

# Public-Private Partnership with a Governmental Fund: an Optimal Incentive Device

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# Introduction

- Infrastructure challenges in Japan:
  - Japan needs improvement of its old infrastructure most of which is constructed through 1950-60's.
  - involvements of private sector in both managerial and financial aspects are considered necessary.
- Notable features of the current infrastructure policy in Japan:
  - promoting public-private partnership (PPP) with “concession” (right to operate exclusively)
  - Introducing government infrastructure funds

# The Purpose of this Research

- Studying PPP with a governmental fund from the “incomplete contracting perspectives” (Hart (2003)).
- The scheme can be interpreted as an optimal incentive device among the agents concerned.

# Model (1)

## Project

- There is an infrastructure project with a public goods nature: generating social benefit not traded in the market.
- The project is long-term. It consists of 2 stages: “building” and “operating”.
- The outcomes occurs at the end of operating stage.
- Two types of outcomes: profits, assessed in the market, social benefits, not assessed in the market.

# Model (2)

## Delegation

- The government wants to delegate the tasks to agents of the private sector for their expertise.
- We assume that both the building and operating stages are delegated to a consortium for abstracting away the bundling problem.
- The government is assumed to delegate with a concession contract: the consortium has the exclusive right to operate for a concession fee.

# Model (3)

## Problems from delegation

- Delegation in general may occur moral hazard problems. The government may have to give the consortium appropriate incentives to take actions.
- Distinct problem by delegation in PPP is externalities:
  - the consortium will not internalize the social benefits since it does not affect the profit.
- Possibility of renegotiation may be a problem since it would violate the credibility of contracts.

# Model (4)

## Financing

- We assume that the consortium with no money has to borrow money from private investors.
- A disadvantage of using outside money would be that moral hazard problems may occur; an advantage would be political: taxing is unnecessary.

# Model (5)

## Governmental Fund

- In this model, I focus a governmental fund in assuming it has following characteristics:
  - It raises money through the financial market of a large number of small private investors;
  - It finances the project by a debt contracts: a short-term debt with an option to renew in the same condition.
  - It can observe the consortium's investment decision by spending a fixed amount of monitoring cost  $m$ .



# Model (6)

## Investment decision

- In the building stage, investment that is *not contractible* is implemented. The investment decision has two dimensions: (1) the level of investment  $i$  and (2) the type of investment.
- The investment is assumed to be partly in human capital so that the consortium will be indispensable in the operating stage.
- The indispensability of the consortium will cause *renegotiation* of previous contracts at the end of the building stage.

# Model (7)

## Asset Substitution Problem

- For  $i^*$ , one of the two types of technology are chosen:
  - type1: the first best outcome  $R(i^*)$  realized for sure;
  - type2: high profit  $R_s(i^*)$  with low probability  $q$ , but low profit  $R_f(i^*) < i^*$  with high probability  $1-q$ :
- We assume the following:
  - $$R(i^*) > [qR_s(i^*) + (1-q)R_f(i^*)];$$
  - $$R(i^*) - i^* < q[R_s(i^*) - i^*].$$
- Thus, given the limited liability, the consortium has an incentive to choose type 2.

# Model (8)

## Operating Stage

- The consortium spends unobservable effort.
- The consortium chooses the level of effort  $e$ , given the investment, the debt, and the concession fee.

# Model (9)

## Information

- The consortium knows the level and type of investment and the level of effort
- The government and the financial market (i.e., the private investors) know none of them. However, they observe the debt renewal decision by the government.
- The governmental fund learns the level and the type of investment if it spends monitoring cost.

# Model (10)

## Time Line

- At date 1: the consortium finances its investment with a short-term debt from a governmental fund. The fund decides whether to spend monitoring cost while the consortium decides its type.
- At date 2: the fund observes the consortium's type if it has spent monitoring cost. The fund decides to renew or terminate the loan. If the loan is terminated, the SPV will finance the repayment money through the financial market.

# Model (11)

- At date 2 (continued): Observing the fund's decision, the government forms a belief about the consortium's type. The government and the consortium renegotiate the concession fee. If no agreement is reached, the game ends.
- At date 3: If the game continues, the consortium decides the level of effort. The outcome realizes and monetary rewards are distributed to the parties according to the contract.

# No asset substitution case

- First, we assume away the asset substitution problem. The consortium determines only the level of investment.
- Then, the problem is how to induce the efficient level of investment when there are social benefits that are not assessed in the market.
- We focus on a role of bargaining games.

# Bargaining Game (1)

- Only the government fairly appreciate the value of the social benefits.
- However, through the bargaining game with the government, the consortium can internalize social benefits.
- In this model, the two parties may renegotiate the concession contract since the government has the ownership of the asset and the consortium is “indispensable”.



## Bargaining Game (2)

- **Proposition 1:** *Assume that the consortium has chosen the efficient type of investment and the government knows it. Let  $B$  the social benefit from the investment and the concession fee  $F$ . Then, by setting the high enough initial  $F$  with the government fund guarantee, the government and the consortium lead to renegotiate down  $F$  to  $F - B$ .*

## Bargaining Game (3)

- **Intuition:** First, since the government appreciate the social benefits, both parties bargain over the value of both the profits and the social benefits. Second, once the project is operated, the social benefit will be necessarily generated and appreciated only by the government. Thus, through the bargaining game, all the social benefits are considered to go to the government part. But then, with binding outside option of the government, the consortium will acquire all the increased value of the social benefits in monetary form.

# Bargaining Game (4)

- **Lemma 1:** *In the situation of Proposition 1, the consortium will choose  $i^*$  and  $e^*$ .*
- **Intuition:** The result of Proposition 1 implies that the government will have a fixed level of share so that the consortium will be the residual claimant. This gives the appropriate incentive to invest efficiently.

# Bargaining Game (5)

## Information production for the Government

- For the bargaining game to lead to efficient outcomes, the government should know the investment type of the consortium at the time of the bargaining.
- However, since it delegates all the tasks, the government should also delegate the information production of the consortium type.
- In this model, the government fund reveal publicly the type of consortium through its loan continuation decision.

# With asset substitution case

- Now, we assume back the asset substitution problem. The consortium determines not only the level of investment but the type of investment.
- In the setting of model, the consortium has incentive to become inefficient model: choosing asset substitution.
- We focus on the governance role of a government fund.

# Governance role of Governmental Fund (1)

- The government fund can observe the type of the consortium if it spends monitoring cost.
- Notice that it is rather weak as a governance device: the fund cannot force any action of the consortium; it only observes its action.
- However, with interaction of the financial market, it can work as an effective governance device.

## Governance role of Governmental Fund (2)

- **Proposition 2:** *Suppose the government fund has spent monitoring cost, which is observable to the consortium. Then, if the fund renews the loan then the investors in the financial market supply money to the fund with the same interest rate. If the fund terminates the loan then the investors to the financial market supply money directly to the consortium with a high interest rate.*

## Governance role of Governmental Fund (3)

- **Intuition:** Suppose the consortium is the inefficient type. Then, knowing it, the government fund has no incentive to renew since it never make profits; it terminates the loan. Suppose instead that the consortium is the efficient type. Then, the government fund no more profit by terminating the loan since then the consortium will finance directly from the financial market. The investors in the market correctly infer.



# Governance role of Governmental Fund (4)

- **Lemma 2:** *Given the situation of the Proposition 2, the consortium never chooses asset substitution.*
- **Intuition:** Suppose the consortium chooses asset substitution. But then, the government fund terminates the loan and the investors, observing it, set the interest rate of the loan higher that will eliminate any excess profit of the consortium by choosing the asset substitution.

# Discussion (1)

- The government's learning of the consortium's actions is crucial in implementing an efficient bargaining game. In the simple setting of this model the government can learn the information through the loan continuation action of the governmental fund.
- However, in the real world, information structure could be more complicated and delegation of the information production would require a more complex scheme.

## Discussion (2)

- This model assumes away the initial choice of consortium.
- However, if innate nature of the agents are sufficiently different the initial selection through an auction for example would be necessary. But then, the possibility of the subsequent renegotiation of the initial contract would harm the effectiveness of the auction.

# Conclusion

- Bargaining games can mitigate externalities problems caused by delegating infrastructure projects to private agents. Thus, properly designing rather than just avoiding bargaining games would be an important from the policy perspective.
- Governmental fund can play a governance role if the information produced by the fund is appropriately conveyed to the financial market. Thus, promoting interaction of the fund and the financial market through information would be important from the policy perspective.

# Reference

- Hart, O. (2003), “Incomplete contracts and Public Ownership: Remarks and an Application to Public-Private Partnership”, *Economic Journal*, Vol. 113, No. 486: 69-76.