

# Rent-seeking Behaviors analysis in Engineering Supervision based on the Game Theory

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## Abstract

Based on the theory of rent-seeking, this paper analyzes the behaviors and relationships between the owner, supervision and contractor in engineering supervision. The paper establishes a game model of the engineering rent-seeking behavior and relationship. Based on the game equilibrium solution, a conclusion is drawn that owner should improve the monitoring efficiency and make powerful punishment to rent-seeking behaviors in order to effectively restrain the rent-seeking behaviors in engineering supervision.

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Keywords: Engineering supervision; rent-seeking behavior; game theory;

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## 1. Introduction

Supervision industry has developed for more than twenty years in China. However, there are still many problems in the development of supervision industry, such as the insufficient number and low quality of employees, weak sense of responsibility, illegal practices and so on[1-3]. Furthermore, many factors, such as the imperfect law, regulation system, extensive industry protection, local protection, administrative intervention and regional segmentation, lead to weak standardized of supervision market and shortage of a truly fair, just and open competition environment. Therefore the rent-seeking and other immoral behaviors occurred[4-7].

## 2. Rent-seeking Theory

Rent-seeking is an unproductive activity for profit, and a behavior using resources and taking legal or illegal means to gain privileges as well. Thus causing damage to others' interests which are greater than the rent winner's incomes. For example, sometimes privileges of rent possession are obtained by lobbying and bribery. The results of rent-seeking activities are: the fair competition was destroyed, allocation of economic resources was distorted; resources that could be used for productive activities were wasted on the activities that are not conducive to social development; socio-economic efficiency was reduced, the implementation of more efficient mode of production was hindered. Moreover, if these activities leave the production field and play a role in the circulation, other levels of rent-seeking or rent-avoiding will be resulted.

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### 3. The Relationships Between Tripartite Rent-seeking Behaviors

The behavior subjects of rent-seeking activities that this paper researches and analyzes are mainly owner, supervision unit, and contractor.

First, contractors and owners have an asymmetric characteristic in the information respect. In the process of project construction, contractors know about the work and the environment better than owners. They grasp more professional knowledge, variety kinds of technical solutions and quality standards. Moreover, contractors always have some private information that owners don't know, for example, the resource input and transformation processes, whether their engineering skills are consistent with the project requirements or not, and so on. Owners are also difficult to observe contractors' actual payment directly. In order to pursue their own interests to maximize, contractors will likely to cheat owners for high profits by multi-level contracting, jerry-building or other methods. Even if owners can foresee these behaviors, it is still difficult to prevent. Consequently, owners always tend to delegate supervisors to supervise and manage contractors.

Meanwhile, information from supervision units is also incomplete, because owners cannot completely know their level of management, technical strength and other private information. In addition, supervisors are not the ultimate beneficiaries of safety construction, even though they are on behalf of owners' rights in a certain range and have the right to manage the project. In order to obtain additional income, project supervisors probably abuse their power of attorney to collude with contractors and implement direct non-productive activities when their behaviors can not be observed by owners completely, such as fraud, forging data and files, lowering the project quality, signing unqualified engineering, materials, components and equipments with "qualified"; thus resulting in rent-seeking behaviors. These will cause significant security risks to project quality.

According to economics principle, from the angle of profit maximization: supervision units need to gain supervision business or get supervision income that beyond the normal payment in the nonstandard market; and contractors have to obtain supervisors' permit firstly if they want profits that outside of normal income rage, like getting extra claim proceeds or extending more duration. Therefore, supervisions and contractors probably seek additional revenue through rent-seeking behaviors.

Moreover, China's engineering supervision companies widely have shortcomings, such as pinch of professionals, low quality of employees, and so forth. If the supervisors do not have enough strength or do not perform their supervisory duties, contractors will find ways to make their own irregularities avoid the supervision, which will bring about decreasing the project quality. Another situation is supervisors have the strength: if they supervise conscientiously according to the contract and regulations, contractors' irregularities will hardly escape from their supervision; if supervision units are also in pursuit of excess profits, they may violate professional ethics and be bribed to collude with contractors, thus cause rent-seeking behaviors and affect the project quality and safety seriously.

### 4. Game Model Analysis of Tripartite Rent-seeking Behaviors

#### 4.1. Model Building

This article takes the owner, supervision unit and contractor as the three behavior subjects of the game. We assume that there are two strategies for supervision unit and contractor: choose rent-seeking or not; in allusion to their choices the owner also have two strategies: monitor them or do not monitor; and there are also two results of monitoring: find out rent-seeking behaviors or do not find out. Once the rent-seeking behaviors are found out, they will be punished appropriately. So in these cases, the model conditions are as follows:

- (1) The relationship between owner and the other two is non-cooperative game; the probability of owner's monitoring and managing rent-seeking activities is  $\alpha$ ; the probability of monitoring success is  $\beta$ ; the probability that contractor chooses rent-seeking is  $\theta$ .
- (2) In rent-seeking situation, assuming the available excess profits that contractors can obtain is P, the owner's cost for monitoring rent-seeking activities is C, the rent that contractor pay to supervision units is  $R(R < P)$ .
- (3) If supervision unit and contractor do not take rent-seeking activities, and owner does not monitor them, then their proceeds are all 0.

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