Leveraging Training Outcomes on Public Construction Projects[1]

Abstract

The paper explores the efficacy of public agencies using their contracting relationships with private firms to affect training outcomes in the construction industry. It develops a theoretical perspective on this issue by extending a framework that was originally developed by Hart, Schleifer and Vishny (1997) to study privatisation. This paper shows how their framework can also be applied to situations where the provision of public works is already privatised and the government is attempting to regulate training outcomes via a contracting arrangement. An empirical study of two training policies of the Western Australian government complements this theoretical discussion. We report the results of an analysis of data drawn from the government's Tender Registration System between 1997 & 2006. As such we use a unique and comprehensive resource to examine the possible effects of new training policies on an important segment of the construction 'market'.

1. Introduction

In Australia, government is a significant player in the construction industry, with the level of government-initiated construction projects approaching 30-40% of total industry turnover in the commercial building and engineering sectors (Hampson and Brandon 2004). It is thereby in a position to influence both the construction industry and the parts of the labour market associated with construction. In an environment where the large majority of public construction work is contracted out to private firms, the government may seek to influence outcomes in the construction labour market through its procurement policy for capital works.

This paper first provides a theoretical perspective on the likely efficacy of using contracting relationships with private firms to affect training outcomes in the construction industry. This perspective is informed by a principal-agent framework originally developed by Hart, Schleifer and Vishny (1997) to study the outsourcing of prison services. As is the case with much of the economic literature in this area, Hart, Schleifer and Vishny were concerned to examine whether public ownership or privatisation is the ideal arrangement for service provision. However, importantly, the model can also be applied to situations where services and/or public works are already privatised and the government is attempting to regulate the quality of outcomes via a contracting arrangement.

[1] This paper forms part of the results of the Multi-outcomes Construction Policies research project, funded by the Cooperative Research Centre for Construction Innovation (Project 2006-036-A). A key industry partner in this research project is the Western Australian Department of Housing and Works, which has a legislated responsibility to ensure the efficient administration of public construction contracts in the State.

The paper complements this theoretical analysis with an empirical study of two training policies of the Western Australian government. These policies - the Priority Access Policy and the Building Skills Policy –alter the design of public construction contracts with the aim of ensuring an adequate supply of skilled labour in the construction industry[2]. The Priority Access Policy, first implemented in August 1999, required contractors to meet a range of minimum training requirements[3] before being eligible to tender on public building and construction contracts. The Building Skills Policy, which was first implemented in October 2002, specified that 10% of deemed labour hours be allocated to the employment of apprentices and/or trainees. On January 1 2007 both policies were integrated into the Priority Start – Building Policy.

The empirical analysis makes use of data drawn from the government's Tender Registration System for the time period 1997-2006. This system, first implemented in 1996, records the tender details of all WA government construction projects – such as the size and location of the planned works, the number of bids received, bid prices and winning bid. As such, it is a unique and comprehensive resource for examining changes and variations in bid activity and prices in an important segment of the construction 'market'.

The analysis presented in this paper is important for a number of reasons. First, it comprises a detailed quantitative analysis of a large and comprehensive set of data on public construction contracts. To our knowledge, little use has been made by academics of the data that now exists on tender bids and outcomes in most Australian jurisdictions. This paper hopefully highlights the potential to draw on these sources to gain greater insights into the trends and issues affecting the construction market – and training outcomes in this important market segment.

The paper also represents a novel attempt to examine the efficiency of using the contracting arrangements of public works authorities to achieve training goals. To our knowledge, this particular approach to training policy has not been thoroughly researched in either an Australian or international context. In part this research gap is likely to reflect the relatively short history of contracting out public works. As Jensen and Stonecash (2004) explain, most previous empirical studies of contracting out have focused on the costs and benefits associated with a shift to privatised services. Relatively few studies have been conducted in the 'post-privatisation era' and addressed the effectiveness of alternative contracting arrangements.

In Section 2 we describe a theoretical framework structure that has potential for studies of this kind. This framework, developed initially by Hart, Schleifer and Vishny (1997) is itself an extension of the basic principal-agent model familiar to most economists. In the section we attempt to apply the theoretical discussions associated with Hart, Schliefer and Vishny's work to the case of contracted provisions for training investments. In doing so, we aim to identify a range of factors potentially relevant to the training outcomes achieved via the contracting option. In Section 3 we describe an empirical study of the effects of leveraged training policies on bid activity in the public construction 'market' in Western Australia. The final section provides a discussion and summary.

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[2] *Priority Access n.d.* Retrieved October 20, 2006, from http://policies.det.wa.edu.au/; *Building Skills n.d.* Retrieved October 20, 2006, from http://policies.det.wa.edu.au/.

[3]Contractors need to meet a minimum of 100 points in order for them to be able to tender. Points are allocated based on the contractor's involvement in specified employment and training activities, such as employing apprentices and/or trainees, staff with recognised VET qualifications, staff with tertiary qualifications, or having staff participating in work related training programs.

2. Theoretical Framework

The theoretical framework developed by Hart, Schleifer & Vishny (1997), hereafter the HSV model, provides a possible basis for analysis of the potential efficiency effects of leveraging social outcomes on public construction contracts. As was noted in the introduction, the HSV model was developed to account for features of a contractual relationship relating to the provision of prison services. It was also motivated, in part at least, by a desire to evaluate whether public ownership or privatisation is the ideal arrangement. However, in this section we show that the model can be applied both to situations where the provision of services and/or public works is already privatised and to the specific case of desired training investments on construction projects.

Using the notation used in the original HSV model, *M* is a contractor whose actions (efforts) can influence the social benefits, *B*, and the costs, *C*, associated with a construction project. Residual control rights associated with the project are assumed to lie with the contractor, in the sense that he/she is responsible for any cost over-runs associated with the project and reaps the financial gains of any uncontracted cost savings. *G* is a government representative who is charged with responsibility to ensure the net social benefits associated with the project are maximised.

Attention focuses on the *quality* enhancements the contractor *may* introduce. In our particular example these relate to investments in human capital via training. We model these enhancements as imposing additional financial and effort costs on the contractor. However, they raise the gross social benefits associated with the project. In the first version of the model that we present, the benefits of any quality improvements only flow to the broad community. That is, the benefits of any improvements are assumed *not* to be internalised (or captured) by the firm.

Two equations are defined:

$$B = B_0 + B(e)$$

$$C = C_0 + C(e)$$

where *e* refers to the effort involved in achieving quality enhancement. $C(e) \geq 0$; $B(e) \geq 0$ [4].

The contractor's assessment of ex ante costs takes into account direct (financial) and effort costs:

$$C + e = C_0 + C(e) + e$$

Analysis begins by considering a scenario where quality improvements (eg training investments) are *not* part of the contract agreement; that is, potential improvements can be neglected without triggering a breach of the contract relating to the construction project.

Not surprisingly, given the assumptions about the internalisation of costs but not of benefits, the model predicts that a profit-focused contractor will not introduce the quality enhancement. Such improvements add to his/her financial and effort costs without contributing a financial benefit.

Although this is a very simple result, it does underlie the expressed rationale for specific contract provisions relating to training and other social outcomes. That is, in the absence of

[4] B'(e) > 0; B''(e) <0

these provisions it is likely that investments in quality enhancements that deliver broad social benefits will not take place. The framework introduced here is also a convenient 'building block' for the remaining parts of the analysis.

The next scenario considered relates to a situation where an attempt is made to contract *e* (that is, efforts directed towards quality enhancements). We begin by identifying the 'first best' situation, which involves *G* and *M* selecting a level of *e* to maximise the net surplus from their trading relationship. The surplus can subsequently be divided between the two parties.

In the first best, *G* and *M* solve:

$$\max_{e}\{B(e) - C(e) - e\}$$

This has a unique solution:

$$B'(e^*) - C'(e^*) = 1$$

This constitutes a useful guiding principle for the analysis as it implies that at the social optimum the marginal social benefit (*B'(e)*) of spending extra effort/resources to improve the quality outcomes of a construction project must equal the marginal cost of that effort (*C'(e)*). This is a standard tenet of welfare economics.

We now consider whether negotiated outcomes from a contract that includes *e* will achieve this social optimum (assuming that quality enhancement and investments are fully observable). The payoff from a contract with a renegotiated price to encourage investment in quality will be, for the public agency:

$$U_G = B_0 - P_0 - P(e) + B(e)$$

The payoff for the contractor will be:

$$U_M = P_0 - C_0 + P(e) - C(e) - e$$

Assuming rationality, each party chooses *e* to maximise their respective payoffs.

For the government, this involves solving:

$$\max_{e}\{B(e) - P(e)\}$$

This has a unique solution:

P'(e)=B'(e), implying the agency has an incentive to offer an increased contract price in proportion to the expected social benefits of the innovation.

The contractor will solve:

$$\max_{e}\{P(e) - C(e) - e\}$$

This has a unique solution:

$P'(e_m) - C'(e_m) = 1$, which has the straightforward interpretation that additional investments in quality will be undertaken by the contractor so long as the financial rewards, $P'(e_m)$, exceed the costs, $C'(e_m)$.

There are several implications from this stage of the analysis. First, the outcomes from a contract that includes provisions relating to quality enhancements will (given the satisfaction of assumptions relating to contract performance) result in positive investments in quality. However, compared with the first best outcome, a contract that includes provisions relating to

quality enhancements is likely to result in the contractor *under-investing* in the enhancement. That is, unless $P'(e) = B'(e)$[5], which implies the contractor accrues all the net benefits of the contract renegotiation, the contractor's willingness to make investments in quality will be less than optimal.

The level of competition for contractor services will affect this latter result. Specifically, higher levels of competition (due, for example, strong economic conditions) will bid up the price for any quality improvements and, thus, reduce the net surplus accruing to the government from any provisions that it does negotiate.

Extensions to this basic framework provide additional insights to the issues affecting outcomes from construction contracts that attempt to leverage training outcomes. First, following Hart et al. (1997), we replace function $B(e)$ with $\theta B(e)$, where $0<\theta<1$. θ is used to represent factors affecting the magnitude of the positive impact on social benefits of a contractor's quality innovations. Where θ is small the actions of the contractor have little significance for social outcomes. Thus, the importance or value of special provisions to regulate quality will be small and G's willingness to offer a higher price to secure these investments will be small, ceteris paribus. Conversely, when θ is close to unity the importance of ensuring high investment levels will be large. In a training context, θ is likely to be related positively to the size of the project in relation to the local economy.

It is also useful to replace the function $C(e)$ with $\Phi C(e)$, where $0<\Phi<1$. Φ represents the factors affecting the positive impact on the contractor's costs of production of a prescribed quality innovation. Where Φ is small the barriers to quality innovations will be relatively small, reducing the contract price required to achieve high investment levels, ceteris paribus. In a training context, Φ is likely to be inversely related firm size (given that large firms often already employ apprentices, for example, and thus may not need additional training investments to meet contract provisions). On the other hand, Φ is likely to be positively related to labour market shortages and prevailing, administrated training wages and administrative costs.

Bennett and Iossa (2005) provide an extension of the HSV model that is useful in the context of questions about the factors affecting investments in training. Specifically, Bennett and Iossa address the HSV assumption that all the benefits of a quality innovation are external, in the sense that $B(e)$ accrues to members of the community *other than* the contractor. In a situation where the quality innovation relates to training of workers, this is akin to an assumption that the skills imparted through training are perfectly transferable (or 'general'), rather than specific.

The Bennett and Iossa extension allows us to model a situation where the skills produced by a training program have at least some degree of specificity and/or the skills involved are general but the labour market is imperfectly competitive. In these cases, due to restrictions on the mobility of trained workers, the firm is able to capture (or internalise) at least some of the benefits of a training investment.

A shift factor λ can be added to $B(e)$ in the equation for U_M to represent the share of the benefits of the quality innovation that are internalised by the firm. In these circumstances the residual value of the contract accruing to the firm increases with the quality innovation. This increases the likelihood that the firm will independently make investments in quality. In turn, this reduces the need for special provisions to regulate quality and/or the need for increases in contract prices to achieve these innovations. In a labour market context, λ is likely to be

[5] Note that first best requires $B'(e^*) - C'(e^*) = 1$, whereas, M will operate where $P'(e^*) - C'(e^*) = 1$

related to the nature (general or specific) of the training involved with particular construction projects; the level of competition in the local labour market (competition increases the mobility of workers, reducing possible returns to the firm from investments in general skills); and uncertainty about future product market conditions.

Another important extension of the HSV framework reflects the likely importance of transaction and/or monitoring costs in contracts that incorporate provisions relating to quality innovations. In Globerman and Vining's (1996) analysis, these costs include opportunism and bargaining costs. Opportunism relates to the risks that a contract party will attempt to change the agreed terms of the contract in its favour after the initial contract has been agreed. This risk arises where the other party has a dependence on contract outcomes and limited alternatives. Opportunism contributes transaction costs associated with the design of measures aimed at mitigating its potential influence.

Bargaining costs refer to the costs involved in negotiating and re-negotiating a contract, monitoring its performance and resolving disputes. Although several of these costs are incurred after the contract has been agreed, they can be anticipated during the design of a contract. As such, these bargaining costs are likely to add to contracting costs in the *ex ante* period.

In Globerman and Vining's (1996) analysis, the magnitude of bargaining and opportunism costs will be related to task complexity (i.e. the degree of difficulty in specifying and monitoring the terms and conditions of the contract); competition in the relevant market; and asset specificity (i.e. the extent to which physical and human assets associated with a project *cannot* be secured from, or re-deployed to, other sources). They note, for example, that if task complexity is large and outside the sphere of a government agency's sphere of expertise, transaction costs are likely to be particularly large. High levels of asset specificity add to the risks of opportunistic behaviour and thus also add to transaction costs. Competition within the contract market is predicted to have the opposite influence – acting as a deterrent to opportunistic behaviour (and, thus, lowering transaction costs).

It is possible to incorporate a factor, e.g. $z(e)$, into the U_G function to represent the additional transaction costs to the government associated with requiring quality investments by the successful tenderer. The influence of this factor on contract outcomes will be that the optimal level of investment, e^*, will fall; as will the maximum price, $P(e)$, the government agency will be prepared to pay for promised quality innovations. In turn, this will restrict the amount of investment accomplished through the contract option.

From the above discussion of transaction costs, it is also logical to apply a shift factor, ∂, ($0<\partial<1$) to reflect differences in the significance of $z(e)$ associated with task complexity, competition and asset specificity. In a training context, ∂ is likely to be related positively to the size and length of the project and the complexity of the training task.

The final extension of the HSV framework considered in this paper allows for the likelihood that G (the government) comprises a number of entities, potentially with different perceptions of the net social benefits of particular quality investments. For example, in the case of provisions relating to training, one agency may be responsible for identifying desired levels of training activities, whilst another agency may be responsible for designing and implementing construction contracts. This framework predicts conflict between agencies and potential inefficiencies *if* the government department responsible for training policy doesn't take into account the transaction costs. Specifically, under these circumstances, the training agency would be expecting a higher level of investment than is socially efficient. The importance of the administrative department communicating the magnitude of transaction costs and having these represented in the U_G function is highlighted in this analysis.

3. A Case Study of Leveraged Training Outcomes in Western Australia

Several of the issues raised in the above theoretical discussion have relevance to the experience of public works departments in Western Australia over the 1997-2006 time period. As noted in the introduction, the WA government applied two training policies to its construction projects over this period: The Priority Access Policy, first implemented in August 1999, obliged contractors to meet a range of minimum training requirements before tendering on public construction contracts with a value greater than $150,000. The Building Skills Policy, which was first implemented in October 2002, specified additionally that 10% of deemed labour hours spent on public construction projects with a value of $2 million or more be allocated to the employment of apprentices and/or trainees.

In this section we attempt to assess some of the supply-side responses to these training policies. In doing so we build on the part of the above theoretical discussion relating to the impacts of prescribed 'quality innovations' on contractors' costs of production. Resistance to these 'innovations' were predicted to be highest where the cost impacts were greatest. In a training context (where the innovations relate to contracted training outcomes) these costs were assessed to be inversely related to firm size and positively related to labour market shortages. The nature of the training obligation itself obviously will also affect these costs. The extent of these costs, and thus the supply-side resistance to the contracts which include training provisions, will have significance for changes in contract price (and, thus, the cost of the training), as well as for the levels of training accomplished by the policy intervention.

The WA Department of Housing and Work's Tender Registration System (TRS) data contains records which allow us to explore the supply-side response to the policies. The TRS was implemented in 1996 as a way of recording the tender details of all WA government construction projects. Information recorded in the TRS database includes basic project details, such as a description of the works to be undertaken, the location of the planned work and the estimated pre-tender value of the project. The database also contains information on the number of tender documents requested for each project, together with details on each of the tenders received and the winning bid price. In this study we make use of the TRS information on 2519[6] government non-residential construction contracts awarded between 1997[7] and 2006. 11525 tender bids were recorded on these contracts.

We use bid numbers, rather than pre-tender estimated or winning bid prices to gauge the supply-side response to the training policies. This approach avoids a critical complication inherent in using the price information in the TRS to reflect *current* supply and demand conditions. Specifically, price adjustments are often made on public construction contracts following a *retrospective* evaluation of previous contracting exercises. If estimated prices in previous periods resulted in too few bids then prices are often revised upwards. If pre-tender prices were high relative to contractors' bid prices, these estimates are often revised downwards. As a consequence of this delayed adjustment it is difficult to use current contract prices (or even the gap between the winning bid price and the pre-tender estimate) to assess current market conditions. Bid numbers on current projects provides a more direct measure of

[6] This represents close to all the contracts included in the TRS over the ten year period. Only a very small number of contracts were excluded from the analysis due to incomplete recording of their details. The omission of records on location and tender value appeared to be due to record keeping errors and is, thus, unlikely to be a source of systematic bias in the results of our analysis

[7] Although the TRS was initiated in 1996, records in this year were incomplete and thus excluded from our investigation

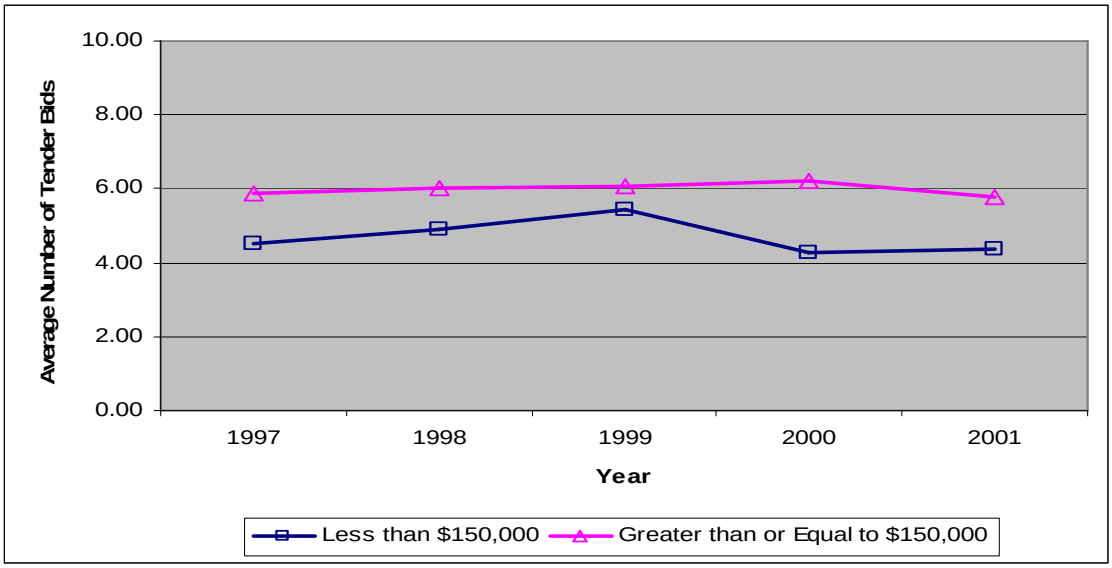
contractors' reactions to new contract provisions and can be easily related to changes in the changes in supply prices referred to in the theoretical discussion.

The particular approach adopted for the study of the impact of the training policies on bid activity involves an examination of variations in bid numbers on non-residential government construction contracts around the time of the implementation of each policy[8]. In the case of the Priority Access policy, the analysis period is August 1997 to August 2001, which encompasses the 24 months prior to and the 24 months after the implementation date of the policy. In the case of the Building Skills policy, the 48 month analysis period is October 2000 to October 2004.

The analysis also focuses on differences in bid activity between the 'market' segments affected and unaffected by the policy. In the case of the Priority Access Policy this involves a comparison of changes in bid activity across the analysis period between a) projects with a pre-tender value of at least $150,000 (and thus potentially affected by the policy); and b) projects with a pre-tender value of less than $150,000 (not affected by the policy). In the case of the Building Skills Policy the two comparison groups are a) projects with a pre-tender value of more than $2million; and b) projects with a pre-tender value of $2 million or less. In each case we hypothesise that if the policies were having a significant supply-side effect, activity levels would fall in relative terms in the market segment affected by the policy. Furthermore, this fall would be observed in the analysis period.

The analysis starts with an outline of the broad trends in bid numbers over the study period and across the market segments. Bid activity in relation to the Priority Access policy is described first, in Table 1. This data is clearly not supportive of a hypothesis that the policy had a substantial supply-side effect. In fact an opposite pattern is apparent: the average number of bids declined for contracts *not* subject to the Priority Access policy over the analysis period, whilst there was negligible change in the average number of bids for tenders subject to the policy.

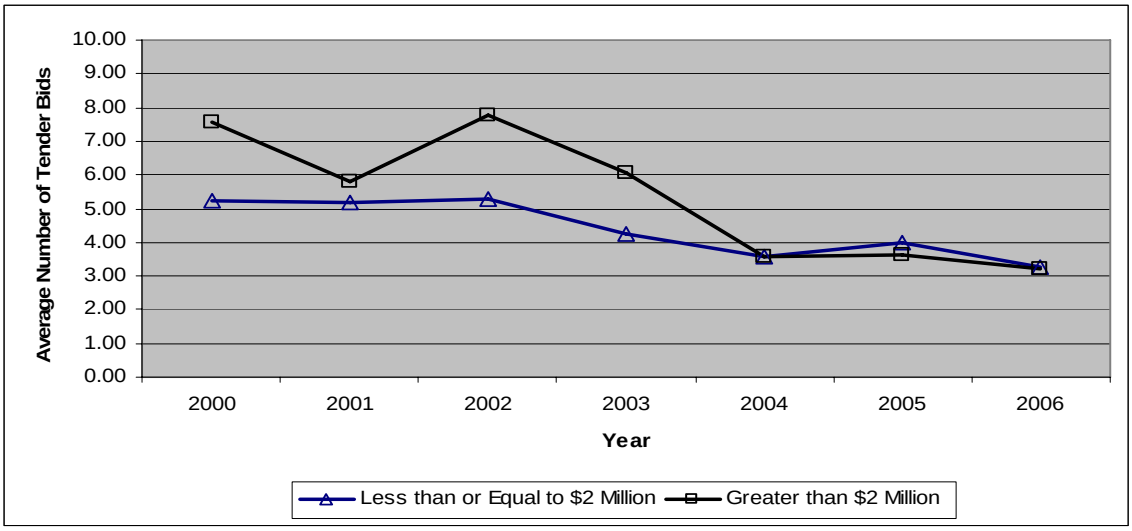
Figure 1: Average Number of Tender Bids for Contracts with a Pre-tender value < $150,000 and Tenders with a Pre-tender value ≥ $150,000 by Year, 1997 to 2001



[8] This approach to restricting the time period allows us to focus more fully on the effects of the policy whilst allowing for the possibility of anticipatory or delayed effects

The following chart provides information on changes in the average number of bids for contracts affected/not affected by the Building Skills policy between 2000 and 2004. At face value this data is more supportive of a hypothesis that the policy had a supply-side effect: the average number of bids for contracts subject to the policy fell at a greater rate than those not subject to the policy over the analysis period. There is also an apparent alignment between the introduction of the policy and this relative change. However, given the strength of the other influences on the construction market (such as changes in private sector construction activity), there is a need for caution before reaching firm conclusions about the effects of the policy.

Figure 2: Average Number of Tender Bids for Tenders with a Pre-tender value ≤ $2m and Tenders with a Pre-tender value > $2m by Year, 2000 to 2006.



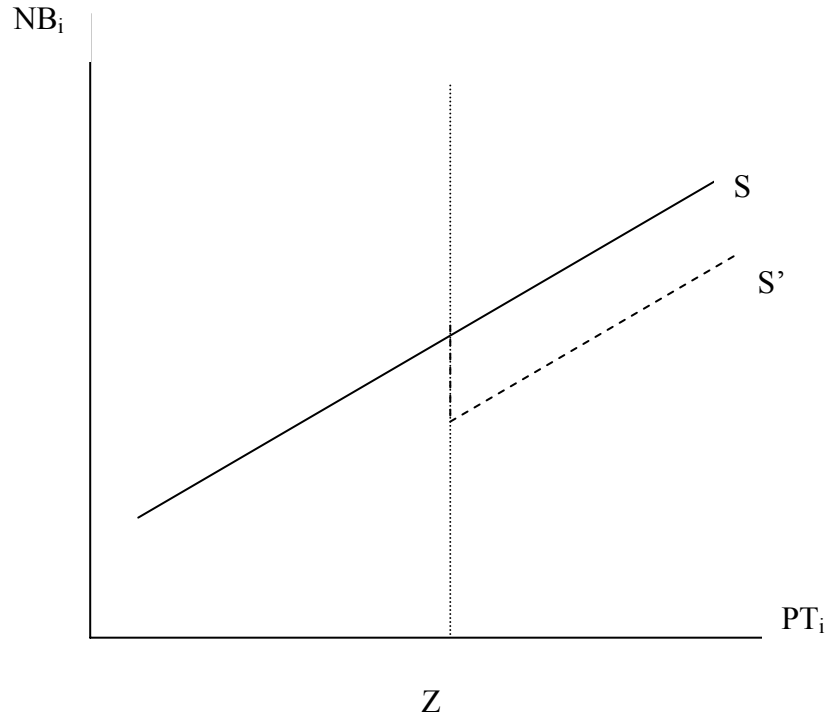
A multi-factor analysis of the relationship between bid activity and policy settings provides clearer insights to the supply-side effects of the two policies by incorporating controls for the other influences on bid activity. This analysis, outlined in the following paragraphs, is structured into two parts, each relating to the key policy initiatives. However, the same approach is taken to the measurement of the effects of each policy. Specifically, linear (OLS) regression techniques are used to estimate the following equation, which relates to the determination of the number of bids for public construction contracts.

$$NB_i = \beta_1 + \beta_2 PD_i + \beta_3 Z_i + \beta_4 PT_i + \beta_5 RN_i + \beta_6 OF_i + \gamma_2 (Z_i \times PD_i) + \varepsilon_i$$

NB_i, is the number of bids submitted on contract *i*; PD_i is a dummy variable that is based on the date of implementation of the policy (for example, in the case of Priority Access this variable takes on a value of 1 for all contracts dated after August 1999); Z_i is a dummy variable that identifies whether the contract falls within the scope of the policy's application (in the case of Priority Access this variable is coded as '1' for all contracts with a value of $150,000 or more); PT_i is a continuous measure that relates to the contract's pre-tender value; RN_i is a dummy variable that identifies whether the location of the project was in the Perth, South-West or Peel Regions, or in another, more remote region where labour is less available. OF_i is a continuous variable based on the value of the Building Cost index in the month that the bids were recorded. It is used in this model to proxy the level of competition in the

construction market[9]. Finally, the interaction term (Z_i*PD_i) identifies those projects that were affected by the implementation of the policy (for example, in the case of Priority Access this variable will only take on a value of 1 for contracts with a pre-tender value of $150,000 or more and dated after August 1999). ε_i is a random error term, which is assumed to be normally distributed with $E(\varepsilon_i)=0$ and the var $(\varepsilon_i)= \sigma^2$.

The modelled relationship can be described in the following simplified terms. First, the function S, shown in the diagram below, represents the positive relationship between the pre-tender value of the contract and the number of bids (as implied by the theoretical model outlined in Section 2).



The other factors in the model are hypothesised to be associated with cost-related shifts in this function. For example, in more remote regions the function S could be expected to shift downwards (implying a positive coefficient on the variable RN_i) due to the greater difficulties in accomplishing construction work and securing labour in these areas as compared to less remote regions[10]. Higher levels of competition from the private construction sector are likely to be associated with a downward/rightward shift in the function (implying a negative value on the coefficient on OF_i). If the introduction of the policy and its application only to projects with a $PT_i \geq Z_i$ has a negative effect on bid activity a discontinuity in S around point Z_i (as represent by the function S') will exist. Evidence in support of this hypothesis would be a significant negative coefficient on the interactive term (Z_i*PD_i). The individual term PD_i controls for the possibility (seemingly remote) that there was a change in bid activity for *all* contracts (i.e. those affected by the policy and exempt projects) around the time of the introduction of the policy. The individual term Z_i controls for the possibility (more likely) that

[9] This index reflects current costs of accomplishing the types of construction projects contracted for via the TRS. A variety of measures of market conditions (such as indexes of labour availability, materials costs, etc) are available. However, testing indicated that these are strongly correlated with the Building Cost Index.

[10] In 2006 the average number of bids on projects located in the Perth region was 3.54, compared with 2.26 on projects in other regions.

there are underlying differences in the relationship between tender activity and pre-tender prices in the group of contracts 'priced' above and below the trigger value of the policy.

The estimated relationships between tender bid numbers and the various explanatory variables included in the RHS of the above equation using the TRS data are outlined in the following paragraphs. Reflecting the above discussion, these results are presented separately for the Priority Access and Building Skills policies.

Priority Access Policy

The model for bid numbers was first estimated with reference to data on DHW contracts for the period August 1997 to August 2001. In this case Z_i is defined by the introduction of the Priority Access Policy in August 1999 and PD_i is defined by the policy's application to projects with a value of $150,000 or more. The results of this analysis are presented in Table 1 below.

Table 1: Estimated Coefficients for Equation on Bid Numbers on Government Non-Residential Construction Contracts (*Priority Access Policy*), Western Australia 1997-2001.

Variable	Coefficient	Prob.
Constant	-4.2950	0.6142
Policy Implementation Date (PD)	-0.4990	0.3528
Contract above trigger value (Z)	0.9299	0.0007
Pre-Tender Value (PT)	-1.29E-07	0.0033
Region	1.4243	0.0000
Building Cost Index	0.0720	0.3394
PD*Z	0.0216	0.9612

Notes: Log-Likelihood: 1957.8; Nobs: 789; Method: OLS

The data in Table 1 indicate that the implementation of the Priority Access Policy in August 1999 *did not* have a significant effect on competition for government non-residential construction contracts in WA. The reduction in bid numbers observed around the time of the implementation of this policy was similar in 'market segments' subject to the influence of the policy (i.e. contracts with a value of $150,000 or more) and in other parts of the 'market'. The figures in Table 2 show, rather, that during the analysis period (August 1997 to August 2001) bid numbers varied between contracts firstly due to regional factors. The average number of bids on contracts in more remote regions was 1.42 bids less than the number of bids on contracts in the Perth, South West and Peel group of regions. Bid numbers in the analysis period were also significantly affected by the value of the contract. Contracts with a value of $150,000 or more had, on average, close to 1 additional bid per contract than those with a lower pre-tender value. A somewhat surprising result is the lack of a statistical significant relationship between the building cost index and bid numbers. The most likely explanation for this is that the period 1997 to 2001 was a period of relatively stable economic conditions. There was little variation in the building cost index over the analysis period and, thus, this was not an important source of differences in bid activity.

Building Skills Policy

The results derived from the application of the model for bid numbers to TRS data relevant to the Building Skills Policy are presented in Table 2. In this case the analysis period spans

October 2000 to October 2004; Z_i is defined by the introduction of the Building Skills Policy in October 2002; and PD_i is defined by the policy's application to projects with a value above $2 million.

Table 2: Estimated Coefficients for Equation on Bid Numbers on Government Non-Residential Construction Contracts (Building Skills Policy), Western Australia 2000-2004.

Variable	Coefficient	Prob.
Constant	9.3524	0.0000
Policy Implementation Date (PD)	-0.4719	0.0516
Contract above trigger value (Z)	1.4512	0.1009
Pre-Tender Value (PT)	1.39E-07	0.0008
Region	1.2794	0.0000
Building Cost Index	-0.0436	0.0004
PD*Z	-1.4152	0.0986

Notes: Log-Likelihood: 1873.5; Nobs: 807; Method: OLS

The data in Table 2 are suggestive of a negative impact of the Building Skills Policy on bid activity relating to government non-residential construction contracts in WA. Keeping in mind that this relationship was only statistically significant at the 10% level, the results indicate that bid numbers on contracts affected by the policy (i.e. above $2 million in value and commencing after October 2002) were, on average, 1.42 bids lower than contracts not affected by the policy after 2002. A further contrast between the results in Table 2 and those in Table 1 is the significance of building costs as a source of variation in bid numbers. The figures in Table 2 indicate a strong negative relationship between the building cost index and bid numbers. This difference between the results in Table 1 and 2 is likely to derive from the relatively large rate of change in the building cost index between 2000 and 2004, as compared to 1997-2001.

A similarity between the two sets of results is the measured importance of regional factors in explaining variations in bid numbers. In Table 2 the average number of bids on contracts in more remote regions was 1.27 bids less than the number of bids on contracts in the Perth, South West and Peel region. Finally, bid numbers in the analysis period relevant to the Building Skills Policy were positively affected by the value of the contract.

4. Discussion

It is important to consider why the Building Skills Policy, but not the Priority Access Policy, had an impact on bid activity for non-residential construction contracts in WA. Bid numbers were lower on contracts affected by the Building Skills Policy following the implementation of the policy in October 2002. This effect was distinct from the influence of changes in construction costs and regional and project size factors on bid numbers. A similar effect was not apparent following the introduction of the Priority Access Policy in 1999.

A superficial assessment of the policies based on these differences might conclude that the Building Skills Policy, which requires that contractors allocate 10% of deemed labour hours to the employment of apprentices and trainees, is less desirable. The policy appears to have contributed to a lowering of competition for public construction contracts in the 48 month period surrounding its implementation. Such an impact has efficiency consequences for the public construction program, potentially contributing to higher costs and/or lower quality outcomes. Given that WA is currently under the influence of a range of economic pressures,

these added costs are of particular concern. The Priority Access Policy, which required contractors to meet a number of requirements relating to employment and training activities (such as having staff with tertiary qualifications) did not appear to add to the contract price for public works.

Our interpretation of the results presented in the above section is quite different – and we conclude that the Priority Access Policy is not necessarily a superior approach to regulating training outcomes on government construction projects. We see in the results evidence that the Priority Access Policy *did not* in fact affect the training behaviour of construction companies: as the introduction of the policy had no evident impact on their willingness to bid for public projects. One possible explanation for this is that the policy did not impose high training requirements on contractors. As such, although the policy may not have affected competition for public works, it is unlikely to have achieved improved training outcomes. It is also likely to have still imposed transaction costs on contractors and, especially, the administering department. In sum, the apparent gains (via investments in training) of the policy are few whilst it was still associated with some costs.

Questions remain about the positive impacts of the Building Skills Policy. As already noted, the policy appears to have influenced the willingness of contractors to bid for public projects. This implies that at least some contractors perceived that they would need to change their training behaviour to meet the new contract requirements. However, a remaining unknown is whether the contractors who remained in this market segment were those already engaged in training or whether the policy encouraged other firms to increase their training commitments. If the former scenario is the more accurate (that is, non-training firms simply shifted to other markets), then the benefits of this policy are also likely to have been small. In total, in this scenario, substantial additional contract and administrative costs are likely to have been incurred as a result of the policy's introduction with little in the way of a net social benefit.

Further research is obviously required to fully assess the efficacy of policies such as the Building Skills Policy – along the lines suggested here. There is also a need for additional research on other alternatives to using the contracting relationship between public agencies and construction companies to affect training outcomes.

The results presented in this paper are only an early starting point for this research. They indicate that some policies have little effect on the behaviour of firms. Thus they are likely to add transaction costs with little positive impact on training. Other policies are likely to have more 'bite'. However, their effects of contractors' costs of production – and, thus, the potential supply-side effect on the public construction market – need to be weighed against changes in training numbers. The theoretical framework outlined in this paper may assist in guiding this research work.

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