Dependent Controllers and Regulation Policies: Theory and Evidence

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Summary

This paper analyzes the effects of supervisors' (i.e., regulators and judges) selection rules on regulated prices. A checks and balances' regulatory review process strengthens the role of the judicial power and election increases the populism of implicitly motivated supervisors. Election arises when the risk related to expropriation of sunk investments and the inter-party distance are lower. Employing U.S. electric power market's data, the empirical evidence strongly confirms these predictions. Indeed, when treated as endogenous, only the election of administrative law judges and not the one of regulators significantly lowers the level of electricity rates. Moreover a more effective supervision technology shows a marginal negative effect on regulated rates as well.

Keywords: Election, Agency, Judges, Regulation, Electricity

JEL Classification: K23, L51, Q43

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1. Introduction

Social "planners" must delegate actual policy choices to broadly defined "public decision makers" and, in doing that, they design a set of institutions able to assure that these agents behave coherently to their desiderata. Among such constitutional rules selection mechanisms play a crucial role. Appointment and election induce different incentives. While politicians want to please the voters in order to win the elections, career concerned bureaucrats want to appear competent to appointing professional peers. However, the widely-accepted idea that elected officials choose policies and appointed ones implement them finds a remarkable exception in the U.S. regulatory system where regulators and High Court judges can be either elected or appointed. Such an environment constitutes a natural field where the relation between judicial, bureaucratic and political powers can be analysed along with the relative merits of different accountability designs. However, the existing literature has only taken into consideration the regulatory institutions and, Besley and Coate [2003], in the first rigorous study of the issue, claim that, in a perfect information world, election allows voters to unbundle policy issues assuring lower regulated prices. The idea is appreciable in its simplicity but far from reality. Indeed, a careful institutional analysis reveals that the symmetric information hypothesis is restrictive and that the consideration of the hierarchical structure (planner-regulator-judge-firm) through which the informational gap between planners and regulated firms is bridged is crucial in understanding the functioning of the agency architecture. This opens to the classical regulation theory new and unexplored perspectives. In fact, starting from the well-known

Laffont and Tirole [1993]'s model and supposing that the planner employ a hierarchy formed by two implicitly rewarded supervisors (a regulator and a judge), my model shows that the judicial role is 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, moving policies in a more populist direction. Besides, when investment concerns affect the planner welfare function, a straightforward theory of accountability institutions becomes available: pro-industry planners prefer appointment when the risk related to expropriation of sunk investments is considerable (i.e., high cost industry and efficient signal extraction technology). The main contributions of the paper are three: 1. the model, at last, clarifies the relation between regulatory outcomes and judicial appointment, which is shown to be the only relevant selection rule when the "revolving door" effect is strong; 2. from a positive perspective,[1] the paper identifies the political and efficiency-driven criteria that have guided partisan planners in allocating policy tasks to elected or appointed policymakers. 3. index models of judges' and regulators' selection and electricity pricing models, both based on U.S. electricity data, confirm the model's predictions. The paper is organized as follows. *Section 2* clarifies the judges' and regulators' activities within the U.S. electric power market. *Section 3* illustrates the model; while *section 4* comments on the econometric results. S*ection 5* concludes delivering several remarks for

[1] Alesina and Tabellini [2005] embrace a normative perspective. Bureaucrats perform better than politicians when vested interests have large stakes and ex-post voters' preferences are predictable.

constitutional designers. 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. electricity market. While 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 (natural gas, telecommunications, water and wastewater, trucking and railroad, insurance) 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] IOUs are not allowed to receive governmental subsides and their revenue must cover their costs (including managerial rewards). IOUs charge two-part tariffs, triggering rate reviews in response to rising costs (Joskow [1974]). 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. 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

[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.

takes a qualified majority enforceable judgment.[3] During the hearings, ALJs and commissioners 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. Ratepayers are represented by consumer advocates, who assure that media carefully track the evolution of files.[4] The resulting enormous body of press testimonies reveals the critical and often underestimated relevance of ALJs' activity. For instance, in 2004 an ALJ forced the Minnesota PUC to revise Qwest rates on the bases of anticompetitive deals; while in 2005 the Texas PUC allowed Cap Rock to recover most costs nixed by three ALJs. The above description suggests two key features of this complex agency architecture:

1. The commissioners' and ALJs' role is one of supervision, i.e. they organize the information disclosure process but do not formulate *de facto* the final motion. The latter is put forward by the PUC's staff that, given the complete record of the hearings and the participation of all the parties, is forced to consider only the available "hard" evidence. This is the main consequence of the adversarial nature of the hearings: no evidence can be denied once the precedent is individuated.

2. The ALJs' supervision activity evidently allows them to control regulatory policies (see also Tiller [1998]). As a measure of such incidence, it is worth to look at the number (*Dockets*) and duration (*Doc_Dur*) of electricity dockets

[3] At this point, PUCs may review the case, provided that the onus of injustice and illegality of the decision lies on the firm. Moreover, the former can appeal to High Courts on formal issues. However, these two last appeal levels are rarely granted.

[4] Consumer advocates are state-funded bodies established in the 70s and 80s in order to allow even residential users to proceed before PUCs. The relative dummy is equal to 1 in the states listed in Holburn and Van den Bergh [2003] plus California and Michigan. This choice is not relevant.

opened in the market over the 1974-1990 period (see *Table 1* for a complete description of variables names and construction). As *Table 2* reports, a docket typically endures nine months (with no significant pattern across selection regimes) and an impressing 85.7% of these files lasted more than 5 months (i.e., the maximum length of time needed to set up quasi-judicial hearings):[5] ALJs rule almost all the U.S. electricity dockets. Besides, the deep attention paid by ALJs to regulation cases would not strike as strange given that electricity files, with their broad echo, represent the most advertised among the policy positions (employment discrimination charges, other regulation dockets and activities, etc.) on which judges are selected.[6]

As follows I will first formalize the above agency relations and then I will identify the incentives shaping the supervisors' activities.

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.[7] Total cost is $C = \theta q$ and

[5] The cumulated number of days between the application reception and the quasi-judicial hearing date do not usually exceed 154 days (see the *1997 Sunset Review of the Colorado PUC*).

[6] To this extent, would not surprise that courts have referred to industry's influence to vindicate judicial review of PUC's decisions (State Farm 463US29, [1983]) and that five of the eleven Texas politicians, who got some of Enron's PAC last money, were ALJs (see the FTCR website).

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

marginal cost can take one of two values $\theta \in \{\underline{\theta}, \overline{\theta}\}$ with probabilities v and $1 - v$ respectively. Let $\Delta\theta = (\overline{\theta} - \underline{\theta}) > 0$. Probabilities are common knowledge, but only the firm's manager knows the true value of θ.[8] Consumers have the same preferences; thus the demand is the one of a representative consumer with gross consumer surplus given by $S(q)$. 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 or not the good i.e., $A \equiv S(q) - P(q)q$. As underlined in *section 2*, firm's revenues must cover managerial reward t; this implies that: $A + pq(p) \geq t$. Both the firm and the supervisors are risk neutral with respect to income. The firm's utility is given by $U = t - \theta q \geq 0$ 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:

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

$$= V(q) - (1+\lambda)C - \lambda U = V(q) - (1+\lambda)\theta q - \lambda U. \quad (1)$$

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 through a simple cost target contract leaving no rent to the firm. Instead, under

[8] Guerriero [2006, b] extends this model to the analysis of cost-reimbursement's rules reforms.

asymmetric information, she does not observe the realization of θ and maximizes expected social welfare offering a pair of incentive compatible schemes $(\bar{q}, \bar{t})$, $(\underline{q}, \underline{t})$. The low cost firm enjoys an informational rent while the high cost one receives a distorted allocation (see Laffont and Tirole [1993] for details). 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*. These 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.[9] Moreover, 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 $\sigma = \{\underline{\theta}; \phi\}$ about the cost structure with precision ξ determined by the supervisors' activity. The information is hard in the sense that it is verifiable and every interested party can convince himself that the signal corresponds to the true state of the world. The signal can only inform about $\underline{\theta}$. If $\theta = \underline{\theta}$ with probability ξ the planner sees $\sigma = \underline{\theta}$ and implements the complete information contract and with probability $1 - \xi$ she observes $\sigma = \phi$. If $\theta = \bar{\theta}$, then $\sigma = \phi$ always. When $\sigma = \phi$, the planner is

[9] 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. Besides the

uninformed, and she updates her beliefs applying Bayes rule. 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 $\xi^u \in (0,1)$. 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 efficiency of the signal extraction technology; K is increasing in the amount of 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,[10] 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 $b > 1$.[11] If either e or ξ are verifiable or contractible, "selling the store" contracts reach efficiency but

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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.

[10] 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.

[11] 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.

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 the following:

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 $\theta \in \left\{\underline{\theta}, \overline{\theta}\right\}$.

Next the firm discovers the only piece of private information: θ.

2. The planner offers a menu of managerial reward-quantity 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.[12]

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 the firm to report its marginal cost (asymmetric information regime).

5. Last a reward-quantity pair is implemented and 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) are captured by the indexes $i = \{Appointed, Elected\}$ and l

[12] Laffont and Martimort [1999] suppose full contracting on the supervisors' performance. The resulting equilibria are collusion-proof, i.e. costly rewards are paid to non-benevolent supervisors and the high cost type allocation is distorted even more in order to lower the firm stake. This set up is neither realistic nor able to capture the supervisors' implicit incentives.

$= \{Regulator, Judge\}$. 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 $\overline{\xi}_{E,l} = (3/2)e_{E,l}^{\exp}$ (exp refers to the voters' expectation). This amounts to say that $H^E\left(e_{E,l}\right) = \Pr\left\{\alpha \geq \left[\left(3e_{E,l}^{\exp}/2e_{E,l}\right) - 1\right]\right\}$. Instead, 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: $H^A\left(e_{A,l}\right) = E\left(\mathrm{E}\left(\alpha/\xi_{A,l}\right)\right) = E\left\{\left[\left(1+\alpha\right)e_{A,l} - e_{A,l}^{\exp}\right]/e_{A,l}^{\exp}\right\}$. Now, a glance at $H^E(\bullet)$ and $H^A(\bullet)$ reveals how elected supervisors will exert more effort than appointed ones.[13] Finally, R and J represent regulators and judges specific

[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: $[Z + g/(g+b)]\, f_\alpha(\overline{\alpha}) > [1 + Zg/(g+b)]$.

parameters. They are defined on (0, 1). *R* captures the "revolving-door" effect: regulators are attracted by future job opportunities in the regulated industry. The higher is *R* the less willing will a regulator be to exert effort in order to favour her future principals. *J* formalizes the judges' desire to leave a legacy of correctness and fairness ("legacy effect"). The higher is *J* the lower will be the cost for a judge to put effort into a proceeding in order to uncover the true (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. Note that there is no strategic interaction between planners and supervisors: this nicely reveals division of powers' properties of the model. The correct equilibrium concept is perfect Bayesian equilibrium. The solution to the supervisors' optimum problems (*Appendix 6.1*) implies that equilibrium efforts can be ranked as: $\hat{e}_{E,J} > \hat{e}_{A,J}$ and $\hat{e}_{E,R} > \hat{e}_{A,R}$. Judges and politicians exert more effort than regulators and bureaucrats respectively. Besides, note that: 1. $\hat{e}_{A,J}$ is greater than $\hat{e}_{E,R}$ if $(1 - R)(1 - J)\, f_{\alpha}(\bar{\alpha}) < 1$; 2. a more efficient supervision technology increases all the equilibrium levels of effort; 3. other accountability institutions affect the implicit incentives' power and, in particular, a longer length term would relax the "revolving door" effect creating focus on the signal extraction task. 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 characterized by the above levels of effort. The planner's posterior belief on $\beta = \underline{\beta}$ is: $\Pr(\beta = \underline{\beta} / \sigma_R = \phi, \sigma_J = \phi) = v(1 - \gamma(\hat{e}_{i,R}, \hat{e}_{i,J})) / (1 - v\gamma(\hat{e}_{i,R}, \hat{e}_{i,J}))$. The expected ex ante probability that the planner receives at least one informative signal

$\gamma(\hat{e}_{i,R},\hat{e}_{i,J}) \equiv \left\{E[\xi_{i,R}(\hat{e}_{i,R})] + (1 - E[\xi_{i,R}(\hat{e}_{i,R})])E[\xi_{i,J}(\hat{e}_{i,J})]\right\}$ is greater the higher K is and if supervisors are elected. Define μ as the shadow cost of public funds. In the *supervision* regime (apex S) the planner's ex-post expected welfare function is:

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

$$\left. + \frac{1-v}{1-v\gamma(\hat{e}_{i,R},\hat{e}_{i,J})}\left[V(\bar{\hat{q}}^S) - (1+\lambda)\bar{\theta}\bar{\hat{q}}^S\right]\right\} - 2(1+\mu)\hat{s} \cdot \qquad (3)$$

As usual, the inefficiency introduced by the asymmetry in information is entirely absorbed by the distortion in the low (high cost) type's quantity. Thus, differences in the ex ante regulated prices are entirely determined by the low type equilibrium allocation $\hat{\underline{q}}^S$, which is pinned down by the following condition:

$$V'(\hat{\underline{q}}^S) = (1+\lambda)S'(\hat{\underline{q}}^S) = (1+\lambda)\bar{\theta} + \frac{\lambda v(1-\gamma(\hat{e}_{i,R},\hat{e}_{i,J}))}{1-v}\Delta\theta \,. \qquad (4)$$

In order to lower the high type rent, the planner is forced to distort the low type's allocation away from the first best; however, given that in equation (4) higher values of K and the election of supervisors increase $\gamma(\hat{e}_{i,R},\hat{e}_{i,J})$, more efficient signal extraction technologies and the election rule curb this distortion and a nice substitutability between explicit market incentives to the regulated firm and the design of the hierarchical institutions arises. *Proposition 1* summarizes:

Proposition 1: *Elected supervisors and a more efficient supervision technology (higher K) lower ex-ante equilibrium prices*.

Similarly, the desire to leave a legacy of fairness (high J) and a mild exposure to "revolving door" promises (small R) increase the value of $\gamma(\hat{e}_{i,R},\hat{e}_{i,J})$. This suggests that there is a high enough value of R (say $\bar{R}$) such that almost all the dockets approach the quasi-judicial hearing stage because regulators select a very

small level of effort; symmetrically there exists a high enough value of J (say $\overline{J}$) such that the eventual second signal received by the planner (σ_J) has a very high precision. Thus, for values of R and J higher than $\overline{R}$ and $\overline{J}$ respectively, the marginal effect of the regulators' selection rule becomes almost insignificant in explaining prices: this is confirmed by the model's calibration (tables available upon request). The latter suggests that the judge's marginal effect is significantly bigger than the regulator's one for high enough values of R and J.[14] This remains true when appointed regulators have bigger R. This last variation captures the Besley and Coate [2003]'s bundling effect: governors interested in the industry's support select pro-shareholders regulators. *Proposition 2* summarizes:

Proposition 2: *For sufficiently high values of R or J, only the selection rule of the judge affects ex ante regulated prices significantly.*

At this point, it is instructive to stress that the picture drawn until now is partially shaded. I assumed a myopic and public interested planner, but what happens when partisan interests and concerns for firm's investments appear on the scene?

3.1 Endogenous Appointment Rules

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

[14] When I impose a quadratic cost function the order $\hat{e}_{E,J} > \hat{e}_{A,J} > \hat{e}_{E,R} > \hat{e}_{A,R}$ is upset only for very low values of R and J, generally (it depends on the values of g and h) smaller than 0.25. The pure elective supervisors' marginal effects ratio $\left[1 - E[\xi_{E,R}(\hat{e}_{E,R})]\right] E\left[\xi_{E,J}(\hat{e}_{E,J})\right] / E[\xi_{E,R}(\hat{e}_{E,R})] =$ is about 4 for low values (i.e.: 0.2) of both R and J and quickly rises to 7-10 for enough strong implicit incentives (R or J over 0.5, or both over 0.4). R is the more effective in pushing π up.

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 crucial questions: is it possible to think of the supervisors' effort exertion as a pandering activity when investments decisions are taken into consideration? How much partisan planners care about such decisions when they select appointment rules? 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]. Assume that, 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 and that $\zeta'(\bullet) > 0, \zeta''(\bullet) < 0, \lim_{I \to \zeta^{-1}(\overline{v})} I = \infty, \overline{v} = (1-v)/v$ and $\zeta'(\bullet) > 1/(v\Delta\theta)$ (investments are effective enough). The planner lacks commitment but anticipates the optimal I (i.e., I^*). Ex ante the firm maximizes its expected ex post rent minus investment costs:

$$I^* \in \arg\max_{I \geq 0} \left\{ v(1+\zeta(I))[1-\gamma(\hat{e}_{i,R}, \hat{e}_{i,J})]\Delta\theta \hat{\overline{q}}^{S,I}(I^*) - I \right\}. \quad (5)$$

The firm underinvests with respect to the social optimum (see *Appendix 6.2* for a revealed preference argument) and a glance at (5) suggests that the extent of inefficiency is higher the more precise the planner's signal is. So the supervisors' information 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. Clearly a planner caring about cost-reducing investments, because faced with a high cost market prefers appointment. *Proposition 3* summarizes:

Proposition 3: *An investment-concerned planner prefers elected supervisors if faced with low cost industries or inefficient supervision technologies (low K).*

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*]). The winner decides the size of an instrument (ρ_j) increasing the investment's utility for the firm ($G(I,\hat{\rho}_j)$). A type j planner attaches weights $\tilde{\chi}_J$ and χ_j to $G(\bullet)$ and I respectively. The weights are such that: $\chi_R = 1+2d, \chi_D = 1+d, \tilde{\chi}_R = 2d-1, \tilde{\chi}_D = d-1$ and $d > \lambda$ represents the extent of party policy differences. Thus, a Republican planner values more *I* and dislikes less an increase in the firm's rent. The firm is risk averse towards non cost-reducing investments and the following regularities hold: $G_1 > 0, G_{11} < 0, G_2 > 0,\ G_{22} < 0, G_{12} > 0, G_{21} > 0$.

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:

$$I^* \arg\max_{I\geq 0} \left\{ G(I,\hat{\rho}_j) + \hat{\underline{t}} - \underline{\theta}\hat{\underline{q}}^{S,I} \right\} s.t.: A + pq \geq t + I \,. \qquad (6)$$

I^* is a function of the selection rules and of both *d* and of the optimal ρ_j, which is such that: $\hat{\rho}_R > \hat{\rho}_D$. Let me define $I^*(\hat{\hat{q}}^{S,I}(i),\hat{\rho}_j) \equiv I(i,j)$. It follows that $I(A,R) \geq$ $\geq I(E,R) \geq I(A,D) \geq I(E,D)$. Let me focus on regimes in which supervisors share the same selection rule and define:

$$\gamma(i) \equiv 1-\gamma(\hat{e}_{i,R},\hat{e}_{i,J}); \qquad \tilde{I}(i,j) \equiv I(i,-j) + x_j(I(i,j) - I(i,-j)) \quad ;$$

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

On top of it, a type *j* planner's ex post expected welfare function writes as:

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

where o is the shadow price of the moral hazard in the investment constraint (first order condition of (6)). The planner considers the political uncertainty and selects appointment the greater is the likelihood of expropriation. Such a strategic institutional design explanation extends to the regulators' appointment rules' reform the intuition suggested by Hanssen [2004 b] for the ALJs' selection rule (i.e., the election of ALJs is linked to a stronger incumbent grip on power and to a smaller party policy distance).[15] The constitutional design is affected by x_j and d and partisan planners design regulatory institutions in a dynamically inefficient manner if enough interested in assuring high rents to the regulated firm. *Proposition 4* reports the precise patterns (see *Appendix 6.3* for proofs):

Proposition 4: ***A.*** *Republican incumbent reformers prefer elected regulators to appointed ones.* ***B.*** *The likelihood of a reform towards regulators' election is higher the smaller the party policy differences are and the weaker (stronger) the incumbent party's grip on power is if she is Republican (Democratic).*

As its main result the above section has identified the political and efficiency-driven forces that have guided partisan planners in allocating policy tasks to elected and appointed supervisors.

3.2 Robustness: Lobbying and Bribing

[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]).

However, when positive rents remain in equilibrium and new resources are in the hands of the regulated firm, the fear of supervisors' capture constitutes a last crucial issue to be discussed. ALJs and PUCs' commissioners exert effort in other tasks, like 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 supposed, as in Alesina and Tabellini [2005 a], observable and contractible.[16] This agent has all the bargaining power and influences supervisors, one at the time, either directly (bribes) or indirectly (campaign contributions) just before the effort level is decided in stage **3.** (or **4.**). The level of performance from the extra task *h* brings a small positive extra-utility to the firm but implies costly effort for supervisors (i.e., assume a non-divisible effort cost function $C\left(e_{i,l}+e_{i,l}^{h}\right)$). Clearly, in a jointly optimal equilibrium, $\hat{e}_{i,l}=0$ and the high type's firm enjoys a higher informational rent (proofs are available upon request). Such equilibria, even if discouraging, are fragile and the following applies: 1. Judges are less corruptible and the return to bribe them is higher; 2. Bribes do not arise if the punishment that a supervisor receives if caught is high enough; 3. Campaign contributions, although legal, would be not even affordable given that the full amount of implicit incentives (the precision's technology is multiplicative) has to be reimbursed. Therefore, provided that implicit incentives are strong enough (i.e., high enough τ, R and J in (2)), the model remains robust to the introduction of lobbying and

[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.

bribing. At this point, the other main contribution of the paper is to face the model with the U.S. electricity data.

4. Evidence: Elected *vs.* Appointed Supervisors

The empirical analysis of the paper refers to two main bodies of literature: elected *vs.* appointed regulators and elected *vs.* appointed judges. While a first colourful block of empirical analysis reported mixed and not conclusive evidence, recent literature has claimed that elected regulators tend to be more populist in their policy making.[17] Interesting is the cross firms approach chosen by Kwoka [2002] who, employing data on IOUs and POUs (Public Owned Utilities) for 1996, shows that accountability-enhancing institutions (elected commissioners, PUCs with fewer members and public ownership) are linked to lower regulated prices.[18] The main drawback of this cross states tradition is that time periods and controls differ widely among studies and Besley and Coate [2003] have considered this literature "worrisome for convincing empirical testing." In order to solve the issue, recent works have considered also the time dimension. Looking at the long-run mean electricity prices for residential, commercial and industrial users for a panel of 44 states, Besley and Coate [2003] find that elected regulators set lower

[17] Some of these contributions looked at rate setting while others have chosen, as regulatory performances, broad measures of the regulatory climate. Examples are: Berry [1979], Harris and Navarro [1983], Smiley and Green [1983], Costello [1984], Crain and McCormick [1984], Primeaux and Mann [1986] and Atkinson and Nowell [1994].

[18] Falaschetti [2005] reports results that suggest how providers of local exchange services maintain significantly smaller capital stocks in electing states. Other interesting contributions are: Smart [1994], Mishra and Thistle [1995] and Fields, Klein and Sfiridis [1997].

residential rates and are less likely to pass through cost changes into prices. Employing a panel of electric utilities' rate reviews, Holburn and Spiller [2002] show that elected PUCs are linked to lower residential-industrial rate ratios and lower returns on equity. A smaller amount of empirical work has dealt with the differences among appointed and elected judges. Helland and Tabarrok [1999, 2000] find evidence that partisan elected judges redistribute wealth from out-of-state business to in-state plaintiffs (i.e., typically voters). Besley and Payne [2003] study a panel of U.S. States and report results according to which appointing states see fewer charges for race, age and gender discrimination being brought.[19] The relevant results of the empirical part are two: evaluate the relative explaining power of the political and efficiency-driven determinants of appointment rules (selection models); bridge the different empirical traditions paying attention to the relation linking the judges' appointment rule and regulatory performances (pricing models). Thus, there are also two sets of empirical predictions:

Empirical Predictions: **1.** ***A.*** *The election of supervisors is linked to less effective supervision technologies and to low cost industries;* ***B.*** *The election rule for regulators is more likely if the reformer is Democratic, the smaller party policy differences are and the lower (higher) the incumbent grip on power is if she is Republican (Democratic).* **2.** ***A.*** *The election of supervisors and a more efficient supervision technology lower ex-ante equilibrium prices;* ***B.*** *A dummy for elected regulators would likely be not (statistically) significant in explaining prices.*

[19] Lateral evidence (see Hanssen [1999, 2000]) highlights how appointed courts are associated with a higher degree of decision uncertainty (i.e., higher number of PUCs' disputes, of High Court filings and higher number of employees in regulatory, insurance and education bureaucracies).

I take advantage of my forerunners; so I first present cross firms results for the 1996 (as in Kwoka [2002] this would avoid the small sample pitfalls of a cross states analysis), warning the reader that this strategy can lead to fragile inference in presence of "non-random pattern of constitutional reforms and the extensive differences among [individuals] belonging to different constitutional groups" (Persson and Tabellini [2003]). Then, as final robustness checks, panel estimates in all similar to the one reported in Besley and Coate [2003] are commented. First of all, let me analyze the results of the estimation of the selection models.

4.1 Non Random Constitution Selection

Institutions are defined as follows. The elected judges' dummy (*Jud_Elec*) takes value 1 if ALJs are selected through both partisan or non-partisan election and 0 otherwise (e.g.: appointment by state legislature, gubernatorial and merit plan appointment). As *Table 3* shows, 13 states have changed their judges' selection rule during the sample 1970-1997; among these, eight switched from election to appointment (or vice versa).[20] The elected regulators' dummy (*Reg_Elec*) takes value 1 if PUCs' commissioners are in whatever way elected, 0 otherwise.[21]

[20] Non-partisan election forbids candidates to reveal party affiliation, but most researchers agree that the two institutions are alike (see Atkins and Glick [1974]). Some state imposes retention election to judges (merit plan). Besley and Payne [2003] claim that these states would constitute a third group in which retention produces an extra accountability incentive; but Hall and Aspin [1987] show how sitting judges almost never loose these elections. Besides it is widely accepted that merit plan, that forbids campaign contributions by law, produces the most independent judges.

[21] There are seven regulatory selection rules (see Besley and Coate [2003]). South Carolina and Tennessee both switched in 1996. I considered both states as electing given that the previously elected commissioners were confirmed. No one of the results is affected when I consider the two states as appointing or I employ slightly different definitions for *Reg_Elec* and *Jud_Elec*.

There are six switching states (see *Table 3*). These two dummies are lowly correlated (– 0.006); so I can control for both of them at the same time without fear for multicollinearity. To capture the party policy differences and the efficiency of the production and signal extraction technologies, I need reasonable proxies. Party policy differences are 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 capturing the incumbent holding on power (see Hanssen [2004, b]). Two long run means (*Av_Maj.1996* and *Av_Dist.1996*) are introduced as controls in the cross-sectional selection model. Here the *Empirical Prediction* ***1.B*** cannot be tested. In all regulators' selection model the effect of a Republican incumbent party (*Rep*) is introduced both directly and indirectly. 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 power of watchdog groups and measures of the amount of staff's resources. The first group includes: *Ind* (proportion of revenues form sales to industrial users), *Advocate* (state consumer advocate office's dummy), *Over_65* (proportion of population aged over 65), *Young* (proportion aged 5-17). 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 staff's benevolence. Investments' concerns are likely linked to costly generation (*P_Fuel*, c_{st} and *O&M*) and to the imputed cost of net electric utility plant (*Plant*). Because public officials' accountability depends not

only on the selection rules but also on how often evaluators can fire them, I add as covariate the length of the judicial term, *Jud_Term* (the regulators' length term is never significant). Finally, other controls are: dockets' duration *Doc_Dur* (a proxy for state specific litigation features), generation by fossil fuels sources (*Gen_Fuel*), state population (*Pop*), income (*Income*) and education (*Edu*) and year in which the state has joined the union (*Join*).

Table 4 reports the results of both a Logit model run on a cross section of 144 firms for the 1996 and a random effect panel Logit run on a panel of 49 states over the 1970-1997 sample. Controls excluded in one specification and other covariates that I will employ in the pricing equations were highly not significant. The evidence strongly supports the model's predictions.[22] For what concern the holding on power proxies, the results clearly lean towards the strategic use explanation: smaller party policy differences favour supervisors' election and Republican incumbents tend to prefer appointed regulators. A bit more mixed is the evidence on the efficiency of the signal extraction technology: when significant, the coefficients attached to the proxies present the correct signs, all except the one attached to *Employ*, *Budget*, *Over_65* and *Ind*. While the first sign comes at no surprise given the above remark, an appealing explanation for the last three is that, in a dynamic set up, the friction between supervisors and interested

[22] Hanssen [2004 b] reports similar evidence on the strategic use effect for the judges' selection rule while Falaschetti [2005] and Holburn and Vanden Bergh [2003] show some similar results for the regulators' selection rule. In order to check part ***1.B*** of the *Empirical Predictions*, remember that the impact of an incumbent Republican reformer is simply given by the sum of the coefficient on *Rep* plus the coefficient on *Av_Maj*Rep* multiplied for the mean of *Av_Maj*, i.e.: – 6.413 = 39.449 – 68.553*0.669. Similar calculations imply that the Democratic marginal effect is: – 0.731.

parties would become so sour to deteriorate the quality of the signal. Finally, high marginal costs increase the attractiveness of appointed supervisors. The main empirical patterns remain true when states' level data are employed. Next I will analyze the relation between selection rules and regulated prices.

4.2 Pricing Models

Table 2 reports the differences in non-controlled long run prices' means between states that elect and appoint their ALJs. The latter states enjoyed significantly (at 1%) lower rates for all customer classes (1970-97). This finding is only suggestive, but, as I will show, it is robust to several multivariate analysis tests.[23] I employ two basic models to estimate the "constitutional" treatment effect: a cost of service (COS) cross firms pricing model and a panel pass-trough model based on states' level data.[24] Under COS, IOUs set prices at system-wide average costs, which are: operations and maintenance (*O&M*) and depreciation and amortization (*D&A*) payments, taxes (*Taxes*) and capital charges (*Plant*). All these figures are expressed in cents per Kwh. As (4) suggests, along with election an efficient

[23] If I look to the PUCs' breakdown, only the residential users' difference is significant (at 10%).

[24] OLS estimates present robust standard errors. Joskow, Rose and Shepard [1993] and Kwoka [2002], who is my reference in this subsection, employ similar pricing models. States that elect their judges have historically offered "public benefit programs". When I introduce binaries for low-income assistance and funded demand side management programs, renewable promotion and R&D initiatives into the pricing model no result is altered. The same holds true for input costs, dual product monopoly and incentive based regulation dummies, sales, market conducts and the other controls present in selection rules' index models. The latter and the fact that neither *Docket* nor *Doc_Dur* pass the endogeneity test would reassure the reader about the Leaver [2003]'s results: commissioners' length term has a negative effect on prices and a positive one on *Docket*.

signal extraction technology lowers regulated prices. Instead, accountability rules relaxing implicit incentives (*Jud_Term*) would increase them. I expect *Employ*, *Budget*, *Ind*, *Over_65* and *Advocate* to be positively related to more efficient signal extraction technologies; *3Mem_Com* (3 members' PUC) would show an opposite pattern. Finally, *Doc_Dur* - a proxy of a sour filing bargaining - would have a positive marginal effect. *Gen_Fuel* and *Join* control for differences in the generation structures and overall quality of institutions, respectively. *Table 5* reports least squares estimates of the above pricing model. *O&M*, *D&A*, *Taxes* and *Plant* (not reported) present the correct sign and are statistically highly significant (most of the time at 1%). The magnitudes of the coefficients (except the one of *Plant*) are near unit: these expenses are passed through dollar per dollar to prices. The coefficients attached to *Plant* imply a 5% rate base. The evidence on the signal extraction technology is mixed: an explanation similar to the one given above applies here.

Focusing on selection rules, *Reg_Elec* and *Jud_Elec* assume, almost all the time, the correct negative signs but they are never significant: could violations of the conditional independence assumption be responsible for such a pattern? As shown in *section 3.1*, appointment rules are not randomly assigned to states. Now, if the variation in constitutional rules used to explain prices is related to the random (unexplained) determinants of the pricing process, OLS inference becomes biased. Indeed, states may well self select into election on the basis of legal, political and social treats fostering the planner concerns with investments' expropriation, as well as a basic strain in legally favouring or making acceptable to consumers the need for technology progress. In order to address this classical selection bias problem, I first decide what selection rule has to be correctly treated

as exogenous. To this extent, *Table 5* reports the p-values of the Davidson and MacKinnon test:[25] cross firms' data advice to treat only *Jud_Elec* as endogenous. Besides, it is worth to stress that *Reg_Elec* is never significant when treated as endogenous and that the results do not change when both dummies are contemporaneously treated as endogenous or interaction-dummies (for example *Reg_Elec*Jud_Elec*) are added. These (whether or not considered as endogenous) are always statistically insignificant. This evidence assures that looking at the impact of supervisors' election separately is the correct strategy and not an unreasonable restriction on the data. I deal with selection bias both employing instrumental variables and the LIML to isolate the truly exogenous variation in the rules and directly adjusting OLS for "self-selection".

4.2.1 Instrumental Variables, Heckman and LIML Estimates

The first stage of the 2SLS estimator is specified exactly as in *section 4.2* and the set of exogenous or excluded instruments (i.e. the controls that are significant in the index models but not in the pricing equations) is given by: *Av_Maj*, *Av_Dist*, *Edu*. These three variables have all the characteristics of good instruments: as seen above, they are highly significant in explaining *Jud_Elec* and clearly enough they are exogenous to the pricing process. Moreover, there are not small sample problems here and the only reasonable objection to this specification strategy is the possible weakness of the employed instruments. When the latter is not an

[25] The Davidson and MacKinnon test consists of a two-step procedure. First, selection rules are regressed on all the index and pricing models controls. Then the retrieved residuals are introduced in the OLS specification reported in *Table 5*: if the OLS estimates are consistent, then the coefficient on the first stage residuals should not be significant in the second step.

issue the F-test on the excluded instruments has to be at least 10 (see Stock, Wright and Yogo [2002]). As *Table 4* shows, this figure for the *Jud_Elec* index model is around 21. Such an observation along with the fact that the data never reject the over-identifying restrictions, and that the results are robust to the consideration of sub-sets of the excluded instruments reassures about the consistency of the estimates. *Columns (1)* through *(4)* of *Table 6* report the coefficients attached to *Jud_Elec* and *Reg_Elec* when the first one is treated as endogenous. *Reg_Elec* is, again, almost always negative but never significant while *Jud_Elec* shows a negative marginal effect, significantly different from zero for average and industrial rates (at 5%). Industrial users secure 1.130 cents per Kwh, which is a considerable 21% reduction (the one for the average price is about 16%).[26] The evidence becomes sharp looking at *Table 7*: here LIML and Heckman estimates of the average and industrial pricing equations are reported. The relevant coefficients and standard errors remain almost unchanged and *Jud_Elec* is significant at 5% in the Heckman estimates. Here, the correlation between the residuals in the pricing and selection equations (*rho*) is positive (0.85 in *(3)* and 0.86 in *(4)*) and very precisely estimated: OLS tend to overestimate the constitutional effect.[27] So, when recursivity is relaxed, judges' election implies a

[26] Dockets' filings interest the whole rate structure, so residential-voters would not be advantaged over other users. Indeed, panel results show that the effect is significant for all customer classes.

[27] Imposing linearity I have ruled out any interaction effect between institutions and controls. If incorrect, such a hypothesis leads to inconsistency. Therefore, I estimated the average treatment effect employing both propensity scores and matching estimators: the evidence is unchanged. This is true also for a SUR estimator; moreover these system estimates show that there is no significant correlation between the residuals of the two index models and residuals of the pricing equation. This excludes the presence of unobservable determinants of both selection rules and prices.

significant negative effect on electricity rates. I obtain similar evidence when the dependent variable is the mark up of prices on average costs.

4.2.2 Panel Estimates

As explained above, even if robust to several estimation procedures, persuasive cross-firms evidence has to be confirmed by the introduction of a time dimension. This is why I look at the effect of cost shocks on prices running panel pass-through models and exploiting the variation in selection rules and costs within states. Due to lack of data, the only available and reasonable measure of average costs is the fossil fuels component (i.e., $c_{s,t}$ - see also Besley and Coate [2003]). To test once again part **2.** of the *Empirical Predictions*, I run the following model

$$p_{s,t} = \eta_s + \beta_t + \phi Reg\_Elec_{s,t} + \varsigma Jud\_Elec_{s,t} + \upsilon_1 Reg\_Elec_{s,t} c_{s,t} + \\ + \upsilon_2 Jud\_Elec_{s,t} c_{s,t} + \upsilon_3 c_{s,t} + \varphi Con_{s,t} + \varepsilon_{s,t} \qquad (7)$$

for each customers class.[28] In (7) $p_{s,t}$ 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; β_t are year dummies picking up macro-shocks and common changes in federal policy; $Con_{s,t}$ includes both state specific time varying controls (*Gen_Fuel*, *Gen_Nucl*, *Income*, *Income*^{2}, *Pop*, *Pop*^{2}) and proxies for the efficiency of the supervision technology (*Budget*, *Employ*, *Ind*, *Young*, *Over_65*); $Jud\_Elec_{s,t}$ and $Reg\_Elec_{s,t}$ represent the time varying dummy for election rules. Basic figures

[28] Being simultaneity a real concern here, unlike Besley and Coate [2003], the panel data set includes also the switching states. When switching states are excluded or the Besley and Coate [2003]'s sample (1960-1997) is used, all the results continue to hold true.

are given in *Table 8*. The coefficient on costs interacted with whether a state elects its public officials is everywhere negative, but, again, only the elected judges' one is significant (at 1%). This implies that prices in judges electing states are almost insensitive to shocks in the fossil fuels' component of average costs. These findings strengthen the cross-firms conclusions and provide strong evidence on the critical relevance of the judges' selection rule.

Of course, as in Besley and Coate [2003], only $Reg\_Elec_{s,t}$ is significant when $Jud\_Elec_{s,t}$ is excluded. Selection rules enter also as direct effects: these coefficients, identified purely off the time variation in the switching states, give the level effects of institutions. These are positive for both rules but significant only in the judges' case (see (*3*)) and always for $Reg\_Elec_{s,t}$.

The total effect of $Jud\_Elec_{s,t}$ is $\hat{\varsigma} + \hat{\upsilon}_3 \overline{c}_{s,t} = -0.207$ cents per Kwh for industrial rates. Residential and commercial users enjoy a similar reduction (6%). When significant, the proxies for efficient supervision technologies (except *Over_65*) show a negative sign: this would partially reassure the reader about the mixed cross-firms' results. This evidence is confirmed when conditional independence is relaxed and I use the Arellano-Bond estimator with two lags of the dependent variable: OLS overestimate the $Jud\_Elec_{s,t}$ effect and the over-identifying restrictions are never rejected.[29]

[29] An interesting further test can be performed looking at the reforms from appointment to election of ALJs. A nice case is South Dakota that switched in the middle of the sample (1981). When I run a threshold model with controls *Income*, *Pop*, *Young*, *Over_65*, *Gen_Fuel*, *Budget_S*, *Employ_S*, such a reform shows a significant (at 1%) negative effect on prices (19% reduction). Due to the fewness of reforms, the analysis cannot be performed on a panel of switching states only. Another robustness check consists in using the residential-industrial rate ratio (see Holburn

5. Concluding Remarks

Strong "revolving door" and "legacy" effects make ineffective the regulators' institutional design and, indeed, U.S. electric power market data suggest that only a reform from appointment to election of ALJs will significantly lower electricity rates. This finding becomes sharp when conditional independence is relaxed and cross sectional-time series data are employed. Besides, better signal extraction technologies lower rates along with institutions that focus supervisors' implicit incentives. An open question remains: who is paying for lower electricity prices? The welfare comparisons depend upon the weights that are placed on short run (i.e., consumer surplus) *vs.* long run (i.e., technological efficiency) perspectives. If investments' concerns are relevant, a possibly partisan planner will take both efficiency and rent seeking reasons into consideration: the index models' results confirm this intuition. Even if from 1997 a big wave of change is trying to enhance competition within U.S. regulated markets, almost all U.S. utilities are still regulated through the hierarchical structure analyzed above. Besides, the rising demand for technical specialization of judges involved in regulation cases makes the U.S. lesson crucial in understanding how correctly design the regulatory institutions of many European markets (see Breyer [2003] and Motta [2004]). To this extent, my analysis delivers three main advices for actual constitutional designers: 1. the importance of a careful assessment of the benefits linked to independence-enhancing institutions (namely appointment) for

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and Spiller [2002]) as dependent variable in the pass through specification. Again I obtain that only $Jud\_Elec_{s,t}$ has a small and significant marginal negative effect.

supervisors when expropriation of investment is a real concern; 2. the relevance of a deep evaluation of the effective efficiency of the signal extraction technology (extent of participation of watchdog groups and regulatory agencies' resources) when accountability rules are chosen; 3. the welfare gains related to a Constitutional table insulated from short-term electoral boosts when the regulatory design is decided.

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Tables Legend

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6. Appendix

6.1 Implicitly Motivated Supervisors

Maximizing $R_{i,I}(e_{i,I}, S)$ with respect to $e_{i,I}$ given $e_{i,I}^{\exp}$, and imposing in equilibrium $e_{i,I} = e_{i,I}^{\exp}$, involves, in an interior solution, the following first order conditions:

$$\hat{e}_{A,R}: \quad [3(1-R)]/(2\hat{e}_{A,R}) = \tilde{C}'(\hat{e}_{A,R});$$

$$\hat{e}_{E,R}: \quad [3(1-R)f_{\alpha}(\bar{\alpha})]/(2\hat{e}_{E,R}) = \tilde{C}'(\hat{e}_{E,R});$$

$$\hat{e}_{A,J}: \quad 3/(2\hat{e}_{A,J}) = (1-J)\tilde{C}'(\hat{e}_{A,J});$$

$$\hat{e}_{E,J}: \quad 3f_{\alpha}(\bar{\alpha})/(2\hat{e}_{E,J}) = (1-J)\tilde{C}'(\hat{e}_{E,J}).$$

Given that $f_{\alpha}(\bar{\alpha})>1$, the solution efforts are such that: $\hat{e}_{E,J} > \hat{e}_{A,J}$ and $\hat{e}_{E,R} > \hat{e}_{A,R}$. ■

6.2 Underinvestment When the Planner Cannot Commit

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

$$\hat{I} \in \arg\min_{I\geq 0} I + v(1+\zeta(I))\underline{\theta} + \left[1 - v(1+\zeta(I))\right]\overline{\theta} = I + \overline{\theta} - v(1+\zeta(I))\Delta\theta \qquad (8)$$

This amounts to say that the objective in (8) 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:

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

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

or $v(\zeta(\hat{I}) - \zeta(I^*))\Delta\theta\left\{1 - [1-\gamma(\hat{e}_{i,R}, \hat{e}_{i,J})]\hat{\overline{q}}^{S,I}(I^*)\right\} \geq 0$. Given the properties of $\zeta'(\bullet)$ and the first order condition of (5), I have that $\zeta(\hat{I}) \geq \zeta(I^*)$ or $I^* \leq \hat{I}$. If, as it is likely, the cost of investment is lower in low cost markets and taking into consideration how *K* affects $\gamma(\hat{e}_{i,R}, \hat{e}_{i,J})$, *Proposition 3* immediately follows. ■

6.3 Positive Determinants of Regulators' Appointment Rule

A planner of type *j* will prefer election if the following holds:

$$W_P^{AI,S}(E) - W_P^{AI,S}(A) > o\left(\partial\tilde{G}(A,j)/\partial I - \partial\tilde{G}(E,j)/\partial I\right) + v\{(1+\lambda+\tilde{\chi}_j)[\gamma(A)G(A,-j) + -\gamma(E)G(E,-j) + x_j[\gamma(A)(G(A,j) - G(A,-j)) - \gamma(E)(G(A,j) + -G(E,-j))]] + (\chi_j - 1 - \lambda)[\gamma(A)\tilde{I}(A,j) - \gamma(E)\tilde{I}(E,j)]\} \quad (9)$$

where $-j$ represents the opposing party. At this point, note that $G(i,j) \geq I(i,j)$ and that the following inequalities hold by hypotheses:

$$I(A,R) \geq I(A,D); I(E,R) \geq I(E,D); \gamma(A) > \gamma(E); G(A,R) \geq G(A,D);$$

$$G(E,R) \geq G(E,D); G(A,R) - G(A,D) \geq G(E,R) - G(E,D). \quad (10)$$

As a consequence, (9) rewrites for an incumbent Republican as:

$$W_P^{AI,S}(E) - W_P^{AI,S}(A) > o\{G_1(A,D) - G_1(E,D) + x_R[G_1(A,R) - G_1(E,R) - G_1(A,D) - G_1(E,D)] + +v\{(2d+\lambda)[\gamma(A)G(A,D) - \gamma(E)G(E,D) + x_R[(\gamma(A) - \gamma(E))(G(A,R) + -G(A,D)) + \gamma(E)(G(A,R) - G(A,D) - G(E,R) + G(E,D))] + +(2d-\lambda)[I(A,D) - I(E,D) + x_R(I(A,R) - I(A,D) - I(E,R) + I(E,D))]\}. \quad (11)$$

Taking into consideration (10), the comparative statics with respect to $\{d, x_j, J\}_{j=D,R}$ of the right hand side of (11) and of the symmetric expression for a type *D* planner lead to *Proposition 4* in the text. ■

6.4 Data

This analysis exploits both cross sectional and time variation in the data. The cross sectional analysis' sample consists of 144 firms belonging to 46 states and the District of Columbia for 1996. Nebraska has been excluded because it has no investor–owned utilities while Utah, Wyoming and Alaska because only minor (see below) utilities serve these states. Only data at the state level are available in the panel analysis that spans the period 1970-1997. Here, besides Nebraska, the District of Columbia has been excluded because no data points are available before 1987. This choice does not change any result.

I. Cross Sectional Analysis:

A.1 Data for electricity prices, operations and maintenance expenses, taxes, utility's net electric plant (in thousands dollars) and sales (in Mwh) are directly collected from a Department of Energy (DOE) publication:

DOE, [1996], *Financial Statistics of Major U.S. Investor–Owned Electric Utilities*, EIA Washington DC.

This survey is processed and published by EIA (Energy Information Administration) for the FERC. Major investor-owned electric utilities are defined as those that, in the past three consecutive calendar years, meet one or more of the following criteria: 1.1 million Mwh of total annual sales; 2. 100 Mwh of annual sales for resale; 3. 500 Mwh of annual power exchanges delivered; 4. 500 Mwh of annual wheeling for others.

The 1996 data are based on reports from 179 major IOUs. Only those 144 that sell energy to all and each of the three broader customer classes (i.e., residential, commercial and industrial) have been included (see Guerriero [2006, b] for a complete breakdown). Average price is calculated as total revenue from sales to ultimate consumers divided by the corresponding quantity. Residential, commercial and industrial prices are calculated from the respective revenues and sales; *O&M*, *D&A*, *Taxes* and *Plant* represent average production costs and they are computed dividing the relevant expenses by total sales (i.e. the sum of sales to ultimate consumers plus sales for resale). In particular, operations and maintenance expenses are the sum of direct costs of power generation, transmission, and distribution and overhead costs (customer accounts and service and sales, administrative and general expenses). *Taxes* represents the sum of federal and state income taxes, other taxes, plus minor adjustments for net payments for deferred taxes and investment tax credit. These figures are expressed in cents per Kwh.

A.2 The NASUCA website lists the states that present a state consumer advocate office.

A.3 Data on education are from Geospatial and Statistical Data Center (GEOSTAT).

A.4 *Join* is directly collected from Hanssen [2004 a].

II. Panel Analysis:

B.1 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) yearbooks:

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

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

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.2 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.3 Data on regulatory selection rules, PUCs' budgets, number of commissioners and number of PUCs' full time employees are collected from:

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

B.4 Political preferences are from the CSG (Council of State Governments) yearbooks:

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

B.5 Data on judges' selection rule and length terms are collected from Hanssen, F. Andrew [2004 b, Table 1] and Besley, Timothy and A. Abigail Payne, [2003, Table 1].

B.6 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.

B.7 Data on dockets concerning the US electric power market are collected from:

NARUC, [1974-1990], *Annual Report on Utility and Carrier Regulation of the National Association of Regulatory Utility Commissioners*, K. Bauer edition, Washington D.C.

6.5 Tables

Preliminary Analysis

Table 1: Variables Names and Descriptions.

	Var.	***Description***
Prices	***Rkha/r/c/i*:**	Revenue per Kwh sales (average, residential, commercial, industrial).
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.
Accountability	***Jud_Term*:**	Judges' term length.
Political Variables	***Av_Maj*:**	Percentage of seats (averaged across upper and lower houses) held by the majority (***Av_Maj.1996*** = average within the 1986-1996 period).
	***Av_Dist*:**	Absolute difference between percentage of seats held by Democrats and Republicans (***Av_Dist.1996*** = average within the 1986-1996 period).
	***Rep*:**	*Dummy* taking value 1 if the government is Republican, 0 otherwise.
Effectiveness of Supervision	***3Mem_Com*:**	Dummy taking value 1 if commissioners are three, 0 otherwise.
	***Advocate*:**	Consumer advocate's *dummy*, taking value 1 if the state has a state consumer advocate office dealing with electricity dockets, 0 otherwise.
	***Employ*:**	PUC's full time employees.
	***Budget*:**	PUC's total receipts in thousands dollars.
Watchdog Groups	***Over_65:***	Percentage of population aged 65 and over.
	Young:	Percentage of population aged 5-17.
	Ind:	Percentage of revenue from industrial users.
	***Dockets*:**	Number of dockets (electricity) opened in front of the PUC per firm.
	***Doc_Dur*:**	Duration of dockets (electricity) opened in front of the PUC per firm (***%Docket > 5*** = Percentage Enduring More than Five Months).

Average Costs (Proxies for the Relevance of Investments' Decisions)	***O&M*:**	Operation and maintenance costs in cents per Kwh sales.
	***D&A*:**	Depreciation and amortization costs in cents per Kwh sales.
	***Taxes*:**	Taxes payments in cents per Kwh sales.
	***c_{st}*:**	Cost of fossil fuels (in cents per Kwh sales) – see Appendix 6.2.
	P_Fuel:	Price of fossil fuels (composite) per net Kwh sales (cents per Kwh).
	***Plant*:**	Imputed cost of net electric utility plant in cents per Kwh sales.
Other Controls	***Gen_Fuel:***	Percentage of total generation from fossil fuels sources.
	Gen_Nucl:	Percentage of total generation from nuclear source.
	Join:	Year in which the state has joined the union.
	Edu:	Per. of 1990 population aged 25 and over, who graduated high school.
	Income:	State income per capita in dollars.
	Pop:	State Population in Thousands People.

Table 2: Mean in Mean Differences.

	States that Elect Judges	State that Appoint Judges	All
	1974 – 1990		
Dockets	0.531 (0.086)	0.574 (0.127)	0.552 (0.109)
%Docket > 5	0.788 (0.249)	0.876 (0.176)	0.833 (0.218)
Doc_Dur	8.912 (1.352)	9.094 (2.353)	9.003 (1.892)
N. of obs.	680	680	680
	1970 – 1997		
Rkhr ***	4.852 (2.288)	6.804 (2.797)	5.845 (2.739)
Rkhc ***	4.609 (2.008)	6.268 (2.631)	5.453 (2.487)
Rkhi ***	3.055 (1.506)	4.437 (2.093)	3.758 (1.954)
N. of observations	1372	1372	1372

Notes: 1. *Standard errors* in parentheses;
2. Test for Equality of Means Between Series:
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3: Supervisors' Selection Rule, 1970–1996.

Judges' Selection Rule	
Jud_Elec [21]:	AL[P], AR[P], GA[P(1970-1983)/Np], ID[Np], IL[P], KY[Np], LA[P(1970-1975)/Np], MI[Np], MN[Np], MS[P(1970-1994)/Np], MT[Np], NV[Np], NC[P], ND[Np], OH[Np], OR[Np], PA[P], TX[P], WA[Np], WV[P], WI[Np];
Jud_App [21]:	AK[Mp], CA[G], CO[Mp], CT[G], DC[G], DE[G], HI[Mp], IN[Mp], IA[Mp], KS[Mp], ME[G], MA[G], MO[Mp], NH[G],

	NJ[G], OK[Mp], RI[Le(1970-1994)/G], SC[Le], UT[Mp], VT[Le(1970-1974)/G], VA[Le];
Jud_Switch [8]:	AZ[Np(1970-1974)/Mp], FL[P(1970-1972)/Np(1972-1976)/Mp] MD[Np(1970-1975)/Mp], NM[P(1970-1989)/Mp], NY[P(1970-1977)/G], SD[Np(1970-1981)/Mp], TN[P(1970-1994)/Mp], WY[Np(1970-1972)/Mp].
Commissioners' Selection Rule	
Reg_Elec [10]:	AL, AZ, GA, LA, MS, MT, ND, OK, SD, VA;
Reg_App [35]:	AK, AR, CA, CO, CT, DC, DE, HI, ID, IL, IN, IA, KS, KY, ME, MD, MA, MI, MO, NV, NH, NJ, NM, NY, NC, OH, OR, PA, RI, UT, VT, WA, WV, WI, WY;
Reg_Switch [5]:	FL[E(1970-1981)/A], TX[E(1970-1976)/A(1977-1996)] MN[E(1960-1971)/A(1972-1975)/E(1976-1977)/A], SC[E(1970-1995)/A], TN[E(1970-1995)/A].
Note: 1. No investor–owned electric utilities serve Nebraska.	

Non Random Constitution Selection

Table 4: Determinants of Selection Rule - Logit and RE Logit Estimates.

	(1)	*(2)*	*(3)*	*(4)*
Dependent Var.:	***Reg_Elec***	***Reg_Elec***	***Jud_Elec***	***Jud_Elec***
Av_Maj		**40.948 (24.609)***		**41.514 (11.128)*****
Av_Maj*Rep		**-68.553 (24.673)*****		
Rep		**39.449 (14.103)*****		
Av_Dist		**-5.500 (11.539)**		**-21.077 (5.499)*****
Ind	**-444.915 (220.298)****	**51.153 (15.385)*****	**166.669 (70.938)****	**29.570 (5.670)*****
Advocate	**-39.068 (16.826)****		**-2.358 (1.019)****	
Over_65	**-8.120 (3.379)****	**2.184 (0.930)****	**-0.157 (0.146)**	**-0.576 (0.431)**
Young		**-2.270 (0.962)****		**0.032 (0.286)**
Budget	**-0.003 (0.001)****	**-0.0002 (0.0001)****	**0.0004 (0.0002)****	**-0.00006 (0.00003)****
Employ	**0.300 (0.123)****	**0.0074 (0.0082)**	**-0.029 (0.010)*****	**-0.0036 (0.0020)***
Doc_Dur			**0.984 (0.236)*****	
P_Fuel	**-67.462 (28.472)****			
c_{st}		**-4.376 (2.053)****		**-0.384 (0.532)**
O&M			**-0.634 (0.222)*****	
Plant	**1.847 (0.911)****			
Jud_Term			**-1.187 (0.350)*****	
Av_Maj.1996	-925.476 (425.049)**		-301.906 (75.234)***	
Av_Dist.1996	600.492 (278.503)**		145.057 (34.980)***	
Gen_Fuel	-75.405 (37.264)**			
Pop				$7.04e^{-07}$ $(2.95e^{-07})$**
Income		-0.0006 (0.0003)**		-0.0008 (0.0001)**
Edu			-0.846 (0.226)***	
Join	0.237 (0.125)*		0.028 (0.010)***	
Constant	234.086 (96.463)**	-28.125 (14.401)**	175.472 (53.875)***	-19.519 (5.755)***
Estimation	Logit	RE Logit Panel	Logit	RE Logit Panel
N. of Observations	144	1372	144	1372
Pseudo R^2	0.90		0.57	
Log Likelihood		-76.218		-125.530
Chi_2	9.08**		21.06***	

Notes: 1. *Robust standard errors* in parentheses;
2. * significant at 10%, ** significant at 5%, *** significant at 1%
3. *Chi_2* refers to the joint significance test on excluded instruments.

Cross–sectional and Panel Inference

Table 5: Determinants of Prices - OLS Estimates.

	(1)	*(2)*	*(3)*	*(4)*
Dependent Var.:	***Rkha***	***Rkhr***	***Rkhc***	***Rkhi***
Reg_Elec	-0.080 (0.225)	-0.073 (0.310)	0.273 (0.276)	-0.094 (0.211)
Jud_Elec	**-0.189** **(0.174)**	**-0.163** **(0.239)**	**-0.026** **(0.212)**	**0.012** **(0.163)**
Jud_Term	0.020 (0.028)	0.087 (0.039)**	0.030 (0.034)	0.028 (0.026)
Advocate	0.295 (0.229)	0.857 (0.315)***	0.696 (0.280)**	0.114 (0.215)
Budget	0.00003 (0.00002)*	0.00005 (0.00002)**	0.00004 (0.00002)**	0.00002 (0.00002)
Employ	-0.0024 (0.0013)*	-0.0044 (0.0018)**	-0.0037 (0.0016)**	-0.0026 (0.0012)**
Over_65	0.020 (0.043)	-0.011 (0.059)	-0.051 (0.053)	0.052 (0.040)
Ind	7.264 (11.385)	5.804 (15.673)	8.780 (13.929)	28.951 (10.670)***
Doc_Dur	-0.022 (0.038)	0.082 (0.050)*	0.084 (0.046)*	-0.028 (0.035)
3Mem_Com	0.351 (0.168)**	0.435 (0.232)*	0.295 (0.206)	0.140 (0.158)
Join	-0.004 (0.002)*	-0.003 (0.003)	-0.0005 (0.003)	-0.001 (0.002)
D&M Test: Reg_Elec	0.71	0.58	0.77	0.52
D&M Test: Jud_Elec	0.02	0.24	0.57	0.01
Other Controls	*Constant*, *O&M*, *D&A*, *Taxes*, *Plant*, *Gen_Fuel*.			
Estimation	OLS	OLS	OLS	OLS
N. of Observations	144	144	144	144
Adjusted R^2	0.89	0.83	0.82	0.88

Notes: 1. *Robust standard errors* in parentheses;
2. * significant at 10%, ** significant at 5%, *** significant at 1%;
3. The specification for the first step of the D&M test on the regulators' selection rule is: *Constant, Av_Maj*, *Av_Dist*, *P_Fuel*, *Pop*, *Over_65*, *Jud_Term*, *3Mem_Com*, *Advocate, Doc_Dur*, *Budget, Employ, Ind,Join, Jud_Elec*, *O&M*, *D&A*, *Taxes*, *Plant*, *Gen_Fuel*;
4. The specification for the first step of the D&M test on the judges' selection rule is: *Constant, Av_Maj*, *Av_Dist*, *Edu*, *Over_65*, *Jud_Term*, *3Mem_Com*, *Advocate, Doc_Dur*, *Budget, Employ, Ind, Join, Reg_Elec*, *O&M*, *D&A*, *Taxes*, *Plant*, *Gen_Fuel*.

Table 6: Determinants of Prices - Instrumental Variables Estimates.

	(1)	*(2)*	*(3)*	*(4)*
Dependent Var.:	***Rkha***	***Rkhr***	***Rkhc***	***Rkhi***
Reg_Elec	-0.315 (0.274)	-0.233 (0.348)	0.206 (0.302)	-0.361 (0.280)
Jud_Elec	**-1.160** **(0.489)****	**-0.824** **(0.621)**	**-0.305** **(0.540)**	**-1.130** **(0.484)****
Ov-Id Test (P-Value)	0.70	0.47	0.94	0.85
Endogenous Var.:	***J_Elec***	***J_Elec***	***J_Elec***	***J_Elec***
Other Controls	*Constant*, *Jud_Term*, *3Mem_Com*, *Advocate, Doc_Dur*, *Budget, Employ, Over_65*, *Ind*, *O&M*, *D&A*, *Taxes*, *Plant*, *Gen_Fuel* , *Join*.			
Estimation	2SLS	2SLS	2SLS	2SLS
N. of Observations	144	144	144	144
Adjusted R^2	0.87	0.82	0.82	0.84

Notes: 1. *Standard errors* in parentheses;
2. * significant at 10%, ** significant at 5%, *** significant at 1%;
3. First-stage specification of 2SLS includes second step right hand side controls plus: *Av_Maj*, *Av_Dist*, *Edu*.

Table 7: Determinants of Prices - LIML and Heckman Estimates.

	(1)	*(2)*	*(3)*	*(4)*

Dependent Var.:	***Rkha***	***Rkhi***	***Rkha***	***Rkhi***
Reg_Elec	-0.323 (0.270)	-0.370 (0.257)	-0.079 (0.204)	-0.069 (0.191)
Jud_Elec	**-1.196** **(0.470)****	**-1.149** **(0.460)****	**-1.017** **(0.220)*****	**-0.856** **(0.212)*****
Rho			0.85***	0.86***
Endogenous Var.:	***Jud_Elec***	***Jud_Elec***	***Jud_Elec***	***Jud_Elec***
Other Controls	*Constant*, *Jud_Term*, *3Mem_Com*, *Advocate, Doc_Dur*, *Budget, Employ, Over_65*, *Ind*, *O&M*, *D&A*, *Taxes*, *Plant*, *Gen_Fuel*, *Join*.			
Estimation	LIML	LIML	Heck. ML	Heck. ML
N. of Observations	144	144	144	144
Adjusted R^2	0.87	0.83		
Log Likelihood			-196.034	-190.904

Notes: 1. *Standard errors* in parentheses;
2. * significant at 10%, ** significant at 5%, *** significant at 1%;
3. First-stage specification of LIML includes first step right hand side controls plus: *Av_Maj*, *Av_Dist*, *Edu*.
4. First-stage specification of Heckman includes: *Constant*, *Av_Maj*, *Av_Dist*, *Edu*, *Over_65*, *Ind*, *Jud_Term*, *Advocate*, *Doc_Dur*, *Budget*, *Employ*, *O&M*, *Join*.

Table 8: Results on Pass-through - Introduction of *Jud_Elec*.

	(1)	***(2)***	***(3)***
Dependent Var.:	***Rkhr***	***Rkhc***	***Rkhi***
Reg_Elec_{st}	0.724 (0.227)***	0.973 (0.225)***	0.552 (0.185)***
Jud_Elec_{st}	**-0.094** **(0.170)**	**-0.164** **(0.169)**	**0.297** **(0.138)****
$Reg\_Elec_{st}.c_{st}$	-0.032 (0.109)	-0.138 (0.109)	-0.006 (0.089)
$Jud\_Elec_{st}.c_{st}$	**-0.516** **(0.100)*****	**-0.463** **(0.099)*****	**-0.458** **(0.082)*****
c_{st}	0.553 (0.056)***	0.542 (0.056)***	0.517 (0.046)***
$Budget_{st}$	$-2.14e^{-06}$ $(1.53e^{-06})$	$-1.52e^{-06}$ $(1.52e^{-06})$	$-2.32e^{-06}$ $(1.25e^{-06})$*
$Employ_{st}$	-0.0019 (0.0007)***	-0.0008 (0.0007)	-0.0012 (0.0006)**
Ind_{st}	-1.860 (0.633)***	0.782 (0.628)	0.203 (0.516)
$Young_{st}$	-0.075 (0.019)***	-0.085 (0.018)***	-0.055 (0.015)***
$Over\_65_{st}$	0.042 (0.025)*	0.053 (0.026)**	0.079 (0.021)***
Other Controls	Gen_Fuel_{st}, Gen_Nucl_{st}, Pop_{st}, $(Pop_{st})^2$, $Income_{st}$, $(Income_{st})^2$.		
Estimation	Fixed time and state effects (within) estimator.		
N. of Obs.	1372	1372	1372
R^2	0.88	0.85	0.83

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

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