第IV部門　　The Structure of Joint Venture Agreement and Social Efficiency

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1. Introduction

Many construction projects are executed by Joint ventures (JV) both in native and in international projects. As we all know construction involves many risks. In the JV agreement the partners define how to share the risks and costs during the course of the project, and at the same time define the procedure the decision when an uncertainty occurs. In this paper, two models are proposed to analyze the impact of each type of contracting structure on the JV members' incentives regarding unverifiable efforts. We also analyze the effect of the liquidated damage rule for EOT on the economic efficiency of the JV project.

2. The assumption and procedure of the model

The two companies, A and B set up a JV to undertake a project. We assume all the partners related with the project is risk neutral. The construction will be undertaken according to the procedure as **Fig.1**. First, at point a, the two companies sign the JV contract with the owner, in this contract they will define the shares of investment. The share of partner A and B are denoted by α and (1-α) respectively. In this contract, they also define the time limit of the project as q_0 and the sum of the contract as p_0. The time limit q_0 defined in the contract intially is decided according to the standard technology and the condition of the owner. They also define a compensation rule to make sure that the owner will always get the benefit v even there is delay. If the project is delayed by Δq, the JV will pay the owner $t\Delta q$ as compensation.

At point b, the partners of the JV partners will choose their effort levels for the project. The effort level of partner A and B are denoted by i_A and i_B respectively. The parameter of effort levels are unverifiable for the third part.

At point c, the states realized as $d \in \{g, b\}$. g denotes the states realized are same with the one defined in the contract, while b denotes the states are tougher than the one in the contract. If $d = b$ it is impossible to finish the project in the time limit defined in the contract. The partners need to pay additional cost to finish the project and pay compensation to the owner.

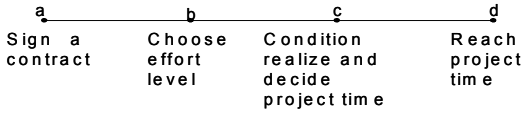

Fig.1 The procedure of the model

3. Integrated type JV

(1) The sponsor style JV

The sponsor (partner A here) will not only define the effort levels of his own but also of partner B. At point c, if the real state realized as g there is no need to change anything. While if it is b the sponsor should choose optimal extension of the time limit by minimizing the loss of the JV under the condition the partners had chosen their effort levels $\hat{i}_A, \hat{i}_B$ at point b. The optimal extension of the time limit Δq^* can be calculated. The partners can choose their effort levels considering the probable optimal extension at point c to make sure to minimize their expected losses. Then they can get the optimal effort levels at point b.

(2) The partner style JV

In the partner style JV all the partners they choose their actions by maximizing their own expected benefits. At point c, when the realized state is b partners choose the optimal extension of the time limit by maximizing their expected benefit. We can find that the optimal extension is same with the one chosen in the sponsor style. Partners choose their effort levels at point b by considering the optimal extension at point c by maximizing their expected benefits.

Comparing the two style of integrated type JV, we can get the following result. There exists $s^\circ(> 1)$, when $a > s^\circ b$ partner A will do higher effort than social efficient effort, while partner B will do lower effort than social efficient effort. When $b/s^\circ < a < s^\circ b$, both of them will do lower effort than social efficient effort. When $b > s^\circ a$ partner A will do lower effort while partner B will do higher effort.

4. Separated type JV

We assume that the effort levels of the partners are independent, If at point c, the real conditions are $d = (d_A, d_B)$. Let $d_A, d_B \in \{g, b\}$ denote the real conditions of partners according to the subproject of each partner. The probability of each set of conditions of both partners are: $\mathrm{Prob}[d = (b, g)] = \pi_1$, $\mathrm{Prob}[d = (g, b)] = \pi_2$, $\mathrm{Prob}[d = (b, b)] = \pi_3$, $\mathrm{Prob}[d = (g, g)] = \pi_4$, the probabilities are exogenous, and $\sum_i \pi_i = 1$. When the project is delayed, the compensation to the client should be shared among the partners. The share of the agreement compensation is defined as: 1) only one subproject is delayed: the compensation to the client should be paid by the patner who undertakes the subproject; at the same time this partner has to pay to the other partner for his fixed cost. How long should the project time is extended is decided by the delay partner. 2) if both the subprojects are delayed, the project time extension and share of the compensation to the client will be decided by negotiation.

(1) The sponsor style JV

In the sponsor style, the sponsor (partner A) will decide the effort levels of both partners to maximize the profit of the JV. The effort levels chosen at point b is denoted by $\hat{i}_A$, $\hat{i}_B$. At point c, the real state realized. By minimizing the cost, the optimal project can be calculated. At point c partners will choose this optimal project as the new time limit. At point b partners can choose their effort levels the prediction of the optimal project time at point c, then they can get optimal effort levels at point b.

(2) The partner style JV

In this section, the partner style JV is discussed. At point c the real conditions realized. How to change the project time will be analyzed. At first, the real conditions are $d = (g, b)$, (b, g), only the project time of the subproject which realized condition is b will be changed. The compensation for the delay will be undertaken by the partner whose subproject is delayed. When the real conditions are $d = (b, b)$, the project time extension will be negotiated between the partners. If the partners can not agree with each other, they will pay large penalties P_A, P_B. The result of the negotiation, the project time which satisfies with social optimal same with the one in the sponsor style in separated type JV. At point b the partners can choose their effort levels by maximizing their expected profits, then we can get the effort levels they chose at point b.

Table.1 Comparison the efficiency of the JVs

Type of JV		EOT	Effort level
Integrated type	Sponsor style	efficiency	efficiency
	Partner style	efficiency	inferior
Separated type	Sponsor style	efficiency	efficiency
	Partner style	efficiency	inferior

Comparing the four styles of JVs, we can get the above Table 1.

(3) The effect of the agreement compensation

We consider that the compensation can be larger than the losses of the client. We can find that the efficient effort levels of the partners can be induced by larger compensation. If it is defined too large, it is possible no one will take part in the bid for the project.

5. Conclusion

The main results of this research can be summarized as follows:

- All kinds of JVs, the principle of decision of the project time extension ex post is to minimize the loss of the JV. In the separated type of JV it is not always that the partners can agree with each other about the extension of the project time, the partners have to undertake some cost to negotiation.
- No matter which type of JV, the sponsor style JV which is based on the trust between the partners is more efficient than the partner style JV in which the partners are equal.
- The separated type of JV is more suitable for the project which can be divided into several independent subprojects.
- When the project can not be divided into subprojects because of the technology needed, and it is impossible to set up an integrated type JV, it is possible that the project will be executed inefficiently.
- To give an incentive to the partners to execute the project efficiently compensations which are larger than the real losses are needed. Under this condition it is possible for the contractors to get no profit, though.