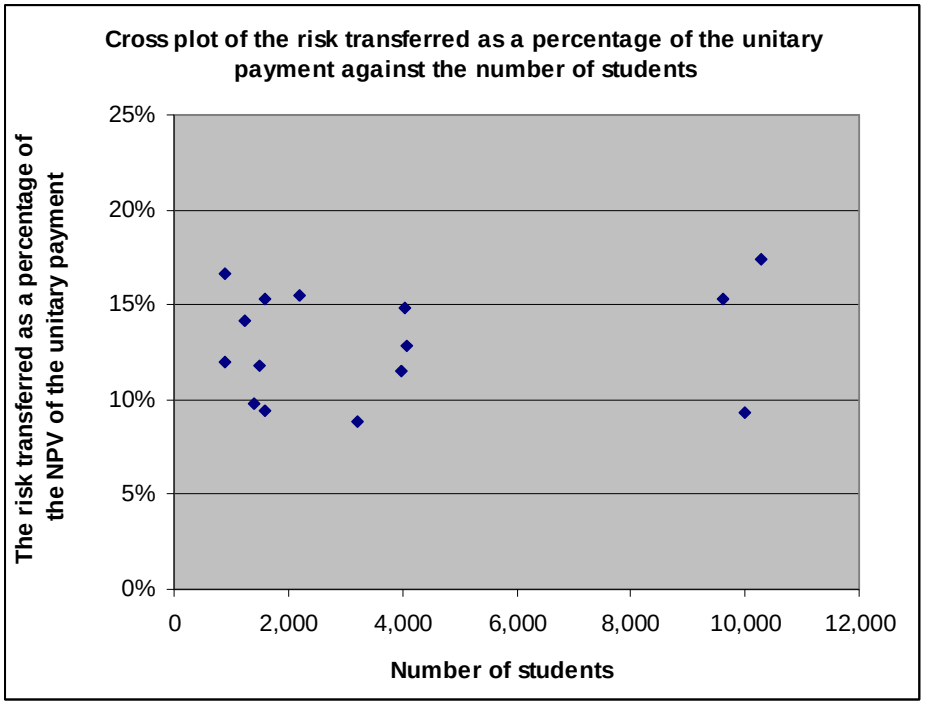
Figure 16



The response rate on the different types of risk transfers was very low (see Appendix 1) so no figures will be given from this information.

If we look at the risk transferred as a percentage of the unitary payment plotted against the number of students, there does not seem to be a clear relationship. One of the large projects transferred risk of 10% of the unitary payment, whilst another transferred 17%. Smaller projects were spread about within this range.

Figure 17



6. The procurement process:

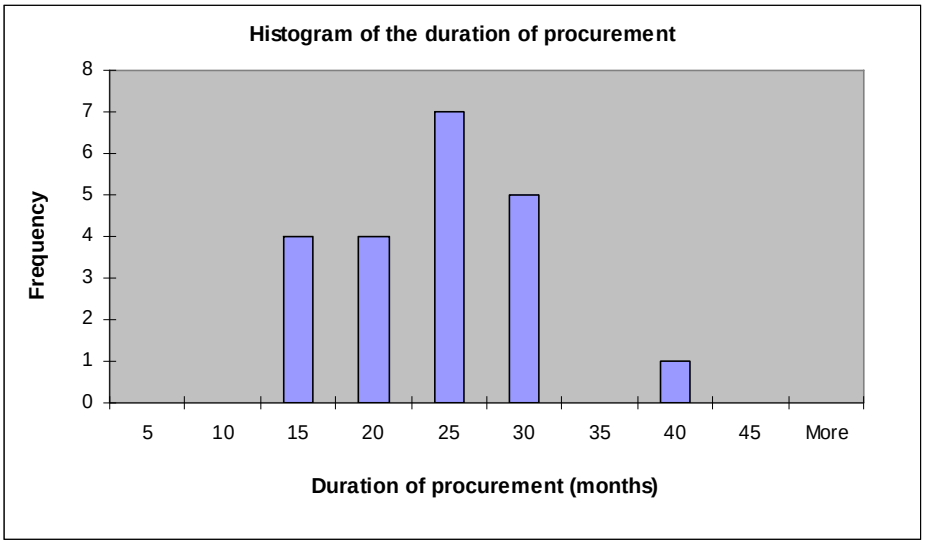
Procurement teams past experience

Almost universally the respondents had experience of procurement, but none of PFI education projects. Occasionally some of the project team might have had previous PFI experience. Given that the use of PFIs has only become widespread since1997, this is probably to be expected, as these are relatively early PFI schools projects. Nearly everyone surveyed had undergone some form of PFI training.

The duration of procurement

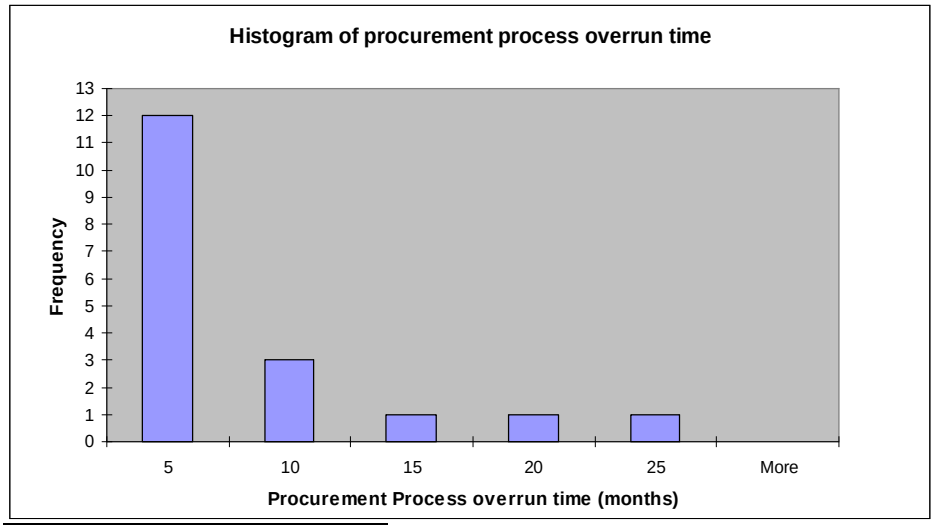
The distribution of the duration of procurement is not dissimilar from the duration of construction, with an average procurement time of 22 months and a standard deviation of 6 months. This is roughly consistent with the duration of procurement found by the Audit Scotland report on PFI schools[8].

Figure 18



The distribution of procurement overruns is plotted in Figure 19 (below), where procurement overruns are defined as deviations from the procurement time that was expected. The most common situation was no overrun.

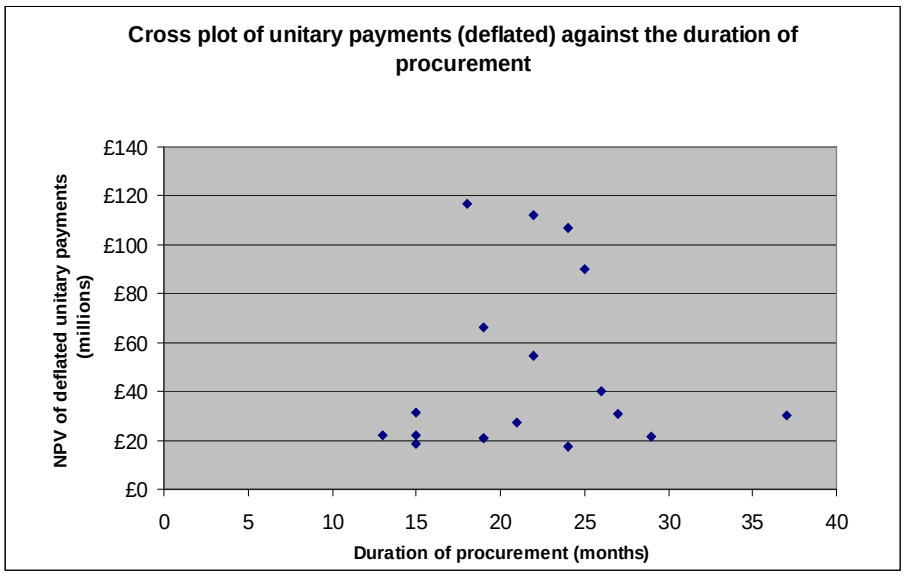
Figure 19



[8] That report (p30) defined the procurement period differently, in that it included the construction phase. However when the construction time is removed from the figures, the numbers are relatively similar.

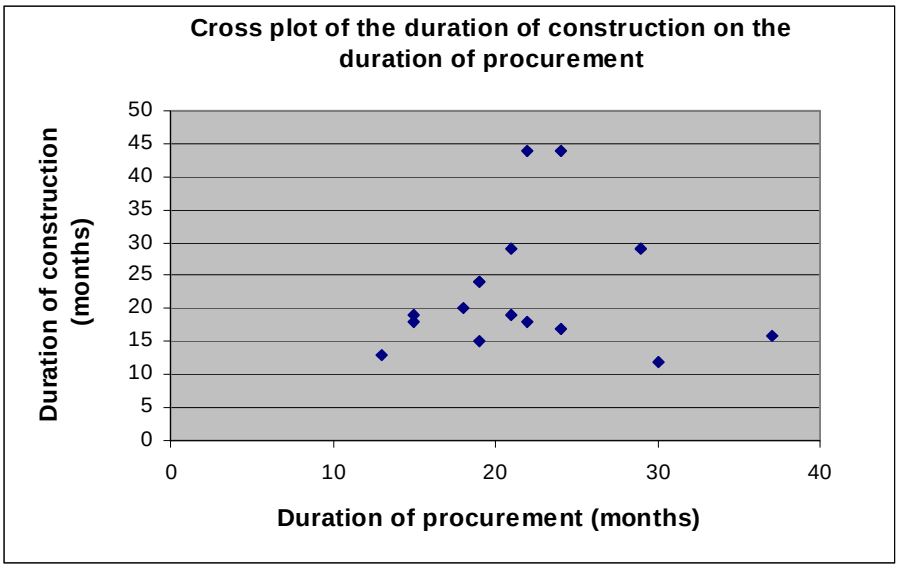
The duration of the procurement does not appear to be closely related to the cost of the project (Figure 20). For example, the project which had the longest procurement time was one of the cheaper projects, whilst the most expensive project had a below average procurement time. Although we don't show the chart, this finding is unchanged if we use the expected duration of procurement on the x-axis.

Figure 20



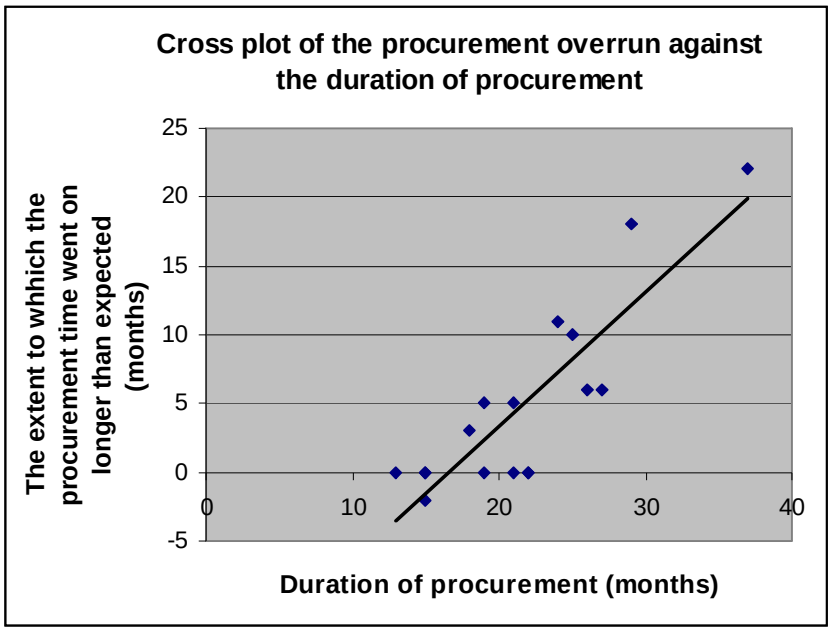
Correspondingly although the distribution of construction duration is similar to that of procurement duration and although construction duration is, as we have seen, directly related to the size of the project, there is no clear relation between construction and procurement duration when we do a cross plot (Figure 21).

Figure 21



If we look at the duration of procurement plotted against procurement overruns then we find a positive correlation (Figure 22). The projects with longer overruns tended to be those with a longer procurement periods. However it should be noted that we were only able to look at those projects that reported the expected and actual procurement time, and there was a relatively low response rate to this.

Figure 22



The survey asked recipients to explain why procurement time might have deviated from the timetable and the difficulties they encountered in procurement. Summaries of the responses are given below.

Qualitative perspective

Why procurement time deviated from timetable:

1. Delays caused by need for additional consultation with schools, planning problems and discussion on affordability and scheme scope.
2. Delays due to identification of land and planning issues.
3. Protracted negotiations due to schools becoming new builds not adaptations during the process.
4. Difficulties of initially engaging the PFI contractor in detailed negotiations following their selection as preferred bidder.
5. Concerns about the payment mechanism.
6. Delays due to difficulties in contractual wording.
7. First preferred bidder withdrew.
8. Proposed site flooded.
9. Delays by the Treasury in releasing funds.

Major difficulties encountered during procurement and negotiation:

A wide variety of answers were given including:

1. During construction major changes were made to the works.
2. Dissolution of the bidders joint legal team, which delayed closure of the project, added to legal costs and made negotiations more difficult.
3. Construction and insurance prices rising.
4. Construction difficulties ranging from provider's reluctance to comply properly with output specs to payment difficulties.
5. Obstruction from residents.
6. Project not sufficiently resourced due to work on other projects. Therefore greater reliance on external advisors.
7. Lack of project management by SPV. Lack of coordination and cohesion amongst SPV sub contractors.
8. External builder and FM provider going bust.
9. Withdrawal of first preferred bidder.

Hours worked by the procurement team

There was information on this from the survey returns, however the answers given were so diverse (hours per week, hours varying over time, months, breakdown across team members) that it is not possible to provide aggregate figures on this.

Internal cost of procurement

Local Authorities were asked to provide information on their internal cost of procurement. Responses to this question came from only 12 Authorities, so these statistics should be treated with particular caution. From Figure 23 it seems that the internal cost of procurement is usually less than the total external advisor cost (EAC).

Figure 23[9]

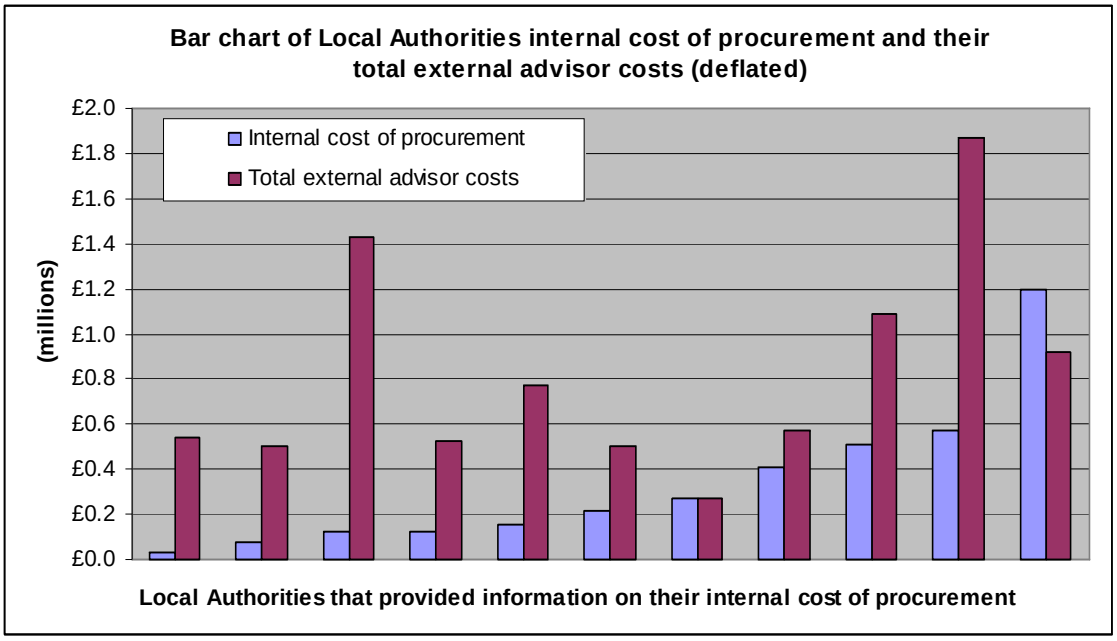
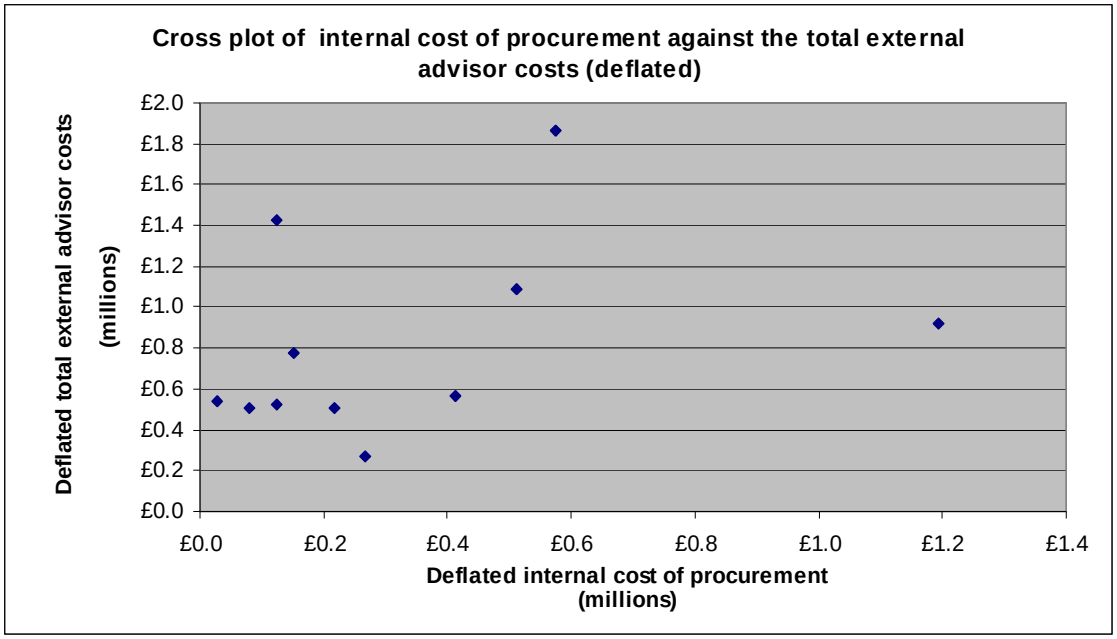


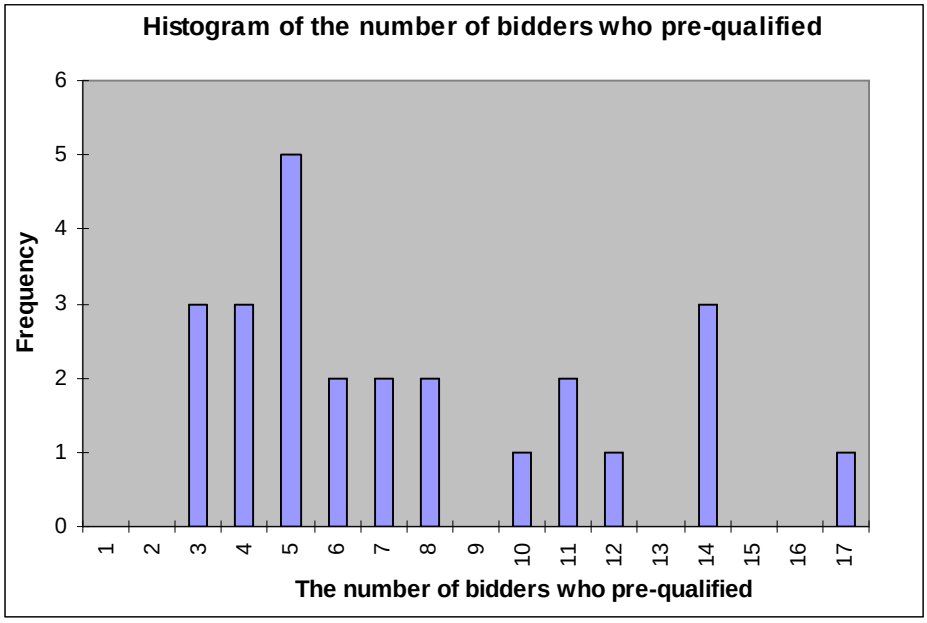
Figure 24: plots the internal cost of procurement against the total external advisor costs.



[9] Chart based on 11 not 12 observations due to missing procurement start date

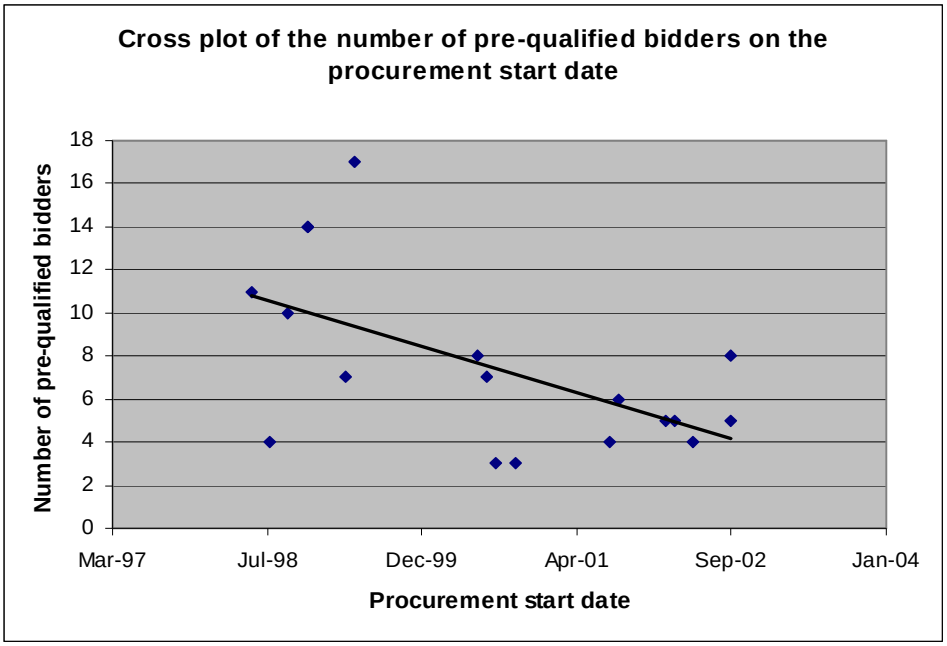
The number of bidders

Figure 25: Histogram of the number of bidders who pre-qualified for the projects.



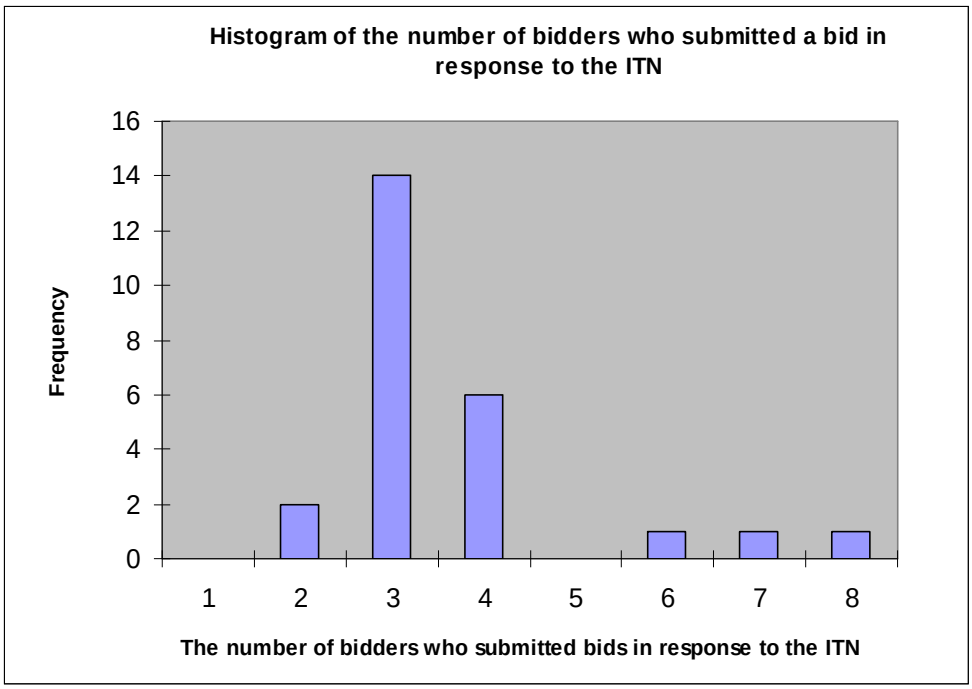
There is quite a lot of variation in the number of bidders who pre-qualified for the projects. This may be a time effect, as there appears to be a relationship between the number of bidders and the date when project procurement started. The earlier projects have on average a slightly larger number of pre-qualified bidders (Figure 26). This may reflect interest from contractors in undertaking the first wave of PFIs. Another factor might be that the industry had more spare capacity in the late 90's, but that firms are now busier (as evidenced by rising output) and have less capacity to bid for work.

Figure 26



There is much less variation in the number of bidders who submitted a bid in response to the invitation to negotiate, with the 3 or 4 bidders being by far the most common (Figure 27). The projects that involved 6 to 8 bidders were earlier ones.

Figure 27



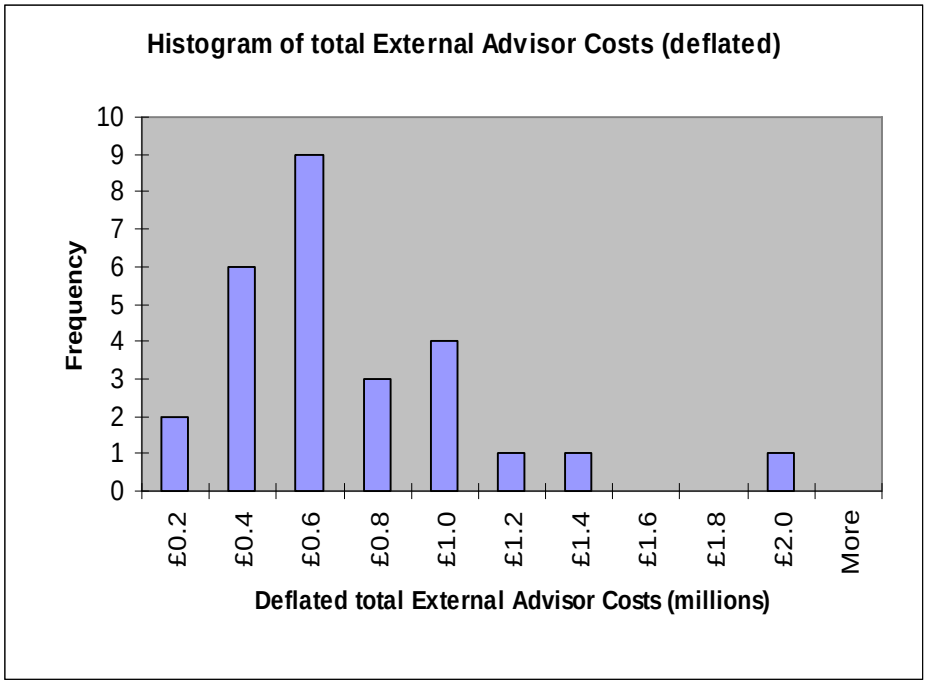
7. External Advisor Costs (EACs)

We now examine some of the characteristics of the external advisor costs and then undertake a regression analysis to try and understand their determinants.

Total External Advisor Costs (EACs)

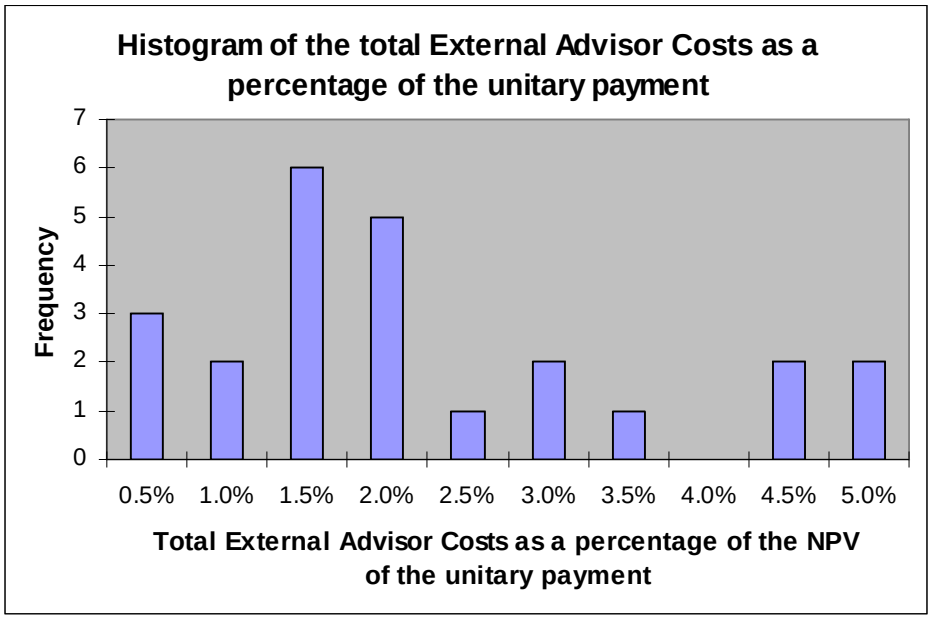
Figure 28 gives a histogram of the distribution of the total EACs (deflated using the GDP deflator) from the sample.

Figure 28



The average total EAC in the sample is £615,000 and the standard deviation is £385,519 (undeflated). Figure 29 gives a histogram of the total EAC as a percentage of the unitary payment [10].

Figure 29



In percentage terms most EACs are 1.5-3.5 % of the cost of the unitary payment. The mean of the distribution is 2% and the standard deviation is 1.3 %.

The breakdown of advisor costs

External advisor costs in PFIs can take many forms. For example they may be the cost of employing lawyers to draw up the contract, payments to accountants for working out the project payment schedule, or design fees incurred in assessing the bids. The headings used to classify EACs in the survey were:

1. Financial
2. Legal
3. Technical
4. Insurance
5. Other

The distinction between the different costs is sometimes a grey area, so there may be classification issues. Some descriptive statistics on the costs (deflated using the GDP deflator) are presented in Table 2 below.

Table 2

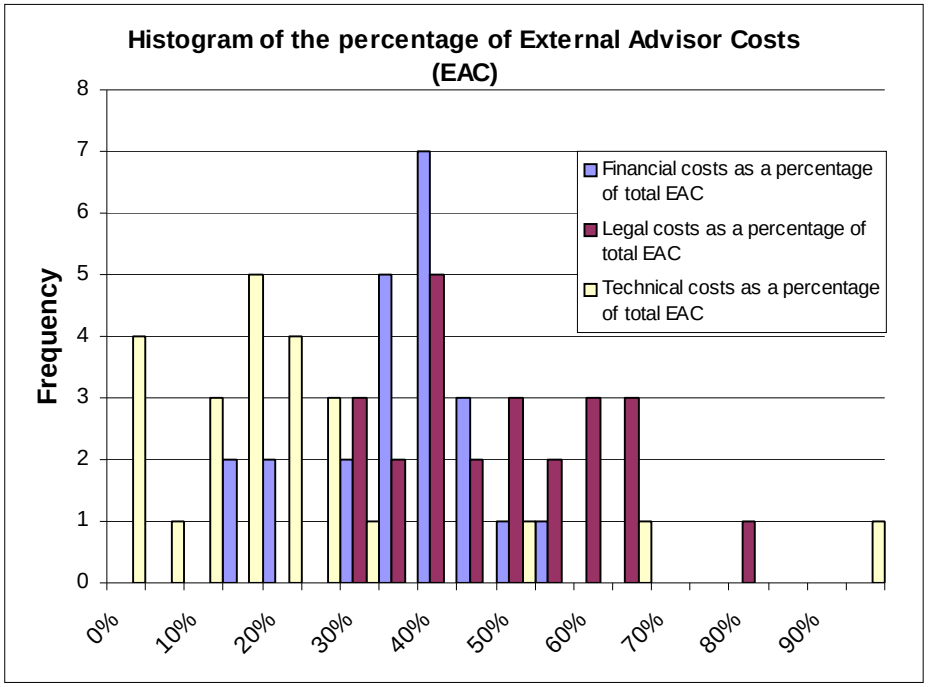
	Average	Standard Deviation	Sample Size
Legal	£270,896	£177,398	21
Financial	£199,522	£145,478	20
Technical	£138,190	£135,187	19
Insurance	£6,426	£11,766	20
Other	£44,631	£134,951	20
Total EAC	**£640,185**	**£405,478**	**23**

[10] Note that the total EAC is not included as part of the unitary payment

Legal advice was the largest EAC on average and also had the largest standard deviation. Financial advice was on average the next most expensive, followed by Technical, with both having large standard deviations. The low average level of EACs for Insurance and Other is largely due to most respondents giving no costs under these headings. The high standard deviation of the Other EAC category probably arises from respondents using it as a catchall term, for anything that didn't fit cleanly under the other headings.

Figure 30 gives the distribution of the different EACs as a percentage of the total EAC for Financial, Legal and Technical costs. The Financial cost information is based on 1 less observation than the others. To keep the chart simple the smaller Insurance and Other costs have been omitted as most constitute 0% of total EACs.

Figure 30



Legal costs are usually the largest proportion of total EAC followed by Financial advice.

In Figure 30 Financial and Legal costs constitute the mainstay of most EACs. Given that the Legal costs are distributed to the right of the Financial costs, there is evidence that they would normally represent the greatest proportion of the advisor costs.

Technical costs tend to be smaller than Financial and Legal costs.

Figure 30 shows that Technical costs normally constitute a much lower percentage of the total EAC than do Financial and Legal, with the mode being around 20% (though there are exceptions as shown by the LA whose technical costs accounted for 100% of its EAC).

Without more detailed knowledge of the PFI procurement process it is hard to know what is behind these findings. For example, is legal advice more expensive than financial advice, or is it just that more is needed?

The costs to the private sector

All these figures refer to the costs incurred by the Local Authorities during procurement. However the private contractors that bid for PFIs also incur transaction costs. Whilst these are not covered in the survey they will hopefully be studied in future work. A source of information on this area is the Major Contractors Group (MCG) 2005 survey of PFI projects which found that bid costs for the private sector overall were on average 6% of the project value. For PFI schools bid costs were £2.4 million pounds on average, a fall from the 2003 finding of £3.1 million.

Regression analysis of total External Advisor Costs (EACs)

A number of possible explanatory factors for total EACs suggest themselves:

1. The physical size of the project and its type of build.
2. The duration of procurement.
3. When the project was procured.
4. The past experience of the procurer.
5. Regional effects.

However, as can be seen from Figures 31 and 32, total EACs (deflated using GDP deflator) don't appear to be very closely related to some of these factors (the number of students and the duration of procurement respectively). In order to assess whether this is true more generally we carry out a regression analysis of the returns. See Appendix 2 for information on some of the issues involved in regression analysis.

Figure 31

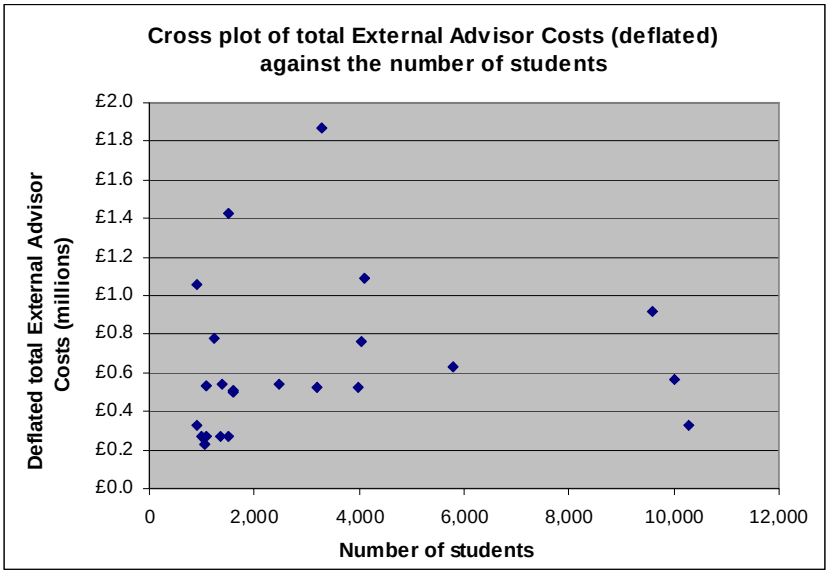
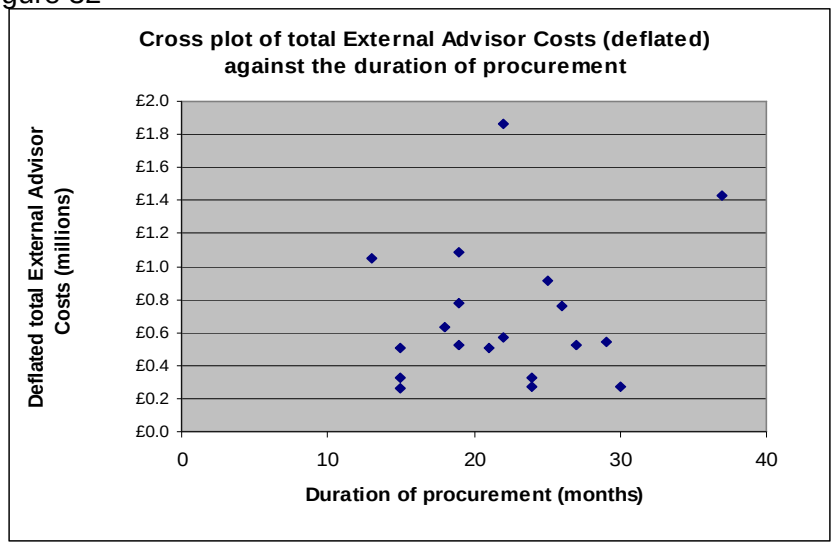


Figure 32



Explanatory variables

In trying to understand the determinants of advisor costs we felt that there were a number of factors that might be influential:

Project size

It seemed possible that there might be a relationship between the size of the project and its advisor costs. As when analysing project costs we used the number of students to capture this effect. The rationale for this is given on page 16.

The type of build

This variable is used to see whether a project being new build or refurbishment had any effect on its cost. In the survey it is indexed 1 to 4, where 4 is 100% new build and 1 is 0-25% new build.

The duration of procurement

This is an obvious variable to include, as it is one of the few direct procurement variables in the survey.

Procurement start date

This allows us to control for any effects that vary over time, such as inflation in advisor costs, changes in PFI procedures etc

The experience of procurers

As these are relatively early PFI school projects, overwhelmingly respondents had traditional procurement experience but none of PFIs. There would not be much to learn from including this information in a regression equation, so it was omitted.

London effect

A dummy variable for London[11] is included to see whether there are any effects from a project being procured in London as opposed to elsewhere in the country.

Table 3: Correlations between explanatory variables.

	Number of students	*Build type*	*Procurement start date*	*Duration of procurement*	*London dummy*
Number of students	1.0				
Build type	-0.7	1.0			
Procurement start date	0.0	0.0	1.0		
Duration of procurement	0.1	-0.2	-0.3	1.0	
London dummy	0.1	-0.3	0.2	0.2	1.0

Correlations greater in absolute value than 0.5 have been shaded. Sample size (18).

[11] A dummy variable is a variable that is given the value 1 when an object has a certain discrete characteristic (such as being in London) but which is otherwise 0.

From Table 3 we can see that the type of build is negatively correlated with the number of students. However this is the only variable which had a correlation greater in absolute terms than 0.5, so hopefully multicollinearity problems (see Appendix 2) will be minimised.

The following regression equation was estimated:

Total EAC = a + b_1(Number of students) + b_2(Type of build) + b_3(Duration of procurement) + b_4(Procurement start date) + b_5(London dummy)

Regression results

Regression Statistics	
Multiple R	0.56
R Square	0.31
Adjusted R Square	0.04
Standard Error	410968.85
Observations	19

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	9.85756E+11	1.97151E+11	1.167297811	0.376071184
Residual	13	2.19564E+12	1.68895E+11		
Total	18	3.1814E+12			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-14028818	7002077	-2.004	0.066	-29155883	1098247
Number of students	-7	44	-0.166	0.871	-101	87
Type of Build	16201	157431	0.103	0.920	-323907	356310
Duration of procurement	20587	17395	1.184	0.258	-16992	58166
Procurement start date	387	191	2.022	0.064	-26	799
London dummy	128275	233895	0.548	0.593	-377025	633575

Interpretation

1. We are unable to explain most of the variation in total External Advisor Costs

Considering the high ratio of explanatory variables to the number of observations we are able to explain relatively little of the variation in the data. In adjusted R^2 terms only a very small percentage (4%) of the variation can be explained and none of the explanatory variables are significant at the 95% confidence level.
This contrasts with our success in explaining the variation in the unitary payment.

2. The total External Advisor Costs seem unrelated to the number of students, the type of build and whether the project is in London or not

All these variables have t statistics that are very insignificant, so we are unable to reject the hypothesis that they have no effect on the level of total advisor costs.

If EACs are independent of the size of the project then we would expect the EAC per school (or per student) to fall as the scale of the project increases. However there is a lot of variation in the costs, so it is not possible to guarantee this for any particular project.

It's intuitive that advisor costs should be less directly related to a project's specifications than its actual cost, and so perhaps not that surprising that we can explain less of the variation. Whilst we are unable to reject the hypotheses that our explanatory variables have of no effects on advisor costs, it is also possible that our sample size is just not large enough for us to pick up any relationships that exist. This is a particular issue given the possibility for measurement error in EACs.

3. Evidence that projects that were procured later had higher advisor costs

The variable that is most significant in determining the EAC is the procurement start date, which has a coefficient that is significant at the 94% confidence level. As mentioned earlier this term may be picking up some of the effects of inflation over the period in which the projects were procured. However, when the regression is deflated (see Appendix 3) the result becomes only marginally less significant. In part this may be a sampling effect, as some of the later projects in the survey had large advisor costs, which it would probably be difficult to explain through inflation alone. However it is also possible that PFI guidance has become more proscriptive over time leading to a greater need for external advice.

If the advisor costs are largely independent of the size of the project then this begs the question of what is causing them. The main source of information that we have on this is from the qualitative responses to the survey given below.

Qualitative Perspective

Q: What are the main drivers of PFI procurement costs?

1. Consultant's fees (legal, finance and design). They are needed due to the lack of in-house specialist knowledge/ experience.
2. The financial institutions wanting certainty, and as a result demanding a large amount of detailed information.
3. Bidders looking to recover costs/ taking a pessimistic view of the project.
4. Complicated planning issues.

Q: Possible remedies to lower procurement costs?

There was a clear feeling for greater standardisation of the documentation.

Q: If the local authority has undertaken more than one PFI project what lessons were learnt from previous experience, where were cost savings and what did you do differently?

1. Low costs due to doing a lot of the legal and financial work in-house.
2. Reusing the PFI team across time and local areas to work on PFI projects.
3. You know how to do things better the second time around.
4. The need for retaining expertise and knowledge.

When we look at the qualitative responses to the question as to what drives PFI procurement costs, none of our regression's explanatory variables are mentioned. However, as most of the respondents had only worked on one PFI project they may be less aware of the effects of these factors. Of the factors mentioned in the answers it seems plausible that 1 and 4 might be subject to substantial variation around the country, which could account for our relative inability to explain advisor costs.

Analysing the determinants of the different types of External Advisor Costs

We have been unable to find a robust relationship between the total EACs and our information on the projects. As the total EAC is mainly composed of the Financial, Legal and Technical advisor costs it might be hoped that a better understanding could be obtained from a separate analysis of these. Indeed an interesting possibility would be that the individual components of the total EAC are determined by our explanatory variables, but with the effects acting in opposite directions, thus cancelling out and leaving the aggregate measure of total EAC unexplained.

We now discuss the results of the regression analysis on the different advisor costs, however with one exception our findings remain largely unchanged. The regression results are presented in Appendix 3. The response rate for the total EAC was higher than that for the advisor cost breakdown, so the read across between the two is not absolute (see Appendix 1).

Results of regression analysis on components of total External Advisor Costs

If we try and explain the components of the total EACs using the same explanatory variables, the results are fairly similar to those obtained earlier and are summarised below.

1. Neither the size of the project, its type of build, its date of procurement start, or whether it is in London have effects statistically different from 0 in explaining the various components of external advisor costs.

2. A relatively low percentage of the variation of the individual advisor costs is explained by the variables, particularly when one considers the high ratio of explanatory variables to sample size.

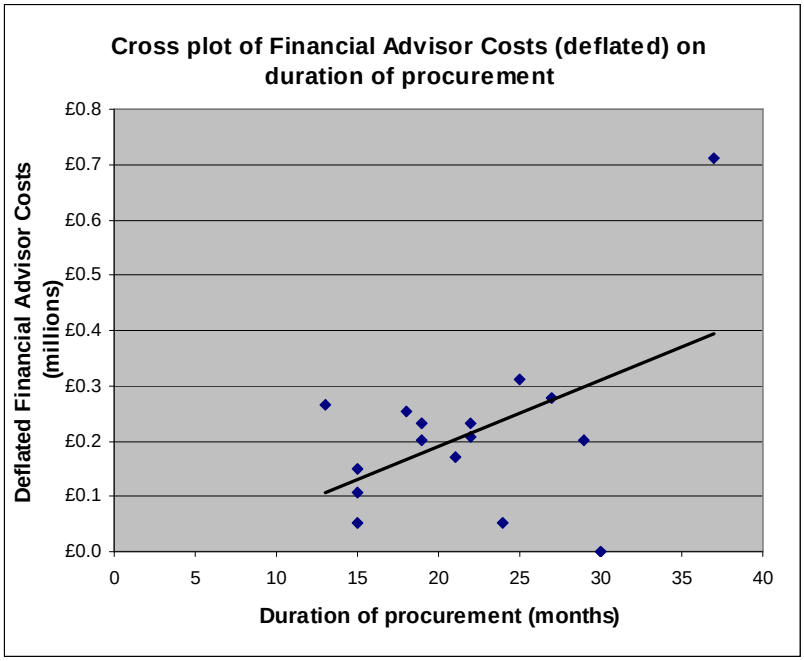
3. There seems to be an effect of duration of procurement on financial advisor costs (though not for the other types of costs) that is significant at the 96% confidence level. The longer the duration of procurement the greater the external Financial advisor costs.

However this last result is partly due to an outlier, as can be seen from Figure 33. The outlier has by far the largest Financial advisor costs and also the longest duration of procurement. When this observation is omitted from the regression, the relationship becomes much less significant.

The finding also raises the question of what form the relationship between the duration of procurement and the financial advice takes. Is it that until the financing is resolved the project cannot go ahead? Or are both the financing and the duration of procurement determined by a third variable?

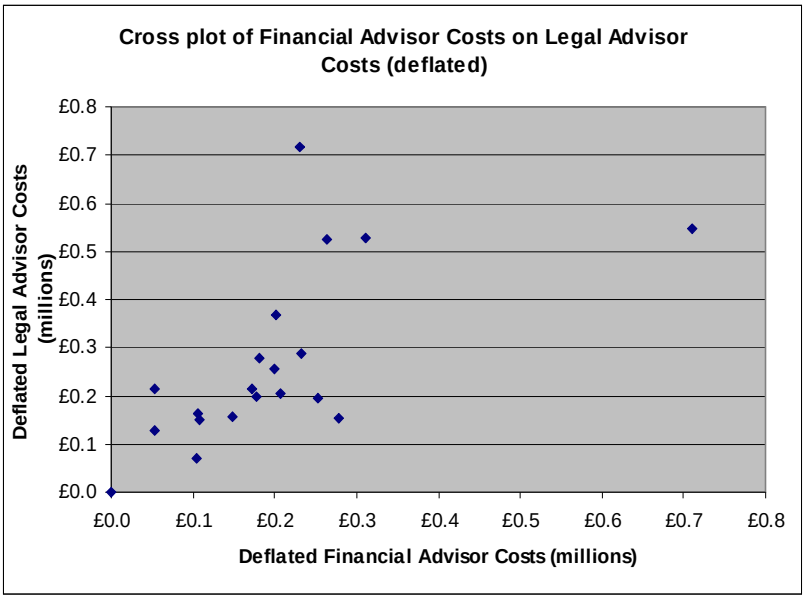
The insignificance of procurement start date may be due to these regressions being based on a smaller sample than the total external advisor cost regressions. There is some evidence of an effect on Technical advisor costs. Deflating the series does not change the significance of the procurement start date substantially.

Figure 33



Although it is hard to explain the individual advisor costs in terms of the information that we have on the project, there is some evidence that they are caused by similar factors.

Figure 34



In Figure 34 there are two outliers, but in general when a Local Authority had a high Financial advisor cost it also had a high Legal advisor cost. This is based on a larger sample than the duration of procurement information, and so is probably more robust than the duration of procurement/Financial advisor costs relationship.

A slight caution is that given the degree of ambiguity between financial and legal advice it is possible the relationship may partly be due to respondents averaging the total cost over the two categories. However it seems intuitive that the correlation could be due to joint causation from some of the factors (in-house expertise, planning issues) that we listed earlier.

8. Conclusions:

Projects were more expensive if they involved more students, had a higher percentage of new build or were built more recently. These findings were statistically robust and explain nearly all the variation in costs. This is very intuitive and consistent with the finding that the duration of construction was found to increase with the physical size of the project.

By contrast we were unable to explain the costs of the external advisors anywhere near as well. The regression results indicate that the total external advisor costs were not related to the size of the projects or how long they took to procure.

Similar results were obtained when we examined the external advisor costs disaggregated into financial, legal and technical advisor costs. A relationship between the duration of procurement and the financial advisor costs was found. However, this was largely driven by an outlier. In general the duration of project procurement was not closely related to the cost of the project or the external advisor costs.

There was evidence that projects' unitary payments and total external advisor costs have risen over time. This may be due to the effects of inflation over the period in which our projects were procured, although the evidence for this was stronger for the project costs than for the advisor costs. A finding which probably reflects a higher inflation rate for construction projects than consultants fees.

Given that the external advisor costs seem independent of the physical scope of the project one might regard them as being generated by the idiosyncrasies of local conditions. Judging from the qualitative returns, factors that determine the advisor costs include: lack of in-house knowledge/specialist experience and planning issues. These may well vary across Local Authorities and might explain the variation that we are unable to account for. As financial and the legal costs were positively correlated with one another, there was evidence that, although we can't directly explain the advisor costs using the information in the survey, the different types of advisor costs had a common cause.

The independence of advisor costs from the physical scope of the project means that the advisor costs per student/per school will in general fall with the size of the project. However as there seems to be a lot of variation in costs it would be hard to guarantee this for an individual project.

The caveat to the advisor cost findings is that our sample size may just not be large enough to pick up relationships that exist between total external advisor costs and the chosen explanatory variables. The sample is undoubtedly small and there is a risk of selection bias. In addition advisor costs unlike the NPV of the unitary payment (the returns on which, were themselves found to contain errors) are not officially defined and may therefore be subject to more measurement error.

9. Summary of results

1. **Surveys were sent to 58 English Local Authorities, with responses received from 28. The replying Authorities procured 90 PFI schools (62 secondary, 28 primary) between 1996 and 2002. Most projects were the first PFI education project that the Authorities had undertaken.**

2. **PFI projects in the survey returns ranged in size from 1 school to 15. With projects of 1 school being the most common. The modal cost of the projects (the NPV of the unitary payment stream) was around £15-25 million. The average cost was £44 million.**

3. **The costs of the PFI projects were strongly positively related to the number of students involved in each project and the proportion of the project that was new build.**

4. **PFI projects that were procured more recently, were found to be more expensive. This seems to be due to the effects of inflation in commercial construction prices over the sample time frame.**

5. **Larger projects had longer construction periods.**

6. **The net benefit of the PFI projects increased with the physical size of the projects. However as a percentage of the unitary payment, the net benefit did not seem related to project size. The same was true of the risk transferred.**

7. **The net benefits of the PFI projects were strongly positively correlated with the risk transferred, with the benefit usually being approximately half of the risk transfer.**

8. **The duration of project procurement did not seem to be related to the size of the project. Some projects that were large/expensive had a short procurement time, whilst smaller/cheaper projects had longer ones.**

9. **There is evidence that the average number of pre-qualified bidders has declined over time. By contrast the number of bidders who submitted bids in response to the invitation to negotiate seems to be stable at 3 – 4, although older projects had slightly more bidders.**

10. **The average total external advisor cost was around £600,000 though there was substantial variation. On average the total external advisor costs were 2% of the NPV of the unitary payment.**

11. **Legal costs usually constituted the largest proportion of external advisor costs, followed by financial and technical costs**.

12. **The total costs of external advisors were not related to the size of the projects. However our sample is not particularly large and may be subject to measurement error, so this finding has to be treated with some caution.**

13. **There was qualitative evidence that advisor costs were determined by the level of in-house expertise of the Local Authority and planning issues.**

14. **If the advisor costs on the project are generated by random local procurement conditions, then the advisor cost per school/per student will on average be lower for larger projects. However this does not mean that larger projects advisor costs are lower in any absolute sense, or that this could be guaranteed for any particular project.**

15. **Although there is some evidence that the financial advisor costs are related to the duration of procurement, the rest of the external advisor costs appear independent of the details of the project.**

16. **Financial and legal advisor costs which constitute the mainstay of the total advisor costs are strongly positively correlated, suggesting that perhaps both are caused by similar factors.**

10. Policy implications

Our main finding was that the external advisor costs of Local Authorities were independent of their PFI projects size and type. Although we have noted some substantial caveats to this finding, we now explore its policy implications.

A priori one might have expected to find a relationship between the nature of the project and the advisor costs in the data. Why do some Authorities procure similar projects with very different levels of external advisor costs and vice versa? Potential drivers of the advisor costs mentioned in the qualitative answers (but which we couldn't control for) were the level of in-house expertise and issues that arose during the procurement process. The two are not necessarily independent, as difficulties on the project leading to reliance on external advisors, may be contingent on whether the Authority lacks the expertise or resources to deal with the situation.

If advisor costs are driven by the necessity of buying in external advice due to lack of internal expertise, then this raises the question of what is the most efficient procurement arrangement. That an Authority had high external advisor costs does not necessarily mean its procurement was inefficient. It may be that it was cheaper to buy in expertise for infrequent large-scale procurement, than to have it permanently in-house. There is information on the internal cost of procurement of Authorities from the survey, but it is based on a very small sample so it is hard to tell whether there is an internal-external cost trade off. Presumably the extent to which external advice is more efficient would depend on local circumstances.

Another issue is the extent to which there are standard elements of procurement expertise that could be centralised at less expense than the use of external consultancies or internal staff. Given that the value for money assessment of PFIs is meant to be a common aspect for all projects there may be scope for this.

It has been suggested that there might be a downward trend in advisor costs over time as Authorities become more experienced with PFIs, but we have failed to find evidence of this. This is probably because most of the projects are early school PFIs and were the Authorities' first PFI education project. Although as the projects were spread over a number of years one might have hoped to see evidence of effects from the diffusion of best practice. Presumably one of the best means of disseminating best practice are training courses. Nearly all the survey respondents had undergone some kind of training, but it would be good to understand the form it took in more detail. If there were common gaps in local expertise that led to the advisor costs increasing, and could be filled by training then this would be worth considering.

Before making more specific recommendations it seems sensible that a number of the survey respondents be interviewed to help understand these issues better.

Appendices

Appendix 1: Response rate to survey questions

Amongst the 28 (22 main survey, 6 pilot) survey returns, the response rate and comprehensiveness of answers to questions varied. Some Local Authorities answered nearly all the questions, whilst others only partially completed the survey. In the latter situation, if the outline business case for the PFI was provided, this was interpreted to fill the gaps. In some instances, answers in the survey were not exactly the same as answers in the outline business case. In this case a judgement was made as to which response should be used. Response rates to individual questions were not uniformly distributed, with some being answered more than others. (See Table 1)

Table 1: Response rate to survey questions amongst returns[12]
(Including answers found in the outline business case).

Number of Schools and project classification	Response rate	**Procurement Information**	Response rate
Number of primary schools	28/28	Internal cost of procurement	12/28
Number of secondary schools	28/28	Previous procurement experience	26/28
Project Classification (4 = 100% new build to 1 = 0-25% new build)	27/28	Training	21/28
Construction Information		First PFI project	26/28
Contract duration (years)	22/28	PQ Bidders	25/28
Expected duration of procurement	18/28	ITN Bidders	25/28
Actual duration of procurement	21/28	**Public Sector Comparator (PSC) Information**	
Expected Construction cost	26/28	NPV PSC	20/28
Actual Construction cost	13/28	Capital Cost	19/28
Duration of Construction (months)	16/28	Running Cost	16/28
Project Specification		Other Costs	7/28
Area (hectares)	12/28	**Risks transfer Information**	
GF Size (m2)	20/28	NPV of risks transferred to the private sector	18/28
Number of students	28/28	Late completion risk	6/28
Number of Classrooms	19/28	Construction cost overrun risk	5/28
External Advisor Costs (EACs)		Operational risk	8/28
Financial	24/28	Other costs	5/28
Legal	25/28	**Cost of PFI and Risk Adjusted PSC**	
Technical	23/28	Risk adjusted PSC	20/28
Insurance	21/28	NPV of the unitary payment stream under PFI	25/28
Other	24/28	Net benefit of procurement through PFI	20/28
Total	27/28		

As can be seen the response rate varies greatly across the questions, going from 28 (100%) on the number of pupils, to only 5 (18%) when asked for the size of “other” risk transfers. There is a range of response rates between these values for the other questions. The gaps in information caused by the varying response rates leads to problems with interpreting the data, an issue which is discussed in more detail in the next section. Regressions and charts may be based on fewer observations than given here due to the absence of complete information on combinations of variables.

[12] In some cases there is ambiguity whether blank responses constitute a non-response or a 0 quantity, which may affect the results. Response rates of 20 or less have been shaded.

Appendix 2: Regression Issues

Comparing data using only one characteristic (or even 2 or 3 in a chart) is potentially misleading, as it does not take full account of the fact that observed differences may be due to other characteristics that are not controlled for. Regression techniques tackle this problem by allowing us to examine relationships between many variables, and are therefore used extensively in this paper. Unfortunately there are a number of difficulties with applying this approach to the survey data, some of which (the list is not exhaustive) are discussed below.

Incomplete survey response

To carry out multiple regression analysis on the entire sample we ideally need complete information on all the desired explanatory and dependent variables, for all the Local Authorities. However as the response rate to the survey questions has varied from authority to authority, it is not possible to use all the survey responses. If we had a larger sample where the gaps constituted only a small percentage of the dataset then we could try and impute the missing values but unfortunately this is infeasible given our sample size. The result is that we have to drop returns from Local Authorities in order to run regressions. This reduces the sample size and makes it harder to draw inferences. A further complication is that the observations on which individual regressions are based will not be the same from regression to regression.

Multicollinearity

If we use variables to understand a particular characteristic, that are highly correlated with each other, then it becomes hard to distinguish the separate effects. Variables may be jointly statistically significant in determining a quantity but be individually insignificant. This means that it is important to analyse relationships between the explanatory variables. For example, as the number of schools procured in a project is related to the number of students, we need to take this into account when trying to explain the total EAC in terms of both.

Sample thinning and outliers

As we try and control for more variables our sample becomes “thinner”, in that we are spreading it over a larger space of possibilities and so are less able to get reliable information on effects of combinations of individual variables. This can be a problem even with quite large samples if the number of explanatory variables used in the analysis is also large. As an example of this: If we look at a sample using just one characteristic we may find that 50% have that characteristic and the rest don’t. However if we also try and look at 6 other characteristics as well, then for any particular combination of these we may be looking at only a few observations and so it can be hard to infer anything.

Although a range of projects are covered in the survey returns, the coverage is not uniform. There are a few very large projects, many small ones and not many in the middle. In certain situations this has meant that the slope of the regression line is determined by the large projects and we don’t know how representative these are.

Limits to the number of explanatory variables/loss of degrees of freedom

For a sample of n observations we can run a regression (with a constant term) on at most n -1 explanatory variables. As our sample size is quite small, this upper bound is not particularly large and can lead to a misleadingly high R^2. For example a 100% R^2 is guaranteed[13] with n -1 explanatory variables, even if they are completely unrelated to the dependent variable.

[13] Assuming linear independence of the explanatory variables and the constant vector.

Appendix 3: Additional regression results

Unitary payment regression deflated by private commercial construction output prices

Regression Statistics	
Multiple R	0.94
R Square	0.89
Adjusted R Square	0.86
Standard Error	12727147.44
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	2.01204E+16	5.03E+15	31.05381	4.25664E-07
Residual	15	2.4297E+15	1.62E+14		
Total	19	2.25501E+16			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-190863791	166654939	-1.15	0.27	-546080603	164353021
Number of students	12246	1312	9.33	0.00	9450	15043
Type of build	13771984	4697551	2.93	0.01	3759384	23784583
Procurement start date	4085	4694	0.87	0.40	-5920	14089
London	1153101	7045753	0.16	0.87	-13864575	16170778

Total External Advisor Cost regression deflated using the GDP deflator

Regression Statistics	
Multiple R	0.53
R Square	0.28
Adjusted R Square	0.00
Standard Error	424056.64
Observations	19

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	9.03912E+11	1.81E+11	1.005329	0.452678073
Residual	13	2.33771E+12	1.8E+11		
Total	18	3.24162E+12			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-13186819	7225067	-1.83	0.09	-28795623	2421986
Number of students	-7	45	-0.15	0.88	-104	90
Type of build	17722	162444	0.11	0.91	-333218	368662
Procurement start date	363	197	1.84	0.09	-63	789
Duration of procurement	21825	17949	1.22	0.25	-16951	60600
London dummy	117604	241344	0.49	0.63	-403788	638996

Legal Advisor Cost regression

Regression Statistics	
Multiple R	0.46
R Square	0.21
Adjusted R Square	-0.14
Standard Error	194909.32
Observations	17

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	1.14E+11	2.28E+10	0.60016463	0.7013666
Residual	11	4.17886E+11	3.799E+10		
Total	16	5.31886E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-1563510	3900785	-0.40	0.70	-10149083	7022064
Number of Students	9	22	0.38	0.71	-41	58
Type of Build	-30176	76503	-0.39	0.70	-198559	138206
Procurement start Date	50	105	0.48	0.64	-182	282
Duration of procurement	2373	8670	0.27	0.79	-16710	21455
London dummy	153628	135958	1.13	0.28	-145614	452870

Legal Advisor Cost regression deflated using the GDP deflator

Regression Statistics	
Multiple R	0.44
R Square	0.19
Adjusted R Square	-0.17
Standard Error	203270.25
Observations	17

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	1.09117E+11	2.18E+10	0.528173563	0.750888681
Residual	11	4.54507E+11	4.13E+10		
Total	16	5.63624E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-997744	4068115	-0.25	0.81	-9951609	7956121
Number of students	10	23	0.41	0.69	-42	61
Type of Build	-31811	79785	-0.40	0.70	-207417	143795
Procurement start date	35	110	0.32	0.76	-207	277
Duration of procurement	2453	9042	0.27	0.79	-17449	22354
London dummy	153526	141790	1.08	0.30	-158552	465605

Financial Advisor Cost regression

Regression Statistics	
Multiple R	0.57
R Square	0.33
Adjusted R Square	-0.01
Standard Error	150642.31
Observations	16

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	1.09587E+11	2.1917E+10	0.96582117	0.482344751
Residual	10	2.26931E+11	2.2693E+10		
Total	15	3.36518E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-3176548	3015686	-1.05	0.32	-9895917	3542821
Number of Students	4	18	0.20	0.85	-36	43
Type of Build	13578	69916	0.19	0.85	-142206	169361
Procurement start date	82	81	1.01	0.34	-99	264
Duration of procurement	14081	6835	2.06	0.07	-1148	29309
London dummy	-26762	106767	-0.25	0.81	-264654	211130

Financial Advisor Cost regression deflated using the GDP deflator

Regression Statistics	
Multiple R	0.56
R Square	0.32
Adjusted R Square	-0.03
Standard Error	161269.76
Observations	16

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	1.20222E+11	24044469295	0.924505	0.503946908
Residual	10	2.60079E+11	26007934477		
Total	15	3.80302E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-2915143	3228436	-0.90	0.39	-10108547	4278262
Number of students	4	19	0.20	0.85	-39	47
Type of build	13902	74849	0.19	0.86	-152872	180675
Procurement start date	75	87	0.86	0.41	-119	269
Duration of procurement	14887	7317	2.03	0.07	-1415	31190
London dummy	-29815	114299	-0.26	0.80	-284490	224859

Technical Advisor Cost regression

Regression Statistics	
Multiple R	*0.53*
R Square	0.28
Adjusted R Square	-0.12
Standard Error	151376.03
Observations	15.00

ANOVA

	df	SS	MS	F	Significance F
Regression	*5*	*8.12E+10*	*16235910272*	*0.708536842*	*0.631947476*
Residual	9	2.06E+11	22914701562		
Total	14	2.87E+11			

	Coefficients	tandard Err	t Stat	P-value	Lower 95%	Upper 95%
Intercept	*-5509823.433*	*3248223*	*-1.69625769*	*0.124071274*	*-12857820.2*	*1838173*
Number of students	-15	18	-0.79	0.45	-56	27
Type of build	-21626	74646	-0.29	0.78	-190486	147235
Procurement start date	156	86	1.80	0.10	-40	351
Duration of procurement	2882	7077	0.41	0.69	-13129	18892
London dummy	-49121	107952	-0.46	0.66	-293325	195083

Technical Advisor Cost regression deflated using the GDP deflator

Regression Statistics	
Multiple R	0.51
R Square	0.26
Adjusted R Square	-0.14
Standard Error	155118.61
Observations	15

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	7.78E+10	15565326527	0.646890011	0.671282558
Residual	9	2.17E+11	24061782158		
Total	14	2.94E+11			

	Coefficients	tandard Err	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-5421782	3328531	-1.63	0.14	-12951448	2107885
Number of students	-15	19	-0.79	0.45	-58	28
Type of build	-19626	76491	-0.26	0.80	-192661	153409
Procurement start date	153	89	1.73	0.12	-47	354
Duration of procurement	3142	7252	0.43	0.68	-13264	19549
London dummy	-52454	110621	-0.47	0.65	-302695	197788

Appendix 4: The survey questionnaire

LOCAL AUTHORITY PFI PROCUREMENT SURVEY

Please complete and return this form by: 12th November 2004
Please use one form per project.
(We understand that not all of these questions may be applicable to yourselves, but would appreciate it if you could complete the form as fully as possible).

1. Local Authority Name & Address

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2. Contact Name

---

3. Telephone Number

---

4. Project Name
(Please confirm the type of procurement used after stating the project name)
a) Project Name
b) If more than one school is included within the project could you please state the number of:
1) Secondary Schools
2) Primary Schools
3) Other (Please specify)
c) Site Address
d) Project Classification: (Place a cross in one box only)
0 –25% New build

26% - 50% New Build
51% - 99% New Build ☐
100% New Build ☐

---

5. Net Present Value of the unitary payment stream.

---

6. Contract duration (in years).

---

7. Could you please provide the date and duration of the procurement period (period of time from OJEU notice to financial close)?
a) Date: From to
b) Duration (months)

---

8. If there was a significant deviation in the procurement duration from the anticipated timetable can you specify the length of deviation and explain why it occurred?

9.What was the estimated and actual cost of construction? If there was a significant cost variation from the estimated figure can you explain why?

10. Could you please provide the date and duration of the construction period? (The period of time from when the contractor started on site work until the date when the school was available for use).

a) Date: From: To:

b) Duration (months)

11. If there was a significant deviation in the construction duration from the anticipated timetable can you specify the length of deviation and explain why it occurred?

12. Can you please specify the size of project in terms of?

a) Development area (hectares) b) Gross floor size (m^2) c) Number of pupils d) Number of classrooms

13. What was the total external advisor cost for each of the following?

a)Financial, Legal, Technical, Insurance, Other (please specify),

Total external advisor cost

14. How large was the internal procurement team (number of staff who work for the local authority and participated in the procurement process)?

15. On average how many hours per week did the internal procurement team spend working solely on the project stated in question 1?

16. What was the internal cost of procurement?

17. Did the internal procurement team have any previous procurement experience?

18. What PFI training programs did the internal procurement team attend?

19. Can you outline any major difficulties that you encountered during the procurement and construction phase?

20. Was this project the first education related PFI project? If not how many previous PFI projects have been undertaken?

21. If your local authority has undertaken more than one PFI project what lessons were learnt from the previous experiences, where were cost savings made on subsequent projects and what did you do differently?

22. How many bidders pre-qualified? (Can you please specify their names)?

23. How many bidders submitted bids in response to the ITN? (Can you please specify their names, the preferred bidder and who won the contract)?

24. What do you believe are the main drivers of PFI procurement costs?

25. What are the possible remedies to lower procurement costs?

26. To assist in the DTI's study on PFI procurement costs could you provide a copy of the final outline business case?

27. What was the net present value of the public sector comparator (PSC) and what was the net benefit of procurement through the PFI?
a) NPV Public sector comparator
Can you please also disaggregate the NPV PSC and report the following

1) Capital cost
2) Running costs
   (Which include operating costs, repair and maintenance costs)
3) Other

---

b) NPV of risks transferred to the private sector
Can you please also disaggregate the NPV of risks transferred to the private sector and report the following

1. Late completion risk
2. Construction cost overrun risk
3. Operational risk
   (Which includes running costs, maintenance and repair costs)
4. Other

---

c) Risk adjusted PSC (a + b)
d) NPV of the unitary payment stream under PFI
e) Net benefit of procurement through the PFI (c – d)

28. The DTI plans to benchmark PFI performance against traditional government procurement. In order to do this the DTI needs procurement cost and construction cost data for schools that were built using conventional government procurement. If you have built a school using conventional procurement the DTI would be grateful if you could also complete a separate conventional procurement survey that can be found in the appendix.

29. Please feel free to make any additional comments that are not covered in the above questions.

Acknowledgements

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References:

The role of cost saving and innovation in PFI projects (2000),
Construction Industry Council (CIC).

Taking the Initiative. Using PFI contracts to renew council schools (2002), Audit Scotland.
http://www.audit-scotland.gov.uk/publications/pdf/2002/02ar03ac.pdf

PFI in Schools, The quality and costs of buildings provided by the first Private Finance Initiative Schemes (2003), Audit Commission.
http://www.audit-commission.gov.uk/Products/NATIONAL-REPORT/D7701D4F-C130-4BA6-B10D-6D0644BDAA98/pfi_report.pdf

PFI: meeting the investment challenge (2003), HM Treasury.
http://www.hm-treasury.gov.uk/documents/enterprise_and_productivity/PFI.cfm

PFI survey, Major Contractors Group (2005).

Post Contract Signature Review of PFI Schools Deals (2005), Partnerships UK - Phase 2 Report.
http://www.teachernet.gov.uk/docbank/index.cfm?id=9262

Risk transfer in Private Finance Initiatives (2006), IES working paper, John Davies, DTI.
http://www.dti.gov.uk/construction/stats/pfirisktransfer.pdf

Schools Private Finance Unit website, Department for Education and Skills (DFES).
http://www.teachernet.gov.uk/management/resourcesfinanceandbuilding/funding/capitalinvestment/typesoffunding/pfi/