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A Comparison Of Two Ways Of Applying Transaction Costs Approach(II): The Case Of Construction Procurement Routes

Chen-Yu Chang and Graham Ive

Bartlett School of Graduate Studies
University College London

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Summary

Whilst the importance of transaction costs in construction has been accorded pervasive recognition, the methodologies used to apply this concept to the analysis of the construction process have been divergent. One way starts from searching for quantifiable items of transaction costs and explores the link between these costs and procurement routes. This paper claims that the attempt to provide explanatory foundation for construction procurement behaviour by quantitatively measuring each important element *of transaction costs in the construction process is highly unlikely to succeed, since the majority of costs with comparative importance are fairly difficult, if not impossible, to estimate. A possible way to avoid this pitfall is to follow Williamson's methodology of comparative institutional analysis. In this context, we take this to involve operationalising the theory by predicting , for transactions with defined attributes, ordinal differences in transaction costs between institutions (procurement routes), and thus, under a 'weak' profit maximising assumption, to derive and test refutable hypotheses concerning the probability or relative frequency of use of each route .*

Keywords: transaction costs, asset specificity, measurement costs, operationalisation

Introduction

In our previous paper [Chang and Ive, 2001], a novel classification system for transaction costs of different origins is set out for explaining the potential measurement difficulty of each type of transaction costs. Type-I transaction costs (TC_I) stems from the need to collect information and bargain for better offer as well as monitor the performance of the trading party for protection of one's own interests. Its occurrence is completely out of information incompleteness and cognitive dissonance, and has nothing to do with the prevention of opportunism. Resources spent out of this reason is called resource-recurring TCs. Another types of transaction costs, triggered by the second round of information problems due to the presence of information asymmetry and lock-in effect, are types-II transaction costs (TC_{II}) . This type of cost contains not only resource-incurring TCs but also rent-transferring TCs, which indicates the loss due to forced acceptance of disadvantageous offer. By way of this classification system, the difficulties in direct measurement of each elements of transaction costs can be compared. First of all, TC_{II} differs from TC_I in its high variation of occurrence. That is, for estimating $TC_{II,}$ it will demand much larger samples to infer the value of the population. Second, empirically, we will be easier to obtain the estimate of resource-incurring TCs than that of rent-transferring TCs in that in most cases, there is no readily available benchmark for judging whether the agreed upon price or quality lives up to competition condition, thus difficult to estimate ΔP or $v(\Delta Q)$. The conclusion that we have drawn is that , in assessing the feasibility of the DMA or IMA, it is necessary to clearly identify what are the principal elements of transaction costs that have comparative significance across governance structures (GSs) in that different nature of transaction cost elements carries with different level of measurement difficulties that is the key determinant in deciding the relative advantage of the DMA and IMA.

Introduction aside, next we analyse the contractual context of the choice of construction procurement systems (incomplete contracting), and explain which elements of TC we think are and are not relevant for this purpose, and why. Then we show that, and explain why, those transaction costs with comparative importance in this context are in fact particularly hard to measure, thereby affecting the applicability of the DMA in the analysis of construction procurement. Last, we make a suggestion for the researchers who intend to adopt the transaction cost approach.

What are relevant items of transaction costs?

Williamson's definition differs from Dahlman(1979) and Barzel(1982) in its emphasis on costs resulting from the consequences of mal-adaptation in the transaction process (second-round problems), rather than on resources expended for completing a transaction (first-round problems). Why are measurement costs and search costs downplayed in Williamson's TCE? The following two subsections attempt to give a preliminary answer.

TCE and measurement costs

In Williamson(1985), measurement cost is not totally ignored, but treated case by case. His standard assertion is as follows:

> *Although the measurement branch plays a less substantial role in the analysis of problems dealt with in this book (partly because the problems selected for study have a bilateral trading quality), it is nevertheless important. [p.112]*

But under what circumstances will measurement costs seem non-negligible relative to the hold-up problem? Williamson doesn't address this question, not to mention answer it. Nonetheless, he does seriously contemplate the importance of measurement costs in three contexts. The first appears in the interpretation of manufacturing firms extending their operations into distribution [p.112]. Owing to the spillover effect of the individual distributor's efforts in promotion, the manufacturer cannot meter their performance by their volume of sales only. Difficult measurement problems obviate the feasibility of output-based reward scheme, so sub-optimal level of efforts prevails. A possible remedy for this is vertical integration.

The second case is related to the organisation of work [p.212]. In talking of internal organisation, Williamson is concerned with principal-agency relationship on the similar ground to Alchian and Demsetz(1972). To check the employee's opportunistic behaviour, two alternatives can be effective: (1) reducing the incentive by way of different contractual arrangements, e.g. changing from output-based contract to wage-based one to curb the proclivity to increase productivity at the expense of quality; (2) decreasing the measurement costs by means of product redesign and task reorganisation.

As applied to Williamson's last case, corporate governance, measurement costs are mainly analysed in terms of information. The unbiased disclosure of information from the informed party can help markedly lower this type of cost.

Whereas the use of measurement costs disperses across several topics, there is something in common – difficulties in measuring the performance of the agent. In the literature, this difficulty is often considered as a function of the quality characteristics of the goods or service. However, in construction it is the joint function of project characteristics and procurement routes. We will go back to this issue later.

A preliminary analysis

In discussing the paradigmatic problem of make-or-buy decision, Williamson justifies the omission of measurement costs by arguing that '*the problems selected for study have a bilateral trading quality*' [Williamson,1985,p.112]. Regarding search costs, no apology is expressed, as if they didn't exist [Alchian and Woodward,1988]. To delve into the reason, we need to focus on how measurement costs and search costs are changed after integration.

For convenience of the following discussion, the principle of cost transferability requires discussion first. Under the circumstance of large-number bidding, the producer's rent will be squeezed to zero ex ante, that is

$$Seller's\ rent = pQ - TVC - TTC - I = 0 \qquad \textbf{Eq. 1}$$

where p is the price per unit, Q quantity produced, TVC total variable costs, TTC total transaction costs, I the ex ante opportunity cost of the investment. As a consequence,

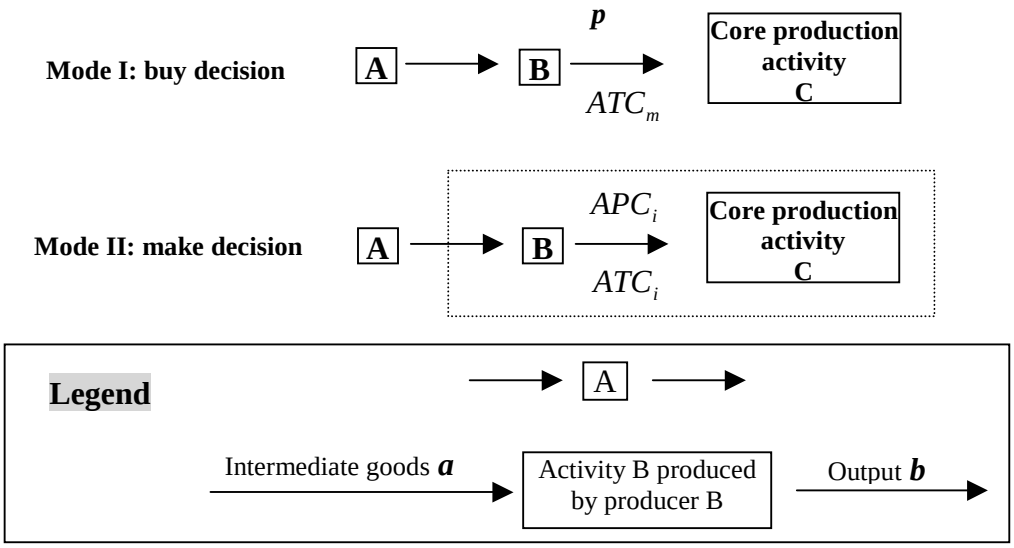
$$p = \frac{TVC + TTC + I}{Q} \qquad \textbf{Eq. 2}$$

This equation indicates that the selling price contains average (seller's) transaction costs, implying that the costs of co-ordinating internal production will be transferred to buyers through the market in the form of increased price. Though the transferred proportion of transaction cost varies as the condition of competition, there is no a priori reason to pre-

clude the possibility that this cost may not be absorbed by its direct bearer. One reason for this is that competition is always changing; another is that ignoring the possibility of cost transferring is liable to camouflage the potential hazards of contracting. To make a sound appraisal of organisation forms, the redistribution of transaction costs through contracting cannot be ignored.

We can examine the significance of search costs and measurement costs by considering the paradigmatic case - vertical integration. In Fig. 1, when B and C are independent firms (mode I), firm C purchases product B from the market with unit price ***p*** and incurs average transaction costs ATC_m. ATC_m covers search costs for finding producer B and and measurement costs for checking the quality of goods. For constraining employee's shirking and assuring quality of production, firm B needs to bear costs for setting up an internal inspection system. Meanwhile, searching for producer A and buyer C as well as measuring the quality of product A are also transaction costs that need to be considered.

Fig. 1 Buy or make decision



After production activity B is internalised (mode II), firm C is facing internal costs of quality control and search cost for finding supplier A and measurement cost for checking product A. All types of these costs are listed in Table 1. Comparing the sum of TCs in the top and bottom rows of Table 1, we can see that mode II economises on each costs
Now we need to address a question of whether measurement costs and search costs matter under different governance structures, market or hierarchy. First, thanks to integration, apparently the total (search and measurement) costs that firm C needs to bear change from $TC^C_{I(1)} + TC^C_{I(2)}$ to $TC^C_{II(1)} + TC^C_{II(2)} + TC^C_{II(3)}$, while we should not omit the fact that transaction costs originally incurred by firm B can be transferred to firm C by way of selling price of product B. That is, from the perspective of firm C, we are interested in the question of whether $TC^C_{I(1)} + TC^C_{I(2)} + TC^B_{I(1)} + TC^B_{I(2)} + TC^B_{I(3)} + TC^B_{I(4)}$ will be much different from $TC^C_{II(1)} + TC^C_{II(2)} + TC^C_{II(3)}$. $TC^C_{I(1)}$ is not expected to be much different from $TC^C_{II(1)}$, while how wide is the difference between $TC^C_{I(2)}$ and $TC^C_{II(2)}$ depends on the characteristics of quality of product A and B. Provided the degree of difficulties in verifying their quality are

of the same level, there is still one cost item left, $TC^{C}_{II(3)}$. This seems to deal a blow to Williamson. The problem is not so simple and we need to dig deeper to inquire into the way $TC^{C}_{II(3)}$ is transferred to the selling price of product C

Table 1 A comparison of search costs and measurement cost influenced by integration

	Firm C	Firm B
Mode I	$TC^{C}_{I(1)}$:search costs for finding producer B $TC^{C}_{I(2)}$:measurement cost for assuring the quality of product B	$TC^{B}_{I(1)}$: search costs for finding producer A $TC^{B}_{I(2)}$: measurement cost for assuring quality of goods A $TC^{B}_{I(3)}$: measurement costs of internally controlling product B $TC^{B}_{I(4)}$: search costs for finding buyer A
Mode II	$TC^{C}_{II(1)}$:search costs for finding producer A $TC^{C}_{II(2)}$:measurement cost for assuring quality of goods A $TC^{C}_{II(3)}$:measurement costs of internally controlling the quality of product B	

First, in principle, decision on organisational strategy is determined by a fundamental formula:

$$ATC_i + APC_i \leq P + ATC_m \qquad \textbf{Eq. 3}$$

where ATC_i is average transaction cost of organising activity B internally, ATC_m cost of using market, APC_i cost of production internally, P prevailing price in the market. The selling price must be the reflection of all the costs producers have incurred, including production costs and transaction costs. $TC^{C}_{II(3)}$ is a part of transaction costs, so constitutes a part of price. According to the principle of cost transferability, this cost should be included in the selling price. That is, if firm B and C are equally competent in carrying out internal quality control, there would not be much difference between $TC^{C}_{II(3)}$ and the transferred part of $TC^{B}_{(3)}$.

From the above analysis, it can be sensed that the comparative importance of search costs is trivial, while that of measurement costs depends on to what extent the assumptions can be held of (1) homogenous quality level of products A and B (in terms of the extent of difficulty in inspection) as well as (2) equal competence of firm B and C on internal quality control. In fact, it is not necessary to make such strong assumptions to make sense of Williamson's claims. As long as, compared with the costs of mal-

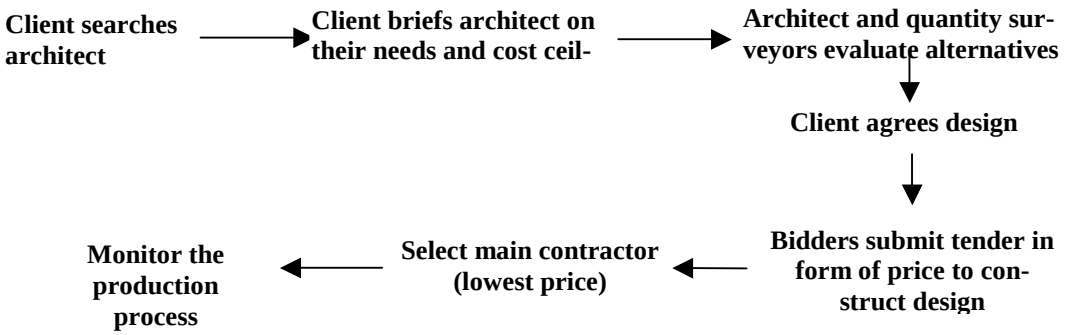
adaptation that Williamson stresses, measurement costs are assumed to be of second-order significance[1], Williamson's arguments still hold.

What are the Items of transaction cost with comparative importance in the construction procurement route

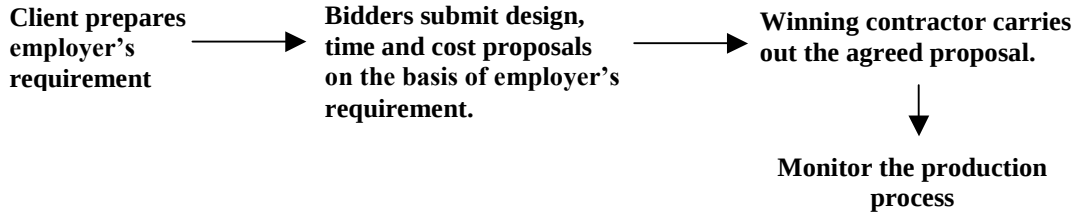
A brief account of governance structure of procurement routes

It is to be noted that items of transaction costs are governance-dependent, so it is essential to realise the operation process of procurement routes first. With reference to Frank(1998), the process charts of traditional system, design-and-build system and management contracting are shown in Fig. 2.

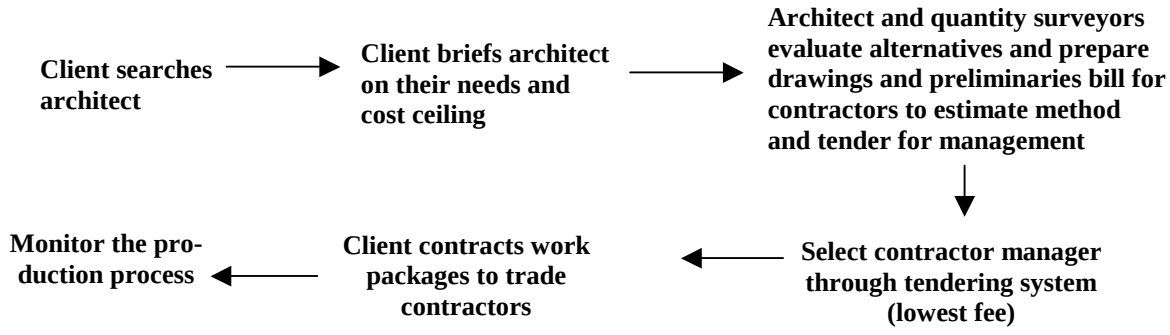
Fig. 2 (a) Traditional system



(b) Design and Build



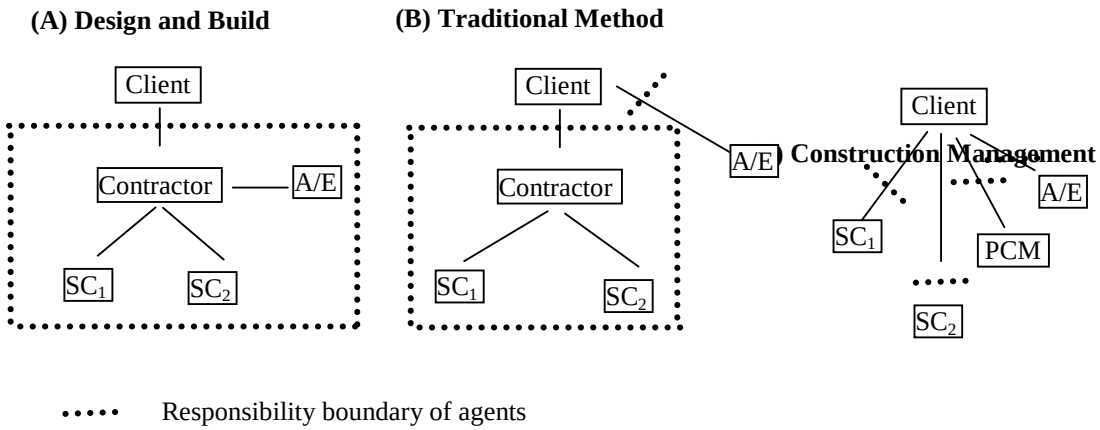
(c) Construction Management



[1] In the sense of Taylor's expansion, the terms of higher orders can be ignored.

With the aid of the above process charts, the contractual structures within these three procurement routes can be exhibited in Fig. 3, in which for convenience of exposition the project contains two work packages only. From the contractual perspective, there is no difference in the total number of contracts used in three procurement routes. What differs is the boundary of the dotted rectangle and its accompanying effects on the efficacy of procurement routes. Each contract can be said to be a transaction, whereby involving transaction costs. With the dotted area shifting, ***the bearers*** of each item of transaction costs change as well. This clarification will help the task of operationalising transaction costs in construction.

Fig. 3 Contractual structures within three procurement routes



Identification Of Transaction Costs In Construction

Which items of transaction costs in construction have comparative significance as between different procurement routes? We can approach the answer by putting together all types of transaction costs that have been pinpointed in the literature, then proceeding to comparative analysis.

Gruneberg and Ive (2000) proposes a list of the important items of transaction costs in construction, including:

(1) Search costs of finding out information about who is offering what products or services and at what prices.
(2) Product or service specification costs
(3) Contract selection, contract design and negotiation costs
(4) Supplier selection costs
(5) Contract performance monitoring costs
(6) Contract enforcement costs of legal bills and delays

Compared with Dahlman(1979) and Williamson(1985), this list is by and large based on the former without much attention to the latter except for the last point. Similarly, Ismail(1997) also asserts that the quantifiable items of transaction costs in construction include tendering costs, simultaneous management costs[2] and costs of dispute resolution. After surveying these costs occurring in three procurement routes - traditional system,

[2] This costs allegedly come from the overlapped responsibility of in-house project manager, architect and quantity surveyor in monitoring the process.

integrated design-and-build and integrated design-and-build with subsidiary contractor, a conclusion is made that '*transaction costs can be quantified in procurement routes' [p.39]*. In this paper, we claim that it is futile to attempt to provide explanatory foundation for procurement behaviour by quantitatively measuring *each important item* of transaction costs in the construction process, since majority of costs with comparative importance are fairly difficult, if not impossible, to estimate.

With reference to Table 1, we can attempt to build up a similar table, Table 2, for comparing the significance of different items of transaction costs[3]. From the stand point of the client, management contracting carries the highest ***direct*** transaction costs, next is traditional system, and the lowest is integrated system. However, from the perspective of the whole systems, made up of which the client and his/her retained agents, the sum of transaction costs would be of no noticeable difference. For the client, the change in identity of the bearer of transaction costs doesn't mean they disappear. In what sense can we assert that the design-and-build contractor will absorb $TC^{B}_{TM(1)}$ and $TC^{B}_{TM(2)}$, letting the client feel comfortable that, despite higher tendering costs, integrated procurement route can waive other costs, like $TC^{C}_{TM(1)}$, $TC^{C}_{TM(2)}$, $TC^{B}_{TM(1)}$ and $TC^{B}_{TM(2)}$? Maybe, sometimes in some special cases, this can be true. But, peculiarities should not be mixed up with the economic principle. As asserted in Sec.4.2.2, the nature of cost transferability would blur the boundary of governance structures (as dotted line in Fig. 3). Keeping this principle in mind will help the following analysis.

Let's go back to Ismail(1997) to examine the comparative importance of the quantifiable costs. First of all, the cost of tendering in the three procurement routes is stated to refer to $TC^{C}_{TM(3)}$, $TC^{C}_{DB(1)}$ and $TC^{C}_{MC(3)}$. According to observation, $TC^{C}_{DB(1)}$ tends to be a bit higher than the other two. However, the tendering costs actually encompass $TC^{C}_{TM(3)} + TC^{C}_{TM(1)}$, $TC^{C}_{DB(1)}$ and $TC^{C}_{MC(3)} + TC^{C}_{MC(1)}$. Taking $TC^{C}_{TM(1)}$ and $TC^{C}_{MC(1)}$ into account will greatly weaken the relative disadvantage of design-and-build route in tendering costs.

Second, regarding simultaneous management cost, Ismail claims that quantity surveyor in the traditional system is an extra monitor of construction process relative to design-and-build route. This seems to imply that the fee paid to quantity surveyor is an additional transaction costs to the client if traditional system is used. What's the problem in here? It is the fact that design-and-build route can provide the client with an ex ante commitment to cost ceiling. Nonetheless, the tasks of assuring value for money are still to be done. Without the aid of quantity surveyor tracking the cost record, the client needs to periodically review the construction plan submitted by main contractor and keep an eye on the quality of what has been done. Accordingly, the mission of cost monitoring is just being transformed into the form of intensified inspection of quality. How wide would this difference be? It absolutely is not as noticeable as it appears

Last, there is no estimate of costs of dispute resolution shown in Ismail(1997) because no interviewed clients have experienced arbitration. But this does not necessarily follow that there is no cost incurred due to disputes. The loss from disputes may take the more subtle form of delay, extra costs of inspecting quality and negative repercussions on the

[3] It is to be noted that our focus here is only are Dahlman-type transaction costs. Discussions about Williamson-type one are left in the next subsection

dispute resolution afterwards. Unfortunately, these costs are very hard to quantify. We need to find other way out.

Table 2 A comparison of search costs and measurement cost influenced by integration

	The client	The contractor and designer
Traditional method	$TC^{C}_{TM(1)}$: tendering costs for finding designer $TC^{C}_{TM(2)}$: measurement cost for assuring the performance of designer $TC^{C}_{TM(3)}$: tendering costs for finding main contractor $TC^{C}_{TM(4)}$: measurement cost for assuring the performance of main contractor	$TC^{B}_{TM(1)}$: search costs for finding subcontractors $TC^{B}_{TM(2)}$: measurement cost for monitoring the performance of subcontractors $TC^{B}_{TM(3)}$: main contractor's tendering costs for bidding a new project $TC^{D}_{TM(4)}$: designer's tendering costs for bidding a new project
Design and Build[4]	$TC^{C}_{DB(1)}$: tendering costs for finding main contractor $TC^{C}_{DB(2)}$:measurement cost for monitoring the performance of main contractor	$TC^{B}_{DB(1)}$: tendering costs for finding subcontractors $TC^{C}_{DB(2)}$:measurement cost for monitoring the performance of subcontractors $TC^{B}_{DB(3)}$: main contractor's tendering costs for bidding a new project
Management contracting	$TC^{C}_{MC(1)}$: tendering costs for finding designer $TC^{C}_{MC(2)}$:measurement cost for assuring the performance of designer $TC^{C}_{MC(3)}$: tendering costs for finding management contractor $TC^{C}_{MC(4)}$:measurement cost for assuring the performance of management contractor $TC^{C}_{MC(5)}$: management contractor fees covering tendering costs for finding qualified subcontractors and monitoring their performance	$TC^{B}_{MC(1)}$: management contractor's tendering costs for bidding a new project $TC^{D}_{MC(2)}$: designer's tendering costs for bidding a new project

Besides, sometimes the fees for management contractors are deemed as the particular item of transaction costs in using the route of management contracting. As emphasised in the principle of cost transferability, the cost of co-ordinating designer and subcontractor appears in all routes. In the tradition system and design-and-build, the cost is included

[4] Assume that designers are all directly employed by the main contractor.

in the awarded price; in the management contracting, it is paid as the agent's fees. They may not totally equal, but their difference in comparison with the costs attendant with the second-round information problems in Sec.0 is not paramount.

What are the relevant items of transaction costs to the selection of procurement routes?

The previous subsection demonstrates that Dahlman-type measurement costs are of little comparative significance. It is understandable. For completing a transaction, some information is what you are supposed to know, but you don't know. The costs of obtaining this kind of information won't be much different across governance structures. What may be different is the bearer of costs. In contrast, Williamson places slight attention to these can-be-expected transaction costs, and concentrate on unexpected ones. These costs are the outcome of interaction between uncertain future and possible strategic reactions of other parties. When the contingency falls out of the stipulation of the contract clauses, renegotiating a fair term is inevitable. For example, when ground conditions force the original design to be modified, for the client who puts the earlier completion as the top priority, the additional or modified works resulting from changes in briefing is vulnerable to be ripped off. If the client is determined to defy the overcharge, a bout of haggling is staging. This story may end in the client's yielding to suffering the extra costs, or appealing to third-party arbitration or even worse litigation. How painful is the process is conditional on how efficient is the procurement route in dealing with the re-distribution of ex post quasi-rent. Because of the adaptability of every procurement routes to unanticipated events is distinct, their differentials in the magnitude of the transaction costs must be remarkable. In contrast to TC_1, the possible losses caused by delay, dispute resolution and litigation may be astronomical numbers. This is why Williamson comfortably relegates it to the minor role. It bears emphasising that asset specificity is not the only leading role in that measurement problems cannot be assumed to be constant under different procurement routes. The complete explanation entails another paper of the same length. Suffice it to say here that is not only affected by the characteristics of the project, but also by the way designer and contractor are organised. For example, the design-and-build route is more plastic than other two in the sense that main contractor has *"a wide range of legitimate decisions within which [he/she] may choose"* [Alchian and Woodward,1987]. As a consequence, a complicated project executed by way of this route may consign the client to severe quality control problems. Except for construction, there are rare cases in which this combined effects is present. As far as this fact is concerned, TC_2 should be elevated to the same level of importance as asset specificity.

The Pros And Cons Of DMA And IMA

Although the methodology of TCE is well established, as the previous section shows, the thinking of the pre-operationalisation era sometimes still has its intuitive appealing in the studies of construction procurement routes. Simply speaking, the most pronounced feature of it is to pick up the items of transaction costs that can be measured (like tendering costs, quantity surveyor fees) and, if any refutable hypotheses want to be derived, need to link up the relation between these costs and the client's choice of procurement systems. Since the necessary condition of applying the DMA lies in the measurability of elements of transaction costs that have comparative importance, a sound assessment on the appropriateness of applying the DMA should be grounded on whether the case of interest lives up to this requirement.

As analysed in Sec.4, the elements of transaction costs considered relevant to construction arise from second-round information problems. The magnitude of ensuing costs varies as the strategies that other parties may take. This kind of opportunism derivative costs can hardly be measured on the ground that they are of probabilistic nature with some extent of variation. In other words, even though one type of transaction costs is found to take place in certain transaction with certain level of magnitude, this observation is not as representative as it is expected to be in that next time, maybe next many times, you may find a totally different observation just because of its nature of probability. What is most devastating, in applying the DMA, the elements of transaction costs to be considered are often due to their ease of being estimated rather than on theoretical considerations. Perhaps, some statistical relations can be discovered. However, ***Fisher's critique will be haunting again.***

Though we have reasons to caution against the feasibility of applying the DMA to the analysis of construction procurement systems, likewise, we should not use IMA as panacea for organisational malaise without meticulously examining its propositions and scope of application. In economics, majority of academic efforts is dedicated to the problems of manufacturing industries. As is well known, construction is a peculiarity. A safe strategy is to anatomise the logic of TCE and then fit the logic into the context of construction.

Conclusions

An effort is made in this paper to expound the fundamental distinction between two alternative research strategies of applying transaction costs to the analysis of procurement route selection: DMA and IMA. The former holds the belief that measuring quantifiable items of transaction costs is a feasible starting point to explore the selection of procurement routes. However, this tack is surrounded amid two points of theoretical sceptics: (1) measurable types of transaction costs may be lack of comparative importance, while the transaction costs with comparative importance are of probabilistic nature with some extent of variations, leading to the biased estimate of using one observation to represent population average; (2) if without strong justifications, using the selective items (often chosen due to the expediency of easy measurement) of transaction costs as theoretical foundation is liable to be charged with ad-hocness.

After Ismai's study is examined, the proposed types of quantifiable transaction costs in construction procurement systems- tendering cost, quantity surveyor fees and costs of arbitration are of no relevance in distinguishing the differential capability of procurement systems in dealing with different construction projects. Only Williamson-type, or more exactly opportunism-derivative transaction costs survive the comparative test. Unfortunately, these costs are where the DMA is least likely to be applicable. On the basis of the conclusion, the next step is to operationalise these observations and conduct empirical investigations to verify these speculation.

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