The Politics of Government Decision Making: Regulatory Institutions

by

Jean-Jacques Laffont and Jean Tirole

MIT-CEPR 90-011WP September 1989

ABSTRACT

Public decision makers are given a vague mandate to regulate industries. Restrictions on their instruments or scope of regulation affect their incentives to identify with interest groups and the effectiveness of supervision by watchdogs.

This idea is illustrated in the context of the regulation of a natural monopoly. Much of the theoretical literature has assumed that a benevolent regulator is prohibited from operating transfers to the firm and maximizes social welfare subject to the firm's budget constraint. The tension between the assumptions of benevolence and of restrictions on instruments in such models leads us to investigate the role played by the mistrust of regulators in the development of this institution. We compare two mandates: average cost pricing (associated with the possibility of transfers). The regulator may identify with the industry, but a regulatory hearing offers the advocacy groups (watchdogs) an opportunity to alter the proposed rule making. The comparison between the two mandates hinges on the dead-weight loss associated with collusion and on the effectiveness of watchdog supervision.

Forthcoming, *Journal of Law, Economics, and Organization*

THE POLITICS OF GOVERNMENT DECISION MAKING: REGULATORY INSTITUTIONS*

by

Jean-Jacques Laffont**

and

Jean Tirole***

December 1988

Revised September 1989

* The authors are grateful to the Ford Foundation, the Pew Charitable Trust, the Guggenheim Foundation, the Center for Energy Policy Research at MIT, the National Science Foundation, and the French Ministère de l'Education Nationale for financial support. We thank Oliver Hart, Patrick Rey, Tom Romer, Richard Schmalensee, Oliver Williamson, two anonymous referees, and the participants of the May 1989 NBER conference on political economy for helpful comments on an earlier draft, and Emmanuelle Auriol for research assistance.

** GREMAQ, Toulouse.

*** Massachusetts Institute of Technology.

1. Welfare foundations of institutions.

Because the philosophy of this paper differs somewhat from that of the theoretical literature on regulation, we take the liberty of discussing its approach in a lengthy introduction. The ideas developed in this section are not new. Indeed, they are central in political science.[1] Our goal is to recast them in a form and vocabulary familiar in economic analysis.

An idealized, but illuminating view of regulatory institutions is that they result from a constitution drafted by some benevolent "founding fathers" or "social planners" behind the veil of ignorance. The founding fathers have some assessment of social welfare, for example, the sum of utilities in society. [In our model, the motivation to regulate is wholly benevolent, as opposed to serving the interests of the industry. Even in such a setup, regulation can encounter problems.] The founding fathers must delegate actual social choices to other agents, broadly labelled "public decision makers," and they design a set of institutions or rules of the game that as much is feasible induce these public decision-makers to behave as if their two assessments of welfare coincided.

This view of institutions can be enriched in several directions. First, one may note that the veil of ignorance is often an abstraction. The founding fathers (or their descendants) may have vested interests in the design of the constitution. Their assessment of social welfare then differs from that of impartial social planners. Second, institutions may not be associated with a constitution. They may also result from a law or even from durable tradition and social norms. Allowing for these two alterations of the previous view preserves its main points of separation between planning and control or between intentions and actual decision making, and of the concomitant need to

---

[1]They are also implicit in some models of public finance. For instance, Brennan and Buchanan [1977] argue that institutions are "uncontrollable" once they are established and study a model in which the government maximizes revenue subject to tax constraints imposed by the Constitution.

constrain the executants.[2] While we will henceforth assume that founding fathers draft a constitution, the notion of "constitution" should be interpreted broadly, the "founding fathers" might stand for law makers (Congress, state legislatures; see Section 4) or tradition, and the so-called social welfare function could be generalized to account for potentially partial goals of the founding fathers.

The design of a constitution is trivial when the founding fathers can design a mechanism that assembles a group of public decision makers whose preferences coincide with their own. The optimal constitution then consists in delegating all authority to these benevolent public decision makers. [Benevolence, of course, does not imply that regulatory outcomes will conform to the founding fathers' and the public decision makers' best-of-all-worlds. The public decision makers may have poor information about the economy. To elicit information, they must design costly incentive schemes for the economic agents and set up regulatory agencies to reduce the informational asymmetries with these economic agents.] The benevolent-public-decision-makers paradigm is the natural first step in analyzing the politics of regulation. It focuses on the public decision makers (e.g., Congress)'s control over agencies and economic agents and it derives the organizational response to the agencies' natural tendency to identify with interest groups.[3]

A serious drawback of the benevolent-public-decision-makers paradigm is that it cannot explain limitations on the scope of authority conferred on public decision makers by the constitution: Any restriction imposed by the

---

[2]A good case in point is the observation that deck-stacking (through administrative procedures and assignment of the burden of proof, for instance) enables a legislature to ensure that agencies "operate to mirror the political forces that gave rise to the agency's legislative mandate long after the coalition behind the legislation has disbanded" (McCubbins-Noll-Weingast [1987, p. 262]).

[3]See Laffont-Tirole [1988a]. See also Baron [1985] and Spiller [1988] for models of regulation with multiple principals.

founding fathers on the benevolent public decision makers amounts to a self-mutilation and can only be welfare reducing.[4] In practice, the scope of authority of public decision makers is limited. First, they have a mandate to regulate some firms, industries or activities, but not others. Second, they are constrained to conduct regulatory hearings and to disseminate the information they obtain. Third, they are given a limited set of instruments to regulate. In the U.S., agencies regulating the electric utilities or the telecommunications industry are prohibited from operating monetary transfers to the regulated firms. Similarly, the Environmental Protection Agency is constrained to use bans or technology standards on some chemical products, and is allowed to use warning labels, instructions or tax incentives for others. Fourth, there are restrictions on how much the current administration may commit future administrations.[5]

The benevolent-public-decision-maker paradigm also has little to say about Montesquieu's well-established vision of separation of powers among branches of government (e.g., executive, legislative, and judiciary) because it implies that there is no need to keep a delicate set of controls between branches of government; nor can it fully account for the watchdog role of non-governmental groups (consumers, mass media) in public decision making. The paradigm thus misses some economic aspects of government decision making and probably most of the interesting issues in political science.

The first key to understanding the development of institutions is to

---

[4]An exception to this is when a benevolent regulator lacks commitment power in a multi-period setting. For instance, a constitutional upper bound on the rate of growth of money supply may prevent a welfare reducing inflationary spiral that may arise even under welfare-maximizing monetary authorities. Similarly, regulatory lags may alleviate the welfare-reducing ratchet effect that may arise even under a benevolent regulator.

[5]See McCubbins [1985] for a discussion of constraints on bureaucratic decision-making. Lewis and Sappington [1988] analyze the choice among a few commitment possibilities when regulators change over time and internalize consumer welfare during their tenure as regulators only.

envision a conflict between the founding fathers and the public decision makers. The public decision makers cannot be trusted to perfectly implement the founding fathers' intent either because they are self interested, have an intrinsically different view of social welfare, or, as will be assumed in this paper, because they have an incentive to identify with specific interest groups.[6] The founding fathers must "stack the deck" in favor of their own objectives by constraining the public decision makers.

The second key is to take the notion of "veil of ignorance" literally. We must assume that the founding fathers are unable to design a "complete constitution" in which all future contingencies are perfectly foreseen and costlessly described.[7] For, if they could write such a complete constitution, public decision making would amount to the implementation of a precise mandate -- formally, the implementation of a revelation mechanism in which all economic agents announce their information when they receive it. The founding fathers would only set up a court that would ensure that their *desiderata* are implemented.[8] The only branch of government would be the judicial branch. In contrast, public decision makers have a non-trivial role when given a vague mandate, i.e., a mandate that incompletely describes the set of states of nature. Government is then divided into the judiciary branch whose role is to ensure that the instructions that have been included in the constitution be fulfilled; and a more activist branch (which itself can be divided into several sub branches, e.g., legislative and executive) that has the authority

---

[6]Empirically it may be difficult to distinguish between the public decision makers' intrinsic preferences and the ones that are induced by their belonging to a social class or by the collusion with interest groups.

[7]The complete constitution is the analog of a complete or comprehensive contract in contract theory (except that it is not written by the parties who will implement it).

[8]The court would then be the analog of Myerson [1986]'s "mediator." See Laffont-Maskin [1982] and Myerson [1986] for general, abstract models of complete contracting.

to fill in the details when contingencies that have not been included in the constitution occur. Note here the resemblance with Williamson [1975, 1985]'s and Grossman and Hart [1986]'s seminal work on vertical integration. Grossman and Hart define authority as the residual rights of control conferred by ownership; that is, one of the parties to a transaction is given power to impose decisions in states of nature not specified in their original contract. In the same spirit, we offer to view the constitution as an incomplete (social) contract.

Williamson and Grossman-Hart emphasize the effects on economic decisions of the distribution of authority between a buyer and a seller.[9] Similarly, in the political arena, authority over economic transactions to be regulated is distributed among the various branches of government through rules of procedures, precedence between executive and legislative, etc. And, as in a contract between economic agents, the range of decisions and instruments for the party on which authority is bestowed can be constrained *ex-ante*.

What prevents the public decision makers from abusing their authority to achieve their own goals or the goals of the interest groups with which they identify?[10] One safeguard is the division of authority among branches of government. A constitution ought to create a viable system of checks and balances (which if possible do not jeopardize flexibility in public decision making). For instance, an agency may be independent in its decision making, but Congress may in the long run exert indirect control through the appropriations procedure. Similarly, the Senate and the House may exert

---

[9] See Hart-Moore [1988] for a more general theory of distribution of authority among n parties.

[10] In the U.S., the concern about the usurpation of government by powerful interest groups dates back to Madison [1788]. The 1946 Administrative Procedures Act was to a large extent a response to this concern about capture. And more recently, the courts have referred to industry influence to vindicate judicial review of agency decisions (e.g., in State Farm, 463US29, 1983). For a more complete discussion of this, see Sunstein [1986].

reciprocal control. But ultimately, what exerts control over the public decision makers is the existence of courts and of a constitution. Note: we are here taking a passive view of the role of courts. That is, they act on hard information transmitted by various parties (e.g., whistle-blowers: consumers, mass media, discontented or idealistic civil servants, etc.), and content themselves with correcting deviations from what is specified in the constitution.[11,12]

The agenda set above -- to develop an incomplete-contract approach to public decision making -- has wide scope, and it would be presumptuous to claim that we have got a good handle even on a small subset of issues. The purpose of this paper is to illustrate some of the above ideas in a particular context. In the process of building an example, we will discuss some modelling issues that are likely to be relevant in other models of institution design. The reader should be warned that we do not possess a fully satisfactory formalization of incomplete contracting. The formidable task of developing the corresponding theoretical apparatus is beyond the limited scope of the paper. We content ourselves with comparing two standard institutions, and (notwithstanding some loose comments in Section 4) we do not enquire into the optimality of these two institutions in the larger class of institutions

---

[11]Courts may exert a more activist role and act on the basis of soft information. They then have discretionary power and compete with the executive and legislative branches in filling in unforeseen contingencies (Shapiro [1986]). Hamilton [1788], in the spirit of Montesquieu, argued that "the judiciary is beyond comparison the weakest of the three departments of power," that its duty is "to declare all acts contrary to the manifest tenor of the constitution void" and that discretion in the courts should be limited. In a similar spirit, the 1984 Chevron decision of the U.S. Supreme Court sharply restricted the scope of judicial review of agency decisions. The Supreme Court stated that the agency was due considerable deference if Congress had not directly addressed the precise question at issue.

Our adhesion to a passive view of courts is not a value judgment, but rather a convenient as well as realistic expositional device.

[12]Under some legislations, only affected parties (firms, consumers) have the "standing" to address the courts directly. Whistle blowers and civil servants then transmit the information indirectly to courts.

that are feasible given the information and the transaction costs of writing the constitution at the date it is enacted.

Section 2 develops a model of a natural monopoly in which the constitution and a countervailing power (consumers) put limits on the discretion of non-benevolent public decision makers. Section 3 solves the model and obtains the comparative statics results. Section 4 discusses the limitations of our analysis, and Section 5 concludes.

2. The model.

2.1. Description of the model. The starting point for this research was the intriguing fact that in some countries and industries, regulators are legally prevented from transferring money to regulated firms, which must then cover their costs entirely through charges to customers. One may adopt the view that this institution survives only because of a general lack of understanding of the basic economic principle that the regulated firm's fixed cost should not affect the consumers' decision of how much to buy. This may be, but before hastily jumping to the conclusion that the institution is irrational, we may wonder whether there do not exist basic underlying economic forces. As discussed in Section 1, a mistrust of regulators should be the foundation for a rational theory of restrictions in the scope of their authority, of the prohibition of transfers in this particular context. We argue that this institution may result from the need to involve parties outside the government (consumers, mass media) to perform the role of watchdogs and to prevent abuse of the government's discretionary power.

In a nutshell we assume that there is a single public decision maker -- the "agency" -- and a single-product regulated firm which is a natural monopoly. The "constitution" (or Congress or state legislature) gives the agency the vague mandate of maximizing social welfare, i.e., of extracting the firm's rent and of pricing its product efficiently. We compare two institutions. In the first, labelled "marginal cost pricing" or "transfer," the agency can use the full set of instruments: monetary transfer to the firm and price control. Maximizing social welfare then consists of charging marginal cost, or rather, as we shall see, the appropriate version of marginal cost in the presence of a shadow cost of public funds; and in choosing transfers so as to extract the firm's rent. In the second institution, labelled "average cost pricing" or "no transfer," the agency is limited to price controls and is not allowed to transfer money to the firm. Maximizing

social welfare subject to this constraint yields average cost pricing. The firm's price is as low as is consistent with the firm's budget balance, where the firm's cost includes its managers' compensation.

Whatever its mandate, the agency, which for simplicity knows the firm's technology, may identify with producer interests. What may prevent such collusion is the possibility that consumers (or the mass media which is indirectly rewarded by consumers through an increase in circulation or ratings) may find it in their interest to investigate the agency's activities. If they find hard evidence of wrongdoing (can prove that the agency defended the firm's interests by allowing a high price), they can ask the judicial system to overrule the agency's decision and to punish the agency.

Obviously "marginal cost pricing," which gives full freedom to the agency, dominates average cost pricing when the agency is benevolent. However, the two institutions respond differently to the perversion of public decision making. Their comparison hinges on the stake in collusion they create for the firm and the agency and on the incentives they give to the public to be effective watchdogs.[13,14]

It is interesting to note that the theoretical literature on regulation reflects the two institutional arrangements. Most of the literature on asymmetric information and incentives in regulation assumes that the regulator can operate transfers to the regulated sector. In contrast, the literature on cost-of-service (Boiteux) pricing, multiproduct firms and contestability assumes away transfers. We feel uneasy about <u>exogenously</u> ruling out

---

[13]The public in our model plays the role of an "external monitor" (although it is not under contract to check on the "internal monitor" -- the agency). Kofman and Lawarree [1988] develop an interesting model of internal and external auditing of management. They show in particular that maximum punishments may not be optimal as they may induce more collusion.

[14]See Freixas-Laffont [1985] for different considerations on the choice between average and marginal cost pricing.

transfers. While this assumption is realistic in some industries on legal grounds, it may mislead the researcher when formalizing the regulator's objectives. As mentioned above, a rational theory of regulation implies that the prohibition is motivated by a mistrust of the regulator. There is thus a tension between the two assumptions that the regulators maximize social welfare and that they are not given free rein.

We now spell out the model in more detail. It considers a four-party hierarchy: founding fathers/agency/firm/consumers.

a) Firm: The firm produces output q at cost

(2.1) $C = (\beta - e) + cq.$

The cost or technology parameter β can take one of two values: "low" or "efficient" ($\underline{\beta}$) with probability ν and "high" or "inefficient" ($\bar{\beta}$) with probability $(1-\nu)$. The firm and the agency know the realization of β. Let $\Delta\beta \equiv \bar{\beta} - \underline{\beta} > 0$. The firm's managers incur an increasing and convex (monetary) disutility $\psi(e)$ ($\psi' > 0$, $\psi'' > 0$) by exerting effort e to reduce cost.

Note that we put all technological uncertainty on the fixed cost. This is an important assumption which will be discussed later.

The gross consumer surplus is denoted by $S(q)$, an increasing and concave function. Let $P(q) \equiv S'(q)$ be the inverse demand function and $q \equiv D(p)$ be the demand function. The revenue is thus $R(q) \equiv P(q)q$. Letting t denote the (net) income of the firm, the firm's utility or rent is

(2.2) $U = t - \psi(e).$

We normalize the firm's reservation utility at 0, so that the firm's participation or individual rationality constraint is:

(2.3) $U \geq 0.$

We will actually assume that the firm faces limited punishment, so that U must always be non-negative.[15]

Our accounting convention is that the firm receives the revenue R from the consumers', pays cost C and retains net income t. In the "marginal cost pricing" institution, this means that the State must transfer (C+t-R) to the firm. In the "average cost pricing" institution, necessarily C+t = R.

b) The agency: The agency receives income s from the State and has utility function:

(2.4) $V(s) = s$.

We will assume that the income s is received if and only if it is not proved that the agency has violated the constitution. If the consumers find hard evidence that the agency cheated, the agency receives no income. That is, limited liability limits the punishment of the agency to a zero income. We assume for notational simplicity that the agency's reservation income (and utility) is equal to 0.[16] Last, we assume for simplicity that the income s received in the absence of evidence of wrongdoing is fixed by the

---

[15]We thus assume either that consumers can (or have incentives to) search only during the hearing period (so that the firm cannot end up with utility $-\psi(e)$ after choosing e and later be denied any payment); or that the firm has utility function $V(U) = U$ for $U \geq 0$ and $V(U) = -\infty$ for $U < 0$ and there is an arbitrarily small probability that the evidence found by consumers (see below) is inaccurate.

[16]We could with little change allow positive reservation utilities (indeed, we do so in some simulations in the section on alternative cost technologies). The agency is then really punished for malfeasance (in the sense that it gets less than its reservation utility). What matters for the theory is that punishment is limited. An example of limited punishment is the dismissal of a utility manager with firm- and industry-specific skills.

One could consider slight variants in which the agency is rewarded differently when there is no wrongdoing depending on whether consumers find evidence. The qualitative results would be unchanged. Note also that it can be argued that in the presence of intervention costs, consumers will intervene only if there is wrongdoing, so that our assumption is not too unrealistic.

constitution.

The agency learns β. This signal is soft information so that it can misreport β if it chooses to.[17]

c) The founding fathers: The founding fathers' utility is the sum of the utilities of all parties in the economy, where the consumers' utility is equal to their net surplus $[S(q)-P(q)q]$ and the taxpayers' utility is equal to minus the expenditure on the regulated industry $(s+t+C-P(q)q)$ times the shadow cost λ of raising public funds through distortionary taxation.[18]

$$(2.5) \qquad W = U+V+[S(q)-P(q)q-(1+\lambda)(s+t+C-P(q)q)].$$

Using (2.2) and (2.4) to eliminate t and s in (2.5) yields:

$$(2.6) \qquad W = [S(q)+\lambda P(q)q]-(1+\lambda)(\beta-e+cq+\psi(e))-\lambda U-\lambda V.$$

That is, from the "generalized consumer surplus" $(S(q)+\lambda P(q)q)$ must be subtracted $(1+\lambda)$ times the total cost of the project $(\beta-e+cq+\psi(e))$ and λ times the rents left to the firm and the agency. The important property of (2.6) for our analysis is that the founding fathers dislike leaving a rent to the firm and the agency.

It is too costly for the founding fathers to describe the technology when

---

[17] Because we model the agency's information as soft, the burden of the proof is placed on the monitors. Alternatively, we could have assumed that the agency may or may not receive hard information about β (as in Laffont-Tirole [1988a]). Thus when the agency reports $\underline{\beta}$ or $\bar{\beta}$, it brings verifiable information that these are the true values. When it reports it obtained no hard information, the monitor may attempt to prove that β takes a particular value ($\underline{\beta}$ in this case). The analysis would be similar to that developed here.

[18] $(s+t+C-P(q)q)$ is the amount of money required to pay the agency and to compensate the firm. To obtain these funds the State levies taxes which at the margin cost society $\$(1+\lambda)$ per \$1 raised. The shadow cost of public funds, λ, is determined economy-wide and is independent of the regulation of this industry.

they draft the constitution. Instead, they give the mandate to maximize the sum of utilities over a specified set of instruments. This mandate is implemented by the agency, and is enforced by the courts. The courts, if called upon by some party, can find out the parameters of the economic environment by itself, except for β the value of which can only be learned from consumers. The courts enforce the welfare-maximizing policy conditional either on the announcement $\hat{\beta}$ of β by the agency, or on the true value of β if it differs from $\hat{\beta}$ and is discovered by the consumers.

d) The consumers: The consumers, who enjoy net surplus $S(q)-P(q)q$ and who also have prior ν on β being $\underline{\beta}$ can spend 0 (no search) or E (search) to investigate. Part of E can be thought of as a cost of organization (in this respect, industrial consumers and households may differ); another part is the cost of going to court if they have a case (see below). They find the true β if they search and do not learn anything if they do not search. Their evidence on β is supposed to be hard, so that they can substantiate their claim about β in front of judges. We assume that taxpayers are too dispersed and do not intervene in the regulatory process. Our model thus reflects the fact that in practice interveners often represent a subset of interested parties and stress increasing their fraction of the (variable-dimensioned) pie.

2.2. The benevolent agency benchmark. Let us begin with the benchmark in which the agency cannot collude with the firm. The consumers have no incentives to search in this case, because the agency tells the truth.

■ Marginal cost pricing: suppose that the agency can use all instruments (t,p). The optimal policy has $V = 0$ and $U = 0$, as the firm's rent is extracted whatever the technology. W is maximized under full information. Cost minimization requires that the marginal disutility of effort be equal to

the marginal cost savings:

(2.7) $\psi'(e) = 1$ or $e = e^*$ for all β.

And the price is given by a simple Ramsey formula:

(2.8) $\frac{p-c}{p} = \frac{\lambda}{1+\lambda}\frac{1}{\eta(p)}$ or $p = p^{MC}$ for all β,

where $\eta(p)$ is the price elasticity of demand ($\eta(p) = -\frac{dq}{dp}\Big/\frac{q}{p}$). The Lerner index (price-marginal cost margin) is inversely proportional to the elasticity of demand (because public funds are costly, revenue is socially valuable, so pricing is intermediate between marginal cost and monopoly pricing). Note that the price is entirely determined by the marginal cost (indeed, for $\lambda = 0$, $p^{MC} = c$), and that it is independent of β. The net transfer to the firm is $t^{MC} = \psi(e^*)$. Let

(2.9) $W^{MC}(\beta) \equiv [S(D(p^{MC}))+\lambda p^{MC}D(p^{MC})]-(1+\lambda)(\beta-e^*+cD(p^{MC})+\psi(e^*))$

be the optimal welfare and

(2.10) $\underline{W}^{MC} \equiv W^{MC}(\underline{\beta})$ and $\bar{W}^{MC} \equiv W^{MC}(\bar{\beta}) = \underline{W}^{MC}-(1+\lambda)(\bar{\beta}-\underline{\beta})$.

■ Average cost pricing. Although the institution is dominated by the previous one (which is socially optimal) when the agency is benevolent, let us assume that the agency is not allowed to transfer money to the firm. The firm's price is then given by the smallest price that yields budget balance:[19]

(2.11) $pD(p) = \beta-e^*+cD(p)+\psi(e^*)$ or $p = p^{AC}(\beta)$.

The firm's revenue $pD(p)$ must cover the firm's cost $[\beta-e+cD(p)]$ as well as the managers' compensation $\psi(e)$ which, like the cost, cannot be paid from public

---

[19] We will for simplicity assume that (2.11) has a solution, and that there exists a unique solution that is lower than the monopoly price. A sufficient condition for the latter assumption is that $(p-c)D(p)$ be quasi-concave or $2D'^2 \geq DD''$.

funds. The benevolent agency, knowing β, can control e (by disallowing excessive cost). The desired level of effort minimizes $[\psi(e)-e]$ and is therefore the same as under marginal cost pricing. Note that the firm's price is now an increasing function of β.

Because the State operates no transfer, and the agency and the firm have no rent, social welfare is

$$(2.12) \qquad W^{AC}(\beta) = S^{n}(q^{AC}(\beta)),$$

where $S^{n}(q) = S(q)-P(q)q$ denotes the net surplus and

$$q^{AC}(\beta) = D(p^{AC}(\beta)).$$

We let:

$$(2.13) \qquad \underline{W}^{AC} = W^{AC}(\underline{\beta}) \text{ and } \tilde{W}^{AC} = W^{AC}(\tilde{\beta}).$$

2.3. Collusive agency. From now on, we allow the agency to collude with the firm. We assume that transferring an income equivalent $\tilde{s}$ to the agency costs $(1+\lambda_f)\tilde{s}$ to the firm, where $\lambda_f \geq 0$ measures the deadweight loss (or transaction cost) associated with the transfer.[20] The agency's income equivalent is then $s+\tilde{s}$. For simplicity, we assume that the agency makes a take-it-or-leave-it offer, according to which the firm must transfer a certain amount of income equivalent (conditional on the decision not being reversed by the courts) to the agency if the latter reports some $\hat{\beta}$. More generally, we could allow bargaining and rent sharing between the firm and the agency.

The timing is as follows:

1. The founding fathers choose between the two institutions: i = MC or AC

---

[20] This transfer can take many forms (bribe, entertainment expenses, prospect of job, social relationships, campaign contributions to members of the Congressional committee overseeing the agency, etc.); see Laffont-Tirole [1988] for a discussion.

and determine the income of the agency s.

2. Society (firm, agency, consumers; courts if they are addressed -- see #5) learns the relevant technology (and that β is either $\underline{\beta}$ or $\bar{\beta}$ and the demand function). The only remaining piece of private (and soft) information is β, which is learned by the firm and the agency.
3. The agency can offer a side-contract to the firm, which specifies a side-transfer (conditional on $\hat{\beta} \neq \beta$ not being found out) if the agency announces $\hat{\beta} \neq \beta$. Side transfers are not observable by third parties.
4. The agency announces its intended policy, which is equivalent to announcing $\hat{\beta}$. It *de facto* proposes the socially optimal allocation (p^{MC}, t^{MC}) or ($p^{AC}(\hat{\beta})$) for parameter $\hat{\beta}$ under whatever institution MC or AC is relevant (this allocation was determined in subsection 2.2).
5. Learning $\hat{\beta}$, the consumers decide whether to search or not.
6. If consumers do not find any hard information, or if they find that $\beta = \hat{\beta}$, the agency's proposed allocation is implemented. If the consumers find out that $\beta \neq \hat{\beta}$, they can ask for a correction of the proposed policy; in this case the allocation implemented is the socially optimal one for parameter β and the relevant institution.
7. Production (and possibly transfers) take place.

Stage 1 is that of constitutional design. Stage 4 corresponds to a regulatory hearing. It is consistent with the constraints of due process imposed in the Administrative Procedures Act in the U.S., according to which an agency cannot announce a policy without warning, but must give notice and solicit comments. As argued by McCubbins *et al.* [1987] and formalized here, this procedure provides non-agency participants with a chance to submit viewpoints for the purpose of altering the proposed rule. Stage 6 assumes weak evidentiary standards in administrative law (here, the constitution) that give the agency flexibility (its proposed policy is implemented unless

consumers come up with hard evidence).

By abuse of notation, we let s denote the agency's (observable) income when there is no evidence of wrongdoing (that is, the agency gets s plus the side transfer, if any). The agency receives 0 if the consumers find out that $\hat{\beta} \neq \beta$ and report it to the court.

Clearly the agency and the firm have no incentive to collude when $\beta = \bar{\beta}$. The agency then announces the truth: $\hat{\beta} = \bar{\beta}$. When $\beta = \underline{\beta}$, announcing $\hat{\beta} = \bar{\beta}$ allows the firm to reduce its effort. More precisely, it can choose effort e such that $\underline{\beta}-e = \bar{\beta}-e^*$ or $e = e^*-\Delta\beta$. Cost accounting then does not reveal that the agency cheated, and the firm which receives compensation $\psi(e^*)$ under either regime enjoys rent

$$(2.13) \qquad U = \Delta_f \equiv \Phi(e^*) \equiv \psi(e^*)-\psi(e^*-\Delta\beta).$$

Δ_f will be called the firm's stake in collusion. Note that it is independent of the institution (this does not generalize to more general technologies -- see below). The agency can thus ask $\tilde{s} = \Delta_f/(1+\lambda_f)$ from the firm in exchange for the policy corresponding to $\beta = \bar{\beta}$ being implemented.

Let Δ_c denote the consumers' stake, i.e., the increase in their net surplus when they can rectify the policy corresponding to $\hat{\beta} = \bar{\beta}$ into that for $\beta = \underline{\beta}$ (we assume that consumers are only a small fraction of taxpayers so that they neglect the reduction s in the agency's income. This assumption can be trivially relaxed). Under institution i:

$$(2.14) \qquad \Delta_c^i = S^n(q^i(\underline{\beta}))-S^n(q^i(\bar{\beta})).$$

We assume that

Assumption A: $E \leq \nu\Delta_c^{AC}$.

Assumption A guarantees that if the agency always cheats (reports $\bar{\beta}$ when the truth is $\underline{\beta}$), the consumers have an incentive to search under average cost

pricing. [They have no incentive to search under marginal cost pricing, as the price is insensitive to the level of β.]

Last, let x denote the probability that the agency cheats; y the probability that the consumers search (when $\hat{\beta} = \tilde{\beta}$; they have no incentive to search when $\hat{\beta} = \underline{\beta}$).

The expected social welfare under institution $i \in \{MC,AC\}$ is given by:

$$(2.15) \quad W^i = (1-\nu)[\tilde{W}^i - \lambda s - y^i E] + \nu(1-x^i)[\underline{W}^i - \lambda s] + \nu x^i\left[(1-y^i)\left(\tilde{W}^i + \frac{\Delta_f}{1+\lambda_f} - \lambda s\right) + y^i \underline{W}^i - y^i E\right].$$

The first term in the right-hand side of (2.15) is social welfare when $\beta = \tilde{\beta}$ minus the social cost λs of the agency's income (the agency does not misreport in this state of nature) minus the expected search cost for consumers (which obviously is incurred in vain). Suppose next that $\beta = \underline{\beta}$. With probability $(1-x^i)$, the agency does not cheat and the consumers do not search as they react to the proposed policy. The only cost relative to the benevolent agency case is that associated with the agency's income, which explains the second term. With probability x^i, the agency announces $\hat{\beta} = \tilde{\beta}$. The consumers search with probability y^i. If they search, they discover the deception, and welfare (gross of search costs) is the welfare under a benevolent agency. If they do not search, everything is as if the agency were benevolent and the true value of β were $\tilde{\beta}$, except that the agency receives income s and furthermore enjoys rent $\Delta_f/(1+\lambda_f)$ appropriated from the firm (it can be checked that $\tilde{W}^i + \frac{\Delta_f}{1+\lambda_f} < \underline{W}^i$ for $i \in \{MC,AC\}$).

3. The solution.

We first determine the equilibrium probabilities of cheating (x^i) and searching (y^i) in the "inspection game" that arises when $\hat{\beta} = \tilde{\beta}$. Substituting

into (2.15) and maximizing over s then yields the expected social welfare under the two institutions. Last, we determine how the founding fathers' choice between the two institutions is affected by a few parameters.

■ AC pricing: Since $E < \Delta_c^{AC}\nu$, the consumers would search if the agency cheated with probability one when $\beta = \underline{\beta}$, and therefore the agency would not cheat; on the other hand if the consumers do not search the agency cheats. Hence the equilibrium must be a mixed-strategy equilibrium where the probability of cheating of the agency, x, is determined by:

$$(3.1) \qquad E = \Delta_c^{AC}\nu x,$$

Because the agency receives its income s if and only if the consumers do not bring evidence of wrongdoing, the probability of the consumers' searching, y, is determined by

$$(3.2) \qquad (1-y)\frac{\Delta_f}{1+\lambda_f} = ys,$$

in order for the agency to be indifferent between cheating and not cheating. (3.2) can be written:

$$(3.3) \qquad y = \frac{\Delta_f}{\Delta_f + s(1+\lambda_f)}.$$

Equation (3.3) highlights a trade-off between the two checks on collusion. One check is consumer search. The other consists of giving an "efficiency income," i.e., an income greater than the reservation income, to the agency in order to reduce the temptation to collude. (3.3) shows that any increase in agency income reduces search by consumers.

We maximize social welfare:

$$(3.4) \qquad W^{AC} = [1-\nu+\nu x(1-y)]\bar{W}^{AC} + \nu(1-x+xy)\underline{W}^{AC}$$
$$- [(1-\nu)y+\nu xy]E - [1-\nu xy]\lambda s + \nu x(1-y)\frac{\Phi(e^*)}{1+\lambda_f},$$

subject to (3.1), (3.3) and $s \geq 0$. Substituting (3.1) and (3.3) into (3.4) to eliminate x and y, the reader will check that the resulting objective function $W^{AC}(s)$ is strictly quasi-concave in s. The optimal agency income s^* is determined, when it is an interior solution, by:

$$(3.5) \qquad \lambda(1-\nu xy) = \frac{(1+\lambda_f)\Delta_f}{[(1+\lambda_f)s^*+\Delta_f]^2}\left[(1-\nu+\nu x)E-\nu x\lambda s^*-\nu x\left[\underset{\sim}{W}^{AC}-\tilde{W}^{AC} - \frac{\Phi(e^*)}{1+\lambda_f}\right]\right],$$

where

$$x = x^{AC} = \frac{E}{\Delta_c^{AC}\nu}$$

and

$$y = \frac{\Delta_f}{\Delta_f+s^*(1+\lambda_f)}.$$

If at $s = 0$, the left-hand side of (3.5) exceeds its right-hand side, we have a corner solution $s^* = 0$. The agency cheats, and y is equal to 1.

■ MC pricing: Under MC pricing, the price is independent of β because the marginal cost is certain (see (2.8)) and therefore the consumers have no stake in the regulatory decision and do not search ($y = 0$). Consequently, the agency always cheats ($x = 1$), its income is optimally set equal to zero, and social welfare can be written:

$$(3.6) \qquad W^{MC} = \tilde{W}^{MC} + \nu\frac{\Phi(e^*)}{1+\lambda_f}.$$

First, we show that either institution can be optimal depending on the values of the parameters:

Proposition 1: MC pricing dominates AC pricing for small uncertainty.

Proof: When $\Delta\beta \to 0$, $W^{MC} \to W^{FB}$ (first-best social welfare, which would be

obtained under a benevolent agency and marginal cost pricing) since $\bar{W}^{MC} \to \underline{W}^{MC}$ and $\Phi(e^*) \to 0$.

On the other hand, W^{AC} is bounded away from W^{FB}, because pricing, which includes the fixed cost, is inadequate. *Q.E.D.*

More interestingly, AC pricing may dominate MC pricing. For example, we have:

Proposition 2: AC pricing may dominate MC pricing when the search costs E are low enough and the cost of collusion λ_f high enough.

Proof: When E tends to 0, the probability of cheating x under AC pricing tends to 0 from (3.1). Equation (3.5) actually indicates a corner solution: $s^* = 0$ for E sufficiently small. This and equation (3.2) imply that the consumers always search: $y = 1$. Thus, as $E \to 0$,

$$W^{AC}-W^{MC} \to (\bar{W}^{AC}-\bar{W}^{MC})+\nu\left[\underline{W}^{AC}-\bar{W}^{AC} - \frac{\Phi(e^*)}{1+\lambda_f}\right].$$

Now, we can adjust the parameters such that $\bar{W}^{AC} = \bar{W}^{MC}$. Indeed, we know that

$$p^{MC} = c - \frac{\lambda}{1+\lambda}\frac{D(p^{MC})}{D'(p^{MC})} > c$$

and that

$$\bar{p}^{AC} = c + \frac{\bar{\beta}+\psi(e^*)-e^*}{D(\bar{p}^{AC})}.$$

We can choose the parameters so that $\bar{p}^{AC} = p^{MC}$. Then, as E tends to 0,

$$W^{AC}-W^{MC} \to \nu\left[\underline{W}^{AC}-\bar{W}^{AC} - \frac{\Phi(e^*)}{1+\lambda_f}\right].$$

Now, let λ_f increase until $\frac{\Phi(e^*)}{1+\lambda_f}$ becomes less than $\underline{W}^{AC}-\bar{W}^{AC}$ (which is

independent of λ_f).

Q.E.D.

Intuitively, when E becomes small, the probability of cheating becomes small. If the AC price for $\beta = \tilde{\beta}$ is identical to the MC price (which is possible because of the shadow cost of public funds), the comparison of welfares reduces to that when $\beta = \underline{\beta}$. The welfare loss when $\beta = \underline{\beta}$ is due to collusion under MC pricing and to the inclusion of the fixed cost in the price under AC pricing. The first loss is

$$L^{MC} = \underline{W}^{MC} - \tilde{W}^{MC} - \frac{\Phi(e^*)}{1+\lambda_f}$$

(efficiency loss minus rent to agency) and the second is

$$L^{AC} = \underline{W}^{MC} - \underline{W}^{AC}$$

(efficiency loss). So when $\tilde{W}^{MC}$ equals $\tilde{W}^{AC}$,

$$L^{MC} - L^{AC} = \underline{W}^{AC} - \tilde{W}^{AC} - \frac{\Phi(e^*)}{1+\lambda_f} > 0$$

for a high λ_f.

It is convenient to write the difference in welfare between the two institutions as:

$$\Delta W \equiv W^{AC} - W^{MC} = \tilde{W}^{AC} - \tilde{W}^{MC} + \nu[\underline{W}^{AC} - \tilde{W}^{AC}](1-x+xy) \tag{3.7}$$

$$- [(1-\nu)y+\nu xy]E - [1-\nu xy]\lambda s$$

$$- \nu(1-x(1-y))\frac{\Phi(e^*)}{1+\lambda_f},$$

where x, y, and s are the values under AC pricing (see (3.1), (3.3), and (3.5)).

Proposition 3: *i)* $\frac{\partial(\Delta W)}{\partial \lambda_f} > 0$ *ii)* $\frac{\partial(\Delta W)}{\partial E} < 0$.

Proof: See Appendix 1.

When the monitoring cost E decreases, the probability of cheating under AC pricing decreases (from (3.1)). The lower monitoring cost and probability of cheating both raise welfare and the desirability of AC pricing. Thus, Proposition 3 suggests that the prohibition of transfers is more likely to be observed in countries or industries where consumer groups are well-organized to investigate whether regulated prices are justified.

An increase in the cost of collusion λ_f has two effects. First, it reduces the income $(\Delta_f/(1+\lambda_f))$ received by the agency when it cheats and is not discovered. Because there is more cheating and less monitoring by consumers (and therefore more income received by the agency) under MC pricing, an increase in λ_f favors AC pricing. Second, an increase in λ_f reduces the attractiveness of cheating for the agency and therefore lowers the probability y that consumers search under AC pricing. But a decrease in y keeping s constant is socially beneficial $(\partial(\Delta W)/\partial y < 0)$, because, at the optimal s, monitoring is encouraged beyond the efficient point in order to reduce s. Thus both effects have the same sign.

The conclusion on the role of λ_f on the choice between institutions relies both on our choice of technology and on the consumers' being the only "outside monitor" (the agency is the "inside monitor"). First, as we will note below, an increase in λ_f may favor the MC pricing institution when the uncertainty affects marginal cost as well. Second, the assumption that the consumers are the only outside monitor implies that there is absolutely no check on collusion under the MC pricing institution when the uncertainty affects the fixed cost only. The agency always colludes with the industry and is never caught. In such a situation one would predict a high demand for the creation of an alternative outside monitor such as a public auditor.[21] Once

[21] In particular state-owned enterprises are often subject to financial audits.

public auditors are introduced, the analysis under MC pricing becomes qualitatively similar to that under AC pricing: The equilibrium of the inspection game between the public auditors and the agency is in mixed strategy as long as the public auditors have enough incentive to monitor (equations (3.1) and (3.2) hold with Δ_c^{AC} and E replaced by the public auditors' incentive and cost of auditing). An increase in λ_f then reduces the equilibrium probability and thus the cost of inspection by public auditors under MC pricing and may favor the MC pricing institution. For these two reasons, we do not find it implausible to imagine that transfers are less likely to be prohibited when public decision makers are less prone to collude with the regulated industry.[22]

Proposition 3 characterizes the effect of the collusion and monitoring variables on the choice between the two institutions. The effect of the traditional variables (cost and demand variables, and shadow price of public funds) is more complex to study and is likely to be ambiguous.

We now study the optimal agency income under AC pricing.

Such audits not only check that the firm's accounting is properly performed, but also report unprofitable activities and waste. Such audits, while useful, are very imperfect instruments of control. In the U.S., the corporation audits created by the Government Corporation Control Act of 1945 are performed only once every three years since 1974. Similarly, the French national audit body (*Cour des Comptes*), while having substantial audit powers, is seriously short of manpower. Another issue is that public controllers may become the advocates of the state-owned enterprise in the ministry (see, for example, the 1967 Nora report in France). We will say more about alternative outside monitors in Section 4.

[22]That is, when λ_f is high. A high λ_f may stem from the civil servants' being "public minded" (their having a high psychological cost of receiving transfers), from a frequent rotation among regulatory jobs (which makes trust between agency personnel and regulated firms harder to develop), or other factors. These considerations (together with the difference in the organization of consumer groups -- represented by the parameter E in our model) might for instance be reflected in the different treatments of transfers in the regulation of electric utilities and telephone companies in France (transfers allowed) and the U.S. (transfers prohibited).

Proposition 4: Under AC pricing:

(a) The agency's income is non-increasing in the shadow cost of public funds.

(b) If $\nu\Delta_c^{AC} \geq E + \frac{\Delta_f}{1+\lambda_f}$, the agency's income is equal to zero for all λ. If $\nu\Delta_c^{AC} < E + \frac{\Delta_f}{1+\lambda_f}$, the agency's income strictly decreases with λ on $[0,\lambda_0]$ and is equal to 0 for $\lambda \in [\lambda_0,+\infty)$, for some $\lambda_0 > 0$.

When λ grows, it becomes more and more costly to reward the agency, and the efficiency-income method of avoiding collusion ($s > 0$) becomes less attractive relative to the method of letting the consumers monitor (part a) of Proposition 4). When E is small, consumer search is cheap and allows a better allocative efficiency. Increasing s beyond 0 would be detrimental because it would reduce consumer search. In contrast when E is larger (but still satisfies assumption A: $\nu\Delta_c^{AC} \geq E$), it is optimal to give an efficiency income to the agency to reduce the extent of search. The condition $\nu\Delta_c^{AC} \leq E + \frac{\Delta_f}{1+\lambda_f}$ is straightforward to interpret: When $s = 0$, the consumers always search and have private gain from searching Δ_c^{AC} and exert negative externality $\Delta_f/(1+\lambda_f)$ on the agency, with conditional probability $\nu x/(1-\nu+\nu x)$ that the agency has cheated given announcement $\tilde{\beta}$. They have private cost E. Using (3.1), the condition says that the consumers have socially too much incentive to search. A positive efficiency income for the agency reduces search by consumers and is socially beneficial.

Proof: a) We earlier noted that $W^{AC}(s,\lambda)$ is strictly quasi-concave in s. It thus suffices to show that $\frac{\partial}{\partial\lambda}\left(\frac{\partial W^{AC}}{\partial s}\right) < 0$. We have:

$$\frac{\partial^2 W^{AC}}{\partial\lambda\partial s} = -(1-\nu xy) + \frac{\partial y}{\partial s}\nu xs < 0,$$

as $\tilde{W}^{AC}$ and $\underline{W}^{AC}$ do not depend on λ and $\frac{\partial y}{\partial s} < 0$.

$$\text{b)} \quad \left.\frac{\partial W^{AC}}{\partial s}\right|_{\lambda = 0} = \frac{\partial y}{\partial s}\left[\nu x(\underline{W}^{AC} - \tilde{W}^{AC} - \frac{\Delta_f}{1+\lambda_f}) - (1-\nu+\nu x)E\right].$$

Thus, for the optimal s to be positive, it must be the case that this expression be positive at s = 0, or, because $\frac{\partial y}{\partial s} < 0$,

$$\underline{W}^{AC} - \tilde{W}^{AC} - \frac{\Delta_f}{1+\lambda_f} < E + \frac{1-\nu}{\nu x}E.$$

The facts that $\underline{W}^{AC} - \tilde{W}^{AC} = \Delta_c^{AC}$ and $\nu x \Delta_c^{AC} = E$ yield the result.

Q.E.D.

Regulation vs. no regulation.

A complete contracting theory of regulation implies that, ignoring the salaries of regulators, the entire economy should be regulated even if the agencies are not benevolent. The results from the fact that at worst the complete contract given to the agency and the industry can duplicate the outcome of a non regulated industry by asking the agency not to intervene (and in general *laisser faire* can be improved upon). Thus the only limit to complete regulation in a complete contracting world is the cost of maintaining agencies. In an incomplete contracting world such as the one in this paper, the agency is given only a vague mandate and enjoys control rights in unspecified contingencies. A non-benevolent agency may abuse those rights, which yields a second reason why regulation of an industry may not be optimal.[23] We thus need a three-way comparison in our model: MC pricing regulation, AC pricing regulation and unregulated private monopoly.

We now show by means of an example that unregulated private monopoly may dominate both forms of regulation. Because we adopted the convention that the agency's reservation utility is equal to zero, the suboptimality of regulation in this example stems from the second reason and not the first.

Suppose that demand in inelastic. Consumers have reservation price r ($r > c$) for the first $\bar{q}$ units and 0 for the following units. A private monopolist then charges price r, sells $\bar{q}$ units and thus introduces no distortion in consumption. Because it is residual claimant for its cost savings, its managers exert the socially optimal level of effort $e = e^*$. The State does not capture the firm's rent, but this imposes a negligible welfare loss if the shadow cost of public funds λ is close to 0. Thus, as λ tends to 0, an unregulated private monopolist yields approximately the first-best

---

[23] There is another "incomplete" contracting reason why regulation may be costly. Namely, the State may lack commitment power in an intertemporal setting (see Laffont-Tirole [1987, 1988b]).

outcome. In contrast, the distortions due to regulation do not disappear in the limit. MC pricing yields effort $(e^{*}-\Delta\beta)$ in state $\underline{\beta}$ and also dissipates the firm's rent through the cost of achieving collusion. AC pricing also imposes a collusion cost and furthermore elicits costly involvement of the consumers.

Thus, it may be optimal not to regulate the industry. Conversely, it is easy to build examples (using the proofs of Propositions 1 and 2) in with either MC pricing regulation or AC pricing regulation is optimal.

Needless to say, the analysis of when it is optimal to regulate an industry, in this model and in richer models, is an important topic for future research.

Subsidies for intervener programs.

In the U.S., Congress and local legislatures have authorized funds for intervenor programs. On the one hand, such funds allow public representatives (Attorney general, independent public staff in regulatory commissions, public advocates) to intervene on behalf of consumers. On the other hand, recognized private intervenors can apply for a refund of their monetary costs.

Assume that a fraction $\bar{\alpha} \in [0,1]$ of the consumers' expenses is observable or verifiable. Suppose that the Constitution or law specifies that the State pay αE to the consumers if the latter decide to search (and discover) where $\alpha \in [0,\bar{\alpha}]$ is a choice variable in the optimal Constitution (the previous analysis thus assumed that $\bar{\alpha} = 0$).

The feasibility of an intervenor program does not affect the marginal cost regime because the consumers have no incentive to search even if they are subsidized. Social welfare is $\tilde{W}^{MC} = W^{MC}$.

Under AC pricing the new welfare $\tilde{W}^{AC}$ $(\geq W^{AC})$ must take into account the fact that the shadow cost of public funds makes subsidies socially costly. The social cost of subsidies is $\lambda(\alpha E)$ and is incurred with probability

$[(1-\nu)y+\nu xy]$. Thus

$$(3.8) \qquad \tilde{W}^{AC} = W^{AC} - [(1-\nu)y+\nu xy]\lambda\alpha E,$$

where W^{AC} is given in (3.4), but with a different x, as discussed below. Subsidies also encourage consumers to search, which, in this model, means that the probability of cheating by the agency that makes consumers indifferent between searching and not searching goes down (thus, in equilibrium the consumers do not search more, but the agency cheats less). (3.1) is replaced by:

$$(3.9) \qquad (1-\alpha)E = \Delta_c^{AC}\nu x.$$

Last, (3.3) remains valid.

Substituting x using (3.9) and y using (3.3) into (3.8) shows that $\tilde{W}^{AC}$, for an s given, is quadratic and convex in α. The convexity implies that for any s the optimal α is a corner solution: $\alpha = 0$ or $\alpha = \bar{\alpha}$.

Proposition 5: Suppose the law can specify that a fraction $\alpha \in [0,\bar{\alpha}]$ of consumer expenses can be subsidized by the State.

(a) There exist shadow costs of public funds λ_1 and λ_2 with $0 < \lambda_1 < \lambda_2 < +\infty$ such that $\alpha = \bar{\alpha}$ is socially optimal if $\lambda \leq \lambda_1$ and $\alpha = 0$ is socially optimal if $\lambda \geq \lambda_2$.

(b) The agency's income (rent) may be reduced or increased by the feasibility of subsidies for intervenors programs.

Proof: See Appendix 2.

Part (a) of Proposition 5 is quite intuitive. Subsidies reduce the probability of cheating by the agency, and are socially inexpensive when the shadow cost of public funds is low. Part b) came more as a surprise to us.

We would have expected that the rent would be reduced by the existence of subsidies that reduce consumer search costs.[24]

Alternative technologies: We assumed that technological uncertainty affects the firm's fixed cost. For instance, the agency may report an inflated cost of the firm's equipment. Focusing on fixed cost uncertainty is natural when deriving rational foundations for average cost pricing. However, it would be worth developing the theory for general cost functions. Here we content ourselves with giving a few elements for the other polar case in which the technological uncertainty affects marginal cost:

$$C = (\beta - e)q + f, \tag{3.8}$$

where f is a known fixed cost.

In the marginal cost pricing regime, the agency is instructed to maximize social welfare over the instruments $\{t,p\}$:

$$\max\left\{S(q)+\lambda P(q)q-(1+\lambda)(t+(\beta-e)q+f)\right\}$$

where $t = \psi(e)$ (because the agency has full information about the firm). This yields

$$\psi'(e) = q \tag{3.9}$$

and

$$\frac{p-(\beta-e)}{p} = \frac{\lambda}{1+\lambda}\frac{1}{\eta(p)}, \tag{3.10}$$

where $\eta(p)$ is the elasticity of demand. Substituting $p = P(q)$ yields $q^{MC}(\beta)$

---

[24] In our model the agency is assumed to obtain the full rent attached to collusion. It is straightforward to modify the model so that the firm has some bargaining power and shares the rent with the agency. The observation that appropriations for intervenor programs are often lobbied against by the regulated industry suggests that the most likely case in Proposition 5b) is that the agency's rent decreases with the feasibility of such programs.

and $e^{MC}(\beta)$.

In the average cost pricing regime, the agency is instructed to set the price so that

$$(3.11) \qquad p = \frac{\psi(e)+(\beta-e)q+f}{q},$$

where the managerial compensation $t = \psi(e)$ is included in the total cost of the firm. To obtain the lowest price, the agency sets e so that

$$(3.12) \qquad \psi'(e) = q.$$

(3.11) and (3.12) yield $q^{AC}(\beta)$ and $e^{AC}(\beta)$.

In both regimes, the agency may collude with the firm. The firm's stake in regime i is $\Delta_f^i = \psi(e^i(\bar{\beta}))-\psi(e^i(\bar{\beta})-\Delta\beta)$. The consumers' gain when reversing the regulatory decision is $\Delta_c^i = S^n(q^i(\underline{\beta}))-S^n(q^i(\bar{\beta}))$. Equation (2.15), and, assuming $E \leq \min_i(\nu\Delta_c^i)$, equations (3.1) and (3.3) are valid in both regimes as long as Δ_f and Δ_c are indexed by i. Both regimes are treated like the AC regime in the previous analysis.

Computer simulations reveal that either regime may be optimal. Furthermore, the effect of λ_f on the choice between regimes is now ambiguous. In particular, an increase in λ_f may make the marginal cost institution desirable. See Appendix 3.

Standards of judicial review: Another issue worth studying is that of standards of judicial review. We assumed that consumers come up with either perfect evidence or no evidence. Suppose more generally that search yields the observation of $\tilde{\beta} \in \{\underline{\beta},\bar{\beta}\}$ that has correlation $\rho \in (\frac{1}{2},1)$ with β (assume that this is still hard information: $\tilde{\beta}$ can be credibly communicated to the court). The court knows the accuracy ρ of the evidence. A standard of judicial review might be characterized by a cut-off parameter ρ^* such that the court overrules the agency's proposed policy if and only if $\rho \geq \rho^*$. Defining

a lower standard (lowering ρ^*) encourages consumers to search, but increases the probability of incorrect reversals of proposed policies. We have not formalized these arguments.

4. Discussion.

Our stylized model assumes a single public decision maker (agency) and a single watchdog/outside monitor (consumers). A crucial assumption of our analysis is thus that other potential watchdogs ignored in our model only imperfectly oversee the agency. In reality there are other parties within and outside the government which can and do perform an oversight role: e.g., Congress, public auditors, independent boards set up to review the agency, and whistle-blowers.[25] If these parties can be given adequate incentives to investigate the agency's activity and to release their findings, constraining regulatory instruments to encourage consumers to oversee the agency ought to be welfare reducing. There are two reasons why these alternative watchdogs perform their function imperfectly.

First, rewarding these watchdogs is costly. Furthermore, it is hard to *ex-ante* specify an adequate reward for a "finding that reverses an agency decision." The finding that an agency is not buying the appropriate brand of pencils is not commensurate with the discovery that the agency inflates prices or sides up with regulated firms on major technological choices. Making the reward commensurate with the importance of major discoveries would be very costly as it is also claimed for minor discoveries. The point made here is the same as the argument that a patent law -- an *a priori* suboptimal system of rewards for innovations because it creates monopoly power -- is judged preferable to a direct price or reward system, which would be superior in an environment in which all potential innovations could be costlessly described

[25]To this list might be added the president and activist courts.

beforehand. In our model the consumers' stake Δ_c^{AC} reflects (imperfectly) the size of the issue, in the same way that the monopoly profit accruing from a patent reflects (imperfectly) the increase in social surplus brought about by the innovation.

Second, the watchdogs may themselves engage in collusive activity. They may be bribed either not to search for information or not to make their discoveries public (for instance, congressional oversight committees are often captured by special interests or the agency). In this case, they should not be trusted to bring information that leads to the overruling of agency decisions and to punishments. This raises the well-known question of "who will take care of the caretakers?".

The possibility of collusion also sheds some light on why the court's estimating the value of evidence found by watchdogs would, most likely, be subject to abuse. We argued that, as in the case of a patent, the court would have much discretion in determining the value of information supplied. One can object to this argument on the basis that courts sometimes do produce such assessments. In particular, under the U.S. antitrust laws, plaintiffs who win their case are entitled to treble damages, where damages are determined by the court. In a sense, however, this antitrust institution obeys the same principle as the institution of not assessing and granting monetary rewards for evidence of agency wrongdoing. Pitting one organized interest group against another (plaintiff against defendant, consumers against agency and firm) and not letting a poorly-organized third party (taxpayers) act as a source of funds limits the scope for abuse.

While these two factors put limits on the efficiency of oversight by Congress, review boards, public auditors and whistle blowers, they may as well apply to consumer groups. We already argued that the first factor has less force for consumers, because their reward (the increase in net consumer surplus) is "proportional to" the social value of discovering agency

wrongdoing. In a sense, consumers signal the value to them of altering the decision by searching. An interesting question is whether the second factor applies less for consumers, that is, whether the delegates of the consumer groups are less prone to colluding with the agency and the firm than the other watchdogs.

While we are not satisfied by the exogeneity of our assumptions that consumers (and their allies) are the only watchdogs and that their rewards are fully identified with their influence on regulatory decisions, rather than with direct monetary transfers, we feel that our model captures many salient features of reality. For instance, McCubbins and Schwartz [1984] argue that what appears to be a neglect of oversight of agencies by Congress is really a preference by Congressmen for "fire-alarm" over "police-patrol" oversight (i.e., for reacting to the whistle blowers over conducting their own investigations):

> Instead of examining a sample of administrative decisions, looking for violations of legislative goals, Congress establishes a system of rules, procedures, and informal practices that enable individual citizens and organized interest groups to examine administrative decisions (sometimes in prospect) to charge executive agencies with violating congressional goals, and to seek remedies from agencies, courts, and Congress itself.

(p. 166).

McCubbins and Schwartz go on to argue that Congress's role consists in creating this decentralized system; and that Congressmen have little incentive to engage in police-patrol oversight because they must spend much time detecting agency violations and yet receive scant credit for their discoveries.

The McCubbins and Schwartz theory reflects the difficulty of designing adequate rewards for a direct oversight of agencies. Reinterpreting the founding fathers of our model as Congressmen and the constitution as the law or congressional intents, our model seems a good description of their view of Congressional oversight activity.

5. Conclusion.

Institutions may be viewed as resulting from an incomplete constitution (or law, or tradition). Because the public decision makers who are conferred discretionary power need not be benevolent, the comparison of institutions must take into account the incentives they give to the public decision makers to identify with interest groups and to counter forces to oversee the public decision makers.

Our very stylized model aimed at finding rational foundations for the prohibition of transfers observed in some industries and traced this institution to a mistrust of regulators. It compared the mandate of average cost pricing (associated with the absence of transfers) with that of marginal cost pricing (associated with the possibility of transfers). And it showed that average cost pricing may dominate marginal cost pricing. This type of analysis is definitely not intended to support the prohibition of transfers, but rather aims to point out some elements that make the observation of such a prohibition more likely.

This normative model presumes that the framers design a constitution behind the veil of ignorance; it is then natural to assume that they maximize a social welfare function such as expected utility in society. As noted in the introduction, an interesting variant would study constitutional design by self interested framers. Our analysis in principle allows us to close the model in other ways than the maximization of a social welfare function. Because consumers, the industry, the taxpayers and the agency have different expected utilities under different forms of regulation, one can predict how they would lobby to influence the choice of a regulatory regime. Inserting these preferences into a model of Congressional voting and political pressure would yield an interesting positive theory positive theory of constitutional design. We hope that future research will investigate this line.

The model is consistent with the thesis developed in McCubbins *et al.* [1987] that administrative procedures such as hearings can serve as instruments of agency control, and argues that the absence of transfers (outside source) pits the consumers against the agency and the industry.

More generally, the creation of conflicts between agents plays a central role in the collection of information and the provision of incentives in public life as well as in private organization. (This comment has much benefited from discussions with Bengt Holmström.) Consider the institution of

cost-plus-profit-markup transfer pricing between two divisions of a firm, which specifies that the selling profit center charges the cost of producing an intermediate good plus a gross margin to the buying profit center. Eccles and White [1988, p. 538] argue that this transfer-pricing rule induces monitoring of the selling profit center by the buying profit center and creates valuable information available to the central office (higher levels of management), helping it to "obviate the loss of control associated with hierarchies without interfering with the prerogatives of these middle managers." This internal organization institution is analogous to the average-cost pricing mandate of our model. First, cost-plus transfer pricing provides the selling profit center with poor incentives for cost reduction while average cost pricing discourages the use of the regulated firm's product by consumers. Second, cost-plus transfer pricing induces the buying profit center to collect information about production and transmit it to the central office, while average cost pricing may induce consumer groups to scrutinize the production of regulated goods and appeal to the courts (or Congress). Last, in these two institutions, the absence of transfers from a third party (central office, State) pits one interest group against another interest group. The relative robustness of "sourceless" or "balanced-budget" mechanisms to collusive activities is the key to understanding the wide-spread use of these otherwise suboptimal mechanisms.

REFERENCES

Baron, D. [1985] "Noncooperative Regulation of a Nonlocalized Externality," *Rand Journal of Economics*, 16, 553-568.

Brennan, G. and J. Buchanan [1977] "Towards a Tax Constitution for Leviathan," *Journal of Public Economics*, 8, 255-273.

Eccles, R. and H. White [1988] "Price and Authority in Inter-Profit Center Transactions," *American Journal of Sociology*, 94, 517-551.

Freixas, X. and J.-J. Laffont [1985] "Average Cost Pricing Versus Marginal Cost Pricing under Moral Hazard," *Journal of Public Economics*, 26, 135-146.

Grossman, S. and O. Hart [1986] "The Costs and Benefits of Ownership: A Theory of Lateral and Vertical Integration," *Journal of Political Economy*, 94, 691-719.

Hamilton, A. [1788] *The Federalist No. 78*, reprinted in *The Origins of the American Constitution*, M. Kammen (ed.), New York: Penguin Books, 1986.

Hart, O. and J. Moore [1988] "Property Rights and the Nature of the Firm," London School of Economic Discussion Paper TE/88/174.

Kofman, F. and J. Lawarree [1988] "Collusion in Hierarchical Agency," Mimeo, U.C. Berkeley.

Laffont, J.-J. and E. Maskin [1982] "The Theory of Incentives: An Overview," in W. Hildenbrand (ed.), *Advances in Economic Theory*, New York: Cambridge University Press.

Laffont, J.-J. and J. Tirole [1987] "Comparative Statics of the Optimal Dynamic Incentives Contract," *European Economic Review*, 31, 901-926.

Laffont, J.-J. and J. Tirole [1988*a*] "The Politics of Public Decision-Making: A Theory of Regulatory Capture," M.I.T., Department of Economics Discussion Paper #506.

Laffont, J.-J. and J. Tirole [1988*b*] "The Dynamics of Incentive Contracts," *Econometrica*, 56, 1153-1175.

Lewis, T. and D. Sappington [1988] "Revolving Regulatory Commissions," WP331, University of California at Davis.

Madison, J. [1788] *The Federalist No. 10* (47-51), reprinted in *The Origins of the American Constitution*, M. Kammen (ed.), New York: Penguin Books, 1986.

McCubbins, M. [1985] "Legislative Design of Regulatory Structure," *American Journal of Political Science*, 29, 721-748.

McCubbins, M., Noll, R. and B. Weingast [1987] "Administrative Procedures as Instruments of Political Control," *Journal of Law, Economics and Organization*, 3, 243-277.

McCubbins, M. and T. Schwartz [1984] "Congressional Oversight Overlooked: Police Patrols versus Five Alarms," *American Journal of Political Science*, 2, 165-179.

Myerson, R. [1986] "Multistage Games with Communication," *Econometrica*, 54, 323-358.

Shapiro, M. [1986] "APA: Past, Present and Future," *Virginia Law Review*, 72, 447-492.

Spiller, P. [1988] "Politicians, Interest Groups, and Regulators: A Multiple-Principals Agency Theory of Regulation (or 'Let Them Be Bribed'), forthcoming, *Journal of Law and Economics*, 1990.

Sunstein, C. [1986] "Factions, Self-Interest, and the APA: Four Lessons Since 1946," *Virginia Law Review*, 72, 271-296.

Williamson, O. [1975] *Markets and Hierarchies: Analysis and Antitrust Implications*, New York: The Free Press.

Williamson, O. [1985] *The Economic Institutions of Capitalism*, New York: The Free Press.

APPENDIX 1

Proof of Proposition 3.

As we saw in the proof of Proposition 2, the solution is a corner solution ($s^* = 0$) for E small. In this case, W^{AC} is (locally) independent of λ_f and decreases with E, while W^{MC} decreases with λ_f and is independent of E. So proposition 3 is trivially satisfied. Next we assume an interior solution for s^*.

(i) Using the fact that s^* maximizes W^{AC} (the envelope theorem), we have:

$$\frac{\partial(\Delta W)}{\partial \lambda_f} = \nu(1-x+xy)\frac{\Phi(e^*)}{(1+\lambda_f)^2} + A\,\frac{\partial y}{\partial \lambda_f},$$

where $A \equiv \frac{\partial W^{AC}}{\partial y} = \nu x\left[\underline{W}^{AC} - \bar{W}^{AC} - \frac{\Phi(e^*)}{1+\lambda_f}\right] - (1-\nu+\nu x)E + \nu x \lambda s.$

(3.5) can be rewritten: $A\,\frac{\partial y}{\partial s} - \lambda(1-\nu xy) = 0.$

Because $\partial y/\partial s < 0$, $A < 0$. Moreover, $\partial y/\partial \lambda_f < 0$. We thus conclude that $\partial(\Delta W)/\partial \lambda_f < 0$.

(ii) Again, using the envelope theorem yields:

$$\frac{\partial(\Delta W)}{\partial E} = -[(1-\nu)y+\nu xy] + \frac{1}{\nu \Delta_c^{AC}}\,\frac{\partial(\Delta W)}{\partial x}.$$

But

$$\frac{\partial(\Delta W)}{\partial x} = -\nu\theta + \nu y(\theta - (E-\lambda s))$$

where

$$\theta \equiv \underline{W}^{AC} - \bar{W}^{AC} - \frac{\Phi(e^*)}{1+\lambda_f}.$$

From (i), we have: $A < 0$ or $\nu x(\theta-(E-\lambda s)) < (1-\nu)E$. Recall now that $E = \Delta_c^{AC} \nu x$. Thus:

$$\frac{\partial(\Delta W)}{\partial E} < -[(1-\nu)y+\nu xy] - \frac{\theta}{\Delta_c^{AC}} + y(1-\nu) < -\nu xy - \frac{\theta}{\Delta_c^{AC}} < 0.$$

Q.E.D.

APPENDIX 2

Proof of Proposition 5.

a) Social welfare is given by

$$\tilde{W}^{AC}(s,\alpha) = (1-\nu+\nu\tilde{x}(1-y))\tilde{W}^{AC}+\nu(1-\tilde{x}+\tilde{x}y)\underline{W}^{AC}$$

$$- (1-\nu+\nu\tilde{x})y(1+\alpha\lambda)E-(1-\nu\tilde{x}y)\lambda s$$

$$+ \nu\tilde{x}(1-y)\frac{\Phi(e^*)}{1+\lambda_f},$$

where

$$\tilde{x} = \tilde{x}(\alpha) = \frac{E(1-\alpha)}{\nu\Delta_c^{AC}}$$

and

$$y = y(s) = \frac{\Delta_f}{\Delta_f+s(1+\lambda_f)}.$$

Thus

$$\frac{\partial\tilde{W}^{AC}}{\partial\alpha} = -\frac{E}{\nu\Delta_c^{AC}}\left[-\nu(1-y)\left(\underline{W}^{AC}-\tilde{W}^{AC}-\frac{\Phi(e^*)}{1+\lambda_f}\right)\right.$$

$$\left. + \lambda\nu ys-\nu yE(1+\alpha\lambda)\right]$$

$$-(1-\nu+\nu\tilde{x})y\lambda E.$$

When λ tends to zero, $\frac{\partial W^{AC}}{\partial\alpha}$ is positive (using the fact that $\underline{W}^{AC}-\tilde{W}^{AC}-\frac{\Phi(e^*)}{1+\lambda} > 0$), unless s tends to infinity which is impossible from (3.5).

When λ tends to $+\infty$, $\frac{\partial W^{AC}}{\partial\alpha}$ is negative and therefore $\alpha = 0$ at the optimum.

b) Because $\tilde{W}^{AC}(s,\alpha)$ is strictly quasi-concave in s, to see how s varies with α, it suffices to study $\frac{\partial}{\partial\alpha}\left(\frac{\partial\tilde{W}^{AC}}{\partial s}\right)$:

$$\frac{\partial^2 \tilde{W}^{AC}}{\partial \alpha \partial s} = \frac{\partial x}{\partial \alpha}\left[\frac{\partial y}{\partial s}\left(\left[\underline{W}^{AC} - \tilde{W}^{AC} - \frac{\Phi(e^*)}{1+\lambda_f}\right]\nu + \lambda\nu s - \nu E(1+\alpha\lambda)\right) + \lambda\nu y\right] - \frac{\partial y}{\partial s}(1-\nu+\nu x)\lambda E.$$

For λ small, $\frac{\partial x}{\partial \alpha} < 0$ and $\frac{\partial y}{\partial s} < 0$ imply that

$$\text{sign}\left(\frac{\partial^2 \tilde{W}^{AC}}{\partial \alpha \partial s}\right) = \text{sign}\left(\Delta_c^{AC} - \frac{\Delta_f}{1+\lambda_f} - E\right).$$

From Proposition 4b), we know that the optimal agency income is strictly positive when $\alpha = 0$ and λ is small if and only if $\nu\Delta_c^{AC} < E + \frac{\Delta_f}{1+\lambda_f}$. Assuming this condition holds, the sign of $\frac{\partial^2 \tilde{W}^{AC}}{\partial \alpha \partial s}$ is negative if ν is close to 1, and positive if ν is smaller (from Assumption A). Furthermore, from Proposition 5a), $\alpha = \bar{\alpha}$ is optimal for λ small. Thus, the agency income is lowered by the feasibility of intervenor programs if ν is close to one, and increased if ν is smaller.

Q.E.D.

§ § §

APPENDIX 3

To compare AC pricing and MC pricing for the technology $C = (\beta - e)q + f$, we ran a couple of simulations for the values: $\psi(e) = \frac{3}{2}e^2$, $f = 0$, $p = P(q) = 12 - q$, $\underline{\beta} = 9$, $\bar{\beta} = 10$, $\nu = \frac{1}{2}$. Moreover, we assume that the agency's reservation income is equal to 1 (it was normalized at 0 in the text; changing the formulas to allow $s^* = 1$ is immediate. The new feature associated with $s^* > 0$ is that the punishment -- the loss of s^* when wrongdoing is discovered -- becomes strictly positive. This introduces no qualitative change, but affects the level of incentive to cheat. In the range of parameters described below, we obtained a corner solution $s = 1$ for the agency's income.

Proposition 1′: MC pricing may dominate AC pricing

(example: $\lambda = .1$, $\lambda_f = .1$, $W^{AC}-W^{MC} = -.180$).

Proposition 2′: AC pricing may dominate MC pricing

(example: $\lambda = .3$, $\lambda_f = .3$, $W^{AC}-W^{MC} = .137$).

Contrary to Proposition 3 in section 3, $\Delta W = W^{AC}-W^{MC}$ need not be monotonic in λ_f and E: see the following tables:

a) $\lambda = .1$, $E = 1.25$

λ_f	.1	.2	.3	.4	.5	.6	.7
ΔW	-.180	-.184	-.188	-.191	-.194	-.197	-.199

b) $\lambda = .3$, $E = 1.25$

λ_f	.3	.4	.5	.6	.7	.8	.9
ΔW	.137	.140	.142	.145	.147	.149	.150

c) $\lambda = .1$, $\lambda_f = 1$

E	.1	.2	.3	.4	.5	.6	.7
ΔW	-.052	-.065	-.078	-.091	-.104	-.118	-.131

d) $\lambda = .3$, $\lambda_f = 1$

E	.2	.3	.4	.5	.6	.7	.8
ΔW	.001	.015	.030	.044	.059	.073	.087