Endogenous Price Mechanisms, Capture and Accountability Rules: Theory and Evidence

Carmine Guerriero

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Carmine Guerriero, *Faculty of Economics, University of Cambridge*

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Summary

This paper analyzes the constitutional determinants of cost reimbursement rules. In order to design the optimal incentive schemes, a possibly partisan planner will take into account the market cost structure, the institutional design of the supervision hierarchical structure and its technology. I employ electricity data from the U.S. electric power market to test the model's predictions. The evidence shows that reforms from low powered incentive scheme (COS) to high powered one (PBR) are linked to high cost industries, the presence of elected supervisors, high inter-party platform distance and large (slim) majority when the reformer is Republican (Democratic). Moreover, there is some evidence in the data that performance-based regulation lowers regulated prices.

Keywords: Industrial Policy, Political Economy, Regulation and Incentives

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Address for correspondence:

Carmine Guerriero
Faculty of Economics
University of Cambridge
Sidgwick Avenue
CB3 9DD Cambridge
UK
E-mail: cg372@econ.cam.ac.uk

A Francesco e Pierluigi con Amore e Profondo Rispetto.

1. Introduction

A major task of economics is to explain the pattern of government intervention in industries that is to say industrial policy. An idealized, but illuminating, view of regulatory institutions is that they result from a broadly defined constitution drafted by some benevolent "founders" behind a veil of ignorance.[1] This "public interest" research program derives policies able to correct market failures such as monopoly pricing. In the last twenty years this paradigm has been substantially improved by explicitly considering informational asymmetries. Industrial policy can be thought as resulting from the optimal trade-off between efficiency enhancement and rent extraction and, indeed, in regulating a natural monopoly, the planner will select optimal cost-reimbursement rules, which arbitrate differently between cost reducement effort (i.e.: moral hazard with risk neutral firm) and informational rents (i.e.: adverse selection). Price-cap favors efficiency, while cost-plus regulation (COS) favors rent extraction. However, the public interest approach completely fails in taking into consideration both the watchdog role of consumers' (i.e.: residential and industrial) interest groups and the delicate set of controls on bureaucrats and politicians. Indeed, judges have discretionary power and compete with executive branches and regulators in filling in unforeseen contingencies (see Shapiro [1986], Spiller and Tiller [1999] and

[1] These social "planners" must delegate actual social choices to other agents (i.e., "public decision makers") and they possibly design a set of institutions or rules of the game inducing these public decision makers to behave as if their respective assessments of welfare coincided.

Guerriero [2006 a]). Moreover, politicians may favor special interest groups (see the Chicago tradition in Peltzman [1976] and Becker [1985]) leaving conspicuous rents to the officials involved in regulation (see Niskanen [1971] and Wilson [1980]). The recent New Theory of Regulation approach has tried to overcome such an inconsistency, employing both the classical principal-agent model and the growing political economy literature. Two are the main merits of this program: 1. the explicit design of the political system details and of the positive forces driving public intervention; 2. the crucial role entrusted to private information in giving rent seeking incentives to regulated firms' interest group and signal extraction foundations to the hierarchical structure of real world regulatory institutions. When explicit contracts on observable efforts or performances are available for supervisors, the low type quantity-effort allocation is distorted even more to take into account the possible capture and the institutional design of the supervision hierarchy (Laffont and Tirole [1993] and Laffont and Martimort [1999]), and the planner's partisan interests (Laffont [1996] and [2000]). In such a collusion-proof equilibrium (i.e. in which capture does not prevail), costly incentive payments are given to non-benevolent regulators for a value equal to the maximum expected collusion offer, which is the firm's expected stake (i.e. high type rent). However this set up basically fails in capturing real world institutions. Regulators and judges are implicitly motivated by simple election-appointment rules. Moreover the review processes' structure makes difficult to swallow the hypothesis that the real role of these officials is one of decision making. Only recently, Guerriero [2006, a] has given a first complete and realistic description of this complex agency structure. A hierarchical rate review process makes crucial the generosity of settlement if judges are interested in leaving a legacy of correctness ("legacy

effect"). This is more likely when regulators are not willing to exert costly effort because they are concerned with obtaining job offers from the industry (i.e.: "revolving door effect"); election magnifies these incentives. A possibly partisan (i.e., interested in the long run profitability of the industry) planner will take into consideration the effectiveness of the signal extraction technology and the accountability power of different selection rules in designing the regulatory institutions. This paper brings two main contributions: 1. It broadens the scope of the Guerriero [2006 a]'s model to the optimal selection of incentive schemes; 2. It empirically evaluates the merit of this new cost-reimbursement selection theory facing it with electricity data. My focus is the economics of regulation but the idea is wider and applies to a rich set of market, fiscal and monetary institutions. The remainder of the paper is organized as follows. *Section 2* briefly illustrates the institutions of the US electric power market. Next, *Section 3* explains the model clarifying the efficiency driven and strategic determinants of incentive schemes. *Section 4* tests this theory, taking into consideration the introduction of performance based regulations (PBR) in the US electricity market during the 80s and 90s; besides, an analysis of the effects of these reforms on the sector-regulated prices is provided. *Section 5* discusses the significance of the paper's findings and proposes an agenda for future research. Tables, proofs and a detailed description of the data are contained in the *Appendix*.

2. Institutions

Investor-owned electric utilities (IOUs) account for over three-fourths of the electricity sales and revenues of the U. S. electric power market. Jurisdiction over

both interstate transmission and wholesale transactions lies inside a federal body (FERC); retail services are regulated by state public utility commissions (PUCs), which deal with several utilities (i.e., natural gas, telecommunications, water and wastewater, insurance, trucking and railroad) and perform a broad range of tasks (e.g. they suggest lines of conduct on services provision, avoid by-passing by non regulated utilities, they rule on environmental issues and so forth) among which the most important is the regulation of prices.[2] Regulated utilities are not allowed to receive governmental subsides and their revenue must cover their cost (including managerial rewards). IOUs usually charge a two-part tariff,[3] triggering rate reviews in response to rising costs (Joskow, [1974]). Even if a docket can be entrusted directly to a commissioner or to an Administrative Law Judge (ALJ), almost all the files are evaluated within formal meetings open to all the interested parties (firms, ratepayers, lawyers of the Attorney General's Office and so forth). In the first instance, commissioners sit on the bench during sessions and consumer advocates[4] represent ratepayers. If the proposed filing is not approved, a formal quasi-judicial hearing, presided by one or more ALJs, is opened. Next, the quasi-judicial tribunal takes a qualified majority enforceable judgment. PUCs may review the case, provided that the onus of injustice and illegality of the decision

[2] Here I follow the descriptions contained in the 1992 and 1997 *Sunset Review of the Colorado PUC* and on the *Washington Utilities and Transportation Commission* (WUTC) official website.

[3] As Joskow and Schmalensee [1986] suggest the fixed premium paid by consumer turns out to assume the some role of the governmental transfer typical of the regulation-procurement literature. As a consequence, I will replace the economic shadow cost of public funds with the marginal deadweight loss associated with an increase in the fixed premium.

[4] Consumer advocates are state funded independent bodies established during the 70s and 80s in the face of steeply rising rates in order to allow even residential users to proceed before PUCs.

lies on the firm. Finally, utilities can also appeal to High Courts on formal issues. These two last appeal levels are rarely granted. Within the hearings, the role of commissioners and ALJs is one of supervision: they examine witnesses and experts, receive the evidence and interpret precedents and regulations. The final motion to be approved is proposed by the PUC's staff. During the process, this body is divided in a "trial" and in an "advisory" team. While the latter reviews the case formulating a staff position in all equated to the one of any other interested party; the former advices regulators and judges on technical and policy issues, proposing *de facto* the motion. The complete record of the hearings and the participation of all parties assure that the PUC's staff uses only "hard" evidence. This is a by-product of the "adversary" scope of the hearings: no evidence can be denied once the precedent is individuated. Thus, the design of incentive schemes can be modeled through the following version of the Guerriero [2006, a]'s model.

3. Theory

The regulated firm produces a variable scale product q and charges a two part tariff $A + pq$ for $q > 0$, where A and p are positive. It can refuse to produce if the contract offered by the principal does not guarantee a minimum level of expected utility, that I will normalize at a reservation level of 0. Both the firm and the supervisors are risk neutral with respect to income. Total cost is $C = (\beta - a)q + \upsilon$ and a represents the manager's effort, while β is an inefficiency parameter, which turns out to be equal to $\underline{\beta}$ with probability ν and to $\overline{\beta}$ with probability $1 - \nu$; with $\Delta\beta \equiv \overline{\beta} - \underline{\beta}$. Assuming that the fixed cost is known, and normalizing it at zero ($\upsilon = 0$) it is possible to denote marginal cost as $c \equiv \beta - a$. Regulation is subject to

both adverse selection (as captured by β) and moral hazard (as captured by a). Let assume that effort remains strictly positive over the relevant range of equilibrium production. If the manager exerts effort level a, she decreases the monetary marginal cost of output by a, and incurs in a disutility (in monetary units) of $\psi(a)$. This disutility is increasing and convex in a (i.e.: $\psi' > 0$; $\psi'' > 0$); moreover the following hold: $\psi(0) = 0$, $\lim_{a \to \beta} \psi(a) = +\infty$ and $\psi''' > 0$.[5] All consumers have the same preferences; thus, the demand is the one of a representative consumer with gross consumer surplus given by $S(\cdot)$. The inverse and regular demand functions and the firm's revenue are given by $p = P(q) = S'(q)$, $q = D(p)$, $R(q) = P(q)q + A$ respectively. Consumers choose q as to maximize net surplus $S(\cdot) - A - pq$ and A is chosen optimally so as to make her indifferent between buying and not buying the good i.e., $A \equiv S(q) - P(q)q$. Firm's revenues must cover both average costs and managerial compensation t; moreover the firm can refuse to produce if a level of expected utility U weakly greater than the reservation level of 0 is not guaranteed. As a result, I have that $A + (p - c)q(p) \geq t$ and $U = t - \psi(a) \geq 0$.

Let denote the social surplus obtained by the production of q as $V(q)$ with $V(0) = 0$, $V' > 0$, and $V'' < 0$. $V(q)$ is the sum of consumers' net surplus plus the firm's revenue evaluated at the shadow price of managerial reward. $V(q)$ rewrites as:

$$V(q) = (S(q) - R(q)) + (1+\lambda)R(q) = S(q) + \lambda R(q) = (1+\lambda)S(q).$$

The planner's objective function, labeled with subscript P, is:

$$W_P = S(q(p)) - A - pq(p) + (1+\lambda)\,[A + (p - c)\,q(p) - t] + U =$$

$$= V(q) - (1+\lambda)[(\beta - a)q + \psi(a)] - \lambda U \qquad (1)$$

[5] This is a sufficient condition for the regulator's optimization programs to be concave and for the optimal incentive schemes to be deterministic.

Here, $1 + \lambda$ can be interpreted as the shadow price of the firm's budget constraint; note that, in contrast to the program with governmental transfers, λ depends on both c and t. Under complete information,[6] the planner implements the first best allocation leaving no rent to the firm with a simple "fixed price" (or a cost target) contract (see *Appendix 6.1* for details). Instead, under asymmetric information, the planner observes only total cost and output[7] and not a: as a result, β is now private information of the firm. Label equilibrium rewards, outputs, average and marginal costs and utilities for the two types as: $\left\{\left(\underline{t},\underline{q},\underline{C},\underline{c},\underline{U},\underline{a}\right),\left(\overline{t},\overline{q},\overline{C},\overline{c},\overline{U},\overline{a}\right)\right\}$.

A contract based on the observables t and C specifies a reward-cost pair for each type. As usual, the program envisions a solution with binding low (inefficient) type's individual rationality and high type's incentive compatibility constraints:

$$\overline{U} = \overline{t} - \psi(\overline{\beta} - \overline{c}) = 0 \qquad \text{(IR\_L)}$$

$$\underline{U} = \underline{t} - \psi(\underline{\beta} - \underline{c}) = \overline{U} + \psi(\overline{\beta} - \overline{c}) - \psi(\underline{\beta} - \overline{c}) = \Phi(\overline{a}) \qquad \text{(IC\_H)}$$

where $\Phi(\cdot)$ is an increasing function defined as $\Phi(a) \equiv \psi(a) - \psi(a - \Delta\beta)$.[8] Such a solution entails an efficient level of effort and a positive informational rent $\underline{U}$ for the high type and under-effort and no rent for the low type. Now suppose that the planner can relax the informational asymmetry by employing a hierarchy of

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[6] Realized costs, outputs and prices are verifiable. The planner knows β and acts as a Stackelberg leader making take-or-live it offers on the observable a.

[7] With a linear technology, the planner observes average costs, which are equal to marginal cost. With know fixed cost υ, she observes $(C - \upsilon)/q = \beta - a$ and the analysis goes on unchanged.

[8] Incentive compatibility prescribes that the contract designed for type $\underline{\beta}$ ($\overline{\beta}$) is the one preferred by type $\underline{\beta}$ ($\overline{\beta}$) in the menu of managerial rewards-cost pairs. This amounts to say that:

$\underline{t} - \psi(\underline{\beta} - \underline{c}) \geq \overline{t} - \psi(\underline{\beta} - \overline{c})$ (IC_H) and $\overline{t} - \psi(\overline{\beta} - \overline{c}) \geq \underline{t} - \psi(\overline{\beta} - \underline{c})$ (IC_L).

two supervisors (i.e. a regulator and a judge) designed exactly as the market described in the institutional analysis. The question is the following: is it possible to assess the ex post normative qualities of the incentive schemes selected by a possibly partisan planner? As the following theory will make clear, the success of the regulatory regime design is sensible to efficiency and political dimensions. I will first treat the former underlining the main similarity with the model of Laffont and Tirole [1993], leaving the positive side of the issue to the next subsection. There I will compare the results with the seminal work of Laffont [1996]. The following analysis strictly tracks the approach of Guerriero [2006, a]. Supervisors can, exerting costly effort, tailor the supervision activity to the specific docket (i.e., they choose the number and quality of the experts, the firms' official papers to be examined and so forth). The equilibrium level of effort and the supervisors' random ability (e.g., ability to examine experts given precedents and prevailing regulations) determine the precision of the planner's signal. As explained above, the report is effectively delivered by the PUC's staff, so I simply assume that the planner has directly at her disposal this benevolent information device.[9] Moreover, given that in our market PUCs' rules and conducts prohibit communication between supervisors, no side contract is allowed between these players. Once one of the two docket's filing steps is set up, the planner receives a signal $\sigma = \{\underline{\beta}; \phi\}$ about the cost structure with precision ξ, determined by the supervisors' activity. This signal can only inform about $\underline{\beta}$. The information is hard, i.e. it is verifiable (in the sense that every interested party can convince

[9] Note that, besides the constraints imposed by the adversary process structure, explicit incentives can be designed for the staff members, who are not implicitly motivated by an appointment rule.

himself that the signal corresponds to the true state of the world). If $\beta = \underline{\beta}$ with probability ξ the planner sees $\sigma = \underline{\beta}$ and implements the complete information contract and with probability $1 - \xi$ she observes $\sigma = \phi$. If $\beta = \overline{\beta}$, then $\sigma = \phi$ always.[10] When $\sigma = \phi$, the planner is uninformed, and she updates her beliefs applying Bayes's rule. Supervisors are evaluated according to the performance $\xi \in [0, 1]$, which is described by the process' records and has a technology given by $\xi = \alpha e + e$. Effort takes value on $(0, \xi^u/(1 + \alpha)]$ with ξ^u to be defined below. The effort cost function can be written as $\tilde{C}(\bullet) = \underset{\sim}{C}(\bullet)(1-K)$ where K measures the effectiveness of the signal extraction technology and is increasing in the PUC's funds and in the watchdog groups' ability to provide hard information. Besides, I have that: $\tilde{C}_e > 0$, $\tilde{C}_{ee} > 0$, $\tilde{C}(0) = 0$ and $\lim_{e \to \xi^U} \tilde{C}_e = \infty$ (with $0 < \xi^u < 1$), i.e. the full precision case is ruled out. Clearly, it is not possible to obtain a perfect signal through effort only. The random ability α has support (0, 1) and a natural choice is to have $\alpha \sim$ Beta (g, b) with density $f_y(y; g, b) = [y^{g-1}(1 - y)^{b-1}]/B(g, b)$ and $B(g, b) = \int_0^1 y^{g-1}(1-y)^{b-1} dy$ - Beta function. The mean is $\bar{\alpha} = g/(g + b)$. If $g = b = 1$, I obtain a uniform distribution on (0, 1): from a Bayesian point of view this corresponds to the case of uninformative prior on the supervisor ability. The only restrictions I impose on g and b is that the distribution is symmetric ($g = b$) and hump-shaped (informative): $g > 1$ and $b > 1$. Note how α and e assume the meaning of overall measures i.e.: they take into account the different judges' and regulators' abilities. The first best arises either for e or ξ verifiable and

[10] This technology simplifies the notation and has the appealing feature that the agent can provide verifiable information only when the proof is possible, i.e., $\underline{\beta}$-case (see also Laffont [2000]).

contractible: "selling the store" contracts reach efficiency. However, the assumption that the planner can write unrestricted contingent contracts with the supervisors does not fit in any way reality and so I assume that ξ is always observable but not contractible. The timing of the game is as follows:

1. Society (planner, firm, regulator and judge if addressed; see stage 3 and 4 below) learns the nature of the regulatory environment: $P(q)$ and that $\beta \in \left\{\underline{\beta}, \overline{\beta}\right\}$. Next the firm discovers the only piece of private information: β.

2. The planner offers a menu of managerial reward-cost pairs to the firm contingent to the realization of the signal obtained through the hearing process. Moreover, an exogenously given wage $\hat{s}$, set a reservation level (for sake of simplicity assumed equal for both), is given to the two supervisors.

3. The regulator chooses the level of effort; next she discovers her random ability and, at last, the planner receives the first signal. If this is informative the first best is implemented; otherwise a hearing is open and the judge enters the game.

4. Step 3 is repeated for the judge. If the signal is again uninformative, the planner asks for a report to the firm and the asymmetric information regime arises.

5. Last a reward-quantity pair is implemented and evaluators make their move.[11]

In order to understand the incentives faced by the supervisors as a function of the selection rules and the nature of the task, note that two are the dimensions of heterogeneity: regulators *vs.* judges and appointed *vs.* elected officials. I capture the latter referring to the set up developed in Alesina and Tabellini [2005, a]. A supervisor receives a payment $\hat{s}$ and she has a utility function given by:

[11] For an elected supervisor the evaluator will be a rational electorate. Note how also ALJs are elected in the US. The evaluator of appointed supervisors is the industry or a selection committee.

$$R_{i,l}(e_{i,l},S)=\left\{1+\tau\left[(1-SR)G^{i}(e_{i,l})-(1-(1-S)J)\tilde{C}(e_{i,l})\right]\right\}\hat{s} \qquad (2)$$

Here, the parameter τ measures the strength of the career concern incentives. For sake of comparison I will exhibit the case of equal draw of α and denote with i = {*Appointed*, *Elected*} and l = {*Regulator*, *Judge*}. In (2), S will be equal to 1 for a regulator and 0 for a judge while $G^{i}\left(e_{i,l}\right)$ differentiates bureaucrats and politicians. A politician's goal is to be re-elected and this happens if ξ exceeds a threshold $\overline{\xi}$. This amounts to say that $G^{E}\left(e_{E,l}\right)=\Pr\left\{\xi\geq\overline{\xi}\right\}$. Voters are rational and understand that the alternative to the incumbent is another politician with average talent who will exert effort $\overline{\xi}=(3/2)e_{E,l}^{\exp}$. So I have that: $G^{E}\left(e_{E,l}\right)=\Pr\left\{\alpha\geq\left[\left(3e_{E,l}^{\exp}/2e_{E,l}\right)-1\right]\right\}$. On the other hand, a bureaucrat is career concerned and she wants to maximize the perception of her ability α given the realization of the relevant measure of performance ξ, i.e., $G^{A}\left(e_{A,l}\right)=E\left(\mathrm{E}\left(\alpha/\xi_{A,l}\right)\right)=E\left\{\left[\left(1+\alpha\right)e_{A,l}-e_{A,l}^{\exp}\right]/e_{A,l}^{\exp}\right\}$. Here, E(·) is the evaluator's expectation over α given the precision realization and E denotes the unconditional expectation over ξ. A glance at $G^{E}(\bullet)$ and $G^{A}(\bullet)$ reveals how elected supervisors will exert more effort than appointed one. This is due to the fact that the density of the Beta evaluated at the mean is always greater than 1 for all g and b greater than 1. The relevant inequality is $f_{\alpha}(\bar{\alpha})>1$. This result is not upset when the distribution of α is asymmetric.[12] Focusing on R and J, they are both defined on (0, 1) and represent regulators and judges specific parameters. The first one captures the so-called "revolving-door" effect: regulators can be attracted by future job opportunities in the regulated industry. The second one (J)

[12] Proofs are available upon request. A local result holds if the substitutability between e and α is imperfect: $\xi=(\alpha+Z)e$. Here, I need: $[Z+g/(g+b)]\,f_{\alpha}(\bar{\alpha})>[1+Zg/(g+b)]$.

reveals the judges' desire to leave a legacy of correctness and unbiasedness (see also Levy [2005]).[13] Clearly enough the equilibrium level of effort can be ranked as follows: $\hat{e}^S_{E,J} > \hat{e}^S_{A,J}$ and $\hat{e}^S_{E,R} > \hat{e}^S_{A,R}$ (see Guerriero [2006 a] for proofs). Moreover these levels will be greater the more effective is the supervision technology *K*. In **2.,** the planner foresees the supervisors' moves and offers to the firm a menu of contracts contingent on the eventual signals $\{\sigma_R, \sigma_J\}$ and fully characterized by the above equilibrium levels of effort. The planner's posterior beliefs on $\beta = \underline{\beta}$ is:

$$\Pr(\beta = \underline{\beta} / \sigma_R = \phi, \sigma_J = \phi) = \frac{v(1 - \{E[\xi^S_{i,R}(\hat{e}^S_{i,R})] + (1 - E[\xi^S_{i,R}(\hat{e}^S_{i,R})])E[\xi^S_{i,J}(\hat{e}^S_{i,J})]\})}{1 - v\{E[\xi^S_{i,R}(\hat{e}^S_{i,R})] + (1 - E[\xi^S_{i,R}(\hat{e}^S_{i,R})])E[\xi^S_{i,J}(\hat{e}^S_{i,J})]\}} = \frac{v(1 - \gamma(\hat{e}^S_{i,R}, \hat{e}^S_{i,J}))}{1 - v\gamma(\hat{e}^S_{i,R}, \hat{e}^S_{i,J})}.$$

where $\gamma(\hat{e}^S_{i,R}, \hat{e}^S_{i,J})$ is greater the higher is K and if supervisors are elected. Now, the planner's ex-post expected welfare function writes as follows:

$$W_P^{AI,S} = v\gamma\left(\hat{e}^S_{i,R}, \hat{e}^S_{i,J}\right)\underline{W}^* + \left[1 - v\gamma\left(\hat{e}^S_{i,R}, \hat{e}^S_{i,J}\right)\right]\left\{\frac{v\left(1 - \gamma\left(\hat{e}^S_{i,R}, \hat{e}^S_{i,J}\right)\right)}{1 - v\gamma\left(\hat{e}^S_{i,R}, \hat{e}^S_{i,J}\right)}\left[V(\underline{\hat{q}}^S) - (1+\lambda)\left[(\underline{\beta} - \underline{\hat{a}}^S)\underline{\hat{q}}^S + \right.\right.\right.$$

$$\left.\left.\left. + \psi(\underline{\hat{a}}^S)\right] - \lambda\Phi(\hat{\bar{a}}^S)\right] + \frac{1 - v}{1 - v\gamma\left(\hat{e}^S_{i,R}, \hat{e}^S_{i,J}\right)}\left[V(\hat{\bar{q}}^S) - (1+\lambda)\left[(\bar{\beta} - \hat{\bar{a}}^S)\hat{\bar{q}}^S + \psi(\hat{\bar{a}}^S)\right]\right]\right\} - 2(1+\mu)\hat{s} \quad (3)$$

where μ is the shadow cost of public funds. Again the high type agent obtains an optimal allocation while the allocation-effort pair for the low type is given by:

$$\hat{\bar{q}}^S = q^*(\bar{\beta} - \hat{\bar{a}}^S) \quad \text{i.e.,} \quad V'\left(\hat{\bar{q}}^S\right) = \hat{\bar{c}}^S = \bar{\beta} - \hat{\bar{a}}^S,$$

$$\psi'\left(\hat{\bar{a}}^S\right) = \hat{\bar{q}}^S - \frac{\lambda}{1+\lambda}\frac{v}{1-v}\left(1 - \gamma\left(\hat{e}^S_{i,R}, \hat{e}^S_{i,J}\right)\right)\Phi'(\hat{\bar{a}}^S), \quad (4)$$

The results in (4) suggest how the rule giving price as a function of marginal cost is the same of the full information case: incentive concerns are entirely taken care of by the cost-reimbursement rule. In order to lower the high type rent, the principal is forced to distort away from the first best allocations and toward low

[13] The revolving door effect does not seem to exist for ALJs.

power (i.e., low level of effort $\hat{\bar{a}}^{S}$) incentive schemes. This distortion is lower the more powerful is the signal extraction technology and implicit political incentives (election) for supervisors act here as substitute for possibly costly explicit market incentives (COS). The following proposition summarizes these findings:

Proposition 1: ***A.*** *High powered incentive schemes are linked to the presence of elected supervisors and more efficient supervision technologies (higher K).* ***B.*** *An increase in the power of the incentive scheme lowers ex-ante regulated prices*.

The above proposition extends the basic insights of the New Regulation Theory program's (Laffont and Tirole [1993]) to the more realistic framework with implicitly interested supervisors and hierarchical signal extraction technology. However, it is instructive to insist that the picture drawn in this section is at least partially shaded. I always assume a myopic and public interested planner, but what happens when partisan interests and concerns for the long run firm's profitability affect the planner's objective function?

3.1 Strategic Price Mechanism Reforms

Following Laffont and Tirole [1993], a sharp tension between rent extraction and investment arises in industrial policies: whether or not the planner can commit to a contract contingent on the level of investment, the equilibrium can envision ex post expropriation of sank investments. In this sense, non-benevolent supervisors may relax such a failure. This intuition proposes several crucial questions: is it possible to think of the supervisors' effort exertion as a pandering activity? If this is the case, can a possibly partisan planner take the expropriation effect into consideration in choosing among selection rules? How much is this choice driven by efficiency concerns and how strong are the rent seeking forces? The answer to

the first question arises naturally when the above model is bridged to the analysis in Laffont and Tirole [1993]. Let me assume that before stage **1.** The regulated firm fixes the level of a non contractible investment of cost I that increases of $\zeta(I)$ the probability that a high type is drawn. Moreover I have that: $\zeta'(\bullet)>0, \zeta''(\bullet)<0$, $\lim_{I\to\zeta^{-1}(\bar{v})} I=\infty$ with $\bar{v}=(1-v)/v$ and that investments are sufficiently effective, i.e. $\zeta'(\bullet)>1/(v\Delta\theta)$. The planner lacks commitment but anticipates the optimal I (i.e., I^*). Ex ante the firm maximizes her expected ex post rent minus investment costs:

$$I^* \in \arg\max_{I\geq 0}\left\{v(1+\zeta(I))[1-\gamma(\hat{e}^S_{i,R},\hat{e}^S_{i,J})]\Phi(\hat{\bar{a}}^{S,I}(I^*))-I\right\} \qquad (5)$$

Employing a revealed preference argument (see *Appendix 6.1*), (5) clarifies that the firm under-invests with respect to the social optimum. Moreover, the objective function in (5) suggests that the extent of inefficiency is higher the more precise is the planner's signal and the less powered the incentive scheme is.[14] Indeed, a fixed-price contract reaches efficiency but at the cost of a too high rent for the high type. It is now clear how a planner caring enough about cost-reducing investments, because faced with a high cost market or because strongly interested in the firm long run profits will prefer a high-powered performance rule. From a long run perspective, the supervisors' signal extraction activity can assume a pandering feature when effort is driven more by career concerns than by a farsighted interest in the market efficiency: this dynamic inconsistency is even stronger when investments in reliability and quality services are taken into

[14] Such an effect is studied in Sappington [1986]. Here, an institution that prevents a regulator from observing the firm's true cost turns out to be optimal to protect the firm from investments' expropriation. In my model the actual presence of higher powered incentives schemes and the appointment rule for supervisors cover the same role.

consideration. These activities do not lower the firm's cost but increase her long run profitability: evidently also a conflict between consumers' groups will arise here. To capture this, I assume that the constitutional reform is decided by the incumbent among two parties: one more pro-shareholders *R* (Republican), and one more pro-consumers *D* (Democratic). Between stages **1.** and **2.,** each party faces an election with winning probability x_j (j = [*D*, *R*]) and decides, if it is the winner, the size of ρ_j, an instrument increasing the investment's utility for the firm, i.e. $G(I,\hat{\rho}_j)$. A type *j* planner attaches a weight $\tilde{\chi}_J$ to the latter and a weight χ_j to *I*. The weights are such that: $\chi_R = 1+2d$, $\chi_D = 1+d$, $\tilde{\chi}_R = 2d-1$, $\tilde{\chi}_R = d-1$. So a Republican planner values more *I* and dislikes less an increase in the firm's utility. The following properties hold: $G_1 > 0, G_{11} < 0, G_{11} < 0, G_2 > 0, G_{22} < 0, G_{12} > 0$, $G_{21} > 0$. The firm shows risk aversion toward non cost-reducing investments and, defining $I^*(\hat{\bar{a}}^{S,I}(i),\hat{\rho}_j) \equiv I(i,j)$, the following regularities hold: $G_{111}/G_{112} \geq G_{11}/G_{12}$ and $\left[G_{11}(I(i,R),\hat{\rho}_j)\,\partial I(i,R)/\partial \bar{a}^{S,I}\right] \Big/ \left[G_{11}(I(i,D),\hat{\rho}_j)\,\partial I(i,D)/\partial \bar{a}^{S,I}\right] \geq 1$ (6)

Before stage **3.**, the firm chooses the non-observable and non-contractible *I* as to maximize her expected ex post utility subject to the budget constraint:

$$I^* \arg\max_{I\geq 0}\left\{G(I,\hat{\rho}_j)+\hat{\underline{t}}-\psi(\hat{\underline{a}}^{S,I})\right\} s.t.: A+(p-c)q \geq t+I. \quad (7)$$

I^* depends from both the power of the incentive scheme and the level of ρ_j and the inter-party distance *d* and the optimal ρ are such that: $\hat{\rho}_R > \hat{\rho}_D$ and $d > \lambda$. So I have that: $I_1(\hat{\bar{a}}^{S,I},\hat{\rho}_R) \geq I_1(\hat{\bar{a}}^{S,I},\hat{\rho}_D) \geq 0$. Clearly, a partisan planner takes into account the political uncertainty and increases the power of the scheme the deeper the fear of expropriation is. Defining $G(I(i,j),\hat{\rho}_j) \equiv G(i,j)$, the ex post expected welfare function for a type *j* planner is:

$$W_j^{AI,S,I}(i,j) = W_P^{AI,S}(i) + v\gamma(i)\left[(1+\lambda+\tilde{\chi}_j)\tilde{G}(i,j) + (\chi_j - 1 - \lambda)\tilde{I}(i,j)\right] - o\left(1 - \partial\tilde{G}(i,j)/\partial I\right).$$

with $\tilde{I}(i,j) \equiv I(i,-j) + x_j(I(i,j) - I(i,-j))$ and $\tilde{G}(i,j) \equiv G(i,-j) + x_j(G(i,j) - G(i,-j))$.

The equilibrium effort for the low type firm is defined as: $\psi'\left(\hat{\bar{a}}^{S,I}\right) =$

$$= \hat{\bar{q}}^{S,I} - \frac{1}{1+\lambda}\frac{1}{1-v}\left\{v\gamma(i)\left[\lambda\Phi'(\hat{\bar{a}}^{S,I}) - (1+\lambda+\tilde{\chi}_j)\,\partial\tilde{G}(i,j)/\partial\bar{a}^{S,I} + \right.\right.$$

$$\left.\left. -(\chi_j - 1 - \lambda)\,\partial\tilde{I}(i,j)/\partial\bar{a}^{S,I}\right] + o\left[\partial^2\tilde{G}(i,j)/\partial I\,\partial\bar{a}^{S,I}\right]\right\}. \qquad (8)$$

Non contractibility of investment along with sharp conflicts over the size of investments' aids among different consumer groups generate the last three new and positive terms in the cost-reimbursement rule. These terms are affected by both the inter-party distance *d* and the holding on power x_j. The latter effect is diametrically different among contrasting partisan planners when the role of public incentives is greater (condition (6)). Such a strategic institutional design[15] extends to the incentive schemes' reform the foundations suggested by Guerriero [2006 a] to the supervisors' selection rules. *Proposition 2* summarizes as follows:

Proposition 2: **A.** *Higher powered incentive schemes will be linked to high cost industries*. **B.** *The likelihood of a reform toward more powerful incentive schemes is higher the higher is the inter-party distance and the higher (lower) is the holding on power if the reformer is Republican (Democratic). The presence of a Republican incumbent reformer increases the likelihood of these reforms.*

These results are strongly at odd with the seminal analysis in Laffont [1996]. There the relation with an incumbent Republican has opposite signs and the

[15] Several studies demonstrate that a lack of permanence in office can inspire policymakers to employ institutional reforms either to influence political outcomes or to impose constraints on future incumbents (see Persson and Svensson [1988] and Tabellini and Alesina [1990]).

incentive rule was insensitive to the holding on power with a Democratic planner. The deep reason is that when loosing the chance of fixing the preferred level of ρ_j becomes more costly (high inter-party distance) an incumbent planner is willing to distort the incentive scheme even more toward less rent extraction.

3.2 Robustness: Lobbying and Bribing

When positive rents remain in equilibrium, they can be employed to capture either partisan parties or directly supervisors. Indeed, *Proposition 1* results somewhat weakened when an organized group interested in maximizing the regulated firm's rent is considered. Both ALJs and PUCs' commissioners exert effort in other tasks. As seen above, examples are the control of bypassing by non-regulated utilities and the analysis of environmental regulation. Well, it turns out that the organized group can relax the supervision constraint offering side-contracts conditional on this second effort level supposed observable and contractible;[16] As in Alesina and Tabellini [2005 a], the interest group has all the bargaining power and influences supervisors either directly (bribes) or indirectly (campaign contributions) before the effort is decided in stages **3.** or in **4.**. The level of performance from the extra task *h* brings a small positive extra-utility to the firm but implies a relevant cost of effort to the supervisor as captured by a non-divisible effort cost function $C\left(e_{i,l}^{S}+e_{i,l}^{h,S}\right)$. In a jointly optimal equilibrium $\hat{e}_{i,l}^{S}=0$ so that the high type's firm enjoys a higher informational rent (proofs are available upon request). Even if discouraging, these equilibria are fragile and the

[16] Here I take aside the eventual multiple principal-multiple agents' strategic interaction, i.e. cost minimization across supervisors' side payments. This remains as open agenda for future research.

following remarks apply: 1 Bribes do not arise if the punishment that a supervisor receives if caught is high enough; 2 Campaign contributions, although legal, would be not even affordable for the interest group, which has to reimburse supervisors for the entire amount of implicit incentives (multiplicative precision technology); 3. Judges are less corruptible even if the return to bribe them is higher (they exert a higher level of effort). Thus, provided that implicit incentives are high enough - high values of τ, R and J in (1) - the model remains robust to possible lobbying and bribing. The next section will face this complex theory, except the firm's lobby part, to the data. The next section will subject this complex theory, except the interest group part, to the U.S. electric market's data.

4. Evidence

The main contribution of the empirical part of the paper is to address finally the constitutional determinants of the reform of cost-reimbursement rules in regulated market, giving, besides, evidence on the effect of the reforms toward performance based regulations on the US Electric power market prices. As *Table 2.A* and *2.B* report, between 1982 and 2002, 41 of the 144 major IOUs operating in the US electric power market switched to some kind of performance based regulations. This enormous wave of change has been interesting 25 of the 49 continental US states and constitutes a perfect source of variation able to test the above model. The empirical questions are: what forces have shaped the reforming planners' incentives at the constitutional tables? How strong were the political positions and how much did the reformer take into consideration efficiency reasons? Can the data reveal the extent of substitutability between market and political institutions?

Such a wide variation over cross sections (i.e. states and firms within states) and time nicely lends itself to a panel approach; moreover, as underlined in Persson and Tabellini [2003], a cross sectional analysis will deliver here fragile inference given the "non-random pattern of constitutional reforms and the extensive differences among [individuals] belonging to different constitutional groups." Thus, I will make use of two main models for evaluating respectively the determinants of the constitutional reforms and the effects of PBRs on prices: 1. a random effects panel with dependent variable a binary for the presence of performance-based regulations; 2. a panel pass-trough pricing equation. *Proposition 1* and *2* arise a set of empirical predictions summarized as follows:

Empirical Prediction: **1. A.** *High powered incentive schemes are linked to more efficient supervision technologies, high cost industries and elected supervisors*. **B.** *High powered incentive schemes are more likely with Republican reformers, the higher is the inter-party distance and the higher (lower) is the holding on power if the incumbent reforming party was Republican (Democratic).* **2.** *High powered incentive schemes lower the level of equilibrium prices.*

4.1 Non Random Constitution Selection

First of all, let define institutions. The high powered incentive schemes' dummy (*PBR_F* and *PBR*) takes value 1 if the firm (or the state) adopts a broadly defined (rate freeze, price or revenue cap with possible earnings sharing)[17] performance based regulation and 0 otherwise (i.e., cost of service regulation). In order to evaluate the *Empirical Prediction*, I make use of several proxies for the efficiency

[17] See EEI, [2000] and Sappington et al. [2001] for a precise definition of each scheme.

of the production and signal extraction technologies and the inter-party competition. The latter is captured by the absolute distance between Democrats and Republicans (*Av_Dist*) while the incumbent's holding on power is measured by the average percentage of seats held by the majority party (*Av_Maj*).[18] Let me define selection rules as: *Jud_Elec*, an elected judges' dummy, and *Reg_Elec*, an elected regulators' dummy. More complex it is to find proxies able to directly quantify the efficiency of the supervision technology; my strategy is to use the two sets of observables that most likely enhance the likelihood of information extraction: proxies for the presence of powerful watchdog groups and proxies for the amount of staff's resources. The first set includes: *Young* (proportion aged 5-17), *Ind* and *Res* (proportion of revenues form sales to industrial and residential users respectively). Staff's resources are measured by the PUC's staff budget (*Budget*) and the number of permanent staff's members (*Employ*). The latter, unfortunately, is a very crude proxy for efficiency; different and unobservable (in my data) skills are required to the PUC's members so it is not clear in what measure higher values of *Employ* provide the planner with a more precise signal or instead relax the assumed benevolence. Finally, investments' concerns are captured by proxies for costly generation (c_{st}) and more crudely by residential prices (*Rkhr*). Generations by nuclear and fuel sources (*Gen_Fuel*, *Gen_Nucl*) are introduced (one at the time to avoid multicollinearity) to control for difference in generation sources across states. Finally, other controls are state population (*Pop*), income (*Income*) and electricity sales (*Sales*). A full account of the variables' source and construction is given in the *Appendix 6.2* and *Table 1*. *Table 3* presents the results of the random effects Logit model. While *columns (1)* and *(2)* report,

[18] See Hanssen [2004] for a detailed explanation of the proxies' choice.

respectively, the estimates for a panel of 49 states for the samples 1970-1997 and 1980-1997; *column (3)* shows the evidence when the same model is estimated for a panel of 143 firms over the same 49 states over the period 1980-1997 (the Potomac Electric Power Company is excluded given the non-availability of data points for the District of Columbia). Note that in *column (3)*, the right hand side variables vary only across states and time and identification is obtained through the firms specific random effects. The evidence strongly supports the model predictions. For what concern the proxies for the holding on power, the results arbitrate clearly in favor of the strategic use explanation. The holding on power increases the probability of a reform toward higher powered incentive schemes if interacted with a Republican incumbent while the sign of *Av_Maj* is negative within the Democratic incumbents' group. Republican incumbent are more likely to reform toward *PBR*.[19] All the proxies are highly significant (almost all at 1%-5%) except *Av_Maj* in *column (1)* and *Av_Dist* in *columns (1)* and *(3)*. Looking to selection rules, it is clear (even if *Jud_Elec* is significant at 20% in *column (3)* and negative in *column (2)*) that the planner substitutes out costly rent-extraction incentives (COS) with accountability-driving institutions. A bit more mixed is the evidence on the efficiency of the signal extraction technology. The relevant proxies show the correct sign except *Employ* always negative and *Res* and *Ind* negative in *columns (2)* and *(3)*. While the first sign comes at no surprise given the above remark, an appealing explanation for the last two is that, in a dynamic set up, the friction between supervisors and interested parties would become so

[19] The impact of an incumbent Republican reformer is given by the sum of the coefficient on *Rep* plus the coefficient on *PBR*Rep* multiplied for the mean of *Av_Maj*. In *columns (1)* and *(3)* these figures are respectively: 4.26 = – 25.54 + 44.48*0.67 and 5.43 = – 15.00 + 31.92*0.64.

sour to deteriorate the quality of the signal. Finally investment concerns (high cost industries) increase the attractiveness of high powered cost-reimbursement rules. *Section 4.2* closes the empirical evidence looking to the relation between price and high powered incentive schemes. To this extent, a wide literature, mainly based on telecommunications' market data, has delivered the following stylized facts: PBRs delivers lower prices and higher earnings with no relevant reduction in overall service quality.[20] What these studies lack is an endogenous treatment of the regulatory institutions: the next section will fill this hole.

4.2 Pricing Models

The model considered relates electricity prices charged at state level to various cost items plus fixed effect terms for regulation regimes. Utilities set prices at system wide average costs. The only rough and available measure is the fossil fuels' component (see Besley and Coate [2003]). This item is useful in assessing the pass through of cost shocks into prices and helps in controlling the differences in the production structures. Thus, I test point **2.** of the *Empirical Prediction* running, for each customer class, a panel regression of the form:

$$p_{s,t} = \eta_s + \vartheta_t + \phi_1 Reg\_Elec_{s,t} + \phi_2 Jud\_Elec_{s,t} + \phi_3 Jud\_Elec_{s,t} +$$

$$+\upsilon_1 PBR_{s,t} c_{s,t} + \upsilon_2 Jud\_Elec_{s,t} c_{s,t} + \upsilon_3 c_{s,t} + \varphi Con_{s,t} + \varepsilon_{s,t}. \qquad (9)$$

In (9) $p_{s,t}$ is a price for state *s* in year *t*; η_s are state fixed effects controlling for long-run differences in production and distribution systems; ϑ_t are year dummies

[20] Sappington et al. [2001] offer a complete and clear cut summary of the literature. Kridel, Sappington and Weisman [1996] is a review of the first pieces of evidence on PBRs. The same scope has Hill [1995] for studies focusing on the electric power market.

picking up macro-shocks and common changes in federal policy; $Con_{s,t}$ includes state specific time varying controls (*Gen_Fuel*, *Gen_Nucl*, *Income*, $Income^2$, *Pop*, Pop^2, *Sales*) and proxies for the efficiency of the supervision technology: *Res*, *Ind*, *Young*, *Budget*, *Employ*. $PBR_{s,t}$, $Jud\_Elec_{s,t}$ and $Reg\_Elec_{s,t}$ represent the time varying dummies for PBRs and election rules respectively. *Table 10* reports the main figures. The model has always an explanatory power higher than 85% and all the proxies for the efficiency of the supervision technology (not shown) are highly significant and have an attached coefficient with the correct sign. The coefficient on costs interacted with whether a state has switched incentive schemes is always negative but never significant when $Jud\_Elec_{s,t}$ is included. The high significance of the latter suggests that implicit political incentives are more effective. This would also explain in an appealing way the lags in the introduction of PBRs in the US. The direct effect of $PBR_{s,t}$ is both significant and positive on residential and commercial rates. Can these results be driven by a failure in conditional independence? *Table 5* addresses such a question. Here, (9) is estimated with the Arellano-Bond procedure without fixed effects but with one lag of the dependent variable; *Av_Maj*, *Rep*, *Av_Maj*Rep* only are employed as extra instruments to avoid weak instrumentation (the over-identifying restrictions are never rejected). As *column (1)* through *(3)* show the indirect effect of $PBR_{s,t}$ is not significant but now null; the direct effect becomes negative: OLS seems to overestimate the overall effect of the reform toward more powerful schemes. This has a significant (at 10%) marginal negative effect on residential prices implying a 2.5% reduction on the residential bills over the 1970-1997 sample. The weak significance is mainly due to the variation captured by the first lag of prices.

5. Concluding Remarks

As the theoretical section broadly explains price-cap and cost-plus regulation do arbitrate the rent-efficiency trade-off in quite different ways: an eventually partisan planner would take into account not only the different comparative advantages of different rules but would also use strategically more powered schemes to tie the hands of new incumbents' parties. I test these propositions on a panel of U.S. states. The results show how the probability of a reform from a low powered incentive scheme to a higher powered one has been linked to Republican incumbents, a higher interparty distance, high cost structures and the presence of more efficient supervision technology and elected supervisors. Less clear remains the effect of PBRs on regulated prices; OLS tend to overestimate the overall effect of the reform on electricity rates and such an effect seems to be negative even if significant only for residential rates. However the point remains as open agenda for further research along with a multidimensional analysis of differently powered incentive rules.[21] All in all, the evidence on the constitutional reforms' likelihood is robust to different estimation procedures and disturbance hypotheses and rationalizes the great wave of change that has interested the market during the last decades. Indeed, at the constitutional table, planners have solved the rent extraction *vs.* efficiency trade off substituting out, according to their own partisan interests, costly - in terms of efficiency - explicit market's incentives (i.e., cost of service) with implicit institutional accountability designs (i.e., election).

[21] When I employ a multinomial Logit and an ordered Logit estimator, the main results remain unchanged (not shown). In the latter model *PBR* is set equal to 1 if a COS regulation is employed, 3 if a pure price cap is in use and 2 if any other PBR scheme is the incentive scheme adopted.

References

[1] Aghion, P., and P. Bolton, [1990], "Government Debt and the Risk of Default: A Politico-Economic Model of the Strategic Role of Debt", in Dornbusch R., and M. Draghi, eds., *Public Debt Management: Theory and Practice*, Cam. Un. Pr..

[2] Alesina, Alberto, and Guido Tabellini, [2005], "Bureaucrats or Politicians?", *NBER working paper*.

[3] Armostrong, Mark, and David Sappington, [2005], "Recent Developments in the Theory of Regulation" forthcoming the *Handbook of Industrial Organization*.

[4] Besley, T. and A. Case, [2003], "Policy Institutions and Policy Choices: Evidence from the United States", *Journal of Economic Literature*, 41 (1): 7-73.

[5] Besley, Timothy, and Stephen Coate, [2003], "Elected versus Appointed Regulators: Theory and Evidence", *Journal of the European Economic Association*, 1 (5): 1176-1206.

[6] Clinton, J. Andrews, [1999], "Innovation and Imitation in U.S. Electricity Sector Regulation", mimeo: Rutgers University.

[7] Chunrong, Ai, and David E. M. Sappington, [2002], "The Impact of State Incentive Regulation on the U.S. Telecommunication Industry," *Journal of Regulatory Economics*, 22 (2): 133-160.

[8] Colorado Department of Regulatory Agencies, [1992, 1997], "1992 (1997) Sunset Review of the Colorado Public Utilities Commission", mimeo: CDRA.

[9] Edison Electric Institute, [2000], *Performance Based Regulation: EEI Member Survey*, Washington DC.

[10] Estache, Antonio, and David Martimort, [2004], "Politics, Transaction Costs, and the Design of Regulatory Institutions", mimeo: INRA.

[11] Guerriero, Carmine, [2006], "Dependent Controllers and Regulators: Theory and Evidence", mimeo: University of Cambridge.

[12] Hanssen, F. A., [2004], "Learning About Judicial Independence: Institutional Change in the State Courts", *Journal of Legal Studies*, 33 (2): 431-474.

[13] Hanssen, F. Andrew, [2004], "Is there a Politically Optimal Level of Judicial Independence?", *American Economic Review*, 94 (4): 712-729.

[14] Joskow, P., [1974], "Inflation and Environmental Concern: Structural Change in the Process of Public Utility Regulation", *Journal of Law and Economics*, 27 (2): 291-327.

[15] Joskow, P., [2005], "Incentive Regulation in Theory and Practice: Electricity Distribution and Transmission Networks", mimeo: MIT.

[16] Laffont, Jean-Jacques, and Jean Tirole, [1993], *"A Theory of Incentives in Procurement and Regulation"*, Cambridge MA: MIT Press.

[17] Laffont, J.-J., [1996] "Industrial Policy and Politics", *International Journal of Industrial Organization*, 14 (1): 1-27.

[18] Laffont, J.-J., and D. Martimort, [1999], "Separation of regulators against collusive behavior", *RAND Journal of Economics*, 30 (2): 232-262.

[19] Laffont, J.-J., [2000], *Incentives and Political Economy*, Oxford Un. Press.

[20] Leaver, Clare, [2004], "Bureaucratic Minimal Squawk Behavior: Theory and Evidence from Regulatory Agencies", mimeo, LSE.

[21] Levy, G., [2005], "Careerist Judges and the Appeals Process", *Rand Journal of Economics*, 36 (2): 275-297.

[22] Maskin, Eric, and J. Tirole, [2004], "The Politician and The Judge: Accountability in Government", *American Economic Review*, 94 (4): 1034-1054.

[23] Mathios, Alan D., and Robert P. Rogers, [1989], "The Impact of Alternative Forms of State Regulation of AT&T on Direct-Dial, Long Distance Telephone Rates", the *Rand Journal of Economics*, 20 (3): 437-453.

[24] Milesi-Ferretti, Gian Maria, [1995], "The Disadvantage of Tying Their Hands: on the Political Economy of Policy Commitments", the *Economic Journal*, 105 (443): 1381-1402.

[25] Persson, Torsten, and Lars E.O. Svensson, [1989], "Why a Stubborn Conservative Would run a Deficit: Policy with Time-Inconsistent Preferences", *Quarterly Journal of Economics*, 104 (2): 325-45.

[26] Persson, T., and G. Tabellini, [2000], *"Political Economics: Explaining Economic Policy"*, Cambridge, MA: MIT Press.

[27] Persson, T., and G. Tabellini, [2003], *"The Economic Effects of Constitutions"*, Cambridge, MA: MIT Press.

[28] Sappington, D., [1986], "Commitment to regulatory bureaucracy". *Information Economics and Policy* 2 (4): 243-258.

[29] Sappington, David E. M., J. P. Pfeifenberger, P. Hanser and G. N. Basheda, [2001], "The State of Performance–Based Regulation in the U.S. Electric Utility Industry", *The Electricity Journal*, 14 (8): 71-79.

[30] Sappington, David E. M., [2001], "The Effects of Incentive Regulation on Retail Telephone Service Quality in the United States", 2(4): 355-375.

[31] Tirole, J., [1986], "Hierarchies and Bureaucracies: On the Role of Collusion in Organization", *Journal of Law, Economics and Organization*, 2: 181-214.

[32] U. S. Department of Commerce, Bureau of the Census, [1960-1996], "Compendium of State Government Finances", G-SF Series, Washington DC.

Tables Legend

Preliminary Analysis

Table 1: Variables Names and Descriptions.

Table 2.A: PBR in the U.S. Electric Power Market (1970-2002).

Table 2.B: PBR in the U.S. Electric Power Market (1970-2002).

Non Random Constitution Selection

Table 3: Determinants of Incentive Schemes - RE Logit Panel Estimates.

Pricing Equations

Table 4: Results on Pass-Through - Fixed Time/State Effects Estimates.

Table 5: Results on Pass-Through - Arellano-Bond Estimates.

6. Appendix

6.1 Solution without Supervision and Investment Concerns

Maximizing (1) with respect of U, e and q yields the following:

1. The existence of the shadow cost of rewards implies no rent for the firm:

$U = 0$ or $t \equiv \psi(a^*)$;

2. The disutility of effort is equalized to the saving in average cost at the margin:

$\psi'(a^*) = q^*$ or $a \equiv a^*$;

3. The social marginal value and cost of output are equalized:

$V'(q) = (1+\lambda)(\beta - a)$ or $S'(q) = p = c$.

The regulated firm receives a price p implicitly defined by the following contract:

$A + p^{PC}q(p^{PC}) = S'(q) = d - (C - C^*)$.

Here $d = \psi(a^*)$ and PC stands for price cap. The firm chooses a in order to maximize $a - ((\beta - a)q - C^*) - \psi(a)$.[22] A price–cap gives the right incentives for cost reduction and the fixed charge C^* can be tailored to fully extract the firm's rent. ■

The socially optimal $\hat{I}$ minimizes the sum of investment costs and ex post costs:

$$\hat{I} \in \arg\min_I I + v(1+\zeta(I))\underline{\beta} + \left[1 - v(1+\zeta(I))\right]\overline{\beta} = I + \overline{\beta} - v(1+\zeta(I))\Delta\beta \qquad \text{(A.1)}$$

This amounts to say that the objective in (A.1) assumes a value greater at I^* than at $\hat{I}$. Evidently, the same can be said for the objective function in (5). Once I sum these two inequalities, the following expression holds in equilibrium:

$$I^* + \overline{\beta} - v(1+\zeta(I^*))\Delta\beta + v(1+\zeta(I^*))[1-\gamma(\hat{e}^S_{i,R}, \hat{e}^S_{i,J})]\Phi(\overline{a}(I^*)) - I^* \geq$$

$$\hat{I} + \overline{\beta} - v(1+\zeta(\hat{I}))\Delta\beta + v(1+\zeta(\hat{I}))[1-\gamma(\hat{e}^S_{i,R}, \hat{e}^S_{i,J})]\Phi(\overline{a}(I^*)) - \hat{I}$$

or $v(\zeta(\hat{I}) - \zeta(I^*))\left\{\Delta\beta - [1-\gamma(\hat{e}^S_{i,R}, \hat{e}^S_{i,J})]\Phi(\overline{a}(I^*))\right\} \geq 0$. Given the properties of $\zeta'(\bullet)$ and the first order conditions of (5), this inequality is met for $\zeta(\hat{I}) \geq \zeta(I^*)$ or $I^* \leq \hat{I}$. Noting how, if it is likely, the cost of investment is lower in low cost market and taking the comparative statics with respect to K, *Proposition 2.***B** follows. ■

6.2 Data

This analysis exploits both cross sectional and time variation in the data. Three are the main data sets: a panel of 49 states for the samples 1970-1997 (1372 observations) and 1980-1997 (888 observations) and a panel of 143 firms over the same 49 states over the period 1980-1997 (2574 observations). Nebraska has been excluded because it has no investor–owned utilities while the District of Columbia is not considered because no data points are available before 1987. Unbalanced panels deliver the same results.

[22] Note that, as long as the planner knows β, she can infer effort from the observation of cost.

B.1 Data on incentive schemes are directly collected from:

B.1.1 EEI, [2000], *PBR Survey (Member Survey)*, EEI, Washington D.C.

B.1.2 Sappington, D. E.M., J. P. Pfeifenberger, P. H. and G. N. Basheda, [2001].

B.2 Data on electric prices, generation and the price of fossil fuels (composite) per net Kwh are collected or calculated from the EEI (Edison Electric Institute) yearbook:

EEI, [1995], *1960-1992: Historical Statistics of the Electric Utility Industry*;

EEI, [1993-1997], *Statistical Yearbook of the Electric Utility Industry*, Washington DC.

EEI refers to the source of data for its yearbooks to various places including DOE, EIA, Federal Power Commission and FERC. EEI reports annual revenues (in dollar terms) and sales (in Kwh) by state and class of service. Prices are calculated from the revenues and sales in terms of cents per Kwh. Residential, commercial and industrial users account for the 95% of revenues. EEI reports electric generation and sources of energy for generation in two types of breakdown, i.e., by type of prime mover driving the generator and by energy source. The totals from the two of them are consistent. I used the second one.

B.3 To construct the fossil fuel cost index for state i in year t, let s_{jit} be the share of energy source j in state i in year t and let p_{it} be the price of fossil fuels (composite) per net Kwh (in cents per Kwh) for state i in year t, calculated as: $p_{it} = \Sigma_j (q_{jit}/q_{it}) p_{ijt}$. Then the fossil fuel cost series will be given by $c_{it} = \Sigma_j s_{jit} p_{it}$ where s_{it} is the share of electricity produced in state i in year t by the fossil fuel energy sources j (i.e.: coal, gas and oil).

B.4 Data on regulatory selection rules, PUCs' budgets and number of PUCs' full time employees are collected directly from:

NARUC, [1970-1997], *Yearbook of Regulatory Agencies*, NARUC, Washington DC.

B.5 Political preferences are from the CSG (Council of State Governments) yearbooks:

CSG, [1970-1997], *The Book of the States*, CSG, Lexington, KY.

B.6 Data on judges' selection rule and length terms are collected from Hanssen, F. Andrew [2004, Table 1] and Besley, Timothy and A. Abigail Payne, [2003, Table 1].

B.7 State income per capita, population, proportion aged over 65 and proportion aged 5-17 are calculated from a U.S. Census Bureau (UCB) publication:

UCB, [1970-1997], *Population Estimates Program*, UCB, Washington DC.

7.2 Tables

Preliminary Analysis

Table 1: Variable Names and Descriptions.

	Variables	***Description***
Pricing Rules	***PBR***	Dummy taking value 1 if the rule is in use in the state, 0 otherwise. (***PBR_F*** = Dummy taking value 1 if the firm uses the rule, 0 otherwise).
Prices	***Rkhr/c/i***	Revenue per Kwh sales (residential, commercial, industrial).
Political Variables	***Av_Maj*:**	Percentage of seats (averaged across upper and lower houses) held by majority party.
	***Av_Dist*:**	Absolute difference between percentage of seats held by Democrats and Republicans.
	***Rep*:**	Dummy taking value 1 if the government is Republican, 0 otherwise.
Selection Rules	***Reg_Elec*:**	Dummy taking value 1 if commissioners are elected, 0 otherwise.
	***Jud_Elec*:**	Dummy taking value 1 if judges are elected, 0 otherwise.
Supervision Technology	***Budget*:**	PUC's total receipts in thousands dollars.
	Employ:	PUC's full time employees.
Watchdog Groups	***Over_65*:**	Percentage of population aged 65 and over.
	***Young*:**	Percentage of population aged 5-17.
	***Res*:**	Percentage of *Sales* from customers who are residential.
	***Ind*:**	Percentage of *Sales* from customers, which are industrial.
Average Cost	c_{st}**:**	Cost of fossil fuels (in cents per Kwh sales) – see Appendix 6.2.
Other Controls	***Gen_Fuel:***	Percentage of total generation from fossil fuels sources.
	Gen_Nucl:	Percentage of total generation from nuclear source.
	***Sales*:**	Sales in thousands Mwh.
	***Pop*:**	State population in thousands people.
	***Income*:**	State income in thousands dollars.

Table 2.A: PBR in the U.S. Electric Power Market (1970-2002).

States	IOUs	PBR	Period
AL	AL Po. Co. ;	Rate case moratorium;	1982-2002
AZ	AZ Pu. Se. Co. , Tucson El. Po. Co.;	None, None;	
AR	Entergy AR Inc. ;	None;	
CA	Pacific Gas & El. Co. , San Diego Gas & El. Co. , * Southern CA Edison;*	None, Revenue and price cap with earnings sharing (see also case A.98-01-014), Price cap with earnings sharing (see also case A.93-12-029);	 1994-2002 1997-2001
CO#	Pu. Se. Co. of CO;*	Rate case moratorium with earnings sharing (see also case 95A and 99A-531EG);	1996-2006
CT	Citizen Utilities Co. , CT Light & Po. Co. ,* United Illuminating Co. ;	None, Price cap (see also case 99-06-21 filed in 2000), None;	 2000-2001
DE	Delmarva Po. & Light Co.;	None;	
DC	Potomac El. Po. Co.;	None;	
FL	FL Po. & Light Co. , FL Po. Co. , Gulf Po. Co. , Tampa El. Co. ;*	None, None, None, Rate freeze with earnings sharing;	 1995-1999
GA	GA Po. Co. , Savannah El. & Po. Co. ;	None, None;	
HI	HI El. ,* Maui El. Co. Ltd. ;	Price cap with earnings sharing (see also case 96-0493 filed 1996), None;	1997-1999
ID	ID Po. Co. ;	None;	
IL	Central IL Light Co. , Central IL Pu. Se. Co. ,* Commonwealth Edison Co. , IL Po. Co. , Mt. Carmel Pu. Se. Co. ;	Price cap with earnings sharing, Price cap with earnings sharing, Price cap with earnings sharing, Price cap with earnings sharing, Price cap with earnings sharing;	1998-2002 1998-2002 1998-2002 1998-2002 1998-2002
IN	IN Michigan Po. Co. , Indianapolis Po. & Light Co. , Northern In. Pu.Se.Co. , PSI Energy Inc. , Southern IN Gas & El. Co. ;	None, None, None, None, None;	
IA	Interstate Po. Co. , IES Ut. Inc. , MidAmerican Energy Co.;*	None, None, Rate case moratorium with earnings sharing (see also APP-96-1, RPU-96-8);	 1998-2000
KS	KS Gas & El.Co., Western Resources Inc.;	None, None;	
KY	KY.Po. Co. , KY Ut. Co. , Louisville Gas & El. Co. ,* Union Light Heat & Po. Co.;	None, None, Revenue sharing (see also case 98-426/7 filed in 1998), None;	 1999-2000
LA	Central LA Inc. , Entergy LA Inc. ,* Entergy New Orleans Inc. , Southwestern El. Po. Co. ;	None, Rate case moratorium with earning sharing (see also case U-20925 filed in 1996), None, None;	 1996-2002
ME	Bangor Hydro-El. Co. , Central ME Po. Co. , ME Pu. Se. Co. ;*	Rate freeze for distribution services, Revenue-per-customer cap and price cap with earnings sharing, Price cap with earnings sharing;	1995-2000 1991-2007 1996-2000
MD	Baltimore Gas & El. Co. ,* Potomac El. Co.;*	Price cap (see also case 8794/8804 filed in 1998), Price cap and rate freeze (see also case 8796 filed in 1999);	1998-2002 2000-2002
MA	Boston Edison Co. , Cambridge El. Light Co. , Commonwealth El. Co. , Eastern Edison Co. ,* Fitchburg Gas & El. Light Co. , MA El. Co. , Western MA. El. Co. ;*	None, None, None, Revenues sharing (see also case 96/94 filed in 1998), None, Rate freeze with earning sharing, Revenue sharing (see also case 97-120 filed in 1998);	 1998-2000 1998-2009 1998-2000
MI	Consumers Energy Co. , Detroit Edison Co. , Edison Sault El. Co. , Upper Peninsula Po.Co. ;	None, None, None, None;	
MN	MN Po. & Light Co., Northern State Po. Co. , Otter Tail Po. Co.;*	None, Price cap with earnings sharing, Price cap with earnings sharing;	 2001-2005 2001-2005
MS	Entergy MS Po. Co. ,* MS Po. Co.;*	Benchmarks (see also case 93-UA-301 filed in 1994), Rate case moratorium with earnings sharing;	1994-1998 1995-2001
MO	Empire District El. Co. , Kansas City Po. & Light Co. , St Joseph Light & Po. Co. , Union El. Co. ,* UtilCorp United Co.;	None, None, None, Rate freeze with earnings sharing (see also case EM-96-149 filed in 1997), None;	 1995-2001
MT	MT Po. Co. ;*	Price cap with earnings sharing (see also D95.9.128 filed 1996);	1997-1998
NV	NV Po. Co. ,	None;	

Table 2.B: PBR in the U.S. Electric Power Market (1970-2002).

States	IOUs	PBR	Period
NV	Sierra Pacific Po. Co.;	None;	
NH	Pu. Se. Co. of NH;	None;	
NJ	Atlantic City El. Co. , Jersey Central Po. & Light Co. , Pu. Se. El. & Gas Co. , Rockland El. Co.;	None, None, None, None;	
NM	Pu. Se. Co. of NM;	None;	
NY	Central Hudson Gas & El. Co. , Consolidated Edison Co.– NY Inc. , Long Island Lighting Co. , NY State El. & Gas Co. ,* Niagara Mohawk Po. Co. ,* Orange & Rockland Utils Inc., Rochester Gas and El. Co.;*	None, Revenue-per-customer cap with earnings sharing, None, Price-cap (for base rates) with earnings sharing (see also case 96-E-0891), Revenue cap and rate freeze- price cap, None, Revenue capand rate case moratorium with earnings sharing;	 1995-2005 1993-2002 1991-2002 1993-2002
NC	Carolina Po. & Light Co. , Duke Po. Co. , Nanthala o. & Light Co.;	None, None, None;	
ND	MDU Resources Group Inc.;	None;	
OH	Cincinnati Gas & El. Co. , Cleveland El. Illumination Co. , Columbus Southern Po. Co. , Dayton Po. & Light Co. , OH Edison Co. , OH Po. Co. , Toledo Edison Co. ;	None, None, None, None, None, None, None;	
OK	OK Gas & El. Co. , Pu. Se. Co. of OK ;	None, None;	
OR	PacifiCorp ,* Portland General El. Co. ;	Price and revenue cap with earnings sharing, None;	1994-2001
PA	Duquesne Light Co. , Metropolitan Edison Co. , PA El. Co. , PA Po. & Light Co. , PA Po. Co. , PECO Energy Co. , West Penn Power Co. ;	None, None, None, None, None, None, None;	
RI	Blackstone Valley Electric Co. ,* Narragansett Electric Co. ,* Newport Electric Co. ;*	Price cap with earnings sharing (see also case 2498/2514 filed in 1996), Price cap and rate freeze with earnings sharing, Price cap with earnings sharing (see also case 2498/2514 filed in 1996);	1997-1998 1997-1998 1997-2004
SC	Lockhart Power Co. , SC El. & Gas Co. ;	None, None;	
SD	Black Hills Co. ; Northwestern Pu. Se. Co. ;	Rate freeze (see also case EL95-003 filed in 1995), None;	1995-2005
TN	Kingsport Po. Co. ;	None;	
TX	Central Po. & Light Co. , El Paso El. Co. , Entergy Gulf States Inc. , Houston Lighting & Po. Co. , Southwestern El. Se. Co. , Southwestern Pu. Se. Co. , TX Utilities Electric Co. ,* TX-New Mexico Power Co. ,* West TX Ut. Co. ;	None, None, None, None, None, None, Benchmarks (see also case 21112), Benchmarks, None;	 2000-2002 2000-2002
VT	Central VT Pu. Se. Co. , Green Mountain Po. Co. ;	None, None;	
VA	Appalachian Po. Co. , VA Electric & Po. Co. ;	None, None;	
WA	Puget Sound Energy Washington Water Po. Co. ;	Price cap, None;	1997-2001
WV	Monongahela Po. Co. , Wheeling Po. Co. ;	None, None;	
WI	Consolidated Water Po. Co. , Madison Gas & El. Co. , Northern States Po. Co. , Northwestern WI El. Co. , Pioneer Po. & Light Co. , South Beloit Water Gas & El. Co. , Superior Water Light & Po. Co. , WI El. Po. Co. , WI Po. & Light Co. , WI Pu. Se. Co. .	None, None, None, None, None, None, None, None, None, None.	

Notes: 1. El., Inc., Po., Pu., Se. are for respectively Company, Electric, Incorporation, Power, Public, Service;
2. IOUs included in the EEI report show the * index;
3. Relevant PUC's docket in parentheses.

Non Random Constitution Selection

Table 3: Determinants of Incentive Schemes - RE Logit Estimates.

	(1)	*(2)*	*(3)*
Dependent Var.:	***PBR***	***PBR***	***PBR_F***
Av_Maj	**- 4.164** (17.767)	**- 80.175** (38.534)**	**- 27.383** (14.761)*
Av_Maj*Rep	**44.479** (16.949)***	**207.118** (75.047)***	**31.915** (11.048)***
Rep	**- 25.536** (10.777)**	**- 92.575** (34.317)***	**- 14.995** (6.840)**
Av_Dist	**5.781** (8.578)	**34.969** (13.700)***	**2.455** (5.604)
Reg_Elec	**18.322** (5.364)***	**73.655** (27.132)***	**20.202** (4.518)***
Jud_Elec	**3.566** (1.963)*	**-19.962** (7.492)***	**2.499** (1.742)
Budget	**0.0001** (0.00004)***	**0.0004** (0.00015)***	**0.00008** (0.00002)***
Employ	**-0.022** (0.0083)***	**-0.041** (0.016)**	**-0.026** (0.0075)***
Res	**229.258** (66.781)***	**-130.166** (57.182)**	**-63.238** (16.823)***
Ind	**16.025** (12.291)	**-69.580** (43.204)	**-36.977** (12.051)***
Young	**1.537** (0.465)***	**4.860** (1.775)***	**0.415** (0.172)**
c_{st}	**4.203** (1.400)***	**6.906** (3.844)*	
Rkhr			**2.702** (0.627)***
Gen_Nucl	-14.211 (6.277)**		
Gen_Fuel		-122.461 (44.931)***	
Sales	0.0002 (0.00007)***	0.0003 (0.0001)***	-0.00005 (0.00003)**
Income	0.0020 (0.0006)***	0.005 (0.002)***	0.001 (0.0003)***
Pop	- 2.47 e^{-08} (1.38e^{-07})	- 7.57 e^{-07} (3.35e^{-07})**	7.92 e^{-07} (1.99e^{-07})***
Constant	-206.191 (58.931)***	-94.809 (46.043)**	-27.835 (13.194)**
Estimation	Random Effects Logit	Random Effects Logit	Random Effects Logit
N. of Obs.	1372	882	2574
Log Likelihood	- 58.469	- 45.212	- 109.498

Note: 1. *Standard errors* in parentheses;
2. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Results on Pass-Through - Fixed Time/State Effects Estimates.

	(1)	*(2)*	*(3)*
Dependent Var.:	***Rkhr***	***Rkhc***	***Rkhi***
PBR_{st}	**0.457** **(0.182)****	**0.540** **(0.181)*****	**0.203** **(0.149)**
Reg_Elec_{st}	-0.092 (0.203)	0.186 (0.201)	0.043 (0.165)
Jud_Elec_{st}	-0.091 (0.158)	-0.214 (0.156)	0.171 (0.129)
$PBR_{st} . c_{st}$	**-0.001** **(0.125)**	**-0.159** **(0.124)**	**-0.068** **(0.102)**
$Jud\_Elec_{st} . c_{st}$	-0.394 (0.082)***	-0.366 (0.082)***	-0.302 (0.067)***
c_{st}	0.542 (0.054)***	0.498 (0.053)***	0.470 (0.044)***
Other Controls	$Budget_{st}$, $Employ_{st}$, Res_{st} , Ind_{st} , $Young_{st}$, Gen_Fuel_{st} , Gen_Nucl_{st} , Pop_{st} , $(Pop_{st})^2$, $Income_{st}$, $(Income_{st})^2$, $Sales_{st}$.		
Estimation	Fixed time and state effects (within) estimator.		
N. of Obs.	1372	1372	1372
R^2	0.89	0.87	0.85
Notes: 1. *Standard errors* in parentheses; 2. * significant at 10%; ** significant at 5%; *** significant at 1%.			

Table 5: Results on Pass-Through - Arellano-Bond Estimates.

	(1)	*(2)*	*(3)*
Dependent Var.:	***Rkhr***	***Rkhc***	***Rkhi***
PBR_{st}	**-0.189** **(0.106)***	**0.069** **(0.137)**	**- 0.023** **(0.123)**
$PBR_{st} . c_{st}$	**0.082** **(0.066)**	**0.025** **(0.076)**	**0.034** **(0.067)**
Other Controls	$Constant_{st}$,$Dependent\ Var.(-1)_{st}$, Reg_Elec_{st} , Jud_Elec_{st} , $Jud\_Elec_{st} . c_{st}$, c_{st} , $Budget_{st}$, $Employ_{st}$, Res_{st} , Ind_{st} , $Young_{st}$, Gen_Fuel_{st} , Gen_Nucl_{st} , Pop_{st} , $(Pop_{st})^2$, $Income_{st}$, $(Income_{st})^2$, $Sales_{st}$.		
Additional Instruments	Av_Maj_{st} ,$Av\_Maj_{st}*Rep_{st}$, Rep_{st} .		
Estimation	Arellano-Bond estimator for dynamic panel.		
Ov-Id Test (P-Value)	0.98	0.99	0.99
N. of Obs.	1274	1274	1274
Notes: 1. *Robust standard errors* in parentheses; 2. * significant at 10%; ** significant at 5%; *** significant at 1%; 3. One-step results employed for inference on coefficients.			

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A Francesco e Pierluigi con Amore e Profondo Rispetto.

1. Introduction

A major task of economics is to explain the pattern of government intervention in industries that is to say industrial policy. An idealized, but illuminating, view of regulatory institutions is that they result from a broadly defined constitution drafted by some benevolent "founders" behind a veil of ignorance. This "public interest" research program derives policies able to correct market failures such as monopoly pricing. In the last twenty years this paradigm has been substantially improved by explicitly considering informational asymmetries. Indeed, industrial policy can be thought as resulting from the optimal trade-off between efficiency enhancement and rent extraction and, in regulating a natural monopoly, the planner would select optimal cost-reimbursement rules, which arbitrate differently between cost reducement effort (moral hazard) and informational rents (adverse selection). Price-cap favours efficiency, while cost of service regulation (COS) favours rent extraction. However, the public interest approach completely fails in taking into account both the watchdog role of consumers' interest groups and the delicate set of checks on bureaucrats and politicians. Judges have discretionary power and they can compete with executive branches and regulators in filling in unforeseen contingencies (see Shapiro [1986], Spiller and Tiller [1999] and Guerriero [2006 a]). Politicians may favour interest groups leaving substantial rents to the officials involved in regulation (see Becker [1985] and Wilson [1980]). Recently, the New Theory of Regulation program has tried to overcome such an inconsistency, employing both principal-agent and political economy models. The main merits of this literature are two: 1. the explicit design of the

political system details and of the positive forces driving public intervention; 2. the crucial role entrusted to private information in giving rent seeking incentives to regulated firms' interest groups and a signal extraction role to the hierarchical structure of real world regulatory institutions. When explicit contracts on observable performances or efforts are available for supervisors, the low type quantity-effort allocation is distorted even more to take into account the eventual capture, the institutional design of the supervision hierarchy (Laffont and Tirole [1993] and Laffont and Martimort [1999]), and the planner's partisan interests (Laffont [1996, 2000]). In collusion-proof equilibria (i.e. in which capture does not prevail), costly incentive payments are given to non-benevolent regulators for a value equal to the maximum expected collusion offer, which is the firm's expected stake (i.e. high type rent). Nevertheless, this set up basically fails in capturing real world institutions. Regulators and judges are implicitly motivated by simple election-appointment rules and the review processes' structure makes difficult to swallow the hypothesis that the effective role of these officials is one of decision making (i.e.: to report the signal). Only recently, Guerriero [2006, a] has given a first complete and realistic description of this complex agency structure. A hierarchical rate review process emphasizes the judges' generosity of settlement, rendering the judicial role pivotal when judges want to leave a legacy of correctness ("legacy effect") and regulators are not willing to exert costly effort because they are interested in obtaining job offers from the industry ("revolving door effect"). Election strengthens the first effect and damps the second one. Possibly partisan planners will take into consideration the efficiency of the signal extraction technology and the accountability power of different selection rules in designing the regulatory institutions. This paper brings two main contributions: 1.

it broadens the scope of the Guerriero [2006 a]'s model to the optimal selection of incentive schemes; 2. it empirically evaluates, for the first time in literature, the merit of different cost-reimbursement selection theories, proving the explanatory power of the model developed in *Section 3* when faced with US electricity data. Even if from 1997 a big wave of change is trying to enhance competition within U.S. regulated markets, electricity firms along with all the other major utilities (natural gas, trucking, telecommunications, water and wastewater, insurance, railroad) are still regulated through the hierarchical structures analyzed below. Moreover, the rising demand for technical specialization of judges involved in regulation cases[1] makes the U.S. lesson increasingly crucial in understanding how to correctly design the regulatory institutions of many European markets. The remainder of the paper is organized as follows. *Section 2* provides details about the US electricity market. S*ection 3* clarifies the efficiency-driven and strategic determinants of incentive schemes; while *section 4* tests the theory considering the reform towards performance based regulations (PBR) in the US electric power market. *Section 5* discusses the evidence proposing an agenda for future research. The *Appendix* contains tables, proofs and a detailed description of the data.

2. Institutions

Investor-owned electric utilities (IOUs) account for over three-fourths of the electricity sales and revenues of the U.S. electric power market. While jurisdiction

[1] The Ahlstrom *vs.* European Commission [1993] and Enel *vs.* Wind-Infostrada [2002] cases have stressed the need for a "gate-keeper" role of administrative judges as regards economics experts witnesses within regulation-antitrust trials (see also Breyer [2003] and Motta [2004]).

over both interstate transmission and wholesale transactions lies inside a federal body (FERC), retail services are regulated by state public utility commissions (PUCs), which deal with several markets and perform a broad range of tasks (e.g. they suggest lines of conduct on services provision, they avoid by-passing by non regulated utilities, they rule on environmental issues and so forth) among which the most important is the regulation of prices.[2] Regulated firms are not allowed to receive governmental subsides and their revenue must cover their costs (including managerial rewards). IOUs charge a two-part tariff, triggering rate reviews in response to rising costs. Even if dockets can be directly entrusted to a commissioner or to an Administrative Law Judge (ALJ), almost all the files follow a precise hierarchical trial routine composed of two levels of formal hearings open to all the interested parties (firms, ratepayers, lawyers of the Attorney General's Office). In the first instance, commissioners sit on the bench and consumer advocates[3] represent ratepayers. If the proposed filing is not approved, a formal quasi-judicial hearing, presided by one or more ALJs, is opened and the quasi-judicial tribunal takes a qualified majority enforceable judgment. PUCs may review the case, provided that the onus of injustice and illegality of the decision lies on the firm. Finally, utilities can also appeal to High Courts on formal issues. These two last appeal levels are rarely granted. ALJs and commissioners are either elected or appointed and, during the hearings, their role is one of supervision: they examine witnesses and experts, receive the evidence

[2] Here I follow the descriptions contained in the 1992 and 1997 *Sunset Review of the Colorado PUC* and in the *Washington Utilities and Transportation Commission* (WUTC) official website.

[3] Consumer advocates are state-funded independent bodies established during the 70s and 80s in the face of steeply rising rates in order to allow even residential users to proceed before PUCs.

and interpret precedents and regulations. The final motion to be approved is proposed by the PUC's staff. This body is divided in a "trial" and in an "advisory" team. While the latter reviews the case formulating a staff position in all equated to the one of any other interested party; the former advices regulators and judges on policy issues proposing *de facto* the motion. The complete record of the hearings and the participation of all parties assure that the staff may consider only the available "hard" evidence. This is a by-product of the "adversary" nature of the hearings: no evidence can be denied once the precedent is individuated. Thus, the design of incentive schemes can be modelled through the following version of the Guerriero [2006, a]'s model.

3. Theory

The regulated firm produces a variable scale product q and it charges a two part tariff $A + pq$ for $q > 0$, where A and p are positive.[4] Total cost is $C = (\beta - a)q + \upsilon$ and a represents the manager's effort, while β is an inefficiency parameter, which turns out to be equal to $\underline{\beta}$ with probability v and to $\overline{\beta}$ with probability $1 - v$, with $\Delta\beta \equiv \overline{\beta} - \underline{\beta}$. Assuming that the fixed cost is known and normalizing it at zero ($\upsilon = 0$), it is possible to denote marginal cost as $c \equiv \beta - a$. Regulation is subject to both adverse selection (as captured by β) and moral hazard (as captured by a). Let me assume that effort remains strictly positive over the relevant range of equilibrium

[4] As Joskow and Schmalensee [1986] suggest the fixed premium paid by consumers turns out to assume the some role of the governmental transfers typical of the regulation-procurement literature. As a consequence, I will replace the economic shadow cost of public funds with the marginal deadweight loss associated with an increase in the fixed premium.

production. If the manager exerts effort level a, she lowers the marginal cost of output by a, and incurs in a disutility (in monetary units) of $\psi(a)$. This disutility is increasing and convex in a (i.e.: $\psi' > 0$; $\psi'' > 0$); moreover the following holds: $\psi(0) = 0$, $\lim_{a \to \beta} \psi(a) = +\infty$ and $\psi''' > 0$.[5] Consumers have the same preferences; thus the demand is the one of a representative consumer with gross consumer surplus given by $S(\cdot)$. The inverse and regular demand functions and the firm's revenue are given by $p = P(q) = S'(q)$, $q = D(p)$, $R(q) = P(q)q + A$ respectively. Consumers choose q as to maximize net surplus $S(\cdot) - A - pq$ and A is optimally fixed so as to make them indifferent between buying and not buying the good i.e., $A \equiv S(q) - P(q)q$. Firm's revenues must cover average costs and managerial compensation t (as underlined in *section 2*), i.e. $A + (p - c)q(p) \geq t$. Both the firm and the supervisors are risk neutral with respect to income. The firm's utility is given by $U = t - \psi(a)$ and a reservation level of 0 is required. Let me denote the social surplus obtained producing q as $V(q)$ with $V(0) = 0$, $V' > 0$ and $V'' < 0$. $V(q)$ is the sum of consumers' net surplus plus the firm's revenue evaluated at the shadow price of managerial reward λ and it rewrites as:

$$V(q) = (S(q) - R(q)) + (1+\lambda)R(q) = S(q) + \lambda R(q) = (1+\lambda)S(q).$$

The planner's objective function, labelled with subscript P, is:

$$W_P = S(q(p)) - A - pq(p) + (1+\lambda)\,[A + (p - c)\,q(p) - t] + U =$$

$$= V(q) - (1+\lambda)[(\beta - a)q + \psi(a)] - \lambda U \qquad (1)$$

Here, $1+\lambda$ can be interpreted as the shadow price of the firm's budget constraint. Under complete information, the planner implements the first best allocation

[5] This condition assures the concavity of the planner's objective function and that the optimal incentive scheme is deterministic.

through a simple "fixed price" (or cost target) contract leaving no rent to the firm (see *Appendix 6.1* for details).[6] Instead, under asymmetric information, the planner observes only total cost and output[7] and not *a*: as a result, β is now private information of the firm. Label equilibrium rewards, outputs, total and marginal costs, utilities and effort for the two types as: $\left\{\left(\underline{t},\underline{q},\underline{C},\underline{c},\underline{U},\underline{a}\right),\left(\overline{t},\overline{q},\overline{C},\overline{c},\overline{U},\overline{a}\right)\right\}$.

A contract based on the observables *t* and *C* specifies a reward-cost pair for each type. As usual, the program envisions a solution with binding low (inefficient) type's individual rationality and high type's incentive compatibility constraints:

$$\overline{U} = \overline{t} - \psi(\overline{\beta} - \overline{c}) = 0 \qquad \text{(IR\_L)}$$

$$\underline{U} = \underline{t} - \psi(\underline{\beta} - \underline{c}) = \overline{U} + \psi(\overline{\beta} - \overline{c}) - \psi(\underline{\beta} - \overline{c}) = \Phi(\overline{a}) \qquad \text{(IC\_H)}$$

where $\Phi(\cdot)$ is an increasing function defined as $\Phi(a) \equiv \psi(a) - \psi(a - \Delta\beta)$.[8] Such a solution entails an efficient level of effort and a positive informational rent $\underline{U}$ for the high type and under-effort and no rent for the low type. Now suppose that the planner can relax the informational asymmetry by employing a hierarchy of two supervisors (i.e. a regulator and a judge) designed to match the institutions described in *section 2*. The question is the following: is it possible to assess the ex post efficiency of the incentive schemes selected by a possibly partisan planner?

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[6] Under this regime, realized costs, outputs and prices are verifiable. The planner knows β and acts as a Stackelberg leader making take-or-live it offers on the observable *a*.

[7] With a linear technology, the planner observes average costs, which are equal to marginal cost. With know fixed cost *v*, she observes $(C - v)/q = \beta - a$ and the analysis goes on unchanged.

[8] Incentive compatibility prescribes that the contract designed for type $\underline{\beta}$ $(\overline{\beta})$ is the one preferred by type $\underline{\beta}$ $(\overline{\beta})$ in the menu of managerial rewards-cost pairs. This amounts to say that:

$\underline{t} - \psi(\underline{\beta} - \underline{c}) \geq \overline{t} - \psi(\underline{\beta} - \overline{c})$ (IC_H) and $\overline{t} - \psi(\overline{\beta} - \overline{c}) \geq \underline{t} - \psi(\overline{\beta} - \underline{c})$ (IC_L).

As the following theory will make clear, the success of the regulatory regime design is sensible to technological and political dimensions. As follows I will treat the former underlining the main similarity with the Laffont and Tirole [1993]'s model, leaving the positive side of the issue to the next subsection. There I will compare the results with the seminal work of Laffont [1996].

The analysis tracks the approach of Guerriero [2006, a]. Supervisors can, exerting costly effort, tailor the supervision activity to the specific docket (i.e., they choose the number and quality of the experts, the firms' official papers to be examined and so forth). The equilibrium level of effort and the supervisors' random ability (e.g., ability to examine witnesses and to understand precedents and prevailing regulations) determine the precision of the planner's signal. As emphasized in *section 2*, the report is effectively delivered by the PUC's staff, so I simply assume that the planner has directly at her disposal this benevolent information tool.[9] Besides, given that in the U.S. electricity market PUCs' rules and conducts prohibit communication between supervisors, no side contract is allowed between these players. Once one of the two docket's filing steps is set up, the planner receives a signal $\sigma = \{\underline{\beta}; \phi\}$ about the cost structure with precision ξ, determined by the supervisor's activity. The information is hard, i.e. it is verifiable (in the sense that every interested party can convince himself that the signal corresponds to the true state of the world). If $\beta = \underline{\beta}$ with probability ξ the planner sees $\sigma = \underline{\beta}$ and implements the complete information contract and with probability $1 - \xi$ she observes $\sigma = \phi$. If $\beta = \overline{\beta}$, then $\sigma = \phi$ always. When $\sigma = \phi$, the planner is

[9] Besides the constraints imposed by the adversarial trial structure, explicit incentives can be designed for staff's members, who are not implicitly motivated by any appointment rule.

uninformed, and she updates her beliefs applying Bayes rule.[10] Supervisors are evaluated according to the performance $\xi \in [0, 1]$, which is described by the docket's records and is generated by a combination of effort e and random ability α as $\xi = \alpha e + e$; e takes value on $(0, \xi^u/2]$ with $\xi^u \in (0,1)$ and the effort's cost function writes as $\tilde{C}(e) = \underset{\sim}{C}(e)(1-K)$ where $K \in \left[0, \bar{K}\right)$ measures the effectiveness of the signal extraction technology. K is increasing in the PUC's resources and in the watchdog groups' ability to provide hard information. Suppose that: $\underset{\sim}{C}_e > 0$, $\underset{\sim}{C}_{ee} > 0$, $\underset{\sim}{C}(0) = 0$, $\lim_{e \to \xi^U} \underset{\sim}{C} = \infty$. Thus, the full precision case is ruled out and it is not possible to obtain a precision of ξ^u through effort only. The random ability α has support (0, 1). Without loss of generality,[11] suppose that $\alpha \sim$ Beta (g, b) with density $f_y(y; g, b) = [y^{g-1}(1-y)^{b-1}]/B(g, b)$ and $B(g, b) = \int_0^1 y^{g-1}(1-y)^{b-1}dy$ (the Beta function). The mean is $\bar{\alpha} = g/(g + b)$. If $g = b = 1$, I obtain a uniform distribution on (0, 1): from a Bayesian point of view, this is the case of uninformative prior on the supervisors' ability. The mild restrictions I impose on g and b are such that the distribution of α is symmetric ($g = b$), which can be relaxed and hump-shaped (informative), i.e. $g > 1$ and $b > 1$.[12] If either e or ξ are verifiable or contractible, "selling the store" contracts reach efficiency; but the

[10] This technology simplifies the notation and has the appealing feature that the agent can provide verifiable information only when the proof is possible: low cost case (see also Laffont [2000]).

[11] Indeed, all the theoretical results continue to hold if one of the other continuous non degenerate distributions supported on a bounded interval (i.e.: Triangular, Kumaraswamy, Logarithmic, Uniform) is employed (see also *footnote 13*). Among these, the Beta function is the most versatile.

[12] Here, α and e assume the meaning of overall measures: they take into account the different judges' and regulators' abilities. For sake of comparison I will exhibit the case of equal draw of α.

assumption that the planner can write unrestricted contingent contracts with the supervisors does not fit in any way reality and so I assume that ξ is always observable but not contractible. The timing of the game is given as follows:

1. Society (planner, firm, regulator and judge if addressed; see stage **3.** and **4.** below) learns the nature of the regulatory environment: $P(q)$ and that $\beta \in \left\{\underline{\beta}, \overline{\beta}\right\}$. Next the firm discovers the only piece of private information: β.

2. The planner offers a menu of managerial reward-cost pairs to the firm contingent to the realization of the eventual signals obtained through the hearing process. An exogenously given wage *s*, set at the reservation level $\hat{s}$ (assumed equal for both judges and regulators), is given to the two supervisors.

3. The regulator chooses her level of effort; next she discovers her random ability and, at last, the planner receives the first signal. If this is informative the first best is implemented; otherwise a hearing is open and the judge is asked to rule it.

4. Step **3.** is repeated for the judge. If the signal is uninformative, the planner asks to the firm to report its marginal cost (asymmetric information regime).

5. The firm exerts the chosen cost-reducing effort and a reward-quantity pair is implemented. Finally, supervisors' evaluators make their move. Note that for elected supervisor the evaluator will be a rational electorate; while for appointed ones she is a politician or a selection committee.

Supervisors face different incentives as a function of the nature of the task and of the selection rule. The two dimensions of heterogeneity (regulators *vs.* judges and appointed *vs.* elected officials) are captured by the indexes $i = \{Appointed, Elected\}$ and $l = \{Regulator, Judge\}$. The supervisors' utility function is given by:

$$R_{i,l}(e_{i,l}, S) = \left\{1 + \tau\left[(1 - SR)H^{i}(e_{i,l}) - (1 - (1 - S)J)\tilde{C}(e_{i,l})\right]\right\}\hat{s} \qquad (2)$$

In equation (2), S is equal to 1 for a regulator and to 0 for a judge and τ measures the strength of the career concerns. $H^i\left(e_{i,l}\right)$ differentiates elected and appointed supervisors (here my reference is the Alesina and Tabellini [2005, a]'s model). Elected ones want to be re-elected and this happens if $\xi_{E,l}$ exceeds a threshold $\overline{\xi}_{E,l}$. This means that $H^E\left(e_{E,l}\right)=\Pr\left\{\xi_{E,l}\geq\overline{\xi}_{E,l}\right\}$. Voters are rational in the sense that they understand that the alternative to the incumbent is another politician with average talent who will achieve a precision $\overline{\xi}_{E,l}=(3/2)e_{E,l}^{\exp}$ (where the apex exp refers to the voters' expectation). Therefore, it follows that: $H^E\left(e_{E,l}\right)=\Pr\{\alpha\geq$ $\geq\left[\left(3e_{E,l}^{\exp}/2e_{E,l}\right)-1\right]\}$. Appointed supervisors are career concerned and they want to maximize the conditional perception of their ability. Employing E(·) (or, with a slight abuse of notation, the apex exp) to indicate the evaluator's expectation over α given the performance realization and E to label the unconditional expectation over $\xi_{A,l}$. It follows that $H^A\left(e_{A,l}\right)=E\left(\mathrm{E}\left(\alpha/\xi_{A,l}\right)\right)=E\left\{\left[\left(1+\alpha\right)e_{A,l}-e_{A,l}^{\exp}\right]/e_{A,l}^{\exp}\right\}$ and a glance at $H^E(\bullet)$ and $H^A(\bullet)$ reveals how elected supervisors will exert more effort than appointed ones.[13] Finally in (2) R and J represent regulators and judges specific parameters. They are defined on (0, 1). R captures the "revolving-door" effect - regulators are attracted by job opportunities in the regulated industry -

[13] In fact, the density of the Beta evaluated at the mean is always greater than 1 for all g and b greater than 1. The relevant inequality (i.e., $f_\alpha(\overline{\alpha})>1$) remains true for $g\neq b$ (asymmetric Beta) and for all the other continuous distributions supported on a bounded interval (except for the uninformative prior/uniform case when it holds as equality) when the hump-shape property is imposed. Proofs are available upon request. The result becomes local for imperfect substitutability between e and α ($\xi=(\alpha+Z)e$). Here, I need: $[Z+g/(g+b)]\,f_\alpha(\overline{\alpha})>[1+Zg/(g+b)]$.

while *J* formalizes the judges' desire to leave a legacy of correctness (see Levy [2005] for a similar treatment). The revolving door effect does not exist for ALJs. In order to solve the model, I proceed by backward induction considering first the supervisors' effort choice and then the mechanism design problem faced by the planner. The correct equilibrium concept is perfect Bayesian equilibrium.

Equilibrium levels of effort can be ranked as follows: $\hat{e}_{E,J} > \hat{e}_{A,J}$ and $\hat{e}_{E,R} > \hat{e}_{A,R}$ (see Guerriero [2006 a] for a proof). These levels are greater the more efficient the supervision technology (higher *K*) is. At stage **2.** the planner foresees the supervisors' moves and offers to the firm a menu of contracts contingent on the eventual signals $\{\sigma_R, \sigma_J\}$ and fully characterized by the equilibrium levels of effort. The planner's posterior belief on $\beta = \underline{\beta}$ is: $\Pr(\beta = \underline{\beta} / \sigma_R = \phi, \sigma_J = \phi) =$ $= v(1-\gamma(\hat{e}_{i,R}, \hat{e}_{i,J}))/(1-v\gamma(\hat{e}_{i,R}, \hat{e}_{i,J}))$. Note how the expected ex ante probability that the planner receives at least one informative signal $\gamma(\hat{e}_{i,R}, \hat{e}_{i,J}) \equiv \{E[\xi_{i,R}(\hat{e}_{i,R})] +$ $+(1-E[\xi_{i,R}(\hat{e}_{i,R})])E[\xi_{i,J}(\hat{e}_{i,J})]\}$ will be greater the higher *K* is and if supervisors are elected. Define μ as the shadow cost of public funds. In the *supervision* regime (note the apex *S*), the planner's ex-post expected welfare function writes as:

$$W_P^{AI,S} = v\gamma(\hat{e}_{i,R}, \hat{e}_{i,J})\underline{W}^* + \left[1-v\gamma(\hat{e}_{i,R}, \hat{e}_{i,J})\right]\left\{\frac{v\left(1-\gamma(\hat{e}_{i,R}, \hat{e}_{i,J})\right)}{1-v\gamma(\hat{e}_{i,R}, \hat{e}_{i,J})}\left[V(\hat{\underline{q}}^S) - (1+\lambda)\left[(\underline{\beta} - \hat{\underline{a}}^S)\hat{\underline{q}}^S + \psi(\hat{\underline{a}}^S)\right] + \right.\right.$$

$$\left.\left. -\lambda\Phi(\hat{\underline{a}}^S)\right] + \frac{1-v}{1-v\gamma(\hat{e}_{i,R}, \hat{e}_{i,J})}\left[V(\hat{\overline{q}}^S) - (1+\lambda)\left[(\overline{\beta} - \hat{\overline{a}}^S)\hat{\overline{q}}^S + \psi(\hat{\overline{a}}^S)\right]\right]\right\} - 2(1+\mu)\hat{s} \quad (3)$$

As usual, only the low type's allocation-effort pair is distorted and I have that:

$$\hat{\underline{q}}^S = q^*(\overline{\beta} - \hat{\underline{a}}^S) \quad \text{i.e.,} \quad V'\left(\hat{\underline{q}}^S\right) = \hat{\underline{c}}^S = \overline{\beta} - \hat{\underline{a}}^S,$$

$$\psi'\left(\hat{\underline{a}}^S\right) = \hat{\underline{q}}^S - \left(\lambda/1+\lambda\right)\left(v/1-v\right)\left(1-\gamma(\hat{e}_{i,R}, \hat{e}_{i,J})\right)\Phi'(\hat{\underline{a}}^S). \quad (4)$$

In equation (4), the rule giving price as a function of marginal cost is the same of

the full information case: incentive concerns are entirely taken care of by the cost-reimbursement rule. In order to lower the high type rent, the planner is forced to distort the low type's allocation away from the first best and towards low powered (smaller $\hat{\bar{a}}^{S}$) incentive schemes. A more efficient signal extraction technology curbs such a distortion; moreover, implicit political incentives (election) for supervisors act as substitute for costly explicit market incentives (COS) for the regulated firm. The following proposition summarizes these findings:

Proposition 1: ***A.*** *High powered incentive schemes are linked to the presence of elected supervisors and more efficient supervision technologies (higher K).* ***B.*** *An increase in the power of the incentive scheme lowers ex-ante regulated prices*.

Proposition 1 extends the New Regulation Theory's (Laffont and Tirole [1993]) insights to the more realistic framework with implicitly interested supervisors. At this point, it is instructive to stress that the picture drawn in this section is at least partially shaded. I assumed a myopic and public interested planner, but what happens when concerns for the long run firm's profitability appear on the scene?

3.1 Strategic Price Mechanisms Reforms

Following Laffont and Tirole [1993], a sharp tension between rent extraction and investments arises in industrial policies: whether or not the planner can commit to a contract contingent on the level of investments, equilibrium allocations can envision ex post expropriation of sunk investments. In this sense, non-benevolent supervisors may relax such a time inconsistency. The intuition proposes several new questions: is it possible to think of the supervisors' effort exertion as a pandering activity when investments are taken into consideration? How much partisan planners care about investment's decision by the regulated firm in

selecting incentive schemes? How much is this choice driven by efficiency evaluations and how strong are the rent seeking forces? A first set of answers arise naturally when the above model is bridged to the parallel analysis in Laffont and Tirole [1993]. Before stage **1.,** the firm fixes the level of a non contractible investment of cost I that increases of $\zeta(I)$ the probability that a high type is drawn. Assume that $\zeta'(\bullet)>0, \zeta''(\bullet)<0, \lim_{I\to\zeta^{-1}(\overline{v})} I=\infty, \overline{v}=(1-v)/v$ and $\zeta'(\bullet)>1/(v\Delta\theta)$ (i.e., investments are effective enough). The planner lacks commitment but anticipates the optimal I (i.e., I^*). In the *investment* regime (note the additional apex I), ex ante the firm maximizes its expected ex post rent minus investment costs:

$$I^* \in \arg\max_{I\geq 0} \left\{ v(1+\zeta(I))[1-\gamma(\hat{e}_{i,R},\hat{e}_{i,J})]\Phi(\hat{\bar{a}}^{S,I}(I^*)) - I \right\} \qquad (5)$$

The firm underinvests with respect to the social optimum (see *Appendix 6.2* for a revealed preference argument) and a glance at expression (5) suggests that the extent of inefficiency is higher the more precise the planner's signal is and the less powered the incentive scheme is.[14] Fixed-price contracts reach efficiency but leave a disproportionately high rent to the high type. So the supervisors' signal extraction activity can assume a pandering feature when effort is driven more by career concerns than by a farsighted interest in the market's efficiency and a planner caring enough about cost-reducing investments, because faced with a high cost market, prefers a high-powered rules. The following proposition summarizes:

Proposition 2: *Investment-concerned planners prefer higher powered incentive rules if faced with high cost industries.*

[14] A similar effect is studied in Sappington [1986] who shows how an institution preventing the regulator from observing the firm's true cost is optimal when investments' expropriation is a real concern. Here, PBRs and the appointment rule for supervisors cover the same role.

This inefficiency is even stronger when investments are directed towards reliability and quality services. In fact, these activities do not lower the firm's cost but increase its long run profits: evidently also a conflict between consumers' groups arises here. To capture this, I assume that the constitutional reform is decided by the incumbent among two parties: one more pro-shareholders *R* (Republican) and one more pro-consumers *D* (Democratic). Between stages **1.** and **2.,** each party faces an election with winning probability x_j (j = [*D*, *R*]) and decides, if it is the winner, the size of ρ_j, an instrument increasing the investment's utility for the firm ($G(I,\hat{\rho}_j)$). A type *j* planner attaches a weight $\tilde{\chi}_J$ to $G(\bullet)$ and a weight χ_j to $G(\bullet)$. The weights are such that $\chi_R = 1+2d$, $\chi_D = 1+d$, $\tilde{\chi}_R = 2d-1$, $\tilde{\chi}_R = d-1$ where $d > \lambda$ represents the extent of party policy differences. A Republican planner values more *I* and dislikes less an increase in the firm's rent. Define $I^*(\hat{\bar{a}}^{S,I}(i),\hat{\rho}_j) \equiv I(i,j)$. The firm is risk averse towards non cost-reducing investments and the following holds:

$G_1 > 0, G_{11} < 0, G_{11} < 0, G_2 > 0, G_{22} < 0, G_{12} > 0, G_{21} > 0, G_{111}/G_{112} \geq G_{11}/G_{12}$ and

$$\left[G_{11}(I(i,R),\hat{\rho}_j)\,\partial I(i,R)/\partial \bar{a}^{S,I}\right]/\left[G_{11}(I(i,D),\hat{\rho}_j)\,\partial I(i,D)/\partial \bar{a}^{S,I}\right] \geq 1 \qquad (6)$$

Before stage **3.**, the firm chooses the non-observable and non-contractible *I* as to maximize its expected ex post utility subject to the budget constraint:

$$I^* \arg\max_{I\geq 0}\left\{G(I,\hat{\rho}_j)+\hat{\underline{t}}-\psi(\hat{\underline{a}}^{S,I})\right\} s.t.: A+(p-c)q \geq t+I\,. \qquad (7)$$

I^* is a function of the incentive scheme's power and of both ρ_j and *d*. The optimal ρ_j is such that $\hat{\rho}_R > \hat{\rho}_D$. It follows that: $I_1^*(\hat{\bar{a}}^{S,I},\hat{\rho}_R) \geq I_1^*(\hat{\bar{a}}^{S,I},\hat{\rho}_D) \geq 0$. Let me focus on regimes in which supervisors share the same selection rule and define:

$$\gamma(\hat{e}_{i,R},\hat{e}_{i,J}) \equiv \gamma(i); \qquad \tilde{I}(i,j) \equiv I^*(i,-j)+x_j(I^*(i,j)-I^*(i,-j));$$

$$G(I^*(i,j),\hat{\rho}_j) \equiv G(i,j); \qquad \tilde{G}(i,j) \equiv G(i,-j) + x_j(G(i,j) - G(i,-j))$$

and *o* as the shadow price of the moral hazard in investment constraint (first order condition of (7)). A type *j* planner's ex post expected welfare function writes as:

$$W_j^{AI,S,I}(i,j) = W_P^{AI,S}(i) + v\gamma(i)\left[(1+\lambda+\tilde{\chi}_j)\tilde{G}(i,j) + (\chi_j - 1 - \lambda)\tilde{I}(i,j)\right] - o\left(1 - \partial\tilde{G}(i,j)/\partial I\right).$$

On top of it, the low type's equilibrium effort is given by: $\psi'\left(\hat{\overline{a}}^{S,I}\right) =$

$$= \hat{\overline{q}}^{S,I} - \frac{1}{1+\lambda}\frac{1}{1-v}\left\{v\gamma(i)\left[\lambda\Phi'(\hat{\overline{a}}^{S,I}) - (1+\lambda+\tilde{\chi}_j)\,\partial\tilde{G}(i,j)/\partial\overline{a}^{S,I} + \right.\right.$$

$$\left.\left. -(\chi_j - 1 - \lambda)\,\partial\tilde{I}(i,j)/\partial\overline{a}^{S,I}\right] + o\left[\partial^2\tilde{G}(i,j)/\partial I\,\partial\overline{a}^{S,I}\right]\right\}. \qquad (8)$$

Non contractibility of investment along with a sharp conflict among different consumer groups generates the last three positive terms in the cost-reimbursement rule. These terms are affected by both the party policy distance *d* and the holding on power x_j: partisan planners will take into account the political uncertainty and select the power of the incentive scheme according to the consequences that expropriation has on their constituency.[15] The straightforward comparative statics of equation (8) with respect to $\{d, x_j, J\}_{j=D,R}$ implies the following patterns:

Proposition 3: ***A.*** *The likelihood of a reform towards more powerful incentive schemes is higher the larger party policy differences are and the higher (lower) the holding on power is if the reformer is Republican (Democratic).* ***B.*** *Higher powered incentive schemes are more likely if the reformer is Republican*.

Such a strategic institutional design explanation extends to the incentive schemes' reform the intuition suggested by Guerriero [2006 a] for the supervisors' selection

[15] Several studies demonstrate that a lack of permanence in office can inspire policymakers to implement institutional reforms either to influence political outcomes or to impose constraints on future incumbents (see Persson and Svensson [1988] and Tabellini and Alesina [1990]).

rules constitutional reforms. It is worth to emphasize how sharp is the difference of these results compared with the seminal analysis in Laffont [1996]. There the relation between PBRs reforms and the holding on power was negative when the incumbent reformer is Republican and null when the reformer is Democratic. Clearly enough, when high powered schemes leave positive rents in equilibrium, new resources are in the hands of the regulated firm and the fear of supervisors' capture becomes a real concern. To this extent, the following section proposes a few interesting remarks about the impact on the above model of the action of an organized group interested in maximizing the regulated firm's rent.

3.2 Robustness: Lobbying and Bribing

Both ALJs and PUC's commissioners exert effort in other tasks. As seen above, examples are the control of bypassing by non-regulated utilities and the analysis of environmental regulation. The organized group want to relax the supervision constraint offering side-contracts conditional on this second effort level supposed (as in Alesina and Tabellini [2005 a]) observable and contractible.[16] The interest group has all the bargaining power and influences supervisors, one at the time, either directly (bribes) or indirectly (campaign contributions) just before the supervision effort is decided in stages **3.** or in **4.**. Let me assume that the level of performance from the extra task *h* brings a small positive extra-utility to the firm but implies a relevant cost (in terms of effort) to the supervisor (i.e., the effort cost function $C\left(e_{i,l}+e_{i,l}^{h}\right)$ is non-divisible). It turns out that in a jointly optimal

[16] Here I take aside the eventual multiple principals-multiple agents' strategic interaction, i.e. cost minimization across supervisors' side payments. This remains as open agenda for future research.

equilibrium $\hat{e}_{i,l} = 0$ so that the high type's firm enjoys a higher informational rent (proofs are available upon request). Even if discouraging, these equilibria are fragile and the following remarks apply: 1 Bribes do not arise if the punishment that a supervisor receives if caught is high enough; 2 Campaign contributions, although legal, would be not even affordable for the interest group, which has to reimburse supervisors for the entire amount of implicit incentives (this is due to the precision's multiplicative technology). Thus, provided that implicit incentives are strong enough (i.e., high enough values of τ, R and J in (2)) the model remains robust to the introduction of lobbying and bribing. At this point, the other main contribution of the paper is to face the model with U.S. electricity market's data.

4. Evidence

The empirical questions I want to answer are: what forces have significantly shaped the reforming planners' incentives at the constitutional tables? How strong were the political positions and how relevant the efficiency reasons? Can the data reveal the extent of substitutability between market and political institutions? What is the relation between PBRs reforms, considered as endogenous, and regulated prices? Based on the theoretical propositions, the following *Empirical Predictions* formulates such questions as testable empirical predictions:

Empirical Predictions: ***1. A.*** *High powered incentive schemes are linked to more efficient supervision technologies, high cost industries and elected supervisors.* ***B.*** *High powered incentive schemes are more likely with Republican reformers the larger party policy differences are and the higher (lower) the incumbent holding on power is if the reforming party is Republican (Democratic).*

2. *High powered incentive schemes lower the level of equilibrium prices.*

While *Table 1* reports variables' names and construction, *Table 2.A* and *2.B* show how, between 1982 and 2002, 41 of the 144 major IOUs operating in the US electric power market switched to some kind of PBRs. This enormous wave of reforms has interested 25 of the 49 continental US states and represents a perfect source of variation for a panel analysis. Besides, following Persson and Tabellini [2003], another justification to a panel approach is that cross sectional models would deliver fragile inference given the "non-random pattern of constitutional reforms and the extensive differences among [individuals] belonging to different constitutional groups." Therefore, I will make use of two main models for evaluating points **1.** and **2.** (respectively) of the *Empirical Predictions*: a random effects logit with dependent variable a performance-based regulation dummy and a panel pass-trough pricing equation.

4.1 Non Random Constitution Selection

First of all, let me define institutions. The high powered incentive schemes' dummy (*PBR_F* and *PBR*) takes value 1 if the firm (or at least one firm within the state) adopts a broadly defined performance based regulation (rate freeze, price or revenue cap with possible earnings sharing)[17] and 0 otherwise (COS). To capture the power of the supervisors' implicit incentives, the party policy differences and the efficiency of the production and signal extraction technologies, I will make use of several proxies. Implicit incentives are captured by *Jud_Elec* (an elected judges' dummy) and *Reg_Elec* (an elected regulators' binary). The party policy

[17] See Sappington et al. [2001] for a definition of each scheme.

distance is measured by the absolute difference in the percentage of seats held by Democrats and Republicans (*Av_Dist*); while the average percentage of seats held by the majority party (*Av_Maj*) is the proxy chosen for the incumbent's holding on power (see Hanssen [2004, b]). Creating a proxy for the efficiency of the supervision technology is a more complex task. My strategy is to use the two sets of observables that more likely enhance the likelihood of information extraction: proxies for the presence of powerful watchdog groups and measures of the amount of staff's resources. The first group includes: *Young* (proportion aged 5-17), *Ind* and *Res* (proportion of revenues form sales to industrial and residential users respectively). The second set is composed by *Budget* (PUC's staff budget) and *Employ* (the number of permanent staff's members). The latter, unfortunately, is a very crude measure for efficiency. Varied and unobservable (in my data) skills are required to the PUC's members so it is not clear if higher values of *Employ* assure a more precise signal or instead relax the assumed staff's benevolence. Investments' concerns are reasonably linked to costly generation (c_{st}) and more crudely to high residential prices (*Rkhr*). Generations by nuclear and fuel sources (*Gen_Fuel*, *Gen_Nucl*) are introduced (one at the time to avoid multicollinearity) in the specification in order to control for difference in generation sources and federal policies across states. Other controls are state population (*Pop*), income (*Income*) and electricity sales (*Sales*). *Columns (1)* and *(2)* of *Table 3* reproduce the estimates of a random effect Logit model with dependent variable *PBR* for a panel of 49 states over the samples 1970-1997 and 1980-1997. This second breakdown shows how the results are affected when the Embargo shocks years are excluded. Moreover, *column (3)* reports the estimates when the same model is ran for a panel of 143 firms located in the same 49 states

over the 1980-1997 period. Here, the right hand side variables vary only across states and time: identification is obtained through the firms specific random effects. The evidence strongly supports the model's predictions. For what concern the proxies for the holding on power, the results clearly lean towards the strategic use explanation: the holding on power increases the probability[18] of the introduction of PBRs if interacted with *Rep* while the sign of *Av_Maj* is negative within the Democratic incumbents' group. Republican incumbent are more likely to introduce PBRs.[19] All the proxies are generally highly significant. A bit more mixed is the evidence on the efficiency of the signal extraction technology. The relevant proxies show the correct sign except *Employ* always negative and *Res* and *Ind* negative in *columns (2)* and *(3)*. While the first sign comes at no surprise given the above remark, an appealing explanation for the last two is that, in a dynamic set up, the friction between supervisors and interested parties would become so sour to deteriorate the quality of the signal. Finally, high marginal costs (investment concerns) increase the attractiveness of high powered cost-reimbursement rules. All these findings are insensible to the sample choice. Finally, looking at selection rules, it is clear (even if *Jud_Elec* is negative in *column (2)*) how the planner tends to substitute costly rent-extraction incentives (COS) with accountability-driving institutions. The regulators selection rule seems to cover a more relevant role in such a substitution pattern. The

[18] To be precise, each coefficient reported in *columns (1)-(3)* measures the effect on the logarithm of the odds ratio (for the event *PBR*) of a unit increase in one of the right hand side variables.

[19] The impact of an incumbent Republican reformer is given by the sum of the coefficient on *Rep* plus the coefficient on *PBR*Rep* multiplied for the mean of *Rep*. In *columns (1)* and *(3)* these figures are respectively: 4.26 = – 25.54 + 44.48*0.67 and 3.46 = – 18.839 + 34.836*0.64.

consideration of the reforms' timing as dependent variable confirms this finding.[20] *Column (4)* shows the estimates of an exponential proportional hazards model with failure event identified by *PBR_F*. *Jud_Elec* is negative and not statistically significant. All the other points of the *Empirical Predictions* continue to hold. In interpreting *column (4)*'s figures, remember that the effect of a unit increase in one of the right hand side variables (say c_{st}) is to increase the hazard of *PBR_F* (i.e., the instantaneous probability of a reform given that COS was in place) by a factor equal to the exponential of the estimated coefficient attached to that variable (i.e., exp(1.064)).[21] At this point, a natural question arises: what are the effects of PBRs' reforms on regulatory performances (i.e., prices)?

4.2 Pricing Models

Recent cross-states empirical analyses, mainly based on telecommunications data, have delivered the following stylized facts: PBRs assure lower prices and higher earnings with no relevant reduction in overall service quality.[22] What this literature lacks is an endogenous treatment of the regulatory institutions: as follows I will fill this hole. The specification relates electricity prices charged at

[20] However, the log-rank test significantly (at 5%) rejects the equality of the survivor functions across electing and appointing groups for both selection rule breakdowns.

[21] The results are not sensible to the specific parametric form imposed to the underlying hazard function. Besides, the Cox proportional hazards model delivers a very similar output.

[22] See Sappington et al. [2001] and Kridel et al. [1996] for complete reviews of the empirical literature. Hill [1995]'s and Joskow [2006]'s reviews focus on electric power market studies. Recently a wide cross-countries literature has been interested in the relative performances of benchmarking techniques applied to electric utilities (see Jamasb and Pollitt [2000]).

state level to various cost items plus fixed effect terms for regulatory regimes. Utilities set prices at system wide average costs and the more considerable component of such costs is the fossil fuels' item. The latter is useful in assessing the pass-through of cost shocks into prices and it helps in controlling the differences in the production structures. Therefore, I test point **2.** of the *Empirical Predictions* running, for each customer class, the following panel regressions:

$$p_{s,t} = \eta_s + \vartheta_t + \phi_1 Reg\_Elec_{s,t} + \phi_2 Jud\_Elec_{s,t} + \phi_3 PBR_{s,t} +$$

$$+\upsilon_1 PBR_{s,t} c_{s,t} + \upsilon_2 Jud\_Elec_{s,t} c_{s,t} + \upsilon_3 c_{s,t} + \varphi Con_{s,t} + \varepsilon_{s,t}. \quad (9)$$

In equation (9) $p_{s,t}$ is a price for state *s* in year *t*; η_s are state fixed effects controlling for long-run differences in production and distribution systems; ϑ_t are year dummies picking up macro-shocks and common changes in federal policy; $Con_{s,t}$ includes state specific time varying controls (*Gen_Fuel*, *Gen_Nucl*, *Income*, *Income*^{2}, *Pop*, *Pop*^{2}, *Sales*) and proxies for the efficiency of the supervision technology (*Res*, *Ind*, *Young*, *Budget*, *Employ*). $PBR_{s,t}$, $Jud\_Elec_{s,t}$ and $Reg\_Elec_{s,t}$ represent the time varying dummies for PBRs and election rules respectively. *Table 4* reports the main figures. The model has always an explanatory power higher than 85% and all the proxies for the efficiency of the supervision technology (not shown) are highly significant and generally have an attached coefficient with the correct sign. When $Jud\_Elec_{s,t}$ is included, fossil fuels' costs interacted with $PBR_{s,t}$ have always a negative but never significant marginal effect. The high significance of $Jud\_Elec_{s,t}$ suggests that implicit political incentives are more effective: this would also offer an appealing justification to the lags in the introduction of PBRs in the U.S.. The direct effect

of $PBR_{s,t}$ is both significant and positive on residential and commercial rates. Given the endogeneity of cost-reimbursement rules (see *section 4.1*), can these results be driven by a failure in conditional independence? *Table 5* addresses such a question. Here, (9) is estimated with the Arellano-Bond procedure without fixed effects but with one lag of the dependent variable; *Av_Maj*, *Rep*, *Av_Maj*Rep* only are employed as extra instruments to avoid weak instrumentation. As *columns (1)*, *(2)* and *(3)* show the indirect effect of $PBR_{s,t}$ is not significant but now null; the direct effect becomes negative: OLS seems to overestimate the overall impact of the reform towards more powerful schemes. This has a significant (at 10%) direct marginal negative effect on residential prices implying a 2.5% reduction on residential bills over the 1970-1997 sample. The weak significance is mainly due to the presence of the first lag of prices. Finally, note that the over-identifying restrictions are never rejected.

5. Concluding Remarks

As the theoretic section explains price-cap and COS arbitrate the rent extraction-efficiency trade-off in different ways. Partisan planners not only take into account the comparative advantages of different rules but they also use high powered schemes to strategically tie the hands of new incumbents' parties. I test these propositions on a panel of U.S. states. The results show how the probability of a reform from a low powered incentive scheme to a higher powered one has been linked to Republican incumbents, larger party policy differences, high cost industry structures, the presence of a more efficient supervision technology and elected supervisors. This evidence is robust to different estimation procedures and

to the consideration of the reforms timing as dependent variable. Less clear are the findings concerning the relation between regulated prices and PBRs. OLS overestimate the negative marginal effect of the reform, which is statistically significant for residential rates only. Such a point remains as open agenda for future studies on the field along with a multidimensional analysis of differently powered incentive rules.[23] All in all, the empirical section rationalizes the great wave of change that has interested the market during the last decades and shows how, at the constitutional table, partisan planners have substituted, according to their own partisan interests, explicit market's incentives (COS) with implicit accountability ones (election).

On top of it, my analysis delivers three main points to be seriously considered by actual constitutional designers: 1. the importance of a careful assessment of the benefits linked to high powered incentive schemes when expropriation of investment is a real concern; 2. the relevance of a deep evaluation of the effective efficiency of the signal extraction technology (i.e., extent of participation of watchdog groups and regulatory agencies' resources) when regulatory reforms are put in place; 3. the welfare gains related to a Constitutional table insulated from short-term electoral boosts when the delicate incentive schemes-institutional designs mix has to be decided.

[23] When I employ a multinomial Logit and an ordered Logit estimator, the main results remain unchanged. The dependent variable of the multinomial Logit is set equal to 1 if a COS regulation is employed, 3 if a pure price cap is in use and 2 if any other PBRs' scheme is adopted.

References

[1] Aghion, P., and P. Bolton, [1990], "Government Debt and the Risk of Default: A Politico-Economic Model of the Strategic Role of Debt", in Dornbusch R., and M. Draghi, eds., *Public Debt Management: Theory and Practice*, Cam. Un. Pr..

[2] Alesina, Alberto, and Guido Tabellini, [2005], "Bureaucrats or Politicians?", *NBER working paper*.

[3] Armostrong, Mark, and David Sappington, [2005], "Recent Developments in the Theory of Regulation" forthcoming the *Handbook of Industrial Organization*.

[4] Besley, T. and A. Case, [2003], "Policy Institutions and Policy Choices: Evidence from the United States", *Journal of Economic Literature*, 41 (1): 7-73.

[5] Besley, Timothy, and Stephen Coate, [2003], "Elected versus Appointed Regulators: Theory and Evidence", *Journal of the European Economic Association*, 1 (5): 1176-1206.

[6] Chunrong, Ai, and David E. M. Sappington, [2002], "The Impact of State Incentive Regulation on the U.S. Telecommunication Industry," *Journal of Regulatory Economics*, 22 (2): 133-160.

[7] Colorado Department of Regulatory Agencies, [1992, 1997], "1992 (1997) Sunset Review of the Colorado Public Utilities Commission", mimeo: CDRA.

[8] Edison Electric Institute, [2000], *Performance Based Regulation: EEI Member Survey*, Washington DC.

[9] Guerriero, Carmine, [2006], "Dependent Controllers and Regulation Policies: Theory and Evidence", FEEM working papers, 104.

[10] Hanssen, F. A., [2004], "Learning About Judicial Independence: Institutional Change in the State Courts", *Journal of Legal Studies*, 33 (2): 431-474.

[11] Hanssen, F. Andrew, [2004], "Is there a Politically Optimal Level of Judicial Independence?", *American Economic Review*, 94 (4): 712-729.

[12] Jamasb, T., and Michael, Pollitt, [2000], "Benchmarking and Regulation of Electricity Transmission and Distribution Utilities: Lessons form International Experience", CWPE working papers.

[13] Joskow, P., [2000], "Deregulation and Regulatory Reform in the U.S. Electric Power Sector"in *Deregulation of Networks Industries*, eds. Peltzman and Winston, AEI-Brooking Joint Center for Regulatory Studies.

[14] Joskow, P., [2006], "Incentive Regulation in Theory and Practice: Electricity Distribution and Transmission Networks", NBER working papers.

[15] Kotz, S., Balakrishnan, N., and Johnson, N. L., [2000], *Continuous Multivariate Distributions, Vol. 1: Models and Applications,* New York: Wiley.

[16] Laffont, Jean-Jacques, and Jean Tirole, [1993], *"A Theory of Incentives in Procurement and Regulation"*, Cambridge MA: MIT Press.

[17] Laffont, J.-J., [1996] "Industrial Policy and Politics", *International Journal of Industrial Organization*, 14 (1): 1-27.

[18] Laffont, J.-J., and D. Martimort, [1999], "Separation of regulators against collusive behavior", *RAND Journal of Economics*, 30 (2): 232-262.

[19] Laffont, J.-J., [2000], *Incentives and Political Economy*, Oxford Un. Press.

[20] Leaver, Clare, [2004], "Bureaucratic Minimal Squawk Behavior: Theory and Evidence from Regulatory Agencies", mimeo, LSE.

[21] Levy, G., [2005], "Careerist Judges and the Appeals Process", *Rand Journal of Economics*, 36 (2): 275-297.

[22] Maskin, Eric, and J. Tirole, [2004], "The Politician and The Judge: Accountability in Government", *American Economic Review*, 94 (4): 1034-1054.

[23] Milesi-Ferretti, Gian Maria, [1995], "The Disadvantage of Tying Their Hands: on the Political Economy of Policy Commitments", the *Economic Journal*, 105 (443): 1381-1402.

[24] Persson, Torsten, and Lars E.O. Svensson, [1989], "Why a Stubborn Conservative Would run a Deficit: Policy with Time-Inconsistent Preferences", *Quarterly Journal of Economics*, 104 (2): 325-45.

[25] Persson, T., and G. Tabellini, [2000], *"Political Economics: Explaining Economic Policy"*, Cambridge, MA: MIT Press.

[26] Persson, T., and G. Tabellini, [2003], *"The Economic Effects of Constitutions"*, Cambridge, MA: MIT Press.

[27] Sappington, D., [1986], "Commitment to regulatory bureaucracy". *Information Economics and Policy* 2 (4): 243-258.

[28] Sappington, David E. M., J. P. Pfeifenberger, P. Hanser and G. N. Basheda, [2001], "The State of Performance–Based Regulation in the U.S. Electric Utility Industry", *The Electricity Journal*, 14 (8): 71-79.

[29] Sappington, David E. M., [2001], "The Effects of Incentive Regulation on Retail Telephone Service Quality in the United States", 2(4): 355-375.

[30] Tirole, J., [1986], "Hierarchies and Bureaucracies: On the Role of Collusion in Organization", *Journal of Law, Economics and Organization*, 2: 181-214.

[31] U. S. Department of Commerce, Bureau of the Census, [1960-1996], "Compendium of State Government Finances", G-SF Series, Washington DC.

[32] White, M., [1996], "Power Struggles: Explaining Deregulatory Reforms in Electric Power Markets", *Brooking Papers in Econ. Activity: Micro.*, 201-250.

Tables Legend

Preliminary Analysis

Table 1: Variables Names and Descriptions.

Table 2.A: PBR in the U.S. Electric Power Market (1970-2002).

Table 2.B: PBR in the U.S. Electric Power Market (1970-2002).

Non Random Constitution Selection

Table 3: Determinants of Incentive Schemes - RE Logit Panel Estimates.

Pricing Equations

Table 4: Results on Pass-Through - Fixed Time/State Effects Estimates.

Table 5: Results on Pass-Through - Arellano-Bond Estimates.

6. Appendix

6.1 Solution without Supervision and Investment Concerns

Maximizing (1) with respect of U, e and q yields the following:

1. The existence of the shadow cost of rewards implies no rent for the firm:

$U = 0$ or $t \equiv \psi(a^*)$;

2. The disutility of effort is equalized to the saving in average cost at the margin:

$\psi'(a) = q^*$ or $a \equiv a^*$;

3. The social marginal value and cost of output are equalized:

$V'(q) = (1+\lambda)(\beta - a)$ or $S'(q) = p = c$.

A price–cap gives the right incentives for cost reduction and the fixed charge C^* can be tailored to fully extract the firm's rent. In such a "selling the store" mechanism, the price (*PC* stands for price cap) is implicitly defined as follows:

$t \equiv A + p^{PC}q(p^{PC}) - C(q(p^{PC})) = S'(q(\cdot)) - C(q(\cdot)) = d - (C(q(\cdot)) - C^*)$

where $d = \psi(a^*)$. The firm chooses a in order to maximize $d - ((\beta - a)q - C^*) - \psi(a)$.[24]■

6.2 Underinvestment When the Planner Cannot Commit

The socially optimal $\hat{I}$ minimizes the sum of investment costs and ex post costs:

$$\hat{I} \in \arg\min_I I + v(1+\zeta(I))\underline{\beta} + \left[1 - v(1+\zeta(I))\right]\overline{\beta} = I + \overline{\beta} - v(1+\zeta(I))\Delta\beta \qquad (10)$$

This amounts to say that the objective in (10) assumes a value greater at I^* than at $\hat{I}$. Evidently, the same can be said for the objective function in (5). Once I sum these two inequalities, the following expression holds in equilibrium:

$$I^* + \overline{\beta} - v(1+\zeta(I^*))\Delta\beta + v(1+\zeta(I^*))[1-\gamma(\hat{e}_{i,R},\hat{e}_{i,J})]\Phi(\overline{a}(I^*)) - I^* \geq$$

$$\hat{I} + \overline{\beta} - v(1+\zeta(\hat{I}))\Delta\beta + v(1+\zeta(\hat{I}))[1-\gamma(\hat{e}_{i,R},\hat{e}_{i,J})]\Phi(\overline{a}(I^*)) - \hat{I}$$

or $v(\zeta(\hat{I}) - \zeta(I^*))\left\{\Delta\beta - [1-\gamma(\hat{e}_{i,R},\hat{e}_{i,J})]\Phi(\overline{a}(I^*))\right\} \geq 0$. Given the properties of $\zeta'(\bullet)$ and the first order condition of (5), this inequality is met for $\zeta(\hat{I}) \geq \zeta(I^*)$ or $I^* \leq \hat{I}$. If, as it is likely, the cost of investment is lower in low cost markets, *Proposition 2* follows. ■

6.3 Data

This analysis exploits both cross sectional and time variation in the data. Three are the main data sets: a panel of 49 states for the samples 1970-1997 (1372 observations) and 1980-1997 (888 observations) and a panel of 143 firms over the same 49 states over the period 1980-1997 (2574 observations). Nebraska has been excluded because it has no

[24] Note that, as long as the planner knows β, she can infer effort from the observation of cost.

investor–owned utilities while the District of Columbia (and consequently the Potomac Electric Power Company) is not considered because no data points are available before 1987. Unbalanced panels deliver similar results.

B.1 Data on incentive schemes are directly collected from:

B.1.1 EEI, [2000], *PBR Survey (Member Survey)*, EEI, Washington D.C.

B.1.2 Sappington, D. E.M., J. P. Pfeifenberger, P. H. and G. N. Basheda, [2001].

B.2 Data on electric prices, generation and the price of fossil fuels (composite) per net Kwh are collected or calculated from the EEI (Edison Electric Institute) yearbook:

EEI, [1995], *1960-1992: Historical Statistics of the Electric Utility Industry*;

EEI, [1993-1997], *Statistical Yearbook of the Electric Utility Industry*, Washington DC.

EEI refers to the source of data for its yearbooks to various places including DOE, EIA, Federal Power Commission and FERC. EEI reports annual revenues (in dollar terms) and sales (in Kwh) by state and class of service. Prices are calculated from the revenues and sales in terms of cents per Kwh. Residential, commercial and industrial users account for the 95% of revenues. EEI reports electric generation and sources of energy for generation in two types of breakdown, i.e., by type of prime mover driving the generator and by energy source. The totals from the two of them are consistent. I used the second one.

B.3 To construct the fossil fuel cost index for state i in year t, let s_{jit} be the share of energy source j in state i in year t and let p_{it} be the price of fossil fuels (composite) per net Kwh (in cents per Kwh) for state i in year t, calculated as: $p_{it} = \Sigma_j (q_{jit}/q_{it}) p_{ijt}$. Then the fossil fuel cost series will be given by $c_{it} = \Sigma_j s_{jit} p_{it}$ where s_{it} is the share of electricity produced in state i in year t by the fossil fuel energy sources j (i.e.: coal, gas and oil).

B.4 Data on regulatory selection rules, PUCs' budgets and number of PUCs' full time employees are collected directly from:

NARUC, [1970-1997], *Yearbook of Regulatory Agencies*, NARUC, Washington DC.

B.5 Political preferences are from the CSG (Council of State Governments) yearbooks:

CSG, [1970-1997], *The Book of the States*, CSG, Lexington, KY.

B.6 Data on judges' selection rule and length terms are collected from Hanssen, F. Andrew [2004, Table 1] and Besley, Timothy and A. Abigail Payne, [2003, Table 1].

B.7 State income per capita, population, proportion aged over 65 and proportion aged 5-17 are calculated from a U.S. Census Bureau (UCB) publication:

UCB, [1970-1997], *Population Estimates Program*, UCB, Washington DC.

6.4 Tables

Preliminary Analysis

Table 1: Variable Names and Descriptions.

	Variables	***Description***
Pricing Rules	***PBR***	Dummy taking value 1 if the rule is in use in the state, 0 otherwise. (***PBR_F*** = Dummy taking value 1 if the firm uses the rule, 0 otherwise).
Prices	***Rkhr/c/i***	Revenue per Kwh sales (residential, commercial, industrial).
Political Variables	***Av_Maj*:**	Percentage of seats (averaged across upper and lower houses) held by majority party.
	***Av_Dist*:**	Absolute difference between percentage of seats held by Democrats and Republicans.
	***Rep*:**	Dummy taking value 1 if the government is Republican, 0 otherwise.
Selection Rules	***Reg_Elec*:**	Dummy taking value 1 if commissioners are elected, 0 otherwise.
	***Jud_Elec*:**	Dummy taking value 1 if judges are elected, 0 otherwise.
Supervision Technology	***Budget*:**	PUC's total receipts in thousands dollars.
	Employ:	PUC's full time employees.
Watchdog Groups	***Over_65*:**	Percentage of population aged 65 and over.
	***Young*:**	Percentage of population aged 5-17.
	***Res*:**	Percentage of *Sales* from customers who are residential.
	***Ind*:**	Percentage of *Sales* from customers, which are industrial.
Average Cost	c_{st}**:**	Cost of fossil fuels (in cents per Kwh sales) – see *Appendix 6.2*.
Other Controls	***Gen_Fuel:***	Percentage of total generation from fossil fuels sources.
	Gen_Nucl:	Percentage of total generation from nuclear source.
	***Sales*:**	Sales in thousands Mwh.
	***Pop*:**	State population in thousands people.
	***Income*:**	State income in thousands dollars.

Table 2.A: PBR in the U.S. Electric Power Market (1970-2002).

States	IOUs	PBR	Period
AL	AL Po. Co. ;	Rate case moratorium;	1982-2002
AZ	AZ Pu. Se. Co. , Tucson El. Po. Co.;	None, None;	
AR	Entergy AR Inc. ;	None;	
CA	Pacific Gas & El. Co. , San Diego Gas & El. Co. , * Southern CA Edison;*	None, Revenue and price cap with earnings sharing (see also case A.98-01-014), Price cap with earnings sharing (see also case A.93-12-029);	 1994-2002 1997-2001
CO	Pu. Se. Co. of CO;*	Rate case moratorium with earnings sharing (see also case 95A and 99A-531EG);	1996-2006
CT	Citizen Utilities Co. , CT Light & Po. Co. ,* United Illuminating Co. ;	None, Price cap (see also case 99-06-21 filed in 2000), None;	 2000-2001
DE	Delmarva Po. & Light Co.;	None;	
DC	Potomac El. Po. Co.;	None;	
FL	FL Po. & Light Co. , FL Po. Co. , Gulf Po. Co. , Tampa El. Co. ;*	None, None, None, Rate freeze with earnings sharing;	 1995-1999
GA	GA Po. Co. , Savannah El. & Po. Co. ;	None, None;	
HI	HI El. ,* Maui El. Co. Ltd. ;	Price cap with earnings sharing (see also case 96-0493 filed 1996), None;	1997-1999
ID	ID Po. Co. ;	None;	
IL	Central IL Light Co. , Central IL Pu. Se. Co. ,* Commonwealth Edison Co. , IL Po. Co. , Mt. Carmel Pu. Se. Co. ;	Price cap with earnings sharing, Price cap with earnings sharing, Price cap with earnings sharing, Price cap with earnings sharing, Price cap with earnings sharing;	1998-2002 1998-2002 1998-2002 1998-2002 1998-2002
IN	IN Michigan Po. Co. , Indianapolis Po. & Light Co. , Northern In. Pu.Se.Co. , PSI Energy Inc. , Southern IN Gas & El. Co. ;	None, None, None, None, None;	
IA	Interstate Po. Co. , IES Ut. Inc. , MidAmerican Energy Co.;*	None, None, Rate case moratorium with earnings sharing (see also APP-96-1, RPU-96-8);	 1998-2000
KS	KS Gas & El.Co., Western Resources Inc.;	None, None;	
KY	KY.Po. Co. , KY Ut. Co. , Louisville Gas & El. Co. ,* Union Light Heat & Po. Co.;	None, None, Revenue sharing (see also case 98-426/7 filed in 1998), None;	 1999-2000
LA	Central LA Inc. , Entergy LA Inc. ,* Entergy New Orleans Inc. , Southwestern El. Po. Co. ;	None, Rate case moratorium with earning sharing (see also case U-20925 filed in 1996), None, None;	 1996-2002
ME	Bangor Hydro-El. Co. , Central ME Po. Co. , ME Pu. Se. Co. ;*	Rate freeze for distribution services, Revenue-per-customer cap and price cap with earnings sharing, Price cap with earnings sharing;	1995-2000 1991-2007 1996-2000
MD	Baltimore Gas & El. Co. ,* Potomac El. Co.;*	Price cap (see also case 8794/8804 filed in 1998), Price cap and rate freeze (see also case 8796 filed in 1999);	1998-2002 2000-2002
MA	Boston Edison Co. , Cambridge El. Light Co. , Commonwealth El. Co. , Eastern Edison Co. ,* Fitchburg Gas & El. Light Co. , MA El. Co. , Western MA. El. Co. ;*	None, None, None, Revenues sharing (see also case 96/94 filed in 1998), None, Rate freeze with earning sharing, Revenue sharing (see also case 97-120 filed in 1998);	 1998-2000 1998-2009 1998-2000
MI	Consumers Energy Co. , Detroit Edison Co. , Edison Sault El. Co. , Upper Peninsula Po.Co. ;	None, None, None, None;	
MN	MN Po. & Light Co., Northern State Po. Co. , Otter Tail Po. Co.;*	None, Price cap with earnings sharing, Price cap with earnings sharing;	 2001-2005 2001-2005
MS	Entergy MS Po. Co. ,* MS Po. Co.;*	Benchmarks (see also case 93-UA-301 filed in 1994), Rate case moratorium with earnings sharing;	1994-1998 1995-2001
MO	Empire District El. Co. , Kansas City Po. & Light Co. , St Joseph Light & Po. Co. , Union El. Co. ,* UtilCorp United Co.;	None, None, None, Rate freeze with earnings sharing (see also case EM-96-149 filed in 1997), None;	 1995-2001
MT	MT Po. Co. ;*	Price cap with earnings sharing (see also D95.9.128 filed 1996);	1997-1998
NV	NV Po. Co. ,	None;	

Table 2.B: PBR in the U.S. Electric Power Market (1970-2002).

States	IOUs	PBR	Period
NV	Sierra Pacific Po. Co.;	None;	
NH	Pu. Se. Co. of NH;	None;	
NJ	Atlantic City El. Co. , Jersey Central Po. & Light Co. , Pu. Se. El. & Gas Co. , Rockland El. Co.;	None, None, None, None;	
NM	Pu. Se. Co. of NM;	None;	
NY	Central Hudson Gas & El. Co. , Consolidated Edison Co.– NY Inc. , Long Island Lighting Co. , NY State El. & Gas Co. ,* Niagara Mohawk Po. Co. ,* Orange & Rockland Utils Inc., Rochester Gas and El. Co.;*	None, Revenue-per-customer cap with earnings sharing, None, Price-cap (for base rates) with earnings sharing (see also case 96-E-0891), Revenue cap and rate freeze- price cap, None, Revenue capand rate case moratorium with earnings sharing;	 1995-2005 1993-2002 1991-2002 1993-2002
NC	Carolina Po. & Light Co. , Duke Po. Co. , Nanthala o. & Light Co.;	None, None, None;	
ND	MDU Resources Group Inc.;	None;	
OH	Cincinnati Gas & El. Co. , Cleveland El. Illumination Co. , Columbus Southern Po. Co. , Dayton Po. & Light Co. , OH Edison Co. , OH Po. Co. , Toledo Edison Co. ;	None, None, None, None, None, None, None;	
OK	OK Gas & El. Co. , Pu. Se. Co. of OK ;	None, None;	
OR	PacifiCorp ,* Portland General El. Co. ;	Price and revenue cap with earnings sharing, None;	1994-2001
PA	Duquesne Light Co. , Metropolitan Edison Co. , PA El. Co. , PA Po. & Light Co. , PA Po. Co. , PECO Energy Co. , West Penn Power Co. ;	None, None, None, None, None, None, None;	
RI	Blackstone Valley Electric Co. ,* Narragansett Electric Co. ,* Newport Electric Co. ;*	Price cap with earnings sharing (see also case 2498/2514 filed in 1996), Price cap and rate freeze with earnings sharing, Price cap with earnings sharing (see also case 2498/2514 filed in 1996);	1997-1998 1997-1998 1997-2004
SC	Lockhart Power Co. , SC El. & Gas Co. ;	None, None;	
SD	Black Hills Co. ; Northwestern Pu. Se. Co. ;	Rate freeze (see also case EL95-003 filed in 1995), None;	1995-2005
TN	Kingsport Po. Co. ;	None;	
TX	Central Po. & Light Co. , El Paso El. Co. , Entergy Gulf States Inc. , Houston Lighting & Po. Co. , Southwestern El. Se. Co. , Southwestern Pu. Se. Co. , TX Utilities Electric Co. ,* TX-New Mexico Power Co. ,* West TX Ut. Co. ;	None, None, None, None, None, None, Benchmarks (see also case 21112), Benchmarks, None;	 2000-2002 2000-2002
VT	Central VT Pu. Se. Co. , Green Mountain Po. Co. ;	None, None;	
VA	Appalachian Po. Co. , VA Electric & Po. Co. ;	None, None;	
WA	Puget Sound Energy Washington Water Po. Co. ;	Price cap, None;	1997-2001
WV	Monongahela Po. Co. , Wheeling Po. Co. ;	None, None;	
WI	Consolidated Water Po. Co. , Madison Gas & El. Co. , Northern States Po. Co. , Northwestern WI El. Co. , Pioneer Po. & Light Co. , South Beloit Water Gas & El. Co. , Superior Water Light & Po. Co. , WI El. Po. Co. , WI Po. & Light Co. , WI Pu. Se. Co. .	None, None, None, None, None, None, None, None, None, None.	

Notes: 1. El., Inc., Po., Pu., Se. are for respectively Company, Electric, Incorporation, Power, Public, Service;
2. IOUs included in the EEI report show the * index;
3. Relevant PUC's docket in parentheses.

Non Random Constitution Selection

Table 3: Determinants of Incentive Schemes - RE Logit Estimates.

	(1)	*(2)*	*(3)*	*(4)*
Dependent Var.:	***PBR***	***PBR***	***PBR_F***	***PBR_F***
Av_Maj	**- 4.164** (17.767)	**- 80.175** (38.534)**	**- 1.399** (17.829)*	**- 5.024** (5.024)
Av_Maj*Rep	**44.479** (16.949)***	**207.118** (75.047)***	**34.836** (11.000)***	**9.107** (4.107)**
Rep	**- 25.536** (10.777)**	**- 92.575** (34.317)***	**- 18.839** (6.999)***	**- 5.716** (2.735)**
Av_Dist	**5.781** (8.578)	**34.969** (13.700)***	**- 0.474** (7.514)	**2.867** (2.306)
Reg_Elec	**18.322** (5.364)***	**73.655** (27.132)***	**7.273** (2.118)***	**1.242** (0.589)**
Jud_Elec	**3.566** (1.963)*	**- 19.962** (7.492)***	**5.112** (2.092)**	**- 0.513** (0.706)
Budget	**0.00010** (0.00004)***	**0.00040** (0.00015)***	**0.00004** (0.00001)***	**$6.34e^{-06}$** ($4.92e^{-06}$)
Employ	**- 0.022** (0.0083)***	**- 0.041** (0.016)**	**- 0.046** (0.0077)	**-0.001** (0.002)
Res	**229.258** (66.781)***	**- 130.166** (57.182)**	**- 46.517** (16.193)***	**- 9.236** (7.086)
Ind	**16.025** (12.291)	**- 69.580** (43.204)	**- 42.243** (13.041)***	**- 7.178** (4.737)
Young	**1.537** (0.465)***	**4.860** (1.775)***	**0.290** (0.134)**	**0.187** (0.056)***
c_{st}	**4.203** (1.400)***	**6.906** (3.844)*		**1.064** (0.346)***
Rkhr			**2.298** (0.524)***	
Gen_Nucl	- 14.211 (6.277)**			
Gen_Fuel		- 122.461 (44.931)***	- 8.234 (2.787)***	- 4.448 (1.337)***
Sales	0.0002 (0.00007)***	0.0003 (0.0001)***	- 0.00008 (0.00003)**	$1.49e^{-06}$ ($7.84e^{-06}$)
Income	0.0020 (0.0006)***	0.005 (0.002)***	0.0014 (0.0003)***	0.00003 (0.00005)
Pop	$-2.47e^{-08}$ ($1.38e^{-07}$)	$-7.57e^{-07}$ ($3.35e^{-07}$)**	$4.53e^{-07}$ ($1.38e^{-07}$)***	$3.28e^{-08}$ ($7.79e^{-08}$)
Constant	- 206.191 (58.931)***	- 94.809 (46.043)**	- 45.523 (18.676)**	1.758 (5.424)
Estimation	Random Effects Logit	Random Effects Logit	Random Effects Logit	Exponential Proport. Hazards
N. of Obs.	1372	882	2574	2515
Log Likelihood	- 58.469	- 45.212	- 106.497	- 35.795

Notes: 1. *Standard errors* in parentheses;
2. * significant at 10%; ** significant at 5%; *** significant at 1%;
3. The *dependent variable* in *column 4* represents the failure event.

Pricing Equations

Table 4: Results on Pass-Through - Fixed Time/State Effects Estimates.

	(1)	*(2)*	*(3)*
Dependent Var.:	***Rkhr***	***Rkhc***	***Rkhi***
PBR_{st}	**0.457** **(0.182)****	**0.540** **(0.181)*****	**0.203** **(0.149)**
Reg_Elec_{st}	-0.092 (0.203)	0.186 (0.201)	0.043 (0.165)
Jud_Elec_{st}	-0.091 (0.158)	-0.214 (0.156)	0.171 (0.129)
$PBR_{st} . c_{st}$	**-0.001** **(0.125)**	**-0.159** **(0.124)**	**-0.068** **(0.102)**
$Jud\_Elec_{st} . c_{st}$	-0.394 (0.082)***	-0.366 (0.082)***	-0.302 (0.067)***
c_{st}	0.542 (0.054)***	0.498 (0.053)***	0.470 (0.044)***
Other Controls	$Budget_{st}$, $Employ_{st}$, Res_{st} , Ind_{st} , $Young_{st}$, Gen_Fuel_{st} , Gen_Nucl_{st} , Pop_{st} , $(Pop_{st})^2$, $Income_{st}$, $(Income_{st})^2$, $Sales_{st}$.		
Estimation	Fixed time and state effects (within) estimator.		
N. of Obs.	1372	1372	1372
R^2	0.89	0.87	0.85

Notes: 1. *Standard errors* in parentheses;
2. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5: Results on Pass-Through - Arellano-Bond Estimates.

	(1)	*(2)*	*(3)*
Dependent Var.:	***Rkhr***	***Rkhc***	***Rkhi***
PBR_{st}	**-0.189** **(0.106)***	**0.069** **(0.137)**	**- 0.023** **(0.123)**
$PBR_{st} . c_{st}$	**0.082** **(0.066)**	**0.025** **(0.076)**	**0.034** **(0.067)**
Other Controls	$Constant_{st}$,$Dependent\ Var.(-1)_{st}$, Reg_Elec_{st} , Jud_Elec_{st} , $Jud\_Elec_{st} . c_{st}$, c_{st} , $Budget_{st}$, $Employ_{st}$, Res_{st} , Ind_{st} , $Young_{st}$, Gen_Fuel_{st} , Gen_Nucl_{st} , Pop_{st} , $(Pop_{st})^2$, $Income_{st}$, $(Income_{st})^2$, $Sales_{st}$.		
Additional Instruments	Av_Maj_{st} ,Av_Maj_{st}*Rep_{st} , Rep_{st} .		
Estimation	Arellano-Bond estimator for dynamic panel.		
Ov-Id Test (P-Value)	0.98	0.99	0.99
N. of Obs.	1274	1274	1274

Notes: 1. *Robust standard errors* in parentheses;
2. * significant at 10%; ** significant at 5%; *** significant at 1%;
3. One-step results employed for inference on coefficients.

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