

# Transport infrastructure investment and incentives with supranational funding

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# *Introduction*

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- Although transport infrastructure investments are essential for economic activity, they require important amounts of public funds.
- Transport infrastructure projects are usually financed by regional and national governments. Sometimes they are also financed by a supranational organization.
- The European Commission is a clear example.
- The total funds - distributed through the European Regional Development Fund (ERDF), the European Social Fund (ESF), and the Cohesion Fund- raise €340 billion for the period 2007-2013 (European Commission, 2005).

# *Introduction*

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- In this paper we make use of a simple theoretical model to highlight the asymmetric information problems arising when a national project is financed by a supranational organization.
- We distinguish two different levels:
  - The first level is related to the institutional design in which supranational funds are obtained: *The supranational planner and national government relationship.*
  - The second level is related to the selection of the contracts to be used for the construction, maintenance and operation of the infrastructure: *The national government and the contractor relationship.*

# *Introduction*

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- Most of the economic literature concentrates on the second level.
- However, we show that the institutional design regarding supranational funds in the first level may affect politicians' incentives and, thus, main results in the second level.
- We focus on three kind of supranational funding mechanisms: *Total cost-plus*, *sunk cost-plus*, and *fixed-price* financing mechanisms.

# *Introduction*

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- With a *total cost-plus financing mechanism* a percentage of the difference between investments costs and the discounted profits of the project are covered by the supranational organization.
- With a *sunk cost-plus financing mechanism* the supranational organization covers just a percentage of the difference between investments costs and the discounted revenues net of maintenance and operating costs.
- With a *fixed-price financing mechanism* countries are granted with a fixed quantity to support the costs of the project chosen by the country.

# *Introduction*

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- The aim of this paper is to analyze the incentive power of each type of financial mechanism in order to encourage efficiency and optimal pricing.
- Finding the level of the optimal grant is out of the scope of this paper.
- We focus on efficiency. Distribution issues are ignored.

# *A simple theoretical model*

- Let us consider a country with a transport infrastructure project that may be financed by a supranational planner.
- The country is governed by a politician, who must decide the main characteristics of the project, make a cost-benefit analysis, and report it to the supranational planner in order to be financed.
- Suppose only two periods. During the first period, the new infrastructure must be constructed. During the second period, the infrastructure is used by the citizens of the country.
- Let us denote by  $K$  the real investment cost:

$$K = k + \theta - e,$$

where  $e$  denotes the effort exerted by the politician in order to be efficient.  $\theta$  can be understood as an inefficiency measure, implying that efficiency can never be achieved if the politician exerts no effort.

# *A simple theoretical model*

- Let us denote by  $c(e)$  the cost of effort.
- The inverse demand function for the use of the new transport infrastructure is denoted by  $P(Q)$ .
- $C(Q)$  denotes the maintenance and operating costs.
- Let us denote by  $\Pi$  the profits obtained during the second period:  
$$\Pi = P(Q)Q - C(Q).$$
- $C(Q)$  is privately known (*adverse selection problem*) and  $e$  is unobservable (*moral hazard problem*).
- The utility function of the politician depends on his own private income  $X$ , the probability of reelection  $q$ , and the cost of effort,  $c(e)$ :

$$Utility = X(1 + \delta q) - c(e),$$

where  $\delta$  denotes the discount factor.

# *A simple theoretical model*

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- The higher is the welfare of voters in the second period, the higher is the probability of reelection.
- The welfare of voters is defined as the sum of consumer surplus (CS) and the value of social expenditures (G).
- Let us denote by  $S$  the level of supranational funds.

***Assumption 1:*** *Even if the investment cost is reduced to the minimum financing from the supranational planner is always needed.*

***Assumption 2:*** *The value of social expenditures in the second period,  $G$ , depends both on the value of the project and the level of supranational funds in the second period. Formally:*

$$G = g + (1/\delta)(S-K) + \Pi,$$

*with  $g$  being a positive parameter sufficiently high.*

# *Cost-plus versus fixed-price financing mechanism*

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## **Benchmark situation: The social optimum**

***Proposition 1:*** *It is socially optimal to construct the infrastructure at the minimum investment cost and set the price for its use equal to the marginal operating and maintenance cost.*

# *Cost-plus versus fixed-price financing mechanism*

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## **Total cost-plus financing mechanism**

**Proposition 2:** *If the supranational planner uses a total cost-plus financing mechanism, the politician will exert no effort in being efficient, and the price for the use of the new infrastructure will be zero.*

**Corollary 1:** *If the supranational planner uses a total cost-plus financing mechanism, the level of inefficiency will be at its maximum. Moreover, both the use of the new infrastructure and the level of supranational financing will be excessive.*

# *Cost-plus versus fixed-price financing mechanism*

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## **Sunk cost-plus financing mechanism**

**Proposition 3:** *If the supranational planner uses a sunk cost-plus financing mechanism, the politician will exert no effort in being efficient, while the price for the use of the new infrastructure will be equal to marginal maintenance and operating costs.*

**Corollary 2:** *If the supranational planner uses a sunk cost-plus financing mechanism, the level of inefficiency will be at its maximum. However, the socially optimal price is always implemented.*

# *Cost-plus versus fixed-price financing mechanism*

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## **Fixed-price financing mechanism**

**Proposition 4:** *If the supranational planner uses a fixed-price financing mechanism, the politician will exert a strictly positive effort in being efficient, and the price for the use of the new infrastructure will be equal to the marginal maintenance and operating costs.*

**Corollary 3:** *If the supranational planner uses a fixed-price financing mechanism, the socially optimal effort may be implemented.*

**Corollary 4:** *If the supranational planner uses a fixed-price financing mechanism, the socially optimal price is always implemented.*

# *The European Commission and the funding-gap method*

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- The so-called “funding-gap” method is the basic mechanism to co-finance infrastructure investments in the European Union.
- The European Commission finances a percentage of the difference between investment costs and revenues (net of maintenance and operating costs).
- It is a kind of sunk cost-plus financing mechanism which penalizes revenue generating projects:
  - Low incentives in being efficient.
  - In absence of externalities, the socially optimal price is implemented.

# *The European Commission and the funding-gap method*

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## **Additional problems of the funding-gap method:**

- If there are externalities, the funding-gap method does not guarantee optimal pricing (optimal pricing requires the price to be equal to social marginal costs).
- If there are several levels of governments (supranational versus national and national versus regional) the funding-gap method does not guarantee optimal pricing.
- With the funding-gap method, the cost-benefit analysis is just a bureaucratic requirement for national governments to obtain supranational funds

# *The European Commission and the funding-gap method*

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The fixed-price financing mechanism may provide the necessary incentives to reduce costs and charge the socially optimal price.

Moreover, with the fixed-price financing mechanism, the cost-benefit analysis is a very useful tool for governments.

- The problem of giving national governments an *ex ante* fixed amount of funds is that, although it is a very high-powered incentive scheme, the European Commission loses its influence on the selection of projects.
- An intermediate solution: to substitute the funding-gap method by an *ex ante* fixed-quantity funding linked to generic objectives like investing, in “accessibility” , “environmental quality”, etc.

# *Conclusions*

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- Public infrastructure investments are considered a key element not only for economic growth and competitiveness, but also for the improvement in the quality of life.
- Supranational governments such as the European Commission allocate a significant amount of their budget to support the construction of new projects in transport, water, electricity and other economic and social infrastructures.
- Information asymmetries create moral hazard and adverse selection problems which can be mitigated or compounded depending on the financing scheme chosen by the supranational agency.

# *Conclusions*

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- There are two levels in the process of funding, construction and operation of co-financed infrastructure projects.
- The first one relates to the institutional design, in which supranational and national governments negotiate the projects to be financed.
- The second level relates to the selection of the concessionaire for the construction and operation of the project.
- Most papers in the literature focus on the second level.
- However, in this paper we show that the financing mechanism in the first level affects the results in the second level.

# *Conclusions*

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- The supranational financing mechanism should not be related to costs to recover the interest of national governments in productive and allocative efficiency.
- The financing mechanism should not be related to revenue either.
- Optimal social pricing increases social surplus and, therefore, it should be encouraged.
- A subsidizing scheme which penalizes cost efficiency and the optimal pricing should be avoided.