

# Public and Private Investments in Regulated Network Industries: Coordination and Competition Issues

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- Network industries (telecom, energy, transport, water, post..) represent a large share of investment (15% for developed countries)
- Historical tendency from monopoly to deregulation
- But bottlenecks remain: energy transport, rail, water distribution
- In telecommunications: the local loop is a bottleneck but under the threat of new technologies (fiber, wireless)
- Two types of public interventions
  - Regulation of access conditions
  - Public investment (or subsidy to investment)

## The paper

- In many case, public investments is made at the local level
  - fiber, collect,...
- We are concerned about the interplay between public investment and private incentives when
  - private investment is made by large firms under access regulation
  - public investment is made by local authorities
- The objective is to understand the benefits and costs of local intervention, and potential remedies
- Related literature: Dana and Spier (1994), Caillaud and Tirole (2004)

- One representative 'district'
- An incumbent  $I$  can build/upgrade infrastructure at cost  $c > 0$
- Access to the new infrastructure at price  $a$ .
  - The (final) demand is  $\theta D(a)$ ,
  - Elasticity  $\varepsilon(a)$  is increasing and  $\varepsilon(0) = 0$ .
  - The surplus is  $\theta W(a)$ , with  $W'(a) = -D(a)$
- Regulator sets a price cap on access  $r \geq a$  (objective: total welfare)
- Local authority  $L$  may build an infrastructure at random cost  $k \geq c$ 
  - Objective  $\theta W(a) - \text{transferts}$

# Timing

- 1  $R$  decides of the price for the access  $r$
- 2 The value of  $k$  is realized
- 3  $I$  decides whether to invest
- 4  $L$  decides whether to build a competing network.

If  $I$  invests alone, price is  $a = r$

If  $I$  invests and  $L$  duplicates, competition induces  $a = 0$

If  $L$  invests alone, it sets (optimally)  $a = 0$

## Shared information ( $k$ is public)

- The decision of  $L$  depends on  $I$ 's choice
  - If  $I$  doesn't invests,  $L$  invests if  $\theta W(0) - k \geq 0$
  - If  $I$  invests,  $L$  duplicates if  $\theta W(0) - k > \theta W(r)$
- $I$  invests only if  $\theta D(r) \geq c$  and  $L$  doesn't duplicates
- The welfare would be  $\theta W(r)$  if  $I$  invests and  $\theta W(0) - k$  if  $L$  invests, the optimal rule is:
  - $I$  invests at  $r = r_{BB}$  with  $\theta D(r_{BB}) \geq c$  if  $\theta W(0) - k \leq \theta W(r_{BB})$
  - $L$  invests if  $\theta W(0) - k > \theta W(r_{BB})$

**Result 1:** *With shared information (even if regulator is not informed about  $k$ ), the optimal rule can be implemented with  $r = r_{BB}$  and  $L$  free to duplicate*

- $I$  anticipates the behavior of  $L$
- The choice of  $L$  is aligned with the preference of regulator

Thus local public investment can have negative drawback only if there is asymmetric information or local and regulator preferences are not aligned

- Suppose that  $k$  is not observed by  $I$
- Then it cannot no longer predicts the behavior of  $L$  which duplicates if  $k < \hat{k}(r) = \theta(W(0) - W(r))$ .
- Define the access price  $r_D$  that cancels the expected profit of  $I$ :  $[1 - F(\hat{k}(r_D))] \theta r_D D(r_D) = c$ .
- If  $r_D$  doesn't exist, then the regulator choose between forbidding duplication with welfare  $\theta W(r_{bb})$  and public investment with welfare  $\mathbb{E} \{ \max(\theta W(0) - k, 0) \}$ .
- Assume that  $r_D$  exists:  $r_D > r_{BB}$ .

- Allowing duplication and setting  $r = r_D$  yields a welfare

$$\theta W(r_D) + E[\max\{\theta W(0) - k - \theta W(r_D), 0\}]$$

- Forbidding duplication and setting  $r = r_{BB}$  yields a welfare  $\theta W(r_{BB})$
- With duplication there is a trade-off because
  - $L$  intervention reduces the final price
  - The risk induced on  $I$  leads the regulator to raise the price

**Result 2:** *When  $k$  is not observed by  $I$ , it is optimal to forbid duplication.*

- The regulator then chooses between  $r_{BB}$  and only public investment
- In this case the risk premium is too large to justify the intervention of  $L$
- There are 3 inefficiencies
  - Too high prices
  - Inefficient duplication (when only  $I$  should invest)
  - Excessive investment by  $I$  (when only  $L$  should invest)

Some issues arise because the local authority objectives are not aligned with the regulator preferences

We identify three such motives

- 1 Perequation or lack of information about  $\theta$  imply rents left to the incumbent: then local authorities duplicates too much and may generate a "stranded asset" problem because they don't internalize the profit of the incumbent
- 2 Cost externalities between region (returns to scale): the duplication in one district raises the cost in other districts by reducing the overall scale of investment
- 3 "Electronic Dumping": mobility of firms/households may motivate local authorities to invest to attract constituents
  - Local competition with leads to excessive local investment
  - Attracting constituents from other districts reduces their base for recouping investment

## Perequation (shared information)

- The access charge is such that  $\theta D(r) - c = \Pi > 0$
- Duplication occurs if  $\theta W(0) - k > \theta W(r)$  while efficiency would require  $\theta W(0) - k > \theta W(r) + \Pi$ 
  - There is excessive duplication
- Alternatives to ban on duplication or laissez-faire
  - 1 price-floor on  $L$  is not optimal if  $\Pi$  is small
  - 2 ex-post authorization (if  $k$  is observed by  $R$ ) induces insufficient duplication ( $c$  is sunk but not revenue)
    - $\theta W(0) - k > \theta W(r) + \theta D(r) > \theta W(r) + \Pi$
  - 3 Obligation of compensation of stranded assets is better than ex-post authorizations with more duplications
    - $\theta W(0) - k > \theta W(r) + c$

## Companion paper: Negotiation vs duplication

- We allow  $L$  to contract with  $I$  to reduce the price
- Ex-ante contracting improves welfare
- Ex-post (after  $I$ 's investment) contracting improves welfare if  $L$  is ex-ante committed not to duplicate
- When  $I$  has private information there may be problems because  $L$  uses duplication as a threat in the negotiation ex-post and its credibility depends on equilibrium beliefs
  - $L$  should duplicate when  $I$  wants to reject a low price offer
  - "negotiation trap" (hold-up):
    - $L$  duplicates if  $I$  rejects the offer thus  $I$  always accepts the offer at profit below investment cost
    - ex-ante  $I$  doesn't invest

- Investment by local governments may help fostering fast development of new infrastructures
- Public policy should guard itself from potential crowding out of efficient private investment
- Key dimensions
  - the risk born by private investors
  - the differences between the motives of the local authorities and the social welfare.
    - foregone profits
    - externalities
    - political economy or prestige considerations
- Our discussion doesn't clearly support banning duplication but rather suggests that some form of control on the local interventions may help improve efficiency.