The Political Economy of Incentive Regulation: Theory and Evidence from U.S. States.

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A long theoretical tradition (Laffont and Tirole, 1993; Laffont, 1996 and 2000; Laffont and Martimort, 1999; Boyer and Laffont, 2003) and a recent body of empirical research (Ai and Sappington, 2002; Eckenrod, 2006) have been focusing on the relative merits–rates and investment level–of differently powered:

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1. optimal incentive schemes should trade off informational rents extraction and cost-saving inducement;
2. performance based regulation (PBR, therein) can deliver lower rates and higher profits with no onverall reduction in quality.

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- bridge mechanism design and political economy.

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- Supervision–adversarial hearings: in order to assure higher transparency, regulators and High Court judges only examine witnesses and experts, receive the evidence and interpret regulations; the final motion is proposed *de facto* by the PUC staff who acts as the jury in the anglo-american process(Gormley, 1983; CDRA, 1992).

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- General Setting: Newbery (2000), OECD (2000).

Technology.

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- The firm's utility is $U = t - \psi(a)$ where t are the managerial rewards and ψ with $\psi' > 0$, $\psi'' > 0$, $\psi''' > 0$ is the effort cost function. Define $\Phi(a) \equiv \psi(a) - \psi(a - \Delta\beta)$. The IR constraint $U \geq 0$ is imposed. Thus, the ex-ante expected social welfare can be written as: $W = V(q) - (1 + \lambda)[(\beta - a) q + \psi(a)] - \lambda U$. where $V(q) = (1 + \lambda) S(q)$.

Information.

- The planner obtains two truthful and orthogonal signals whose precisions' technology is multiplicative in each supervisor $i = E, A, l = J, R$'s effort $e^*_{i,l}$ and in the common random ability $\alpha \sim f$ with $\alpha \in [0, 1]$: $\xi^*_{i,l} = \alpha e^*_{i,l}$.

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- In particular, each signal is such that if the type is $\underline{\beta}$ the planner is informed with probability $\xi^*_{i,l}$; when the type is $\overline{\beta}$, she always remains uniformed–the court wants to prove that the firm is indeed efficient.

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5. If also this signal is uninformative, the planner asks the firm to report its information. Next, the firm exert the equilibrium effort and the rewards-cost pair is implemented. Finally, the signals precision are revealed and each supervisor receive her reward.

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3. $\tilde{C}(\cdot)$ is the supervisors' effort cost function and K an efficiency of the information-gathering technology parameter.

The Planner's Problem.

Define the ex-ante expected probability of at least one informative signal as $\gamma(i,j) \equiv \mathrm{E}(\xi_{i,R}) + [1 - \mathrm{E}(\xi_{i,R})]\,\mathrm{E}(\xi_{j,J}))$.

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The planner's objective function is:

$$\begin{aligned}\tilde{W}^s \quad = \quad & v\gamma(i,j)\,W^* + \\ & + [1 - v\gamma(i,j)] \left\{ \frac{v[1-\gamma(i,j)]}{1 - v\gamma(i,j)} \left[V\left(\underline{q}^s\right) - (1+\lambda)\left[\left(\underline{\beta} - \underline{a}^s\right)\underline{q}^s + \psi\left(\underline{q}^s\right)\right] - \lambda\Phi(\bar{a}^s) \right] \right. \\ & \left. + \frac{1-v}{1 - v\gamma(i,j)} \left[V(\bar{q}^s) - (1+\lambda)\left[\left(\bar{\beta} - \bar{a}^s\right)\bar{q}^s + \psi(\bar{a}^s)\right]\right] \right\} - 2(1+\mu)\,r\end{aligned}$$

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Thus, in a PBE, the level of prices and the power of the contract are determined by the low type effort:
$\psi'\left(\hat{a}^s\right) = \hat{q}^s - \frac{\lambda}{1+\lambda}\Gamma(v)\left[1-\gamma(i,j)\right]\Phi'\left(\hat{a}^s\right)$,
where the rent $\Phi(a) \equiv \psi(a) - \psi(a-\Delta\beta)$ has $\Phi' > 0$, $\Phi'' > 0$.

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Remark 1: Two extents of complementarities: the political (in the spirit of Gibbons and Murphy, 1992) and the technological one. ▸ Complementarity Pattern.

Remark 2: Endogenous collusion proofness coherently to Ka and Teske (2002). ▸ Endogenous Collusion Proofness.

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- Dependent Variable:
  1. $PBR\_O_{i,t}$ equal 1 in state i and year t if cost of service was in place, 2 if rate case moratoria or revenue sharing was employed and 3 if a price cap was used.
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  with $k =$ power levels, $i =$ states, $t =$ time-years, $\tau_k =$ unknown threshold parameters, $\Lambda =$ logit function and $y_{i,t} = PBR\_O$.

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- Want to identify the relevant determinants of the PBR introduction timing. Use the following exponential proportional hazard rate model:
  $\lambda(t, z_{i,t}) = exp(\beta' z_{i,t})\lambda_t^*$,
  with $\lambda_t^* =$ baseline hazard and $z_{i,t} = PBR$. Notice tha a coefficient greater than one implies higher odds that an individual in the treatment group implements the reform before one in the control group.

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- *Budget* is a raw proxy for more resources to allocate in information-gathering;
- While *Price_R(-2)* is linked to more costly production structure, *Rep* summarizes the planner's tastes.

	PBR_O	*PBR_O*=3	*PBR*
Reg_Elec	2.353	0.055	5.328
	(0.368)[1] ***[2]	(0.013)***	(3.417)***
Jud_Elec	0.080	0.001	0.562
	(0.298)	(0.003)	(0.315)
Rev_Door	- 0.893	- 0.011	0.554
	(0.345)***	(0.005)**	(0.407)
Jud_Term	- 0.082	- 0.0008	1.106
	(0.063)	(0.0007)	(0.116)
Budget	0.00002	$2.08E^{-07}$	1.00001
	$(4.47E^{-06})$***	(0.00000)***	$(4.44E^{-06})$***
Price_R(-2)	0.428	0.004	0.878
	(0.159)***	(0.002)**	(0.188)
Republican	0.073	0.0007	0.625
	(0.351)	(0.004)	(0.446)
Majority	2.527	0.025	6.281
	(1.416)	(0.013)**	(15.581)
PBR_Nei	0.328	0.003	7.779
	(0.956)	(0.010)	(12.637)
Population	$7.17E^{-08}$	$7.22E^{-10}$	1
	$(2.72E^{-08})$***	(0.0000)***	$(2.71E^{-08})$*
GSP	0.0001	$1.02E^{-06}$	1.0002
	(0.00004)**	(0.0000)**	(0.00007)**
Estimation	Ordered logit (coefficients)	Ordered logit (marginal effects)	Exponential survival (hazard ratio)
Likelihood			- 22.365
Log Pseudolikelihood	- 183.300	- 183.300	
Pseudo R^2	0.25	0.25	
Number of Observations	736	736	692

[1] Robust standard errors (z distribution) in parentheses;

[2] *** denotes significant at the 1% confidence level; **, 5%; *, 10%.

	PBR_O=3	*PBR*
Reg_Elec	0.055	5.328
	(0.013)***[3]***[4]	(3.417)**
Jud_Elec	0.001	0.562
	(0.003)	(0.315)
Rev_Door	- 0.011	0.554
	(0.005)**	(0.407)
Jud_Term	- 0.0008	1.106
	(0.0007)	(0.116)
Budget	$2.08E^{-07}$	1.00001
	(0.000)***[5]***[6]	$(4.44E^{-06})$***
Price_R(-2)	0.004	0.878
	(0.002)**	(0.188)
Estimation	Ordered logit (marginal effects)	Exponential survival (hazard ratio)

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	PBR_O=3	*PBR*
Republican	0.0007	0.625
	(0.004)	(0.446)
Majority	0.025	6.281
	(0.013)*	(15.581)
PBR_Nei	0.003	7.779
	(0.010)	(12.637)
Population	$7.22E^{-10}$	1
	(0.0000)***	$(2.71E^{-08})$*
GSP	$1.02E^{-06}$	1.0002
	(0.0000)**	(0.00007)**
Estimation	Ordered logit (marginal effects)	Exponential survival (hazard ratio)
Likelihood		- 22.365
Log Pseudolikelihood	- 183.300	
Pseudo R^2	0.25	
Number of Observations	736	692

UNIVERSITY OF CAMBRIDGE

Incentive Rules and Regulated Rates: Issue.

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Endogeneity: states may well self select into PBR on the bases of unobserved shocks affecting at the same time, for instance, the cost structure and the political saliency of the reform.

Incentive Rules and Regulated Rates: Strategy.

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Use the Arellano and Bond difference GMM estimator to estimate:
$y^s_{i,t} = \eta_i + \vartheta_t + \theta y^s_{i,t1} + \phi PBR_{i,t} + \varphi X_{i,t} + \epsilon_{i,t}$,
where $y^s_{i,t}$ is a price for ratepayers class s; $X_{i,t}$ gathers the time-varying determinants of incentive rules, a fossil fuels cost index c and other controls.

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Remark: treat both PBR and c as endogenous and $y^s_{i,t-1}$ as predeterminated
Both prices and marginal costs are autoregressive of order 1. An extra exogenous instrument is: *PBR_Nei* (Steiner, 2004).

Incentive Rules and Regulated Rates: Results.

	Price_R	*Price_C*	*Price_I*
PBR	0.126	- 0.100	0.093
	(0.214)	(0.163)	(0.139)
Other Controls	*Reg_Elec*, *Jud_Elec*, *Budget*, *Republican*, *Majority*, *Population*, *Young*, *Old*, *GSP*.		
Predetermined	*LaggedDependentVariable*		
Endogenous	*c*, *PBR*		
Instruments (collapsed)	One lag of dependent and *c*, *PBR_Nei*		
Estimation	Fixed state and time effects difference GMM estimator		
Instruments Count	28	28	28
Autocov. of order 2	0.74	0.54	0.68
Hansen test for overid.	0.90	0.46	0.67
Number of Observations	644	644	644

Three Main Contributions.

1. The paper formalizes and tests a theory of complementarities among supervisors' implicit and firms' explicit incentives arising from the contractability of the firms' allocation as opposed to the non-contractability of supervisors' effort.

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2. Endogenous Collusion Proofness.

3. First empirical analysis of the efficiency and strategic political determinants of incentive regulation and the first test of the endogenous impact of incentive rules on prices: the reforming wave was mainly aided to repay sunk investments.

Advices for Constitutional Designers.

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2. Before calibrating the power of the explicit incentives to be imposed on the regulated firm, the efficiency of the information-gathering technology and the broad set of concerns to which supervisors respond need to be considered attentively;

3. The success of regulatory regime reforms cannot abstract from a Constitutional table insulated from short-term electoral boosts.

Accountability in Government and Regulation Policy.

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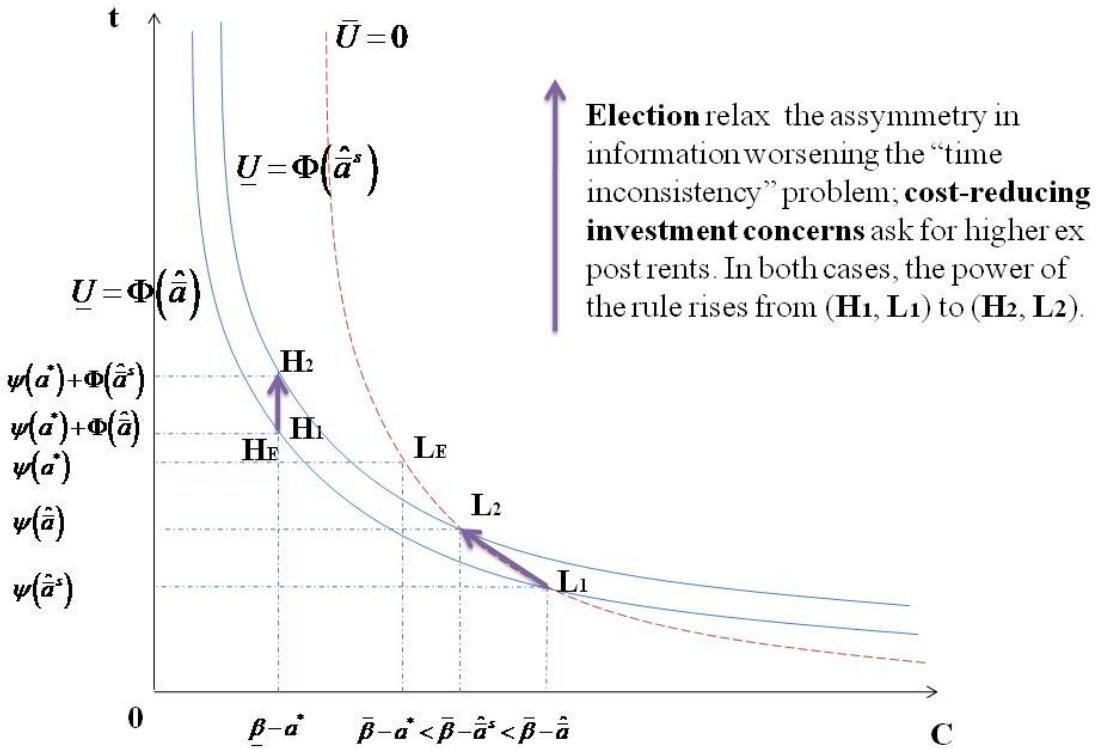
The Complementarities Patterns.



$$F=\underline{\beta}-a^*, F'=\overline{\beta}-a^*, F''=\overline{C}=\overline{\beta}-\hat{a}$$

Return

Endogenous Collusion Proofness: Set Up.

- Follow Alesina and Tabellini (2008) and assume that supervisors have two tasks and a lobby interested in maximizing the firm's rent can offer to each supervisor a side contract–illegal bribes or legal campaign funds–conditional on the effort exerted in the other activity–*e.g.*, avoiding by-passing.

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  1. The technology of the second task is $h_{i,l} = \alpha e_{i,l}^{h}$ and its benefits are negligible for consumers and $\kappa h_{i,l}$ with $\kappa > 0$ for the firm;

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  2. α is now truncated normally distributed;
  3. The planner cannot condition her choice–*i.e.*, incentive schemes–on the supervisors' collusive activities.

Endogenous Collusion Proofness: Results.

1. Appointed supervisors:
   - For sufficiently strong non-monetary incentives, supervisors never accept bribes; at the same time, the lobby prefers to be ex-ante passive if the firm's stake is too narrow or legal systems work efficiently.

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Proposition 2.

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- Result: if, before learning β, the firm can commit a monetary investment increasing the ex ante probability of being a high type, in equilibrium the degree of under-investment is higher the more powerful is the incentive rule. Therefore, a benevolent planner should rise the power of the incentive rule the more relevant are investment concerns (see also Sappington, 1986).

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Proposition 3: the Investment Game.

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2. Add to the usual timing two more steps: 6. An election with exogenous winning probability x_m, $(m = D, R)$ is held; and the winner can, exerting the costly effort ρ_m with $\rho_R > \rho_D > 1$, ease the firm's private-funds-seeking activity; 7. the frim can commmit to an investment with fixed monetary cost $\bar{I} \geq 0$ and stochastic return whose expected value is $\pi \equiv \bar{\pi}\delta + \underline{\pi}(1-\delta) > 0$ with $\bar{\pi} > 0 > \underline{\pi}$ and $\delta > 0$.

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The firm is infinitively risk averse in the range of the ex-post negative utilities so that only the high type invest if:
$\Phi\left(\hat{a}_{\tilde{m}}^{S,I}\right) + \underline{\pi}\bar{I} \geq 0$, where $\tilde{m} = D, R$.

Proposition 3: Results.

- Each party evaluates the ex-post participation to the investment game constraint at both the common shadow price $o > 0$ and a specific investment concern $\chi_{\tilde{m}}$–the party's willingness to leave higher ex post rents to shareholders–with:
  $\chi_R \equiv 1 + o - \gamma < 1 + o + \gamma \equiv \chi_D, \gamma > 0$ and $\tilde{x} < \lambda/\gamma$

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- All in all, the equilibrium low type's allocation is:
  $\psi'\left(\hat{a}^{S,I}_{\tilde{m}}\right) = \hat{q}^{S,I}_{\tilde{m}} - \Gamma\,(v)\,[1 - \gamma\,(i,j)]\left[\frac{\lambda}{1+\lambda} - \frac{1+o-\chi_{\tilde{m}}}{1+\lambda}\tilde{x}\right]\Phi'\left(\hat{a}^{S,I}_{\tilde{m}}\right)$,
  which, in turn, implies Proposition 3.

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