

**SUBCONTRACTING IN THE CONSTRUCTION INDUSTRY - A
TRANSACTION COST MINIMIZATION PERSPECTIVE**

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K. W. Chau

and

A. Walker

Department of Surveying
The University of Hong Kong
Pokfulam Road
Hong Kong

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K.W. CHAU and A. WALKER

Department of Surveying. The University of Hong Kong

SUMMARY

This paper introduces an approach which is potentially very powerful in explaining observed phenomena related to the organization of construction activities. The approach is used to analyse one common phenomenon in the construction industry - i.e. subcontracting. Our preliminary findings suggest that the major reason for the wide spread use of subcontractors stems from the fact that the costs of identifying and agreeing prices of the components (the subcontracting package) of a construction project are in general relatively cheaper than the cost of planning and monitoring worker's performance in a construction site. Under certain situations (such as when the nature of the work is uncertain or cannot be easily identified) where the former is more expensive, other forms of contract such as the wage contract will be adopted instead. Other explanations such as fluctuating workload and specialization, cannot be sustained. The argument that subcontracting leads to exploitation and inefficiency is also found to be not sustainable.

KEYWORDS

Subcontracting, institutional arrangement, transaction costs.

INTRODUCTION

Subcontracting is a very common phenomenon in the construction industry. Perhaps so common that it has been taken for granted. This is evident from research related to construction subcontracting, most of which treat the practice as given. Our understanding of the nature of subcontracting is in fact minimal. Seldom will this issue be touched upon but when such question is raised (normally as a side issue), explanations such as tradition, custom, flexibility and incentive etc., are often quoted.

Not only are most of these explanations given without the support of a logical argument within a sound theoretical framework, these explanations are also simply not scientific, are tautological or at best ad hoc.

THE TRANSACTION COST AND THE NATURE OF THE SUBCONTRACTING

Simplification is inevitable for the derivation of a theory. Standard neo-classical economic (or micro economics) analysis assumes zero transaction cost and therefore ignores various institutional arrangement such as firms, subcontracting, government and various types of observed contractual arrangements among input owners. Under the assumption of zero transaction cost and private property rights, all production and exchange will be costlessly guided by the invisible hand of the market and resource allocation will be similar irrespective of the how such activities are arranged. This means that under this assumption (zero transaction cost), different methods of organizing production and exchange would not exist and even if they do exist, they are random events which cannot be explained and predicted. This is one of the major argument in Coase(1937), which was later referred to by S. N. S. Cheung and other economist as the Coase Theorem.

In reality, even in an economy with private property rights structure, not all economic activities are guided by the invisible hands of the market, different institutional arrangements in which production and exchange activities are directed by visible hands do exist. That is, instead of responding to price signals, resource owners are using their resources according to the direction of a third party in a classical Coasian firm. Since a resource owner voluntarily follows the direction of a visible hand, under the maximization postulation, output must be larger than when guided by the invisible hand of the market. How could the central agent (visible hand) provide better market information than the market? Coase's explanation is that there are costs of using the price mechanism¹. On the other hand, there are also costs in organizing production activities within a firm.

These costs are commonly called transaction costs. Cheung (1987) defines transaction costs as "... those costs that cannot be conceived to exist in a Robinson Crusoe economy where neither property rights, nor transactions, nor any kind of organization can be found". Perhaps the term transaction cost is somewhat misleading in that such costs do not only arise when there is market transaction. Transaction costs include all costs of using an institutional arrangement and are therefore sometimes referred to as institutional costs. Cheung further clarify the concept of transaction cost by giving examples of such costs "... transaction costs may be viewed as a spectrum of

¹The most obvious cost is that of discovering what relevant prices are. Chenug(1983) identified four reasons why such costs may be higher in the absence of a firm, namely (1) the large number of contracts that has to be made between input owners and consumers, (2) the high information cost of knowing (the price of the components of) a product, (3) high cost of measuring the quantity and quality of a product, (4) difficulty in separating the contributions of resources owners working in collaboration.

institutional costs including those of information, of negotiation, of drawing up and enforcing contracts, of delineating and policing property rights, of monitoring performance and of changing institutional arrangement. In short, they comprise all those costs not directly incurred in the physical process of production.”.

Coase sees the firm and the market as competition choices which individual resource owners can freely choose to adopt. The choice must be dependent on the relative size of the transaction cost involved. In other words, the choice of different institutional arrangements are made to reduce transaction costs. When the cost of using the market is higher than the cost of directing resource use in a firm, the firm will be the choice i.e. the firm supersedes the market and vice versa. When the firm supersedes the market, resource owners contract with a central agent instead of directly transacting with consumers, the product market is said to be superseded by the factor market. It needs a lot of insight to originate this seemingly simple thesis. As evident by subsequent research (the majority of which started 30 years after Coase’s paper), Coase’s theory of the firm or the Coase Theorem is an extremely important generalization of the neoclassical paradigm. This approach has later been developed by numerous researcher, the more important ones include Alchian (1984), Alchian and Demsetz (1972), Barzel (1984), Cheung (1969, 1983), Demsetz (1983), Jensen and Meckling (1976), Richardson (1972), and Williamson (1975, 1980, 1985).

Provided that the type of transaction costs can be identified and the way they vary under different circumstances can be specified, the transaction cost minimization paradigm can successfully explain most real life phenomena related to the choice of institutional arrangement.

THE FIRM AS ONE FORM OF CONTRACTUAL ARRANGEMENT

How can Coase’s theory of the firm be applied to subcontracting in the construction industry? How should the firm be defined? Should the main contractor who is involved in a number of different projects be one firm or should each individual project be one firm? Should subcontractor’s be treated as the main contractor’s (or the upper level subcontractor’s) employee or as a separate firm? Is the purchase of the labour only subcontractor’s services a product market or factor market transaction? There seems to be no clear answer to these questions. This is not that all surprising since Coase has not clearly defined what a firm is.

Coase’s main concern seems to be the choice between (complete) 'direction' by market price signals and (complete) direction by the central agent of the 'firm'. Real life observations however do not necessarily belong to either category but somewhere in between and construction subcontracting is a very good example. Cheung’s (1983) generalization of Coase’s theory of the firm provide a very useful solution to the problem. Instead of viewing the market and the firm as the only two competing rivals, Cheung suggests that it is the choice of contractual arrangements (and therefore the

institutional arrangement) that matters. (Complete) direction by the market and the (complete) direction by an agent are two of the many forms of contractual arrangements.

Rather than saying that the firm supersedes the market, it is more appropriate to say that one form of contractual supersedes another form of contract. Although it is difficult to define the firm, its definition is not important in term of explaining real world observations as Cheung wrote "Thus it is futile to press the issue of what is or is not a firm. If each individual is a private input owner - of his own labour, if nothing else - then almost all individuals in society are bound by contracts when they compete and interact. The important questions are why contracts take the form observed and what are the economic implications of different contractual and price arrangements.". Cheung's generalization of the Coase's theory of the firm is particularly useful for understanding the nature of construction subcontracting as it is an institutional arrangement that neither resemble the market nor the firm in Coase's sense.

OBJECTIVES

The major objective of this paper is to explain the popular use of subcontractors in the construction industry using a transaction cost minimization paradigm which has been briefly reviewed in previous sections. Stemming from the main objective is the introduction of the concepts of property rights and transaction costs description of the relevant subcontracting practices and observations, identification of the type of transaction costs involves and the specification of how they vary under different observable situations. Hong Kong is among the best place to conduct the research due to minimal government intervention (in the choice of the form of contract) and the absence of strong labour unions. Certain common believes and explanations are also reviewed in the light of the findings in this paper.

SUB-CONTRACTING IN THE CONSTRUCTION INDUSTRY

When a construction company as a main contractor is awarded a construction project, it categorizes the project into easily identifiable tasks or work packages which will be sub-contracted to the relevant "second-level contractors" (sub-contractors). Typical examples of such work packages are "excavation", "formworking", "steel blending", "concreting", "plastering", "painting", "scaffolding", "plumbing" etc. The "second-level contractors" will in turn further categorize their tasks into smaller tasks which will be sub-contracted to the relevant "third-level sub-contractors" (sub-sub contractors). For instance, the "steel blending" task is divided into "cutting" and "delivering". In turn, the "third-level contractors" would pass on some of their work to the "fourth-level sub-contractors" (sub-sub-sub contractors).

Besides searching for suitable subcontractors, the role of the main contractor is that of co-ordinating and managing the second level subcontractors. The main contractor also bears the risk of non-performance by the subcontractors as the contract between the main contractor and the client is normally much more formal.

The main contractor sometimes also provides information on the sources, quality and prices of the resources (mainly construction labour and material)

The main contractor therefore acts as an agent (middle man), manager and entrepreneur (risk taker) and to a lesser extent financier of the project. A large part of the difference in the price charged by the subcontractors and the price quoted by the main contractor is transaction cost. Such difference represents the reward to the main contractor's role in the project and also return to his/her previous investments which contributes to its goodwill in case of private sector projects and monopolistic rights in case of public sector projects².

The above analysis also applies to the subcontracting of the work by the second-level contractors. As mentioned, the income of the second-level contractor is a reward to his effort in finding, managing and co-ordinating the lower level subcontractors. The disaggregation of tasks, quality control and supervision are therefore the key duties of the second-level contractors. These tasks are not to be overlooked as the skills and knowledge of the lower level sub-contractors and their construction workers are limited. The process of disaggregation enable these sub-contractors and workers to understand their rights and responsibilities, rendering price setting less costly, and minimizing the costs of disputes over job description.

The main contractor will not normally contract directly with the workers as such an arrangement, despite involving less middle agents, is in fact very costly. The costs include search costs, negotiation costs, costs of obtaining market information, costs of delineating output quality assurance and the cost of directing a large number of workers. From a project management perspective, to bypass the "middlemen" and employ the construction workers at the end of the sub-contracting chain implies that the company must employ and direct the activities of personnel supervisory staff. One reason for subcontracting is to reduce such cost. The other reason is to save the costs of searching and negotiating with far too many parties involved in a construction project.

On the other hand, the subcontractors further down in the subcontracting chain such as the third and fourth level contractors are also not willing to deal with the main contractors directly for otherwise they would bear the same costs of negotiation and information.

As we move up towards the spring of the sub-contracting network to the route of the contract between the main contractor and the developer, similar principles apply. When the developer passes the task of a construction project on to the main contractor the contractual arrangement also depends on the magnitude of the transaction costs

²Under the current system of classification and registration of contractors adopted by the Hong Kong Government, the contractors are graded and classified according to their experience, financial and technological capability. The grades are related to the size of the public sector projects the main contractors are eligible to tender for

involved. The developer would rarely opt to employ and supervise directly the construction workers as the typical development in Hong Kong is not only large in scale, but also complex involving many specialists, rendering direct employment and supervision of all tasks virtually impossible. Furthermore, the cost of contracting with individual employees for a short duration and the cost of searching for the workers with suitable skill is also very high. Nor will the developer by-pass the main contractor and contract with the subcontractors directly since not only would the developer have to contract with a large number of parties, but he/she would also have to co-ordinate these subcontractors as well. The transaction costs involved can be substantially higher than if the developer contracts with one single party.

Thus, the developer will simply contract out the whole project to one single main contractor and rely on the main contractors' expertise to search, co-ordinate, supervise and direct subcontractors and workers.

When the main contractor subcontracts part of the project to the second level subcontractor, the subcontracted work is often a discrete and easily identifiable package of tasks. For instance, the tasks of excavation, formworking, steel bending are subcontracted in whole to three different second-level contractors. The rationale for this arrangement is to minimize the cost of delineating the rights and responsibilities of the contracting parties. Similar to the main contractor, the second-level sub-contractors will be paid according to their progress and therefore have an incentive to work fast so as to get paid earlier.

To facilitate specialization and to maintain flexibility in an environment where the workload is fluctuating are often cited as the reasons for the wide spread use of subcontractors in the construction industry. Since predicting future workload requires costly information which is also one form of transaction cost, such explanation is consistent with the minimization of transaction cost paradigm. However, we consider such explanation much less important than the one advocated above since the type of transaction cost can also be reduced by using daily wage casual labour whose contract can be as short as one or a even half day.

In Hong Kong, the contractual relationship between the main contractor and subcontractors or between the subcontractors is usually informal and rely on 'trust' or 'good will' of the respective parties. The subcontractors normally have a long term relationship with the higher level subcontractors or the main contractors. This arrangement helps to minimize the cost of sub-contracting and therefore lower the transaction cost. This analysis applies to all the lower level subcontracting practices as well.

When the second-level sub-contractors contract with the third-level sub-contractors, the second-level sub-contractors will usually bear the cost of construction materials while the third-level contractors bear the labour cost only (i.e. labour only subcontractors). The sub-contractors and workers at the lowest levels of the subcontracting chain are

called 'gangs', who work in the form of partnerships. Each gang has only a small number of persons. The size of the gang is also limited by the transaction cost involved in forming the gang. As all gang members are partners who share the rewards for the work done by the group. There are therefore implicit contracts among members of the group. Such contracts are often based on understanding and are normally informal in nature. Therefore there is the possibility for some members of the gang to free ride on the others and thus lower the efficiency of the gang. When the size of the gang is too large, a costly monitoring system is required to prevent gang members from free riding on the others. As all individuals are partners, all of them should have an incentive to work hard.

Consider the example of "formworking". As soon as the second-level formwork subcontractor gets the job from the main contractor, he subdivides the work into discrete tasks such as erecting formwork to walls, floors and beams and dismantling of formwork. The task will then be subcontracted in the form of a piece-rate contract (say one floor as one piece) to the third-level sub-contractors or gangs. The formwork contractor will normally supply the formwork. When the third-level sub-contractors complete a piece of work, say one floor, he gets paid for the work done. Successive payments are made every time on completion of an additional floor until the whole multi-storey building is completed.

The gang leader will earn more than the other gang members as the gang leader also plays the role of supervision, information gathering (i.e. getting jobs from subcontractors) and risk bearing (risk of gangers not performing). A ganger usually works faster, harder and for longer hours than a casual daily or monthly wage worker. He has also to bear the risk of under-employment or temporarily un-employment. These, however, cannot be seen as exploitation by the gang leader or the upper level subcontractors. Under the subcontracting arrangement, the gangers are paid according to the level of output. Therefore they have the incentive to work hard and for longer hours. The information gathered by the authors from informal discussion with construction workers suggests that the average daily income for a worker working as a ganger is about 70% to 130% higher than the average daily income of a casual worker who is paid on a daily wage basis. However, a construction worker cannot always work as a ganger, or if he has chosen to do, he has to bear the risk of un-employment from time to time.

A construction worker (except for some old and less productive workers) would normally opt for working as a ganger rather than in a wage worker if possible. This suggests that the average daily income of a ganger, even taken into account the periodic un-employment, is higher than the average daily income of a wage worker.

Since gangers are paid by the upper-level subcontractors, the extra earnings received by the gangers (compared with their income if they are working on a daily wage basis) must be out of the pocket of those subcontractors. Does this imply that the employers of the gangers are disadvantaged or cheated by the labour only subcontracting system. As

there is no labour union nor is there any government intervention regulating the contractual arrangement between construction workers and their employers in Hong Kong, the popularity of labour only subcontracting implies that there is mutual benefit to both sides (employers and workers) under this arrangement. Where does this benefit come from? the answer can be found by applying the same analysis given in the previous sections. Imagine the situation where the employers employ workers on a time charge basis. Since time is only a proxy for the worker's output the cost of monitoring the performance of the worker must be very high. To ensure that workers perform and to monitor the quality of output, the employer would need to employ supervisors and foremen, create an incentive system or a complex monitoring system within the organization structure. All such arrangements are not costless. In fact they are usually very costly in the construction industry due to the unique nature of construction projects which prohibits the replication of the same system for all projects. When such costs exceed the costs of forming and enforcing labour contracts in the form of labour only subcontracting, there will be saving in cost by adopting the subcontracting arrangement. This saving will be distributed between the two parties (i.e. the employer and the worker) and therefore both sides benefit.

The above analysis illustrates the type of transaction costs that can be saved by adopting labour only subcontracting as oppose to both the casual daily wage contract and the longer term monthly wage contract. Such savings will be distributed between the employers and the workers (the distribution ratio depends on market conditions) and therefore the incomes of both sides will be higher than the case when labour only subcontracting is not suppressed by government regulations

The obvious question that follows this argument is why casual daily wage contracts or monthly wage contracts (paid by proxy) can co-exist with labour only subcontracting (paid by output) within the same specialist area (trade). The answer lies in the difference in nature of the work undertaken by the workers and therefore have different implications on the types and size of transaction costs under these forms of contractual arrangements.

The transaction costs of labour only subcontract are mainly the costs of forming and enforcing the contract which involves clear delineation of the rights and responsibilities of both parties. These costs are relatively low when the nature of the work undertaken by the workers is a easily identifiable work package.

There are however miscellaneous tasks such as rectifying the labour only subcontractor's work, minor addition or alterations resulting from architect's instruction etc. These works are minor in nature and each task involves from a few minutes to the maximum of half a day's work. There are however, a large number of such tasks and some of which cannot be specified in advance. To specify and measure a large number of small tasks for the purpose of contracting will be very costly and even impossible in some cases (e.g. urgent and unexpected tasks), therefore time is used as a proxy for the worker's output. Although the cost of monitoring the worker's performance is higher

under such arrangements, the daily casual labour arrangement still involves the least transaction costs amongst all alternative contractual arrangements and will therefore be adopted.

CONCLUSIONS

The above survey of the institution of subcontracting in the construction industry of Hong Kong serves to illustrate the basic point that the choice of contracts is not random. Rather, it is predicated on the attempt to minimize transaction costs.

The number of contracts, the availability of market information about material costs, time and expenditure in negotiating and drafting contracts, quality assurance, and contract enforcement are all the transaction costs that would arise in subcontracting. That the parties involved are prepared to pay these costs voluntarily indicate that they are more than offset by the savings in other types of transaction costs under an alternative arrangement.

Two alternative arrangements which are extreme cases of direction by the market and the central agent have been examined. On the one extreme, the end-users of the product (construction work) contract directly with individual workers, specialist, and machinery owners who contribute to the construction of different parts of the structure. Resource owner's activity will be guided by the end-user's preference through the market mechanism. In this case, there will be no subcontractor, contractor and even developer. All end-users simply contract with each other to share part of a development project and they in turn contract directly with individual resource owners (together with a professional co-ordinator if necessary) to construct the building. The cost of such an arrangement is however exceedingly high due to the large number of contracts involved. The end-user do not normally know the technical details of the structure and therefore to reach a price of a component of the structure is difficult. There is also a major difficulty in separating the contributions of different resource owners to the production of an identifiable component of the structure. It is also costly for the end-users to discover their preference.

On the other extreme, the main contractor (or developer in the extreme case) can contract directly with the workers and instruct / direct the workers what to do with no or little reference to the market prices of their outputs, as in case of the classical Coasian firm. Since the workers are not paid according to their output as in case of the subcontracting but paid by some proxy of their outputs such as hours worked, the cost of monitoring their performance becomes very high. Another important cost is that of planning the construction activities to minimize the worker's idle time. The fact that these two extreme arrangements are not adopted in reality suggests that the type of transaction costs mentioned in each case are higher than the transaction cost of adopting a subcontracting arrangement.

The most important cost of subcontracting, i.e. the costs of specifying the subcontracting packages and agreeing on their prices are relative lower than the major transaction costs identified in the above two extreme cases. This is confirmed by the fact that all subcontracted work is relatively discrete and easily identifiable. Since both contractor and subcontractors are specialists who process market information about the output of the subcontractor, it is relatively easy for them to agree on the price.

Since contractors can employ worker on a daily basis and can rent construction plant and machinery, fluctuation in demand for construction work cannot be a major reason for the wide spread use of subcontractors.

Due to the nature of construction projects, it is impossible to subdivide the whole construction work into discrete components in a precise manner. Neither can the project be unambiguously subdivided into distinguishable components nor can the nature of the work be specified in exact detail before it is subcontracted out. Therefore subcontracting although dominating, cannot be the sole institution arrangement adopted in the construction industry. There are other forms of contractual arrangements which are not superseded by subcontracting. For example, the main contractor almost invariably employ a small amount of workers directly on a monthly or daily wage basis to perform miscellaneous duties and some unexpectedly urgent work. Even with the subcontracting arrangement, the subcontractor may sometimes be paid by the time proxy. In most subcontract, provision is often made for payment on daywork basis, such provision is necessary when variations in design lead to the construction of new components or components which are difficult to price.

In a highly competitive and free market, "exploitation" is hardly a meaningful concept. Each level of subcontractors are competing among themselves in terms of time, quality and prices and they are objectively forced to minimize costs. A further point is that the types of contract selected can be accurately predicted by an examination of the nature of work and the types of transaction costs involved, in terms of work delineation, monitoring, contract negotiation, and formation.

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