

Subcontractor procurement in construction: the interplay of price and trust

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Abstract

Purpose – The purpose of this paper is to examine the relative importance of price and trust and their interaction in subcontractor selection. By doing so, it aims to respond to the currently dominant view that trust-based procurement is the remedy to performance problems in construction. The paper also aims to argue that a specific interplay of both price and trust is always inherent to the selection of subcontracted services.

Design/methodology/approach – A choice-based conjoint experiment was conducted to underpin the initial argument. The conjoint analysis is based on a sample of medium-sized contractors from the Dutch residential building industry.

Findings – The research shows that neither price nor trust can be downplayed as procurement mechanisms. On the one hand, through repeated relationships main contractors become more confident in judging the performance of subcontractors. The level of trust increases and finally affects the supplier selection. On the other hand, favourable quotes are a prerequisite for trust to become choice relevant. Moreover, the extent to which subcontractors have performed with respect to quality, technical know-how and cooperation in the past finally accounts for whether they are chosen or not.

Research limitations/implications – The joint occurrence of price and trust as procurement mechanisms should be acknowledged. More research is needed to understand the trade-offs main contractors make between price and trust while procuring subcontracted services.

Practical implications – Subcontractors need to offer competitive bids to be able to increase their chance of recurrent relationships with main contractors and thus trust development.

Originality/value – This study is one of the first that considers the interaction of price and trust in subcontractor procurement. It contributes to the ongoing discussion around partnering and supply chain integration in construction.

Keywords Subcontracting, Procurement, Prices, Trust, Construction industry, The Netherlands

Paper type Research paper

Introduction

Subcontracting is a key characteristic of construction. For up to 90 per cent of the total value of a construction project, subcontractors supply labour and material and transform order-related drawings and specifications into physical components of the facility (Hinze and Tracey, 1994). Selecting appropriate subcontractors and managing subcontractor relationships are pivotal to project performance, but have, somewhat surprisingly, only received considerable attention in construction in recent years (Dainty *et al.*, 2001; Karim *et al.*, 2006). It is argued that a more integrated supply chain is needed that comprises not only improved relationships between clients and main contractors but also enhanced collaborative working down the chain to subcontractor and suppliers (Briscoe and Dainty, 2005). However, so far the notion of partnering seems to be restricted to client-main contractor linkages, thus neglecting

the contributions of subcontracting firms to an improved project performance (Dainty *et al.*, 2001).

The ongoing discussion around partnering arrangements and integration throughout the construction supply chain often presumes that price-based tendering and trust-based procurement are mutually exclusive. On the one hand, it is argued that adversarial relations and mistrust emerge from competitive bidding (Kadefors, 2004; Wong *et al.*, 2005) and, thus, the establishment of main contractor-subcontractor relationships should be redirected from price competition to collaborative procurement practices (Matthews *et al.*, 2000; Thorpe *et al.*, 2003). On the other hand, the claim is made that long-term and close relationships may create trust among project participants, but prevent firms from taking advantage of favourable offers (Bresnen and Marshall, 2000; Wong *et al.*, 2005). Of course, construction procurement can and has been based on price or trust solely. However, a strong case can be made that price and trust are not irreconcilable, but rather are intertwined procurement mechanisms (Bradach and Eccles, 1989; Haugland and Reve, 1994; Das and Teng, 1998). In this paper, we argue that a specific interplay of both mechanisms is always inherent to subcontractor selection processes.

To improve our understanding about the interactive effect of price and trust on the establishment of a main contractor-subcontractor relationship in construction projects, we examine the procurement behaviour of medium-sized

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contractors from The Netherlands. More specifically, we conduct a choice-based conjoint experiment to show that price and trust govern the procurement of subcontracted services concurrently. We use the choice experiment to shed more light on the relative importance of price and trust in subcontractor selection. We particularly focus on the relevance of past relationships to induce trust and those attributes of subcontracted services (e.g. quality and cooperation) that require confidence. Furthermore, we determine the trade-offs main contractors make between these attributes and price for the choice decision. To our knowledge, this empirical research is the first to consider the interaction of trust and price in subcontractor procurement in construction.

The paper is organised as follows: we start with a brief discussion on the rationale behind the simultaneity of price and trust in subcontractor procurement. We continue with an outline of the design of our choice-based conjoint experiment. Subsequently, we will present the findings of the empirical investigations and discuss our results with regard to the role price and trust play in the procurement of subcontracted services. The paper concludes with managerial implications, the limitations of our study and recommendations for further research.

Conceptual and theoretical background

Price and trust as procurement mechanisms

Since in construction the output of the production process has to be adapted to the needs of particular clients, main contractors are confronted with a fluctuating and unpredictable demand. As a result, they face uncertainty about the amount and nature of their future work and the utilisation of their resources (Eccles, 1981; Usdiken *et al.*, 1988). Although other industries also show similar kinds of environmental uncertainty, main contractors are insufficiently able to balance fluctuations through e.g. stock-keeping or market creation. Their very common response is to subcontract services in order to increase flexibility and minimise fixed assets (Winch, 1989; Arditi and Chotibhongs, 2005). Through subcontracting, main contractors are able to reallocate resources at lower risks. It represents a proper means of surviving the volatility of the construction business (Dainty *et al.*, 2001). Additional uncertainties are associated with the offer main contractors make to the client and emerge from the need to estimate the costs for a tailor-made product that does not yet exist. Main contractors can consider these uncertainties through a supplement to the quoted price, but this would lower the chance of getting the order (Syben, 1999). Price-oriented subcontracting minimises costs and, thus, reduces the danger of costs not covered by the bid. As a corollary it also heightens the chance of maximising profit. It is the cost-price imperative that eventually prompts main contractors to procure disaggregated services based on the lowest bid (Hillebrandt, 1985).

However, transactions between main contractors and subcontractors do not occur in a pure spot market. Main contractors' own project success relies on temporally bounded and interdependent services of subcontractors. These services have yet to be performed and completed on time, within budget and with the expected quality. Thus, it remains difficult for main contractors to accurately evaluate in advance the motives and intentions of subcontractors and the quality

of their resources, assets and capabilities (Ngowi and Pienaar, 2005). Main contractors need to have the confidence that subcontracting firms are able and willing to deliver their services according to project specifications and agreements made and do not exploit any exchange uncertainties. Trust and control are two sources in developing this confidence (Das and Teng, 1998). Trust is the psychological mechanism that allows trading partners to interact through the collective constitution of meaning and shared expectations about their future behaviour (Luhmann, 1984; Rousseau *et al.*, 1998). It is the “willingness of a party to be vulnerable to the actions of another party based on the expectation that the other party will perform a particular action important to the trustor, irrespective of the ability to completely monitor and control that other party” (Mayer *et al.*, 1995, p. 712). Of course, strict monitoring and control systems can also lower the risks associated with a relationship, but motivations, intentions and behaviour may then be solely attributed to the control means (Schoorman *et al.*, 2007). As a consequence, trust development is hampered and therewith the ability to respond flexibly and quickly to unforeseen events inherent to almost every project. During the often complex and dynamic endeavour of a construction project, trust can provide the basis for interorganisational cooperation characterised by effective information exchange and joint problem solving. As empirically shown, eased negotiation, reduced conflicts and enhanced performance are outcomes if trust is present in exchange relationships (Zaheer *et al.*, 1998; Kramer, 1999).

That price and trust jointly affect the establishment of main contractor-subcontractor relationships is empirically indicated by Eccles (1981). His study of the procurement behaviour of 26 residential homebuilders shows that main contractors maintain stable and continuous relationships over long periods of time with a limited number of subcontractors. Bilateral arrangements are established from project to project based on some form of negotiation but periodically tested by competitive bids from other subcontractors. Although Eccles' study undoubtedly points to a certain and dynamic interplay between price and trust, the joint influence of both mechanisms on subcontractor selection in construction is less understood and investigated. That is somewhat surprising because transaction cost economics generally emphasises the joint occurrence of price and trust as governance mechanisms in transaction relationships (Bradach and Eccles, 1989; Hennart, 1993; Foss, 2002). In addition, it is argued that procurement procedures – the selection of subcontractors is part of these procedures – are tailored to transaction relationships (Eriksson and Laan, 2007). From a transaction cost perspective it can be expected that price and trust also simultaneously affect the selection of subcontractors.

Trust development

In order to gain a more thorough picture of price and trust in subcontractor selection, we first need to elaborate more on both mechanisms. Conceptualising price is relatively straightforward. It describes the costs for the work a subcontractor offers and some surplus covering overheads and profit. Trust, however, is a multidimensional and somewhat elusive concept that is difficult to observe and measure (Ganesan and Hess, 1997; Bierly and Gallagher, 2007). According to Gulati (1995), prior relationships between organisations may serve as proxy to trust, as

through repeated interaction transaction partners learn about each other and, thus, become more confident in their judgment of the other. He argues that two exchange partners with prior contact are more likely to trust each other than two parties who never have had a relationship before. Consequently, higher levels of trust incrementally develop with the recurrence of social as well as economic relationships.

Following Gulati's argumentation, a main contractor entering a new relationship faces difficulties to assess the intention of the subcontractor to perform an action that is beneficial and the subcontractor's capability to do so. The main contractor needs to rely on short-term available information on the past actions of potential subcontractors that demonstrates their ability, integrity and previous performance. Besides certification and references, reputation in particular represents such source of trust (Ganesan, 1994; Liu *et al.*, 2006). It is bestowed on by others and allows a trustor to know something about the reliability, capability and goodwill of potential transaction partners (Jones *et al.*, 1997). The value of reputation evolves from reciprocity. Performing well in relationships with business partners in the present can induce trust in future transactions through recommendations of third parties (Barney and Hansen, 1994). Likewise, opportunism can prevent trusting behaviour in upcoming relationships due to warnings of the same parties (Rooks *et al.*, 2000). However, due to the diffusion across several organisations, information about reputation may be inaccurate, misinterpreted or give a false colour (Jones *et al.*, 1997).

Once a relationship is established, the main contractor and subcontractor are able to directly experience and collect information about the performance and capabilities of the other party which confirm or controvert their initial expectations. Granovetter (1985) points out that information from one's own past relations with an individual or organisation is more preferable than information from a trusted informant who is reliable. First-hand information is cheap, richer, more detailed and accurate. In the case of a successful collaboration repeated exchange cycles may follow, through which the behaviour of exchange partners becomes more predictable (Rooks *et al.*, 2000). The more exchange partners successfully cooperate, the more the faith in the intentions and capabilities of the partners increases, the more the partners are willing to rely upon each other and the more robust the relationship will be against expectations once unmet (Rousseau *et al.*, 1998). The value of experiences from direct relationships again lies in their reciprocal, behavioural effect. Violating an ongoing agreement decreases the probability of trust in the future, whereas cooperation during the current relationship can bring on trusting behaviour during the next exchange.

To sum up, focusing on price during procurement may create a competitive environment before the bid is let, whereas trust-based procurement may constitute a cooperative environment during project realisation. Trust then develops through the recurrence of working relationships and the experiences one yields about the intentions and capabilities of the other. Notwithstanding the indications for an interaction between price and trust, questions that still need to be addressed are: Do main contractors compromise on price to increase their confidence concerning the process and outcome of subcontractors' service delivery? Or, to which extent are they willing to risk reduced reliability on

subcontractor performance to obtain most favourable bids? Are there decision-relevant attributes of subcontractor services that require a higher level of trust than others? In our empirical study, we will cover these questions.

Research method

As stated above, our main assumption is that main contractors derive their preference for a particular subcontractor from the conjoint evaluation of the price and trust dimension of a subcontractor's offer. We conducted a choice-based conjoint experiment to elicit the relative importance of both procurement mechanisms in forming this preference.

Conjoint design and sampling

Choice experiments have been frequently applied in marketing studies to determine consumer preferences. Typically, in a choice experiment respondents are requested to choose the alternative that best reflects their preferences among a set of alternatives (e.g. products) or to rate a number of alternatives with regard to the likelihood of choosing them. In our experiment, the alternatives to be chosen are subcontractors who are characterised by certain price and trust levels. To develop realistic scenarios, we started with an exploratory study involving 16 personal interviews with managers from medium-sized main contractors (20–100 employees) in The Netherlands. The interviews focused on the subcontractor selection process and, in particular, the criteria used and the role prior relationships play for the choice decision. The interview results enabled us to draft a first version of our conjoint experiment. The interviews made clear that previous experience with subcontractors is a key aspect in the decision-making process of main contractors. At the same time, main contractors seem to consider price as the primary selection mechanism. A known subcontractor will not be awarded the contract if it does not offer a competitive bid. Finally, the main contractor tries to build a sustainable relationship with these subcontractors. Interpersonal relations and "give and take" flexibility are important and are not exchangeable. Based on the outcomes of the first 11 interviews, we showed the managers the initial conjoint design in the last five interviews. We asked them to evaluate how realistic the hypothetical scenarios are and how easy the choice task is. Based on their feedback, we revised the design of the conjoint study.

The final choice task requested the main contractors to choose between four subcontractors: three subcontractors typified as known to the main contractor and one subcontractor with whom the main contractor had not had any working relationship before. The four subcontractors were described by four criteria with two levels each (Table I). The first criterion is the price subcontractors offered for the work and which is based on the tender. The price varied in terms of whether it was higher or lower compared to the prices offered by the competitors. The second criterion, technical know-how, comprises knowledge of working methods, materials, machines and tools required to do the job. In our design, subcontractors could possess technical know-how either sufficient or superior to do the job. The third criterion, quality, refers to the extent to which subcontractors actually deliver products or services that meet project requirements. The quality levels were also

Table I Description of selection criteria

Criteria	Level 1	Level 2
Price	Low	High
Offered for the work and compared to competitors		
Known and unknown subcontractor are judged on the tender		
Technical know-how	Superior	Sufficient
In terms of applied working methods, materials, machines and tools		
Known and unknown subcontractor are judged based on project references		
Quality	Superior	Sufficient
In terms of the extent to which products/ services delivered meet project requirements		
Known subcontractors are judged on own past experience		
Cooperation	Superior	Sufficient
In terms of extent to which agreements are fulfilled and problems are proactively solved and prevented		
Known subcontractors are judged on own past experience		

described as being sufficient or superior for the specific work to do. The fourth criterion we included is cooperation, which was defined as the extent to which a subcontractor fulfils agreements and proactively solves and prevents problems. Again, the cooperative behaviour of a subcontractor could be judged as being sufficient or superior.

Choosing among four subcontractors of which the three known subcontractors varied in the two levels of the four criteria characterising them would result in a full factorial design (4,096 choice sets) which is not viable. For most choice experiments a fractional factorial design is needed that reduces length and difficulty of the choice task without sacrificing too much of the statistical quality. Several design procedures were proposed to obtain practicable designs that would allow main effects and/or two-way interaction effects to be estimated. We adopted the method Street *et al.* (2005) developed. For choice sets with three alternatives and binary attributes and based on an orthogonal main effects plan for the first alternative, they suggest to systematically change the levels in a way that one level appears twice and the other level appears once in a choice set. Following this design procedure, our experimental design resulted in eight choice sets with three subcontractors labelled as known and differing in their performance. To each choice set we added the unknown subcontractor as fourth alternative but with fixed, superior performance criteria over all choice sets. Figure 1 shows an example of a choice set and the decision that a respondent had to make.

The sampling frame consisted of medium-sized contractors (20–100 employees) working in the commercial and house-building sector in The Netherlands. These contractors are likely to be appointed as main contractors who would then employ subcontractors to carry out work. We used the database of the Economic Institute for Construction (EIC). The EIC is a privately funded research organisation that

collects economic data of the construction industry. The database of the EIC contained 922 medium-sized firms. In administering the survey we sent out a package to all 922 firms containing an introductory letter, the questionnaire and a post-paid return envelope. In the letter we specifically asked to pass the questionnaire to those persons within the firms who mainly decide on the selection of subcontractors. After eight weeks a follow-up letter was sent to those that had not yet responded. The follow-up letter was accompanied by the questionnaire and a post-paid return envelope.

Trust importance measure

Our conjoint design measures the importance of trust in three ways. First and more generally, by differentiating between known and unknown subcontractors, we use, as suggested by Gulati (1995), previous relationships as proxy for trust. Through prior exchanges main contractors are better able to judge subcontractor performance and thus are more likely to trust known subcontractors. Hence, selecting a known subcontractor demonstrates the relevance of past relationships and consequently trust for the choice decision. Second, we incorporated reputation and past experiences as sources of trust in our design to describe the levels of trust more specifically. In the case of a known subcontracting firm, main contractors consult their own experiences made with this firm to evaluate the firm's performance on quality and cooperation. For judging an unknown subcontractor they need to rely on information from others. Third, by introducing technical know-how, quality and cooperation as choice criteria, we are able to show the importance of trust for different aspects of subcontracted services. As previously discussed, main contractors cannot accurately judge services of subcontractors in advance of a project. They need to develop confidence that subcontractors possess the expertise to do the job, are willing to meet project requirements and proactively deal with emerging problems. The three criteria then indicate for which service aspects trust is required. Moreover, it discloses the level of trust that needs to be developed. The more main contractors perceive the three non-price criteria to be vital for the project success, the more likely a known partner will be chosen. To reveal this effect, we only varied the levels of the four selection criteria for the known subcontractors. The levels of the criteria describing the unknown subcontractor remained fixed with a low price and superior technical know-how, quality and cooperation. That is, choices had to be made between three known subcontractors who do not perform superiorly on all criteria and one unknown subcontractor showing best performance on all criteria. The unknown subcontractor serves as fixed comparator in our choice experiment.

Data analysis

To analyse the choices main contractors made among the four subcontractors in the eight choice sets, we used the multinomial logit (MNL) model. The model can be expressed as follows (Louviere *et al.*, 2000):

$$P_{iq} = \frac{\exp(V_{iq})}{\sum_{j=1}^J \exp(V_{jq})} \quad (1)$$

$$V_{iq} = \sum_{k=1}^K \beta_{ik} X_{ikq} \quad (2)$$

Figure 1 A sample choice setWhich one of the four subcontractors would you choose? (*tick the subcontractor you prefer*)

	Subcon A (known)	Subcon B (known)	Subcon C (known)	Subcon D (unknown)
Price	High	Low	High	Low
Technical know-how	Sufficient	Superior	Sufficient	Superior
Quality	Sufficient	Sufficient	Superior	Superior
Cooperation	Sufficient	Sufficient	Superior	Superior
	☐	☐	☐	☐

where P_{iq} is the probability of subcontractor i to be selected from the q th choice set with J possible alternatives. V_{iq} represents the linear, additive utility of subcontractor i in choice set q . X_{ikq} is the value of criterion k of subcontractor i in choice set q . β_{ik} depicts the effect of criterion k on the utility of subcontractor i . K is the total number of attributes or in our case criteria. Since the known subcontractors disclose no further information to the respondent besides their performance criteria, we considered the utility parameters of the four criteria and thus the choice probability to be the same for all three subcontractors.

Before analysing the data, we effect-coded the two levels the criteria could contain. If the level of technical know-how, quality and cooperation was superior, it was coded +1. The level was coded –1 if the criteria were characterised as being sufficient. For a high price we coded –1 and +1 for a low price. The parameters of the model were found using maximum likelihood estimation.

Results

Of the 922 questionnaires sent out, 252 (27 per cent) were returned with varying degrees of completeness, of which 202 (22 per cent) were used for the analysis. The majority of respondents are middle to top management including directors of the company and project managers. The results thus reflect the views of senior people who regularly make decisions about subcontractor selection. Their firms are medium sized in terms of number of staff ($\mu = 55$) and annual turnover ($\mu = \text{€}17,300,000$). The majority of them undertake complex residential and commercial projects.

Table II shows the parameter estimates for the main effects of the MNL model.

To determine how well the estimated model reproduces the observed choices, we compared the log-likelihood of the model $LL(\beta)$ with the log-likelihood of a base model $LL(0)$ in which no coefficients are estimated (Table III). The log-likelihood ratio test shows that the estimated model is

Table II Parameter estimates of the MNL model for subcontractor selection

Variable	Estimates	Std error	p-value
Constant	–1.7068	0.0966	0.0000
Price	–2.0375	0.0838	0.0000
Technical know-how	0.7325	0.0648	0.0000
Quality	1.1491	0.0607	0.0000
Cooperation	0.8074	0.0522	0.0000

Table III Goodness-of-fit of the estimated MNL model

Measure	Value
Number observations	1,616
LL (0)	–2,227.20
LL (β)	–1,238.35
Log-likelihood ratio	1,977.70*
Pseudo R^2	0.4465
Pseudo R^2 (Adj.)	0.4460

Note: *Significant at 1 per cent, χ^2 distributed with four degrees of freedom

statistically significant at the 5 per cent level and thus better represents the data. Similar to the proportion of explained variance in linear modelling, the pseudo- R^2 gives an indication to which extent the model explains variation in the choices observed. Our model shows a pseudo- R^2 of 0.44 which, according to Hensher *et al.* (2005), represents a good model fit.

Standard errors and p -values are also reported in Table IV. All parameters are statistically significant at the 1 per cent level. Since we used standardised coding for the levels of the four selection criteria, the estimated parameters represent the relative importance of the criteria for subcontractor choice. It should be noted that in the conjoint design, only the criteria for the known subcontractors varied and hence only their utility. A positive parameter suggests a positive relationship between the criterion and a subcontractor's utility. For instance, if a known subcontractor performs with superior quality, the overall utility for that subcontractor increases. Likewise, the negative sign of the price parameter indicates that the overall utility of a known subcontractor will increase if the offered price decreases.

Our results show that price is by far the most important criterion for forming main contractors' preference. This is followed by quality and cooperation. The least important selection criterion is technical know-how. What attracts attention is the relatively large and significant constant term which has a negative sign and, thus, a negative effect on the utility of a known subcontractor. This constant reflects the utility associated with the unknown subcontractor, whom we used as fixed comparator. In other words, the respondents attribute a positive utility to an unknown subcontractor performing superiorly with regard to all four criteria, and the overall utility of the known subcontractors is relative to this base alternative.

Table IV Utility and choice probability of subcontractors

	Known subcontractor	Unknown subcontractor	Known subcontractor	Unknown subcontractor	Known subcontractor	Unknown subcontractor
Price	Low	Low	High	Low	Low	Low
Technical know-how	Superior	Superior	Superior	Superior	Sufficient	Superior
Quality	Superior	Superior	Superior	Superior	Sufficient	Superior
Cooperation	Superior	Superior	Superior	Superior	Sufficient	Superior
Utility	4.7265	1.7068	0.6515	1.7068	– 0.6515	1.7068
Choice probability	0.9534	0.0465	0.2582	0.7417	0.0864	0.9135
Price	Low	Low	Low	Low	Low	Low
Technical know-how	Superior	Superior	Superior	Superior	Sufficient	Superior
Quality	Sufficient	Superior	Superior	Superior	Superior	Superior
Cooperation	Superior	Superior	Sufficient	Superior	Superior	Superior
Utility	2.4283	1.7068	3.1117	1.7068	3.2615	1.7068
Choice probability	0.6729	0.3270	0.8029	0.1970	0.8255	0.1744

Discussion

The main driver behind our study was the current discussion on partnering and a more integrated supply chain in construction which arouses the impression that price and trust are mutually exclusive procurement mechanisms. Our conjoint experiment aimed to show that price and trust govern the procurement of subcontracted services concurrently. Moreover, our objective was also to examine whether main contractors are willing to accept a higher price to increase their confidence in other attributes of subcontractor's service delivery such as quality and cooperation.

Therefore we asked the respondents to choose between three subcontractors with whom they had worked before and one with whom they had had no previous working relationship. Although the unknown subcontractor performed better in all choice situations than the known subcontractors, prior relationships increase the utility of the known firms. The effect of repeated interactions on the utility of a subcontractor will be most prevalent when the known firm is superior on all criteria. Our data suggest that in this case the utility between a new and an incumbent subcontractor will differ by a factor of 3 (Table IV). Or in terms of choice probability: if a main contractor has to choose between two subcontractors both performing superiorly on all relevant choice criteria, but one firm is known to the main contractor the other is not, the known subcontractor will have a 95 per cent chance of being selected (Table IV). Using recurrent relationships as proxy for trust this finding empirically underpins the common view that through past experience firms become more confident in judging the performance of their exchange partners. The level of trust increases and finally affects the supplier selection (Gulati, 1995; Rooks *et al.*, 2000). In our study this judgment of previous performance was based on reputation for the unknown subcontractor and on the main contractor's own previous experiences in the case of the known subcontractor. Hence, our data are also in line with Granovetter's (1985) argument that information from one's own past with a firm is more trustworthy than information from other parties. A more general conclusion is that main contractors prefer stable and continuous relationships. This reconfirms the findings of Eccles (1981).

Price comes first – the relative importance of trust

Our results indicate that main contractors are not willing to compromise on price. According to our results, main contractors mainly select offers that have a lower price than alternative bids. Not having a competitive price reduces the utility of a known subcontractor drastically compared to an unknown subcontractor with a more favourable price. The chance of the known firm to be selected will drop to 26 per cent (Table IV). Main contractors expect from their subcontractors competitive prices regardless of being known or unknown. The immediate cost savings from advantageous offers seem to outweigh the possibility to reduce the risk of opportunistic behaviour and to diminish transaction costs through repeated exchange relationships.

These results contradict findings of recent studies that suggest price has less weight in the selection of suppliers in construction. One possible explanation is that a number of previous studies focus on the relationships of clients with main contractors or engineering firms (e.g. Wong *et al.*, 2000; Ng and Chow, 2004). The differences might be then seen as an indicator for the slow diffusion of collaborative arrangements down the supply chain. However, even studies on subcontractor selection ascribe less importance to the price criterion (e.g. Rahman and Kumaraswamy, 2005). We believe that another explanation for the deviation lies in the method used to determine the importance of selection criteria. In previous research, respondents were often asked to rate the perceived importance of various factors directly. In our study, main contractors were asked to choose among four subcontractors performing differently on four criteria. That is, even though respondents may perceive certain service attributes as more important for the selection decision than others, in an actual choice situation requiring the conjoint evaluation of these attributes, their attribute weighting may change considerably (Verma and Pullman, 1998).

Although price seems to dominate the selection decision of main contractors, the interplay between price and trust is much more sophisticated. Our exploratory study revealed that by using a pool of known subcontractors, main contractors possess a strong means to activate market forces while at the same time are able to rely on their past experiences with these firms. Main contractors are aware of the benefits associated with trusted partners, but create a competitive environment

embedded in the recurrent relationships with the trusted firms. Additionally, by allowing new subcontractors to place their bids, they force the incumbent subcontractors to provide market-conform prices. Favourable quotes are the prerequisite for trust to become choice relevant. They increase the probability of recurrent relationships and as a consequence trust development (Bradach and Eccles, 1989). Providing a good performance record, subcontractors may then create a considerable entry barrier due to higher trustworthiness, but they will lose this advantage if they are unable to meet the price expectations of main contractors. Price and trust do not act as substitutes for one another, but rather enable each other. While procurement based on price is able to mobilise market forces to elicit the economically most advantageous offers, trust-based selection of subcontractors creates a collaborative environment through which these offers are transformed into construction facilities with the desired performance.

Quality matters – the relative importance of service attributes

The distinction between known and unknown subcontractor allowed us to show that trust has an effect on subcontractor selection in construction. By changing the performance criteria of the known subcontractors, we were also able to demonstrate that apart from price, main contractors are willing to sacrifice subcontractor performance to sustain a trusted relationship. However, a favourable price alone is not sufficient for being selected. The choice probability of a known subcontractor offering solely a low price amounts to only 8 per cent compared to the unknown but superiorly performing subcontractor (Table IV). Although we argued above that a competitive price is a precondition for trust to be choice relevant, the extent to which incumbent subcontractors have performed on the three remaining criteria (quality, technical know-how, cooperation) in the past finally accounts for whether they are chosen or not. The importance of these criteria then answers a further question we raised in our research: To which extent do certain attributes of subcontracted services require a higher level of trust than others?

Our results show that quality yields the highest utility compared to technical know-how and cooperation, or put differently, after price quality is the performance criterion main contractors are the least willing to compromise on. The probability of a known subcontractor with only a sufficient quality evaluation to be chosen decreases to 67 per cent compared to an unknown subcontractor performing superiorly (Table IV). A lower performance on technical know-how and cooperation, on the other hand, reduces the choice probability of an incumbent subcontractor to a lesser extent. With a sufficient technical know-how the subcontractor still possesses an 82 per cent chance to be selected. With a sufficient cooperative behaviour the probability will be 80 per cent (Table IV).

The importance of quality for the choice decision emphasises that, most notably, main contractors need to have confidence in the competence of subcontractors to do the job. That meeting project specifications through the delivery of products and services in a reliable and honest manner plays such a vital role may be due to main contractors' own contractual obligation. Subcontractors vicariously help main contractors to fulfil their contracts and

to provide the final product they are ultimately responsible for. On the other hand, insufficient quality produced by subcontractors will have significant consequences for the value derived by the client and consequently will cause irreparable damage to the main contractors' own performance record. In this regard technical know-how and cooperation may represent means to facilitate the attainment of the main contractors' contractual obligations such as quality. While cooperation refers to the willingness to prevent and deal with problematic incidents, technical know-how covers the capability to find adequate solutions for these problems in a timely and cost-efficient manner.

Given the lower importance of both criteria, however, trust in dealing with unforeseen occurrences in the main contractor's interest needs to be developed to a lesser extent. Or in other words, the outcome of the service delivery is more critical than its process.

Conclusion

This study aimed at examining the interaction of price and trust in subcontractor procurement in construction. Our findings show that both price and trust are important mechanisms in the selection of subcontractors. Once a relationship emerges, the incumbent subcontractor is most likely to acquire the work, even when its performance has varied in the past. However, the main contractor will only select a known firm when they perceive the price offered for the work to be market-conform. Furthermore, main contractors are willing to compromise on technical know-how and cooperative skills as long as the quality of work is acceptable. They need to have confidence in subcontractors' intention to meet project specifications through the delivery of products and services. Trusting in the ability and willingness of subcontractors to handle unforeseen and problematic incidents plays a less important role. The main managerial implication is that known as well as unknown subcontractors need to offer competitive bids to be able to build up main contractors' trust in their integrity and capability to provide the performance required for the current project. For new subcontractors favourable bids open up the possibility to transform their reputation-based performance into an experience-based performance. As a consequence, they increase their chance to enter the main contractor's pool of preferred suppliers. For incumbent subcontractors competitive bids retain the probability of repeated invitations for tendering and to prove their trustworthiness in delivering the expected services. Our study also shows that the current tendency to celebrate trust-based procurement as the remedy to performance problems in construction obscures the dynamic and recursive nature of price and trust in main contractor-subcontractor relationships. Instead of delineating both procurement mechanisms as polar opposites, their joint occurrence should be acknowledged to draw a much more thorough picture of supply chain procurement in construction.

Our results are based on a sample of 202 respondents from the residential building industry. This restriction allowed controlling of extraneous influences but may diminish generalisation. Future research could incorporate other construction sectors to see whether and how different contexts affect the outcomes of the choice task. Future research could also include a sample of large-scale firms. In

this study we focused on medium-sized contractors that work within a strong regional network of clients, subcontractors and suppliers. Given their size and the importance of their regional network, the importance of the known subcontractor might be overestimated. Furthermore, we used only two levels to describe the attributes of subcontracted services. That allowed us to restrict the number of choice alternatives and thus the complexity of the questionnaire. It may be also a shortcoming due to the simplification of the real choice task. For example, the interpretation of what a low or high price is may differ between respondents. A more differentiated picture (trade-off levels) can be drawn if three or four price levels are described as percentage deviation from an acceptable base. More general limitations of conjoint experiments are the restricted number of attributes and the assumption that the choice decisions of all respondents are based on the same attributes. We addressed these limitations by determining the most important selection criteria in an explorative study. However, it should be noted that the importance of each selection criteria in our study is only relevant for the design of this particular study. If selection criteria and their levels are changed, the relative importance of the selection criteria is also likely to change. A further question worth to be investigated is whether main contractors and subcontractors differ in their perception of the importance of price and trust.

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