

RISK-SHARING RULE IN PROJECT CONTRACTS

Kiyoshi Kobayashi, Toshihiko Omoto

Graduate School of Management
Kyoto University
Yoshida-Honmachi, Sakyo, Kyoto, 606-8501, Japan

Masamitsu Onishi

Dept. of Urban Management
Graduate School of Engineering, Kyoto University
Yoshida-Honmachi, Sakyo, Kyoto, 606-8501, Japan

Abstract: In this paper, the risk sharing rules are investigated to characterize the contractual structure of the project contracts. The authors exclusively focus upon the GCW and the FIDIC forms, which can be regarded as typical examples of incomplete contract forms. Risks involved in construction works are classified into exogenous and endogenous ones. The paper claims that clear differences in both contract forms in coping with endogenous risks can be found, while there are no essential differences in dealing with exogenous ones. The paper concludes by summarizing the remaining research issues to be scrutinized in the future.

Keywords: Risk sharing, Project Contracts, Incomplete Contracts, Renegotiation

1. INTRODUCTION

The traditional contract theory has assumed that a contract should contain the agreements as to how to deal specifically with all expected incidents which may, or may not, occur in the future. If the parties to a contract intend to contain all agreements for uncertain situations, a contract document may become extremely complex. Moreover, in the case of large-scale projects that have so much uncertainty, it is in fact impossible to draft a contract [1]. Rather, a contract cannot help being incomplete contract [2].

For the reasons described above, incomplete contracts do not provide specific responses for all contingencies but the rules to cope with contingencies. There are several rules, which should be contained in an incomplete contract, but one of the most important ones is the risk-sharing rule.

In this paper, the risk sharing rules are investigated to characterize the contractual structure of project contracts. The author exclusively focus upon the GCW form (The Standard Form of Agreement and General Conditions of Government Contract for Works of Building and Civil Engineering Construction) [3] and the FIDIC form (Federation Internationale des Ingenieurs-Conseils) [4], which can be regarded as typical examples of incomplete contract forms.

2. METHODOLOGY

2.1 Exogenous risks

In a project, there are many unforeseen contingencies such as geological conditions, nature, change of design or scope of work, law and so on. We call them exogenous risks because parties to a contract cannot control them completely. It is impossible to describe such unforeseen contingencies in a contract, thus a contract cannot help being an incomplete contract.

Instead of providing for all unforeseen contingencies, risk-sharing and renegotiation (variation) rules are contained in incomplete contract. The parties make decisions considering the gains that they can get when such an unforeseen contingency occurs under the variation and the risk-sharing rules described in the contract. It would not be efficient for a contract to allow variations for all risk events. In fact, most contracts do not allow variations for many risk events. Which events should be allowed as a variation depends on the characteristics of each risk event. In an incomplete contract, following two rules are important to cope with the occurrence of exogenous risks: 1) *Who should bear a loss*, 2) *Whether a contract variation should be allowed or not*.

2.2 Endogenous risks

A project contract, as an incomplete contract, has the following three important features:

1) The contractor must complete the work in compliance with the description of the works and within the time for completion. The contractor is prohibited to cancel the contract in both GCW and FIDIC forms, whatever may happen, other than the very limited situations like the employer's non-payment for over a certain period of time.

2) To implement a project for the owner and to get and start a project for the contractor, investments are needed beforehand. Such investments are valueless for other projects, thus, are called relation-specific investments.

3) To make a contract enforceable, a third party such as a court must verify the contingencies or the behaviors of the parties. Some of the agreements in a contract such as the time for completion or the amount of payment are verifiable by the court. But it is often the case with a project that the verifiability is not guaranteed. In this case, it is difficult for the court or the third party to settle a dispute based on the information about the contingencies which have been realized. Such a situation can be described as being observable but unverifiable.

The factors of prohibition of cancellation of contract, relation-specific investment, unverifiability have close relationship with each other. If such factors are contained in a contract, one of the parties may take advantage of another party's investment and make a breach of contract intentionally, that is called a *hold-up problem* [5], or they may conceal the information that leads to disadvantages to themselves, that is called a *moral hazard*. Such risks as to lead to a *hold up* or *moral hazard* are raised by the both parties' strategic behaviors and, therefore, we call them endogenous risks. In an incomplete contract, both exogenous and endogenous risks must be considered to achieve efficiency for a contract performance.

2.3 Project Contracts as Incomplete Contracts

Project contracts do not allow cancellation offered by the contractor. If an unforeseeable contingency causes a loss, the parties intend to solve the problem of loss sharing according to the clause of variation and dispute resolution in accordance with the contract. In an incomplete contract, the significances of providing variation rules and dispute resolution rules in a contract are of the following three points: 1) If exogenous risks realize, the parties can complement the efficient variation and dispute resolution. 2) Providing variation rules makes the structure of contract very simple. 3) Proper design of an initial contract and variation rules gives the parties incentive to comply with the contract. In other words, optimal design of a contract prevents endogenous risks.

3. PROJECT RISK

The principal makes a planning and preliminary survey and design prior to the project implementation. The contractors estimate the cost based on the information at the time of the bid and submit an offer. The awarded contractor takes charge of the project from preparation to completion. Principal often makes kinds of payments; advanced and interim and final. The contractor is obligate

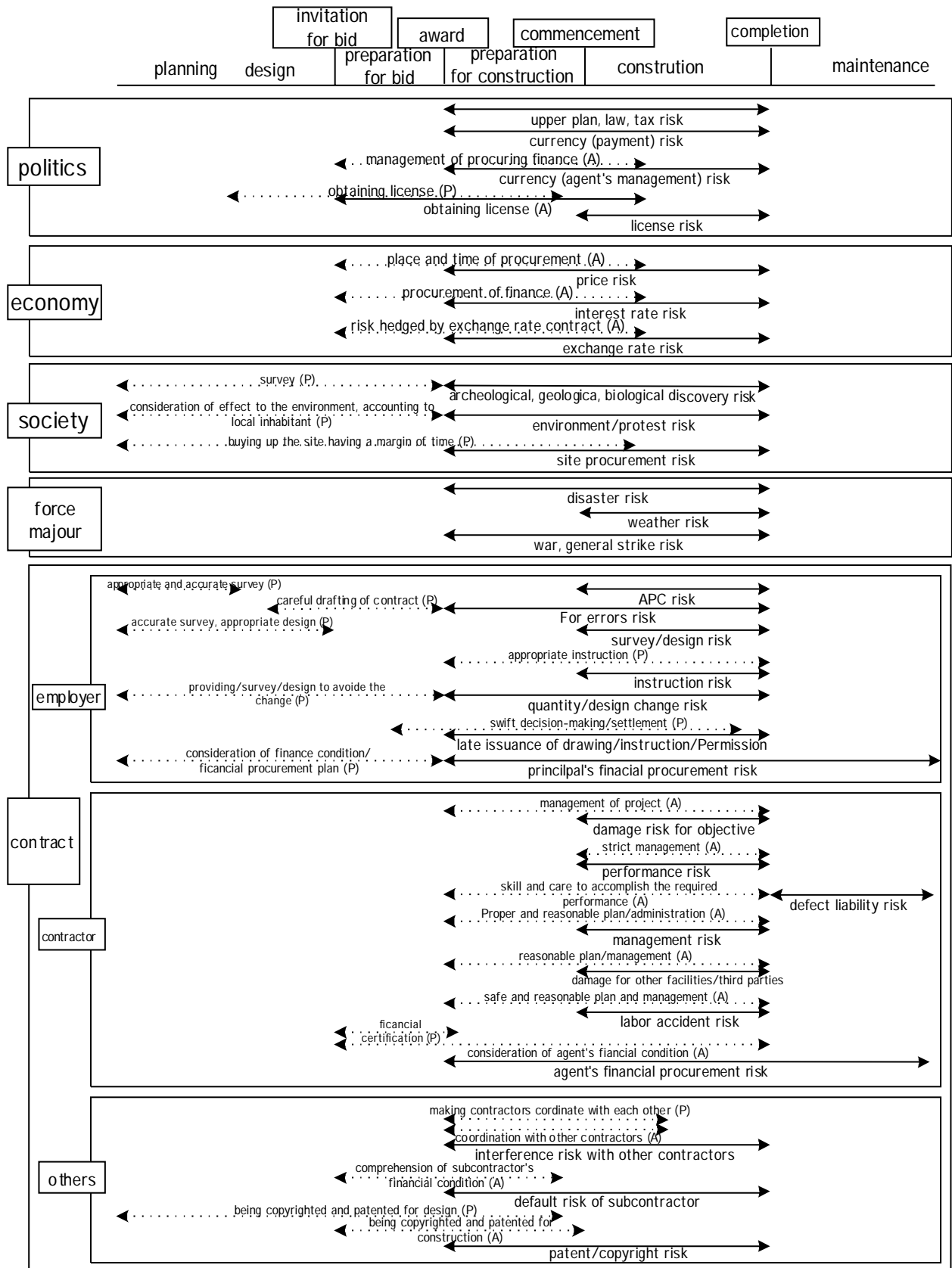
to repair the defects found in a certain period of time after the completion. The project proceeds as shown in **Fig-1**. In this figure, major project risks are categorized and their perils and hazards are shown in the order of the flow that they occur.

Focusing on the peril of the risks, major project risks are classified into five categories: politics, economics, society, force majeure, contract. Political risk means that such a peril has a political factor i.e. policy changes, and so on. It is difficult for private contractors to foresee such a risk. Social Risk means that its peril involves a social problem such as a fossil discovery, pollutions, protests, and so on. This risk occurs throughout the project. Force majeure risk means that its peril is force majeure such as earthquake, flood, weather, war, general strike, and so on. Contractual risk means that its peril or hazard is the parties' behaviors. Careful preliminary surveys and designs and proper plan and management can reduce the contractual risks to a certain extent. But the contractual risks cannot be avoided even though the parties' have made the best efforts to eliminate them by use of their ability to foresee or the information available. In this sense, a contractual risk is recognized as an exogenous risk. But if the parties make negligence intentionally, more large-scale risk can happen. A risk that gives incentive for a moral hazard or a hold up is recognized as an endogenous risk. In reality, it is difficult to distinguish exogenous and endogenous risks.

4. EXOGENOUS RISKS AND VARIATION

4.1 Risks and Risk Sharing Principles

The problem of risk sharing is recognized as that who should bear a loss when a risk occurs [6]. Posner and Rosenfield [7] have proposed that the risk sharing in the contract law result in a problem that which party would bear a loss if they could have foreseen that contingency. In other words, the problem are 1) Which party can prevent or control the risk more efficiently and 2) If the risk cannot be prevented or controlled, which party is in a better position to protect himself against the loss. We can derive the risk sharing principles as follows: 1) The party who can assess and control the risk should bear it. (We call it the first principle.) 2) If none of the parties cannot assess or control the risk, the party who can bears it easier or procure the insurance from market should bear it. (We call it the second principle.) Especially, in the case that the principal is a public sector, it has usually more capability for bearing the risk and is expected to play the role as a deep pocket under the second principle.



Bold-line arrows show the stage in which the peril of each risk occurs. Dotted arrows show the hazards and the stage in which they occur. (P) and (A) show the hazards of the principal and the contractor.

Table-1 Major Risk Events and Risk-Sharing / Variation Rules

Risk Event	Result		GCW (1989)				FIDIC (4 th edition)			
	L	C	R	C	Relating clauses	R	C	Relating clauses		
Upper Plan	2	Y	(P)	(Y)		(P)	(Y)	44.1 Extension of Time for Completion 55.1 Variations, 52.1 Valuation of Variation		
Law	2	Y	(*)	(*)	Depending on laws	P	Y	70.2 Subsequent Legislation		
Tax	2	Y	(P)	(*)		P	Y	70.2 Subsequent Legislation		
Currency Restriction	2	Y	-	-	No clause for domestic contract	P	Y	71.1 Currency Restriction		
Foreign remittance	1	N	-	-	No clause for domestic contract	(A)	(N)	No clause		
License of P	1	Y	(P)	(Y)		P	Y	26.1 Compliance with Statutes, Regulations		
License of A	1	N	(A)	(N)		A	N	8.1 Contractor's General Responsibilities		
Price	1	Y	*	Y	21 Change of contract amount for fluctuation of prices and wages	*	Y	70.1 Increase or Decrease of Cost		
Interest rate	1	N	(A)	(N)		(A)	(N)			
Exvariation	1	N	(A)	(N)		A	N	72.1 Rates of Exvariation		
Fossil Discovery	1	Y	P	Y	17 Variation of Conditions	P	Y	27.1 Fossils		
Pollution	1	Y	P	*	18 Change in the Work 17 Variations of Conditions	*	*	19.1 Safety, Security and Protection of the Environment, 51.1 Variations		
Protest Movement	1	Y	P	Y	18 Change in the Work	P	Y	20.4 Employer's Risks		
Site procurement	1	Y	P	Y	2 Possession of Site 18 Change in the Work	P	Y	42.2 Failure to Give Possession		
Natural Disaster	2	Y	P	Y	18 Change in the Work 19 Extension of Time 25 Damage by Disaster	P	Y	20.4 Forces of Nature, 20.3 Loss or Damage Due to Employer's Risks		
Weather	2	Y	P	Y	18 Change in the Work 19 Extension of Time	P	Y	44.1 Amount or Nature of extra or additional work		
War	2	Y	-	-	No clause for domestic	P	Y	20.4 Employer's Risks		
General Strike	2	Y	-	-	No consideration	P	Y	20.4 Employer's Risks		
APC	1	Y	P	Y	17.1 Special Condition not specified in documents 18 Change in the Work 19 Extension of Time	P	Y	12.2 Not Foreseeable Physical Obstructions or Conditions 11.1 Inspection of Site		
Contract Documents	1	Y	P	Y	17.1 Inconsistency of drawings and Errors or Omissions in Documents	(*)	(*)	5.2 Priority of Contract Documents 8.1 Contractor's General Responsibility		
Failure of survey/design	1	Y	P	Y	17.1 Revelation of Condition different from Design 18 Change in the Work	P	Y	17.1 Setting-out 11.1 Inspection of Site		
Instruction Failure	1	Y	P	Y	16.1 Duty of Variation of improper contract 19 Extension of Time	P	Y	8.2 Site Operations and Methods of Construction		
Quantitative Change	1	Y	P	Y	24 Variation of Payment	P	Y	44.1 Amount or Nature of extra or additional work, 51.1 Variations		

to be continued

Additions	1	Y	P	Y	18 Change in the Work	P	Y	44.1 Amount or Nature of extra or additional work
Delay of Drawing/ Instruction/ Permission	1	Y	P	*	13.3 Inspection of Material Quality, 14.4 Inspection 27 Inspection/Trade 28.3 Payment	P	Y	6.4 Delays and Cost of Delay of Drawings 70.1 Increase or Decrease of Cost
Delay of Payment	1	Y	P	Y	36 Contractor's failure of Non-repayment of payment	P	Y	60.10 Time for Payment, 69.1 Default of Employer, 69.4 Contractor's Entitlement to Suspend Work
Default of P	1	Y	-	-	No provision for public sector	P	Y	69.1 Default of Employer (In reality, Contractor's Loss)
Damage for Objective	1	N	A	N	23 General Damage	A	N	8.1 Contractor's General Responsibilities, 20.1 Care of Works 20.2 Responsibility to Rectify Loss or Damage
Performance	1	N	P	N	16.1 Duty of Reconstruction for improper document 27 Inspection/Trade	P	N	8.1 Contractor's General Responsibilities, 38.2 Uncovering and Making Openings, 39.1 Removal of Improper Work, Materials or Plant, 39.2 Default of Contractor in Compliance, 48.1 Taking-over Certificate
Defect Liability	1	N	A	N	37 Defect Liability	A	N	49 Defect Liability, 50 Contractor to Search
Liability Management	1	N	A	N	38 Damage by Delay of Implementation	A	N	47.1 Liquidated Damage for Delay
Damage for other facility	1	N	A	*	22 Occasional measures 24 Damage for Third Party	A	*	19.1 Duty of Prevention of Damage, 22.1 Damage to Persons and Property 29.1 Interference with Traffic and Adjoining Properties, 30.2 Transport of Contractor's Equipment or Temporary Works Contractors' responsibility except the case of principal causes the accident.
Labor Accidents	1	N	A	*		A	*	
Financial Procurement	1	N	(A)	(N)		A	(N)	8.1 Contractor's General Responsibilities
Default of A	1	N	G	N	39 Guarantor's Responsibility for Completion	P	N	Principals' responsibility except for performance.
Interference of other contractors	1	*	-	(*)	Contractor is obliged to obey principals' coordination.	-	(*)	Clause 31 provides the duty to cooperate with other contractors
Default of Subcontractor	1	N	(A)	(N)		A	N	4.1 Subcontractor
Patent/Copy right	1	N	*	*	Usage of Patent Right (Principal bear in case of no specification.)	*	Y	28.1 Patent Rights (No provision for principal)

Table-1 shows how GCW and FIDIC provide for the risk sharing. We do not find the risk-sharing principles stipulated in GCW and FIDIC, but we find the risk sharing rules of both forms are in accordance with the basic principles as described above. As shown in Table-1, there is no substantial difference between GCW and FIDIC in the regard.

Note that the problem of risk sharing should be analyzed from the two viewpoints: 1) whether risk-sharing rules induce the parties' efficient behavior (efficiency), 2) whether risk sharing rule induce fair attitudes to share the consequences depending on the capability of the parties (fairness). In the research of contract law, the contract that satisfies efficiency and fairness at the same time was sought but Sykes [8] have proved that there does not exist such a contract. But in these papers, an efficient cancellation of a contract is admitted, but they did not deal with the project contracts that cancellation is forbidden.

4.2 Risks and Variation (Renegotiation) Principles

From the general view points of economics of law, in contracts such as project contracts which do not allow cancellation, a contract variation is justified when the benefits of both parties are increased. On the contrary, a variation that is aimed to increase the transaction surplus of only one party is not justified. We call such a principle as the 'variation principle'.

Based on the variation principle, if the contractor should incur a loss due to materialization of a risk which he owes, variation is not admitted. If such a variation is admitted, 1) the loss that is caused by the contractor is transferred to the principal. Thus, only contractor's transaction surplus increases. 2) Endogenous risks in that the contractor does not make efforts to achieve efficiency may occur. If the principal should owe the risk, a variation should be admitted because admitting variation gives the principal incentive to make an effort to achieve efficiency. And as for the risks whose hazards do not belong to any party, a variation should be admitted, 1) if the variation increases the efficiency, or 2) the variation can induce one party to behave in a manner to achieve efficiency while the other party owes the risk because of his deep pocket.

Reviewing the **Table-1**, there is no substantial difference in variation rules between GCW and FIDIC including customs and business practices. Note that the column of 'result' shows our determination based on the risk sharing and variation principles. The number 1 in the column 'L' means that the risk sharing should be determined based on the first principle of risk sharing, and the number 2 means the second one. The column 'C' shows the variation rule. The column 'R' in the GCW and FIDIC columns show the risk sharing rule, 'C' shows whether there is a variation rule or not. 'P' in the column 'R' means that the principal owes the risk, 'A' means

that the contractor owes risk, '-' means there is no clause, 'Y' in the column 'C' means that the contract provides variation, 'N' means no variation clause in the contract, '* ' means the parties share the risk.

5. ENDOGENOUS RISKS AND VARIATION RULES

5.1 Incomplete Contracts and Endogenous Risks

Endogenous risks are affected by the contract structure, so it is not sufficient to provide only variation and risk-sharing rules to achieve efficiency. Whole contract structure, which is composed of the structure of the initial contract, rules of variations and the risk sharing, has to be designed to prevent the generation of endogenous risks.

5.2 Differences in Variation Rule

Project contracts provide the procedure of variation, dispute resolution and remedies to solve conflicts efficiently. Both GCW and FIDIC recognize contractor's right of claim. But we can find the difference in the procedure of claim.

FIDIC provide the strict and detailed procedure of claim, and contractor must proceed claims according to the provisions of the contract. FIDIC clearly establishes the contractor's right of claims to variations and his burden of proof.

In contrast with FIDIC, GCW form does not contain a claim provision but provides the contractors' right to negotiate with the principal. GCW does not have the provision of the contractor's burden of proof of variations. In reality, we can find the basic idea that the principal decides the variations in GCW form. In Japan, there has been a foundation that the principal have the ability to prove or verify the variations and they do not need the contractor's burden of proof. As far as this foundation exists, efficient variations are achieved without the strict and detailed procedure like FIDIC form. In addition, in the case of a public project, the principal have the burden of proof for justification of a variation for the General Accounting Office. But this is not for the contractor but just for accountability for taxpayers.

5.3 Verifiability and Variation Rules

We showed a big difference between GCW and FIDIC as to the contractor's burden of proof in relation to the principal's ability for verification of the claim. The optimal structure of an incomplete contract depends on the principal's ability. Kobayashi *et al.* have proposed the optimal structure of incomplete contracts for both cases when the principal has the ability or not.

First, in the case that the principal has the ability to verify variations, which situation is assumed in GCW form, time for completion, design conditions, amount of payment signed in the initial contract are enforceable. If a variation to the initial

contract is not admitted, the contractor must keep the time for completion. If a variation happens, the variation is made so that the social surplus i.e. the sum of amount of the increase in social benefit and the cost brought about by the variation can be maximized and the social surplus is shared according to the contract. The rules for the surplus sharing may be flexible but the rules must be stipulated in the initial contract.

On the other hand, in the case that the principal does not have the ability to verify variations, which situation is assumed in FIDIC form, it is impossible to make the initial contract enforceable any more. Differences of perception between the principal and the contractor of the initial contract are recognized for the first time when the real condition is revealed. Thus, the initial contract is designed to expect the conditions that make costs lowest in feasible conditions. The initial contract plays a role as the status quo of negotiation process. The initial contract is expected to be changed from the beginning and the time for completion and the contract amount are always changed to increase in the case of variations.

Such a result mentioned above is derived from the assumption that the cost of survey/design or transaction costs such as negotiation costs of variations are ignored, but if the principal's ability to verify is just focused, both GCW and FIDIC are optimal incomplete contract. We have to determine a desirable type of contract depending on the principal's ability, transaction / negotiation costs and design/ survey costs.

6. CONCLUSION

In this paper, it has been pointed out that the project risks are classified into two categories: the exogenous risk and the endogenous risk. There is no difference in risk-sharing rules for exogenous risks between GCW and FIDIC. But there is a substantial difference in rules to verify variations depending on the principal's ability to verify.

REFERENCES

- [1] Hart, O.: *Firms, Contracts, and Financial Structure*, Oxford University Press, 1995.
- [2] Kobayashi, K., Omoto, T., Yokomatsu, M., Wako, T.: The Contractual Structure and Social Efficiency of Construction Works, *Journal of Japanese Society of Civil Engineering*, No.688/IV-53, pp.89-100, 2001. (In Japanese)
- [3] The Central Construction Industry Council of Japan: The Standard Form of Agreement and General Conditions of Government Contract for Works of Building and Civil Engineering Construction (in Japanese), 1989.
- [4] Federation Internationale Des Ingenieurs Conseils (Conditions of Contract for Works of Civil Engineering Construction), Part 1 General Conditions, Fourth edition, 1987.

- [5] Tirole, J.: Incomplete contracts: Where do we stand?, *Econometrica*, Vol.67, pp.741-781, 1999.
- [6] Miceli, T.J.: *Economics of the Law: Torts, Contracts, Property, Litigation*, Oxford University Press, 1997.
- [7] Posner, R. and Rosenfield, A.: Impossibility and related doctrines in contract law: An economics analysis, *Journal of Legal Studies*, Vol.6, pp.83-118, 1977.
- [8] Sykes, A.: The doctrine of commercial impracticability in a second best world, *Journal of Legal Studies*, Vol.17, pp.43-94, 1990.