Regulatory commitment in developing countries: A model and applications

Liam Wren-Lewis

Department of Economics, University of Oxford

INFRASTRUCTURE ECONOMICS AND DEVELOPMENT CONFERENCE, TOULOUSE

14 JANUARY 2010

Outline

Outline

Regulatory commitment in developing countries

Renegotiation is extremely frequent in developing countries

- >40% of concessions in water and transport renegotiated in Latin America 1985-2000 (Guasch et al. 2007,2008)
- Many of these at the request of governments - potentially 'quasi-expropriation'

$\Rightarrow$ Investors fear renegotiation and thus invest less

Outline

Setup

Framework:

- Continuous time
- Infinite horizon

Players:

- Firm (F)
- Government (G)

Actions:

- Player F chooses whether to invest or not
- Player G sets R, the return received by player F

(Players are restricted to playing pure strategies)

Payoffs

Payoffs at time t:

- Investing costs F a flow payoff of -1
- No investment at time $t - \tau \Rightarrow$ Both players receive 0
- Investment at time $t - \tau \Rightarrow$ F receives flow payoff of R, treasury / consumers receive $\overline{R} - R$
  - $\Rightarrow$ G's flow payoff is $\overline{R} - R + (1 - \theta)R = \overline{R} - \theta R$

$\tau =$ Time for investment to come on line *(constant)*

$\overline{R} =$ Total return of investment *(constant)*

$R =$ Return received by F *(chosen by G)*

$1 - \theta =$ Weight of profits in social welfare function *(varies)*

Both players maximize expected discounted payoff, with discount rate r

Government's preferences

G's preferences oscillate between two states:

- Low need for public funds - $\theta = \theta_L$
- High need for public funds - $\theta = \theta_H$
- θ moves according to a time-homogeneous Markov process
- θ is G's private information

Implicit contract form

To incentivise player F to invest, Player G may make a *non-binding* promise as to what R they will pay in the future

- We restrict G to only being able to promise F a constant level of R indefinitely
- If G keeps the promise and sets $R > 0$ we call this **sharing**
- G can however at any time set $R = 0$ - we call this **expropriation**

Outline

Perfect Bayesian equilibria

There exist a range of Perfect Bayesian Equilibria (PBE):

- If discount factor sufficiently low, threat of non-investment can sustain equilibria that include constant investment
- Equilibria with government expropriating iff needs are 'high' ($\theta = \theta_H$) also exist

Two potential problems with these equilibria:

- How do we select between them? The length of punishment T is arbitrary
- Is the threat of punishment credible when renegotiation is possible?

Renegotiation Proofness

We use a definition of 'renegotiation-proofness' from Farrell and Maskin (1989)

- Can express players' strategies as being dependent on a 'state' in addition to payoffs and beliefs
- In the equilibria above, our 'state' is the time since G last expropriated
- An equilibrium is Weakly Renegotiation Proof (WRP) if the payoffs at any pair of states cannot be Pareto ranked

$\Rightarrow$ Equilibria are WRP if at no point both players want to pretend G had expropriated more or less recently

- An equilibrium is Strongly Renegotiation Proof (SRP) if it is WRP and in all states the players would not both wish to renegotiate to an alternative WRP equilibrium

A unique SRP equilibrium

Proposition

There exists a unique SRP PBE. If the discount rate is too high, then this is the zero investment equilibrium. Otherwise, it is an 'episodic investment' equilibrium where:

- *Along the equilibrium path, player G shares if needs are low ($\theta = \theta_L$) and expropriates if needs are high ($\theta = \theta_H$)*
- *Player F invests iff player G has not expropriated within a length of time T^**
- *R is set at minimum level that incites investment at T^**
- *Hence, in equilibrium, there are some periods of investment and some periods of non-investment*

Outline

Uncertain costs

We add uncertainty over future costs to our model:

- After investment, $\overline{R}$ may be either $\overline{R}_L$ or $\overline{R}_H$, with $\Delta\overline{R} = \overline{R}_H - \overline{R}_L$
- $\overline{R}$ is constant for a period of time $\tau + S$, with $0 < S < T^*$, then independently drawn anew with $\mathbb{P}\left(\overline{R} = \overline{R}_L\right) = \mu$

Two types of regulatory regime represented as follows:

- Cost-Plus - Firm takes no risk- receives a single value R independent of $\overline{R}$
- Price-Cap - Firm takes all risk - receives a return of R_L when $\overline{R} = \overline{R}_L$ and $R_H = R_L + \Delta\overline{R}$ when $\overline{R} = \overline{R}_H$

Comparing the two

Proposition

There exists a constant θ_L^* such that

- *If $\theta_L \leq \theta_L^*$, the length of no investment (T^*) in the unique SRP PBE under the cost-plus regime is greater than or equal to the non-investment length in the corresponding equilibrium under the price-cap regime.*
- *If $\theta_L \geq \theta_L^*$, then the length of no investment under the cost-plus regime is less than or equal to the non-investment length under the price-cap regime.*

Importance of θ_L

If θ_L small:

- $\Rightarrow$ Government values profits fairly highly - concerned most by joint surplus, $\overline{R}$
- $\Rightarrow$ Most tempting time for expropriation is when $\overline{R}$ is low (i.e. firm is inefficient)
- $\Rightarrow$ Price cap better as inefficient firm makes lower return

If θ_L large:

- $\Rightarrow$ Government cares little about profits directly
- $\Rightarrow$ Most tempting time for expropriation is when profits are high
- $\Rightarrow$ Cost-plus better as profits less extreme

Developing country difference?

We may expect θ_L to be higher in developing countries due to

- Foreign ownership
- Greater equity concerns
- Higher cost of public funds

$\Rightarrow$ Price-caps more likely to damage commitment in developing countries

Consistent with evidence that price caps more often renegotiated than cost-plus in developing countries (Guasch et al. 2007, 2008)

Outline

Two region model

Suppose there are two regions:

- Only paramater that varies between the two regions is the total return of the investment, $\overline{R_i}$
- Can either be regulated by by central government or by two local governments (with θ_is uncorrelated)

Centralisation

Proposition

When $\overline{R_1} > \overline{R_2}$, centralising regulation produces the following results:

1. *The range of parameters for which the SRP PBE with investment exists is smaller in Region 1 but larger in Region 2.*
2. *If a SRP PBE with investment exists in all cases, then $T_2^* \geq T_0^* \geq T_1^*$*

If $R_1 < R_2$, the opposite of each of these statements apply.

Centralising regulation averages expropriation temptation:

- The temptation to expropriate in region with lower future return is mitigated by the government not wishing to give up investment in higher return region

$\Rightarrow$ In some cases, centralising regulation can create investment in an area where previously the threat of expropriation was too high

$\Rightarrow$ On the other hand, when any credible commitment difficult, best option is to decentralise to those regions where some commitment is possible

Perhaps a dynamic story?

Outline

Overall:

- Changing government preferences can sustain unique renegotiation-proof equilibrium
- Non-investment period is endogenous to model
- Price caps likely to reduce commitment in developing countries
- Effect of decentralisation ambiguous