

PAPER • OPEN ACCESS

## The Choice of the Methods of Engineering Contracts' Contracting and the Prevention of Speculative Behaviors

To cite this article: Feng Guo and Dongming Xu 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **242** 062071

View the [article online](#) for updates and enhancements.

# The Choice of the Methods of Engineering Contracts' Contracting and the Prevention of Speculative Behaviors

Feng Guo<sup>1</sup>, Dongming Xu<sup>1</sup>

<sup>1</sup> Civil Engineering College, Henan University of Science and Technology, Luoyang, Henan, 471000, China

16201974@qq.com

**Abstract.** For a long time, the choice of the methods of engineering contracts' contracting has mainly relied upon the method of Marginal Analysis which is the strong point of Classical Economics, and the feature of analysis is the fixed conditions and demands of engineering, and after comparing the costs of different methods of engineering outsourcing, the chief issue of saving costs is solved. When analyzing the speculations of the field of engineering construction like dishonesty etc, the Marginal Analysis has displayed conspicuous insufficiency. This may be relevant with the hypothesis of human behaviors of Marginal Analysis, however, sufficient consideration of human's limited rationality and speculative tendencies may come closer to the realistic engineering transaction activities. When considering the methods of engineering outsourcing, people need to pay attention to the management abilities of different methods of subcontracting regarding speculations and the effect of application of limited rationality. The delegate of New Institutional Economics, Williamson suggested a method of analysis, choosing the asset specificity, limited rationality and speculation as three important influencing factors when studying market and the problem of corporation signing the contracts, and proposed four contract models using different combinations of the above mentioned three factors in order to prevent speculative behaviors. This essay tries to apply this theory and referring to the transaction characteristics of Chinese construction engineering industry, a discussion has been presented about the influence of the ways of construction engineering contracting upon how to prevent the speculative behaviors of the contractors.

## 1.Introduction

New Institutional Economics calls the purpose of this type of marginal analysis as Second Order Saving, and this type of analysis method is quite concise and effective towards the contract analysis of the simple engineering contracts when both parties of the contracts have little distance of advantages in information [1]. But with the increase of the needs of large-scaled complex engineering, this method has gradually displayed certain limitation in adaptability. The contracting party has difficulties of adjusting to the demands of the needs of large-scaled complex engineering in technical abilities, management abilities and the cost level of monitoring and this has pushed forward the innovations of the contracting methods of the large-scaled complex engineering, developing from the method of autonomous type to that of agent type. The agent type of contracting grants the contractor more authorization in scope, as means the contracting party has more difficulties in observing the behaviors of the contractor. In recent years, the frequent noteworthy problems in the engineering industry like dishonesty, safety quality events, etc. have incurred people's consideration that when choosing the methods of outsourcing, moreover, we need not only consider how much costs will be saved by



different methods, but also consider the contracting party's control abilities of the speculative behaviors after signing the contract.

## 2. Introduction of the basic theory

When analyzing the process of signing the contract, Williamson has suggested a method of analysis that chooses the asset specificity, limited rationality and speculation as three important influencing factors when studying market and the problem of corporation signing the contracts and suggested four contract models using different combinations of the above mentioned three factors. Table.1 demonstrated the contract model adapting to the different combinations of the three factors. Of the three, limited rationality and speculation are the hypothesis of the characteristic of the behaviors of the participants of the transaction, while the asset specificity is the measurement of the mutual reliance of the two parties of the transaction [2].

Table 1. The various attributes of the signing contracts

limited rationality	speculation	asset specificity	contract models
0	+	+	With plan
+	0	+	trustworthy
+	+	0	competitive
+	+	+	Need to solve

+: this condition is important

0: this condition can be ignored.

### 2.1. Three influencing factors

*2.1.1. The asset specificity.* The asset specificity refers to the lasting investment of the both parties of the transaction. The reason people invest upon the asset specificity is that compared with general investment, it is more efficient, but when this investment is used in other fields, it will bring the loss of production values. The more losses are, the higher degree of asset specificity is. The investment of the asset specificity of the two parties of the transaction is asymmetric, and the one having invested more relies more upon the other party, and will be more possibly kidnapped by the other party, as is called blackmailing by economics. By the function of incomplete contracts, some blackmailing may not form an act of contract default. The investment of the asset specificity can be classified into specified locations, specified physical assets, specified human resources, and specified capital.

*2.1.2. Limited Rationality.* Limited Rationality means that a human being means to be as rational as possible, but he can only realize rational behaviors to a limited degree. Generally speaking, if the speculations are out of subjective deliberation, any complex contract is incomplete because of the existence of Limited Rationality.

*2.1.3. Speculation.* Speculation has an alias, opportunism, behaviors to satisfy one's personal profits by cheating actions, including carefully calculated misleading, cheating, confusing or other endeavors to create confusions. Speculation is a mental deliberation, either active behaviors or passive behaviors under some sort of pressures.

### 2.2. Four Contract Models

*2.2.1. Planned Contract Model.* This contract model can be applied to the situation where the hypothesis of complete rationality, speculation and asset specificity exist at the same time. In this

model, because all participants are totally rational in behavior hypothesis, the speculation can be fully anticipated and observed; in the contract, the thoughts and actions of speculation are overcome by the complete planned contract clauses and even when the specific assets are to be transacted, the implementation of the contract will be in accordance with the regulations in the contract, and the disputes about the contract will be solved by the law. In this assumption, a contract has become some sort of plan actually.

*2.2.2. Contract Model of Trustworthy Regulations.* This contract model is suitable for the transactions of admitting Limited Rationality, Asset Specificity, but not considering Speculative Behaviors. In this model, it is considered that in transactions, there is no factors to entice the agents to have speculative intentions, because both parties are of limited rationality, and they will solve the remaining affairs not designed fairly and justly in the contract. With this hypothesis, a contract has become a kind of promise.

*2.2.3. The Contract Model of Competition.* This contract model admits the existence of Limited Rationality and Speculation, but the object of transaction is not Asset Specificity. This means the capital in this transaction is convenient to transfer its use and will meet nearly no loss of production values, namely, if contract default appears, the direct damage of values because of the default can be pledged to the law, and there will be no other loss because of the problem of Asset Specificity. This kind of Competition Contracts exist in realistic transactions of real goods in the condition of full competition. With this hypothesis, all the questions will be solved by market competition.

*2.2.4. The Contract Model needing to be governed.* This contract model can be applied to contracts with Bounded Rationality, Speculative Behaviors and transactions of Specific Assets. Compared with the other three contract models, the above three assumptions have more constraints. The contract model that needs to be governed holds that the law has a limited or high cost to the effective performance of contracts, and that both sides have different degrees of bounded rationality, speculative motives and different degrees of specific asset conversion risk. Williamson believes that such contracts need to be governed. The effective performance of contracts lies in the establishment of reasonable governance organizations based on transaction attributes and the rational use of bounded rationality to overcome the speculative tendencies of both parties.

*2.2.5.* To sum up, if we regard a contract as an endogenous system designed by specific double or multiple parties in exogenous institutional environment, the method of contract analysis proposed by Williamson is a method of institutional comparison, which is different from the marginal analysis that classical economics is good at. From the point of view of optimization, the systematic comparison method is the first-order qualitative method for contract optimization, while the marginal analysis is the second-order quantitative method. The marginal analysis should be based on a specific system. The comparison and selection of systems will determine the boundary of marginal optimization. Therefore, the analysis of contracts adapted to different transaction attributes has been carried out. It is necessary to proceed in the sequence of first order and then the second order. Specifically, one of the typical problems is that the contracting party neglects asset specificity in order to beat down the contract price, and unilaterally uses the competitive contract model. A typical problem is to unreasonably beat down the bidding contract price and use the method of low price first evaluation. The contractor will adopt malicious low price under the pressure of competition and this strategic bidding is followed by speculative measures in the performance process to increase profits. Another problem is that the contracting party neglects the existence of limited rationality and instead, he tries to restrain the contractor's speculation through careful planning and strict supervision, namely, the planned contract model [3]. The contract model needing to be governed may be more suitable for the research of contracting modes of construction projects, emphasizing the effective use of bounded rationality and preventing speculation.

### **3.The Influencing Factors of the Choice of Contracting Ways**

#### *3.1. One of the influencing factors: asset specificity*

*3.1.1. The contracting party's Assets Specificity.* The contracting party's investment in the asset specificity of a specific project has the following characteristics: first, as the largest contracting party of a certain project, the construction unit directly or indirectly involves the contracting of all the products and services of the project construction, while the second order of contracting party usually involves various products and services, and the total input of the contracting party is relatively large. Secondly, it is relatively difficult for the contracting party to transfer the asset specificity, which is determined by the location specificity; thirdly, it involves the asset specificity for different goals, according to the transaction hierarchy of the contracting parties, at least including: consulting, survey, designing, supervision, construction, testing and other purposes; fourthly, the investment for different purposes is highly relevant, and the work is done often as the cooperation of multi-profession in space and time. If one type of investment cannot meet the quality requirements and the stipulated time investment requirement, this often causes the loss of investment for another function.

*3.1.2. Contractor's asset specificity.* Contractor's asset specificity is reflected in two aspects-- industry and project: in the aspect of investment of industry asset specificity, the current system of our country has access permission system for enterprises and individuals: the qualification management systems of the enterprises of design, construction, supervision, consultation, inspection, goods and other products and service and the Licensing Qualification Management System of the staff engaged in key positions in construction industry. The two management systems of professional qualifications can be regarded as the minimum requirement for enterprises and personnel in the construction industry to possess basic specialized assets. This asset specificity is for non-specific projects. Generally speaking, construction enterprises and practitioners have carried out a large number of investments of specialized assets before they trade in specific construction products and services. This kind of asset-specificity investment is for the industry, and the loss caused by asset-specificity investment will occur when the relevant company withdraws from the industry. In the aspect of asset specificity investment in a certain project, no matter which hierarchy of transaction both parties of construction project contracting and contracting are located in regarding a particular project, they will adopt the payment method similar to "advance-allocation of progress payment" to varying degrees. These advance funds can be regarded as one aspect of asset specificity of product and service providers, and the losses of asset specificity occur when the company withdraws abnormally from the project or progress payments cannot be received on time.

*3.1.3. Comparative analysis.* When the asset specificity is placed in the process of contracting and contracting, it can be found that before signing the contract, the contractor's investment in asset specificity is on the side of higher asset specificity level, as brings about the problem that the contracting party uses this to beat the bidding control price and set bidding conditions by low prices. After signing the contract, the contractor takes advantage of the special assets investment that the contracting party has already invested in the project and the position of the contractor in the process of professional cooperation to take similar extortion actions against the contracting party. In engineering construction, such phenomena may be caused by the level of asset-specific investment, the order of investment and the unbalanced distribution of losses.

#### *3.2. Influencing factors: analysis of bounded rationality*

*3.2.1. Limited Rationality of the Contractor.* The bounded rationality of the contracting party is mainly embodied in the bounded rationality of engineering technology and management difficulty, average market price level, the contractor's performance ability, motivation and behaviors. The information of

engineering technology and management difficulty and market average price level can be obtained through engineering consultation and cost consultation incompletely. Excessive evaluation will result in waste, and too low evaluation will lead to speculative reaction of contractors after signing contracts. A common way to inspect the contractor's performance ability, motivation and behavior is to set up qualification examination conditions in the bidding process. But this inspection is often incomplete and difficult. The common practice of borrowed qualification bidding in reality can be used as an example to illustrate the incompleteness and difficulty of this inspection. After signing the contract, the contracting party is limited by its own supervision ability and energy, as causes the incomplete and difficult inspection of the products and services provided by the contractor [4]. The inadvertent loss and speculative behaviors of the contractor, whether observed or not, will cause losses to the construction of the project.

*3.2.2. Limited Rationality of Contractor.* The contractor's bounded rationality may be the erroneous estimation of engineering and management difficulties and corresponding costs in bidding. If overestimated, it will lead to the failure of bidding. If it is underestimated, the contractor has to make a second transaction in the market to solve the problem of insufficient supply capacity after signing the contract, thus generating additional transaction costs and over expenditure of the total cost.

### *3.3. The Third Influencing Factor*

Speculative behaviors can not be ignored in the construction industry of our country. In Figure 1, It can be found in the transaction platform of public resources of the whole country that the number of real estate development enterprises and construction related enterprises in the blacklist of honesty and credit accounts for about 8% of the total number of enterprises published in the blacklist, while the ratio of demand-side real estate enterprises to broad sense construction enterprises which are located in the market need side is about over 4:5. This partial market data can show that speculation can not be completely eliminated even in the field of public resource trading, which is strictly regulated by the government.

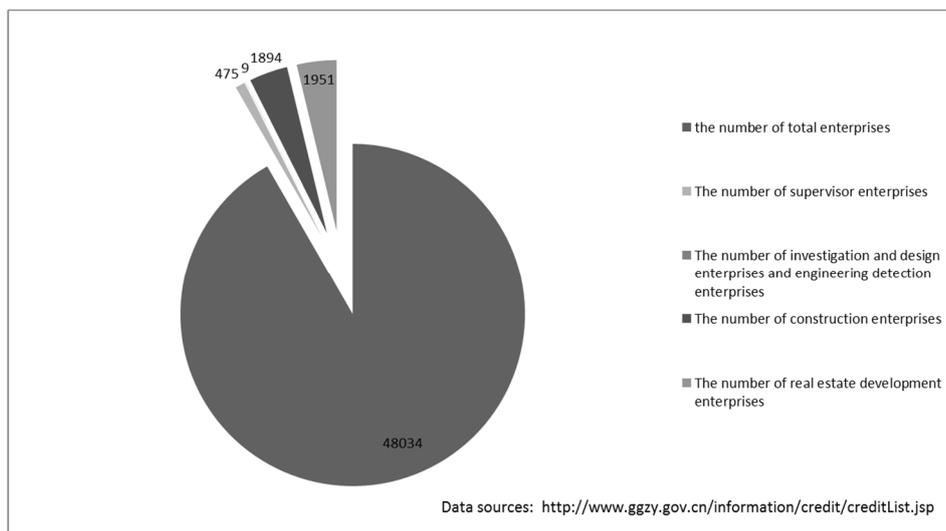


Figure 1. Quantity of real estate development enterprises and construction-related enterprises in the national public resource trading platform trading credit blacklist

*3.3.1. The Contracting Party's Speculation.* The speculative behavior of the contracting party is chiefly that before signing the contract, the contracting party uses the fierce competition between the contractors to depress the bidding control price and set the conditions for winning the bid at a lower price. After signing the contract, the contractor maliciously depresses the quality rating of the contractor's work results or makes deducts and arrears on other unreasonable grounds [5].

*3.3.2. Contractor's speculation.* Contractor's speculative behaviors should at least include: first, when bidding, the contractor may conceal information about his ability and cost of performance. A worse situation is to borrow other people's qualifications to bid, subcontract after winning the bid to seek the price difference. Second, under the pressure of enterprise survival and fierce competition in the market, they are forced to adopt a low-price strategy to win the bid, and later, the contractor is forced by lower contract prices strategy to supply products and services of the low-quality in order to reduce costs.

*3.3.3. Collusive speculation of the two parties.* Collusive speculation between the two sides will lead to negative external problems of construction projects, mainly reflected in the collusion between the two sides to reduce costs by harming the interests of unrelated third parties, such as environmental pollution, third-party safety issues and quality defects of Engineering entities.

#### **4.The Conclusion**

New Institutional Economics holds that the problem of preventing speculations should be considered when choosing contract models. Under the circumstance that limited rationality and speculation act simultaneously, it is beneficial for both parties to take mutually beneficial actions when they invest in the special assets of great importance. It can be seen that the New Institutional Economics holds that adjusting the proportion of asset-specificity investment between the two sides is an important method to prevent speculation. To a large extent, the choice of the way of contract issuance is to determine the scope of contract issuance. And the size of the scope of contract issuance means the level of the contractor's asset-specificity investment in the project. From the point of view of the limited rationality gap between the two parties and the level of the contractor's asset-specificity investment, the paper discusses the preventive abilities of different ways of contracting upon the contractor's speculative behaviors.

##### *4.1. Classification of Contracting Methods*

Wang Zhuofu makes a gross classification of the different ways of project contracting into autonomous type and agent type, as is not absolute. This classification method helps to simplify the understanding of different ways of outsourcing. The autonomous mode requires the contracting party to have higher technology, management ability and lower supervision cost level. The typical mode is DBB mode (Design-Bid-Build). The main transaction participants are both the contracting party and the contractor. The agent mode requires the contracting party to conduct engineering transactions with the contractor through the agent. The typical ways are DB (Design and Build), EPC (Engineering, Procurement and Construction), GC (General Contractor). The main participants are the contracting party, the agent and the contractor. The agent-type contract-issuing mode also has some connection with the project financing mode. The agent-type contract-issuing mode requires the agent to carry out different levels of financing for the project. After comparison, we can find that the two important differences between autonomous contracting and agent-based contract award are the scope of contract award and the degree of the involvement of the contracting party in post-contract financing, technology and management activities[6].

##### *4.2. Prevention of speculative behaviors by autonomous contracting*

Autonomous contract-issuing mode is suitable for engineering transactions with small gap of limited rationality between the two parties. In this case, the contracting party's supervision is basically effective, and the prevention of speculation can rely on supervision activities. If we increase the contractor's asset-specificity investment to prevent speculation through agent-based contracting, it may make the return of asset-specificity investment paid to the contractor higher than the cost of supervision, and make the total cost of the contracting party too high.

#### *4.3. Prevention of speculative behaviors by agency type of contracting*

The agent-type contracting mode is suitable for the engineering transaction with a large gap between the two sides in the level of limited rationality. In this situation, if the autonomous contract issuance mode is adopted, the supervision effect of the contractor by the contracting party is not good or the contracting party needs to pay a higher cost. Therefore, speculation can be prevented by increasing the level of asset-specificity investment of contractors or agents. It should be noted that although the agent type of contract award method enlarges the scope of contracting, and increases the level of asset-specific investment of contractors or agents, as well as their reliance on projects, and reduces the cost of supervision, it is still indispensable to the supervision of important engineering sections. In addition, a more severe punitive compensation clause should be set up in the contract for speculation. The second noteworthy problem is that the agent-based contracting method also needs to consider the agent's full profit margin as compensation for asset-specificity investment in the project. When the profit margin is insufficient, the agent's speculative behaviors may be more concealed and convenient.

#### **References**

- [1] Williamson, O.E. (2002) The world of contracts. In: Yicai, D., Wei, W. (Eds.). Nobel Economics Prize Winners Library: the Economic Institutions of Capitalism: Firms, Markets, Relational Contracting., The Commercial Press., Beijing. pp. 47-64.
- [2] Williamson, O.E. (2016) Chester Barnard and early organizational science. In: Shuo, S. (Eds.). The Mechanisms of Governance China Machine Press Beijing. pp. 37-43.
- [3] Li, P. (2007) The study of engineering project opportunism risk and prevention countermeasures Enterprise Economy., 1: 62-64.
- [4] Li, Z., Meng, Q.F., Sheng, Z.H. (2017) Complexity and computational experiment of opportunistic behavior in construction team. Journal of Systems & Management., 26: 502-510.
- [5] Duan, J.J., Chen, T., Ren, F. (2009) Countermeasure for bounded rationality in construction and operation phases of project. Journal of Xidian University (Social Science Edition), 5: 98-103.
- [6] Zhuofu, W., Yinghui, J. (2006) Trading pattern of engineering. In: Zaoyu, W. (Eds.). Project Management: Model and Development China Water & Power Press, Beijing. pp. 85-118.