Constructing and Improving the Insurance Market of Construction

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Abstract

The view that the safety management in construction industry can be improved by developing market economic leverage is proposed. The current situation and problems of domestic construction market supervision are firstly analyzed, then the possibility of the weakening of government supervision based on the game theory is analyzed. The conditions of insurance market adjustment are put forward, and the model to improve construction safety insurance market is constructed based on the analysis of current situation of domestic insurance market. Finally, the suggestions of improving construction safety insurance market in China are given in this paper.

Keyword: Market economy leverage; construction safety management; insurance market

0 Introductions

Construction industry has always been a high risk industry in the world, second only to coal, much higher than the average level of other industries. China's construction industry after decades of development, Construction safety level has improved, but building construction safety accident are also very high. For a long time, construction safety mainly relies on government regulation, But the time lag of policy and rent-seeking of corporate make government safety supervision of construction enterprises gradually become "overwhelmed". So the urgent need to seek more effective methods to improve the construction safety, ensure the safety of state property and people's life. Lever of the market economy has great adjustment for construction safety management, it can change passive to active, mobilize construction active pursuit of good safety performance. Fostering and standardizing the insurance market, perfecting the insurance legislation, promoting the insurance market competition is a kind of effective market economic leverage. Using the market leverage, it can form a benign market running mechanism, security good companies get real benefits, poor safety performance of enterprises in market competition gradually become obsolete. This paper discussed through perfecting the economic leverage - buildings insurance to achieve the possibility of security market and the necessary conditions, constructed the construction safety insurance market regulation mode perfect model, relevant countermeasures and Suggestions are given.

1. The Current Domestic Construction Market Present Situation and Problems of Government Regulation

At the beginning of the founding of new China, China has been formulated and implemented a "production safety law of the People's Republic of China", "" building law of the People's Republic of China" and so on a series of laws and regulations related to construction safety, which laid the legal basis for the government supervision and construction safety. At present, the construction safety production management model has the unified management, graded responsibility, adhere to the combination of management and hierarchical supervision. However, in recent years, along with our country speed up the pace of reform and opening up, construction safety accident frequency, these also embodies the construction safety of our country government regulatory model exist many problems and disadvantages[1].

(1) Construction safety production supervision imperfect laws and regulations. According to current safety rules and regulations, if the contractor and construction firms have illegal behavior, first of all, will be required deadline to correct, only when enterprises do not make correction will be fined. In this way, construction enterprise to a great extent, there is fluky psychology. Unsafe behavior of the enterprise at the same time have unpredictability, implementation of the transient, increased the watchdog work difficulty, cause regulators cannot effectively supervise to the illegal construction main body. These laws and regulations imperfect often is the important reason of safety accidents.

(2) Lacking of construction supervision and administration of production safety, law enforcement is not standard. Work safety responsibility consciousness weak, ideological guidance on the lack of enthusiasm, the government safety supervision and management function division of fuzzy, not clear functions, responsibilities, gradually formed a mutual shuffle, construction safety laws and regulations can not get the greatest degree of implementation.

(3) Construction supervision and administration of production safety means lag behind. The current construction safety supervision mode, safety supervision almost is belong to the authorized， law enforcement is affiliated to quality supervision institution, safety regulators are not independent, and became a subsidiary, directly led to the source of funds cannot be guaranteed. According to the ministry of construction survey statistics, at present, there are nearly three-quarters of security surveillance can not get any funding, rely mainly on quality supervision fee to raise or maintain safety regulation.

(4) Construction safety production supervision and management team is weak. It is the main problems existing in safety supervision and management of the personnel quantity too little, can't meet the needs of the development of construction industry. Construction safety production supervision is a strong technical, industry and policy work, "composite" lack of talent, restricting the improvement of the construction supervision and administration of production safety work.

Through the above analysis, safety government regulation of construction market in our country, it exists many problems, The improvement of these seriously affect the construction safety, due to the policy the inherent drawback of time lag and so on, so we need to introduce more market.

2. Weakening the Possibility of Building Safety Government Regulation is Analyzed

Establish whether to participate in government regulation for the conditions, whether to increase security investment game model between construction enterprises and analyze the weakening government regulation possibility [2].

2.1 The Basic Assumptions of the Model

Suppose 1: When the government regulatory measures for building enterprises, as a result of these measures is the job content, so will not bring the earnings. Government can choose whether the regulation measures of the enterprise, including government regulation if found the building enterprise no fines for safety investment for F.

Suppose 2: Game between construction enterprise safety， they input costs for C, for the safety of investment cost and the benefits of R.

Suppose 3: Assume that when an enterprise to increase safety input, other companies did not increase security investment, increase the safety investment of enterprise compared with other enterprises will get extra earnings G.

Suppose 4: When business is not for safety investment, the government regulators after checking is required to continue to increase security in E.

Suppose 5: This game is a game under the condition of complete information, and did not occur between construction enterprise and construction enterprise 1 2 "conspiracy", the two sides is a non-cooperative game.

2.2 Game Analysis between the Construction Enterprises under the Condition of Government Regulation

S_A and S_B said building 1 and building enterprise respectively 2 of a particular strategy, $S_A = \{S_A\}$ and $S_B = \{S_B\}$ said for construction enterprises 1, building 2 to choose a collection of all strategic.

$S_A = \{S_A\}$ = {a = enterprises 1 increase security investment, c = enterprises 2 do not increase security investment};

$S_B = \{S_B\}$ = {b = enterprises 2 to increase safety input, d = enterprises2 do not increase security investment};

Table 1: Enterprises under Government Safety Supervision

	Enterprises 2 increases safety investment	Enterprises 2 does not increase safety investment
Enterprises 1 increases safety investment	（R-C，R-C）	（R-C+G，-F-E）
Enterprises 1 does not increase safety investment	（-F-E，R-C+G）	（-F-E，-F-E）

In this game model, assuming that U_1 and U_2 enterprise 1 and 2, respectively pay, pay function for $U_1 = (S_A, S_B)$, combination of pay for $U = (U_1, U_2)$.

U1 (a, b) = (a = enterprises 1 to increase safety input, b = enterprises 2 to increase safety input) = R – C;
U2 (a, b) = (a = enterprises 1 to increase safety input, b =enterprises 2 to increase safety input) = R – C;
$U_{(a,b)}=(U_{1(a,b)},U_{2(a,b)})$=（R-C，R-C）;

U1 (a, d) = (a = enterprises 1 to increase safety input, b = enterprises 2 does not increase security investment) = R - C + G;

U2 (a, d) = (a = enterprises 1 to increase safety input, b = enterprises 2 does not increase security investment) = - F – E;$U_{(a,d)}=(U_{1(a,d)},U_{2(a,d)})$=（R-C+G，-F-E）;

U1 (c, b) = (a = enterprises 1 does not increase security investment, b = enterprises 2 to increase safety input) = - F – E;

U2 (c, b) = (a = enterprises 1 does not increase security investment, b = enterprises 2 to increase safety input) = R -C + G;$U_{(c,b)}=(U_{1(c,b)},U_{2(c,b)})$=（-F-E，R-C+G）

U1 (c, d) = (a = enterprises 1 does not increase security investment, b = enterprises 2 does not increase security investment) = - F – E;

U2 (c, d) = (a = enterprises 1 does not increase security investment, b = enterprises 2 does not increase security investment) = - F – E;$U_{(c,d)}=(U_{1(c,d)},U_{2(c,d)})$=（-F-E，-F-E）;

In this condition, the Nash equilibrium depends on the parameters R, C, G and the relationship between the E and F. When R > - F - E - C + G, the Nash equilibrium of the game for (R - C, R - C), namely enterprise 1 and 2 are increase security investment, which is the optimal state. When R - C + G < - F - E, Nash equilibrium is (F -, E - F - E), in which companies are not increase security investment, and in this case, the construction enterprise increase safety investment benefits brought by the excess return R and G are small and enterprises prefer to be fined.

2.3 Game Analysis between the Construction Enterprises under the Condition of Government is Not Regulation

Table 2: Enterprises not under Government Safety Supervision

	Enterprises 2 increases safety investment	Enterprises 2 does not increase safety investment
Enterprises 1 increases safety investment	（R-C，R-C）	（R-C+G，0）
Enterprises 1 does not increase safety investment	（0，R-C+G）	（0，0）

The same can get payoff function for enterprises, $U_{(a,b)}=(U_{1(a,b)},U_{2(a,b)})$=（R-C，R-C）；$U_{(a,d)}=(U_{1(a,d)},U_{2(a,d)})$=（R-C+G，0）；$U_{(c,b)}=(U_{1(c,b)},U_{2(c,b)})$=（0，R-C+G）；$U_{(c,d)}=(U_{1(c,d)},U_{2(c,d)})$=（0，0）

Under the condition of the government does not regulate, when R - C + G > 0, the Nash equilibrium of the game for (R - C, R - C), namely enterprise 1 and 2 are increase security investment, which is the optimal state.

When R - C + G < 0, the Nash equilibrium is (0, 0), in which companies are not increase security investment, and construction safety in the "vacuum" state, which is the worst outcome.

By the result of game analysis can know, whether in the government supervision of construction enterprise condition, when R + G > C, Nash equilibrium can be reached (R - C, R - C), and it influence the parameters of the Nash equilibrium for R, C, G. In the real production and living, the increase of enterprise safety investment is greater than the benefits of widespread, If construction enterprises spontaneously to increase security investment, it is necessary to improve the enterprise increase safety investment benefits brought by the excess return R and G, make it meet the conditions of R + G > C, can achieve the optimal state (enterprise 1 increase security investment, enterprise 2 increase safety investment).

3. Insurance Regulation by Economic Lever- Construction Safety Construction Safety Management

Through the above analysis, the government supervision in construction market is there is the possibility of weakening, the increase enterprise safety investment profits, the current condition, the low income R, and gains the fuzzy are not clear for the construction enterprise to increase safety input of one of the main reasons. Government regulation there are more disadvantages, compels us to seek a more efficient way to improve the construction safety, and in the construction of security market regulation, insurance is a main method of construction safety, through the insurance market to improve construction safety has been widely used in developed countries.

3.1 The Present Situation of the Construction Safety Insurance Market in China

Building insurance first originated in Britain in the 1930s, since the 30s, the developed European countries system of construction safety insurance for 80 years, but only from the early 80s in China was introduced from the construction safety insurance. Although the construction safety insurance in our country already has 30 years of development, but the development of the domestic construction safety insurance is relatively slow [3].

Table 3: Construction Safety Insurance Status Questionnaire

Types of insurance	Content	Insured	Not insured	Don't know the insurance
1.Construction all risks	Material damage and third party liability	34	37.5	27.5
2.Installation project all risks	Material damage and third party liability	32.5	47.5	20
3.Employers' liability insurance	Employers assume certain economic liability to pay compensation	10	42.5	47.5
4.Personal insurance	The insured's health or life	75	15	10
5.Professional liability insurance	Insurant negligence shall bear the liability for compensation	17.5	45	37.5
6.The project quality risk	The project quality	7.5	67.5	25
7. Mechanical equipment damage insurance	Mechanical equipment	17.5	52.5	30
8.Insurance of mechanical equipment loss of profit	Mechanical equipment	2.5	55	42.5

(Source: Construction engineering safety and insurance status survey. 2011).

As can be seen from table 3, the main construction project all risks of construction safety and installation project all risks insured only accounted for more than 30%, in Europe and the United States and other developed countries, deal with engineering insurance rate reached 90%, while the other is planted effected lower [4]. It is showed from the information provided by the national ministry of construction, the construction engineering insurance premium accounts for only about a year to 0.21% of the construction safety engineering investment, domestic construction engineering project to handle the engineering insurance is more than 10%.

3.2 The Conditions of the Insurance Market Regulation, Compulsory Insurance System

In the United States, with "labor law" established system of construction safety insurance through insurance mechanisms to ensure the labor personnel after injury accident injury in time for professional reasons for economic compensation. In Japan, bodily injury insurance is a common practice.

Construction in our country is still very prominent, the accident rate is high, through the analysis of the game model between enterprises above knowable, If shape building enterprise increase safety investment benefits, and large enough to higher than the safety of pay cost, the enterprise will achieve the optimal Nash equilibrium between, in order to make the building enterprise increase safety investment benefits is enough big, we will build a mandatory construction safety insurance model for analysis.

For building construction companies and insurance companies, the game between the construction enterprise is supposed to be sincere, not deceive the insurance company for insurance fraud. Where N insurance premiums for construction enterprises, G for when safety accident, the insurance company pays the compensation (assuming that the insurance company compensate and construction enterprise of the equal), β is the probability of safety accidents construction enterprise.

Table 3: Construction Companies and the Insurance Company is Covered by the Insurance and Game Analysis

		The insurance company	
		accept insurance	Not accept insurance
Building enterprise	Insured	(-N，N-βG)	(-βG，0)
	Not insured	(-βG，0)	(-βG，0)

As table 3, in this model, when the construction unit choose not to insure the strategy, strategy of insurance companies have no choice, then directly using the backward induction is not directly the equilibrium path of sub-game refining Nash equilibrium, so can only use "reverse" induction logic to find the equilibrium path [5].

(1) If N-βG> 0, namely -βG>-N, for insurance companies, insurance benefits when bigger than when you don't cover, so the insurance company will choose strategic coverage; For the construction enterprise, -N<-βG insurance benefits to smaller than choose not to insure, so construction companies will choose strategy is not insured. So the sub-game refining Nash equilibrium of the balance equilibrium strategy combination is { not covered }, balanced payment combination is (-βG，0), the result of the game is the construction unit is not insured.

(2) If N-βG< 0 namely-βG<-N, for insurance company, insurance benefits when the smaller than when you don't cover, so insurance companies will choose the strategy is not; However, for the construction units, when insurance benefits and do not insure against earnings are(-βG，0), namely cast when protecting the interests and do not cover the same, the construction unit choose any strategy to get profits is the same.

To sum up, the construction unit and the game is the result of the construction unit of insurance company is not insured, or the construction unit of insurance but not the insurance company accepts insurance.

Through the game model analysis can know, if there is no compulsory requirements of state, due to yield problems, construction companies not to buy insurance, even if the construction enterprises to buy the insurance, the insurance company for their own profit consideration, also can choose not to cover, therefore, should pass legislation regulations of the state construction enterprises to buy compulsory insurance to solve this contradiction.

3.3 Construction Safety and Improve the Deficiency of the Insurance Market Regulation Mode

At present, the main problem of construction safety insurance insurance system is not perfect, unbalanced development of region, the government supervision is not enough, construction companies know about the insurance level, etc. Mandatory person accident injury insurance in only a few a few cities outside the pilot implementation, the rest is planted all belong to voluntary insurance, including the employer liability insurance and project all risks [6]. Therefore, lower building safety insurance rate in our country, hindered the development of the construction safety insurance market. Construction market access to basically see the qualification rather than risk of the enterprise bear ability, the contractor is not positive to insure, will insurance as the compulsory requirements of the government and the bank and have to perform a procedure, risk awareness is weak, cast protect consciousness is not strong, the strong claims cumbersome procedures in the process of the serious phenomenon of wrangling.

Table 4 Present Situation of Construction Safety Insurance Overall China and Developed Countries

Category	China	The developed countries
Insurance rate	<15%	>90%
Regulators	China insurance supervision commission	The insurance supervision committee, the industry association
The insurance form	In the form of a single	A variety of forms
Insurance market main body	Main body is less, especially reinsurance companies, insurance brokers and assessor is less	Main body is more, in America, for example, there are thousands of mutual insurance organization
Insurance intermediary	The agent	Broker, agent, an actuary firms, insurance trade association, the law firm
The human resources	Lacking of conform to the talented person	a large number of master professional knowledge engineers and experts

Table 5: China and the United States set Danger is Planted Situation Compared [7]

Plant type	The United States	China
Mandatory type	Contractor's risk General liability insurance Professional liability insurance Motor vehicle insurance	Installation project risks Workers' compensation insurance Product liability insurance Umbrella insurance
		Accident injury insurance
Optional type	Contractor's equipment risk Installation project all risks Liability of project construction supervision Insurance of employers' liability Environmental pollution liability insurance	Construction project all risks Construction engineering design liability insurance

From the above table 4, table 5 in the data as you can see, the insurance of our country's construction safety compared with the developed countries gap is still large. The insurance rate less than 15%, while in developed countries has gone beyond 90%. In addition, our country's insurance form a single, insurance market main body is less, the insurance intermediary is limited to the agent, is also a lack of insurance personnel. In terms of insurance mandatory, only in our country at present the construction unit to compulsory insurance accident injury insurance, the compulsory insurance is more, many construction companies in their own interests and cost considerations, not willing to participate in the construction safety insurance. Insurance market is not perfect and the lack of compulsory insurance types is China's construction safety insurance regulation of the main causes of construction safety. For these defects, this paper puts forward the following the improvement of the construction safety insurance model.

In this model, the safety of the construction enterprise or not is directly related to the engineering cost of enterprises, companies can even sign construction contract with the owner. Through the market competition the enterprise in violation of the cost of insurance company, at the same time increase the benefit of safety investment is also clearly visible, construction safety become "chip" enterprises to participate in market competition.

By the law of compulsory insurance system is a kind of measures to protect the safety of buildings. Due to the regulation of compulsory insurance contract, the construction enterprise must be insured to the insurance company, insurance company will according to the accident rate in construction enterprises in the past, the enterprise security facilities, equipped with safety inspectors and regulators security assessment for risk assessment. The quality of construction enterprise risk determines the insurance company for insurance premium rate of the project, the safety assessment of good enterprise, premium rate of natural low, accordingly, if the enterprise of construction safety investment, high accident rate and the lower the premium will also be increased accordingly. Insurance companies may even drop at, if there is no insurance company accept insurance, the enterprise did not compulsory insurance contract signed with the owner cannot construction contracts.

Construction safety risk through insurance on to the insurance company, insurance company through market competition to provide more and better service, because the compulsory insurance will increase the cost of enterprise, the poor safety of construction enterprise is bound to be at a competitive disadvantage, until the market eliminated. Such, originally the high costs of government supervision and regulation is difficult in a business and reap the benefits of safety input fuzzy could be solved by market economy lever, etc.

3.4 Improving the Construction Safety Insurance Market

Draw lessons from foreign experience in the development of engineering insurance, based on the analysis of the above model, in order to realize the improvement of the engineering insurance market in our country, put forward the following Suggestions.

(1) Perfecting the legal system, the government enforces compulsory engineering insurance. By construction companies and the insurance company is covered by the insurance and game analysis, under the condition of the government not to interfere in, insurance companies and no insurance benefits is the same, even if the enterprises want to insured, the insurance company for its own benefit consideration, will also choose not willing to accept insurance. To solve this contradiction, we need the government's mandatory rules, through perfecting the laws and regulations of the engineering insurance market, involve construction companies to enforce in engineering insurance. After insurance company accept insurance will pay more attention to the safety of the construction enterprise, through such risk transfer, increase the cost of illegal construction enterprise, through the competition in the market rather than government regulation is solving the problem of construction safety.

(2) Reasonably determine the engineering insurance rate. In the construction engineering insurance is a floating premium rate, give full play to the automatic adjustment function of the market. Building enterprise insurance rate and decreased with the increase of security, and for the insurance company, with good security companies to more strict safety management, thus the probability of accident and reduces, so the insurance cost will reduce, it also conforms to the rules of insurance market. On the other hand, if the insured enterprises frequent safety accidents, insurance rates also will increase, and poor evaluation of construction enterprise, and will have been rejected. The insurance company will accord to the size of the insured, allocation of safety inspectors to check each unit, prompted by the insured to improve risk control level unceasingly.

(3) The reasonable distribution of the source of premium. Construction companies involved in insurance, the premium is undoubtedly a huge spending, if the source of the premium ambiguity problem, then forced engineering insurance mode cannot function properly, so you have to draw the source of the premium. How much premium will affect the costs and benefits of construction enterprises, to direct the management of risk control is the construction enterprise, and not the construction unit. If it is for the construction unit, from the construction units to control the risk of construction units, clearly there will be a gap and lag problem, insurance premium should be formally incorporated in the tender offer, finally credited to project cost. Only through this method can solve the problem of the source of the insurance, construction safety insurance system can implement smoothly.

4. The Conclusion

Construction safety management has always been a problem in the world, especially in the aspect of government regulation, there are all kinds of loopholes, whether through government regulation under the condition of the game analysis between the construction enterprise can see, increase the income gained by the safety input costs measured is not clear, this is the main reason for the increased security hinder enterprises. Policy regulatory loopholes, earnings fuzzy and construction safety accident makes the building enterprise of small probability is fluky psychology, so should be introduced compulsory insurance model, through the market from a certain extent, solve the problem of construction safety.

Construction safety management in our country the current government regulatory model more problems, more conducive to the improvement of the construction safety and healthy development of construction market, Through the above analysis, confirmed the government supervision in construction safety is not the unshakable status, thus by introducing insurance market as the core of market regulation construction safety, put forward the problems existing in the construction safety insurance market in China and the implementation condition, and thus put forward the improvement opinion, hopes to through economic levers - building insurance market, adjust to improve construction safety management, safety issues to improve the construction market has a positive effect.

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