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Regulation with Rationed Information or Delegation: Solutions to the under Investment Problem

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Regulation with Rationed Information, or Delegation: Solutions to the Under-investment Problem?

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Abstract

A new perspective is provided on the under-investment problem in the regulation of a firm with market power. We compare a political equilibrium based on a voting model with lobbying with a delegation equilibrium, where a government can delegate to a particular ‘type’ of pro- or anti-industry regulator. Our analysis suggests two possible ways in which we may observe effective, although second-best, price regulation that both encourages socially optimal investment and ensures consumers benefit: first, voters receive just the amount of information that maximizes social welfare and second, the decisions on price are delegated to a sufficiently, but not excessively, pro-industry regulator.

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1 Introduction

A long-standing problem in regulation is under-investment arising from the regulator’s incentive to exploit the sunk cost nature of the regulated firm’s capital investment. Public ownership, or at least the direct regulation of investment avoids the problem, but there is now a broad consensus that such institutional arrangements provide poor incentives for efficiency and innovation. Rate of return regulation provides another possible solution, provided a commitment mechanism is in place that guarantees a ‘fair rate of return’. Again such a ‘low-powered’ regulatory regime provides poor incentives to minimize cost, even if the fair rate guarantee can be made credible. By contrast, price regulation provides strong incentives for efficiency and, in this paper, we focus on this arrangement.

We examine the price regulation of a monopolist who can invest in period 1 in order to reduce network fixed costs in period 2. The efficiency of the firm is assumed to be observed so there is no adverse selection problem as, for example, in Laffont and Tirole (1993). The source of under-investment is the assumption that neither the regulator nor the firm can commit to contracts over the two periods. One way of sustaining the commitment outcome as an equilibrium in complete information dynamic games of this type is through a trigger-strategy equilibrium.\(^1\)

Unfortunately, there are well-known problems with this approach. First the length of the punishment phase (usually infinity) is arbitrary. There exists an infinite number of such equilibria, one for each length of punishment. Even if the two players can coordinate on the best of these equilibria, there is a second more serious problem: the equilibrium is not ‘renegotiation-proof’. The players always have an incentive to renegotiate (i.e., re-coordinate) after a deviation occurs, rather than carry out the punishment. This questions the credibility of trigger-strategy equilibria, even though they are sub-game perfect.\(^2\)

A further reason why policy-makers find commitment to regulated prices in the future difficult is not apparent in our simple model. In a changing uncertain environment, price trajectories must be designed for every conceivable state of the world. For linear models with constant parameters but faced with exogenous noise, these trajectories can be expressed as a linear rule; but in general this is not the case. Regulators therefore need discretion to respond to changes in their perception

\(^1\)Salant and Woroch (1992), and Gilbert and Newbery (1994) (see also Newbery, 1999, chapter 2) show that first-best levels of investment can be sustained as a subgame-perfect equilibrium.

\(^2\)see al-Nowaihi and Levine (1994) who, in the context of a monetary policy game, argue for a refinement they term ‘chisel-proofness’, to resolve this difficulty
of ‘the model’. Policymakers are well aware of this, which is why they are generally reluctant to tie their hands.\(^3\)

We have narrowed the area of interest to price regulation without commitment, so as to allow the regulator the discretion to respond to new circumstances and to new information. Besanko and Spulber (1992), and the derivative paper Urbiztondo (1994) study this problem under the assumption that the firm has private information about cost or demand conditions. They show that in a sequential equilibrium under-investment can be alleviated, at least for the efficient type of firm who is the recipient of informational rent. Laffont and Tirole (1993, chapter 11) arrive at a similar same result in a model of regulatory capture where regulator and firm collude to send incorrect information back to the government.

Solutions to this regulatory problem that rely, indeed make a virtue of asymmetric information, still leave the question of what happens when regulators are well-informed about the firm and prevented from colluding by regulatory procedures that are transparent to the government (though not necessarily to the electorate). This paper provides a new perspective on this regulatory problem. We first examine a political equilibrium using the general framework of Grossman and Helpman (1996) and drawing on its application to price regulation in Trillas (1999). In this model the regulator is the government and is well-informed. However, only a proportion of the voters know the government’s position on regulation policy. The equilibrium is based on a voting model with lobbying that tries to overcome some of the limitations of Median Voter applications, such as the difficulties they have in dealing with multi-dimensionality, interest groups and asymmetric information.\(^4\) Other branches of the positive politico-economic literature provide us with a myriad of modeling possibilities that analyze policies where interest groups and agency problems play a crucial role (see part II of Persson and Tabellini, 1999). The Grossman and Helpman contribution is one such branch which models the interaction between interest groups and voting behaviour in a common agency framework.\(^5\)

\(^3\)A further benefit of discretion in an incomplete information context is that policy actions provide the private sector with information about the type of policymaker (see Cowen et al, 2000).

\(^4\)The following are some Median Voter applications to regulation. Baron (1988) analyzes the problem of a legislature that has to choose the weight of profits in the objective function of an imperfectly informed regulatory agency. Faulhaber (1997a and 1997b) analyzes the determination of cross-subsidies between different products. Beard and Thomson (1996) study the decision concerning two-part tariffs. Laffont (1996) and Schmidt (1997) also use a similar majority voting approach.

We then examine a solution that combines several features of the modern regulatory environment: government commitment to a particular regulator, the provision of independence to that regulator, and heterogeneity across regulators available. Thus in our set-up a government can appoint and credibly delegate to a particular ‘type’ of regulator (or committee). Here a ‘type’ refers to the preferences of the regulator being pro-industry (or anti-industry) in the sense of being pro-rent (or anti-rent) relative to those of the government. This solution to the under-investment problem is analogous to the idea, first proposed by Rogoff (1985), of delegating monetary policy to independent central bankers who are ‘conservative’ in the sense of being more inflation-averse than the government. Spulber and Besanko (1992), in the context of environmental regulation, used the idea of Rogoff-delegation to develop a model where a president is shown to make credible commitments to future agency actions by choosing an agency director whose preferences over consumer and firm interests differ from his own. The divergence between the president’s preferences and those of the desired agency director are shown to depend on the agency’s ability to make credible commitments and on whether the agency’s regulatory action and the action of the regulated firm are profit substitutes or complements.\footnote{Spiller (1990), Besley and Coate (2000) and Boyer and Laffont (1999) also stress the interactions between policy-makers preferences, delegation, voting behaviour and lobbying.}

Our model shows that if lobbying costs are negligible, the outcome obtained in a voting model with lobbying is equivalent to the outcome obtained with an independent regulator, for certain values of the proportion of informed voters and the ‘type’ of regulator. Some voter lack of information and a regulator with preferences relatively favourable to the firm’s rent may provide assurances for a first-best level of investment, in the absence of regulatory commitment. The importance of these assurances to investors increase with the returns to investment and the discount factor. However, regulatory independence and poorly informed voters have a cost in terms of higher prices, which may outweigh the advantages of first best investment. A political equilibrium with lobbying has the additional drawback that political contributions further reduce the amount of resources available for investment.

Our model suggests two potential mechanisms for alleviating the under-investment problem in the absence of regulatory commitment: first, voters receive just the amount of information that maximizes social welfare; and second, decisions on prices are delegated to a sufficiently, but not excessively, pro-industry regulator. These normative results also provide positive insights into observed regulatory structures. Separate regulatory authorities have been created in many countries in the recent and Persson and Tabellini (1999).
past with considerable variation in their powers and profile and two possible roles are suggested for them here: a separate authority that provides voters with the ‘right’ amount of information (and then it is the politicians who actually fix the prices), or a fully independent regulator of the optimal ‘type’ to whom the government delegates price decisions.

The rest of this paper is organized as follows: section 2 sets out the model. Section 3 derives a political equilibrium. Section 4 compares this with a delegation equilibrium. We show that the first-best outcome can be obtained as a delegation equilibrium with the appropriate choice of pro-industry regulator, and both equilibria either result in under-investment, or socially optimal investment but at the expense of a high regulated price. Section 5 deals with empirical issues and section 6 concludes the paper with suggestions for future research.

2 The Model

There are two periods and full information on the part of the policy-maker. In the first period the price is given, and our focus is on alternative regulatory regimes in the second period. Two second-period regimes are compared: price regulation by either a government-controlled regulator or by an independent regulator whose preferences can differ from those of the government. In this section we assume the former and formulate a political equilibrium.

In period 1 the firm, in anticipation of the regulated phase in period 2, spends resources to capture the policy platforms of two competing parties. A fixed proportion of voters are informed and vote for a party strictly on the basis of the effect of its policy on their utility. The rest of the voters are uninformed and their support for a party depends on the intensity of its campaign. This, in turn, depends on contributions from the lobby. As well as devoting resources to lobbying the firm can invest in period 1 to lower costs in period 2. The details of the set-up are as follows.

2.1 The Firm

The regulated company is the only organized interest group or lobby in this economy. It may spend resources with the aim of capturing the will of the public decision-makers, although it does not have a prior preference for any of the parties. In period \( t = 1, 2 \), the firm produces a quantity \( q_t \) of a homogeneous good at total cost

\[
C_t = k_t + a q_t; \quad k_1 = k + i; \quad k_2 = k - f(i)
\]  

(1)
where \( k \) are fixed costs in the first period, \( i \) is monetary investment in period 1 which leads to a lowering of fixed cost of \( f(i) \) in period 2. We assume \( f' > 0, f'' < 0 \). The good is sold at a price \( p_t = \psi(q_t) \) where \( \psi(\cdot) \) is the inverse demand curve.

In period 1 with the regulated price \( p_1 \) and therefore quantity \( q_1 = \psi^{-1}(p_1) \) predetermined, the firm can also devote an amount \( s^j \geq 0, j = L, R \) to lobby the support of party \( j \) for its pricing policy \( p_2^j \) in period 2. The firm is risk neutral and maximizes expected profits. Profits in periods \( t = 1, 2 \), taking into account political contributions, are given by

\[
U_1(p_1, i, s^L, s^R) = p_1q_1 - C_1 - s^L - s^R = (p_1 - c)\psi^{-1}(p_1) - k - i - s^L - s^R \tag{2}
\]

\[
U_2(p_2^j, i) = p_2^jq_2^j - C_2 = (p_2^j - c)\psi^{-1}(p_2^j) - k + f(i), j = L, R \tag{3}
\]

depending on whether party \( L \) or \( R \) is elected in period 2. Suppose first that the elected party has previously rejected the firm’s lobby; then in period 2, given \( i \), it chooses \( p_2 \) to maximize consumers’ net surplus \( W(p_2) \), subject to the firm’s second-period participation constraint \( U_2(p_2, i) \geq 0 \). The standard result of this optimization problem is that the constraint binds, so that \( U_2(p_2, i) = 0 \) which determines \( p_2 = p_2(i) \) and output \( q_2 = \psi^{-1}(p_2(i)) = q_2(i) \). Then, since there is no incentive to invest, we must have that \( i = 0 \) is chosen by the firm in period 1. This should be compared with the first-best outcome, subject to the firm’s participation constraint given by

\[
U_2(p_2, i) = (p_2 - c)\psi^{-1}(p_2) - k + f(i) = 0 \tag{4}
\]

\[
\delta f'(i) = 1 \tag{5}
\]

Notice that to achieve this first-best it is necessary, but not sufficient that the regulator commits; there must also be commitment by the firm over the two periods not to quit the relationship. Otherwise the firm can invest nothing in the first period, enjoy higher rent and still secure zero rent in the second period by closing.

### 2.2 The Voters

There are two types of voters: informed and uninformed. Informed voters, who are a proportion \( \theta \) of the population, are agents who know and understand the parties’ positions on regulatory policy. They derive utility

\[
u^i(p_2^j) = dW(p_2^j) + \phi(j) \alpha^i, \text{ for } j = L, R \tag{6}
\]

where \( W(p_2^j) \) is the net consumer surplus from pricing policy \( p_2^j \), \( \phi(L) = 0 \) and \( \phi(R) = 1 \). In (6), \( d > 0 \) denotes a measure of the importance of regulatory policy
for the voters’ decisions and \(\alpha^i\), unknown to the parties, denotes the \textit{ex ante} bias of an informed individual for party \(R\) before the electoral campaign and before the policy announcement. In other words, \(\alpha^i\) reflects the informed voters’ preferences for the immutable characteristics and program of the parties.

The parties cannot observe the \textit{ex ante} propclivities of any particular voter, although they presume these to be drawn from a known cumulative distribution \(F(\alpha^i)\). In particular, the party bias is distributed according to a uniform distribution in the interval \([-\frac{1}{2} - a, \frac{1}{2} - a]\), where \(a\) reflects an \textit{a priori} advantage for party \(L\). Any one of these informed voters votes for party \(L\) or \(R\) taking into account the difference in the utility she derives from \(p_L^2\) and \(p_R^2\) and taking into account her \textit{a priori} preferences for one of the parties. It follows from (6) that an informed voter prefers party \(L\) if \(d(W(p_L^2) - W(p_R^2)) > \alpha^i\). This defines the critical value \(\tilde{\alpha}\) as:

\[
\tilde{\alpha} = d(W(p_L^2) - W(p_R^2))
\]

Then all informed voters with values of \(\alpha^i < \tilde{\alpha}\) will vote for party \(L\), and all the rest for party \(R\). Thus the distribution function of \(\alpha^i\) can be used as an explicit functional form for the proportion of voters that prefer party \(L\). In particular, from the parties’ point of view there is a probability

\[
F[\tilde{\alpha}] = \int_{-\frac{1}{2} - a}^{\tilde{\alpha}} di = \frac{1}{2} + a + d \left[ W(p_L^2) - W(p_R^2) \right]
\]

that the informed individual \(i\) will vote for party \(L\). Thus the expected proportion of the electorate that is informed and votes for party \(L\) is \(\theta \left[ a + \frac{1}{2} + d(W(p_L^2) - W(p_R^2)) \right]\).

Now consider uninformed voters, constituting a proportion \((1 - \theta)\) of the population, who do not know about the policy platforms of any of the parties. Let \(\alpha^{un}\), unknown to the parties, describe the \textit{ex ante} preferences of an uninformed voter for party \(R\) before the electoral campaign. These individuals decide their votes according to the impression that they get from the intensity or quality of the electoral campaigns. In this sense, the electoral campaigns are not informative. The intensity/quality \(h^j\) of party \(j\)'s campaign depends on the firm’s support to this party in the following form: \(h^j(s^j) = bs^j, j = L, R\). A typical uninformed voter derives utility

\[
u^{un} (h^j) = bs^j + \zeta (j) \alpha^{un} \quad \text{for} \quad j = L, R
\]

where \(\zeta (L) = 0\) and \(\zeta (R) = 1\). As for the informed voters, they vote for party \(L\) if \(u^{un} (h_L^2) - u^{un} (h_R^2) > \alpha^{un}\). Assuming \(\alpha^{un}\) has the same distribution as \(\alpha^i\):

\[
F[u^{un}(h_L^2) - u^{un}(h_R^2)] = \frac{1}{2} + a + b\left(s_L^p - s_R^p\right)
\]
is the probability that the uninformed voters will vote for party L. Then the expected proportion of the voters that are uninformed and that vote for party L is \( (1 - \theta) \left[ \frac{1}{2} + a + b \left( s^L - s^R \right) \right] \) and depends on the difference in the parties campaigns, which in turn is determined by the difference in the support that the firm gives to the two parties.

### 2.3 The Parties and the Government

The Parliament is elected with proportional representation. Each party seeks to maximize its vote share, or equivalently its representation in the Parliament, which with the maintained assumptions for party \( L \) is:

\[
P^L = \frac{1}{2} + a + \theta d [W(p^L_1) - W(p^R_1)] + (1 - \theta) b (s^L - s^R)
\]

and for party \( R \) is \( P^R = 1 - P^L \), given the nature of the two party system. The firm anticipates that the legislature adopts the regulatory policy \( p^L \) with probability \( \nu(p^L) \) and the regulatory policy \( p^R \) with probability \( 1 - \nu(p^L) \). The \textit{ex ante}, two-period objective function of the firm now becomes

\[
\Theta = U_1(p_1, i, s^L, s^R) + \delta [\nu(p^L)U_2(p^L_2, i) + (1 - \nu(p^L))U_2(p^R_2, i)]
\]

We make the following assumptions about \( \nu(p^L) \):

1) \( \nu' > 0 \)
2) \( \nu(\frac{1}{2}) = \frac{1}{2} \)
3) \( \nu'' > 0 \) for all \( P^L < \frac{1}{2} \) and \( \nu(0) = 0 \).
4) \( \nu'' < 0 \) for all \( P^L > \frac{1}{2} \) and \( \nu(p^L) \to 1 \) as \( P^L \to \infty \).

Properties 1) and 2) are obvious requirements, while 3) and 4) ensure that \( \nu \) can be interpreted as a probability.\(^7\) We interpret (11) as the electoral support for the regulation policy of party L. Since \( \nu'(p^L) > 0 \), (11) says that incumbent L party has an advantage \( (a > 0) \), and raising the consumer surplus of informed voters under policy L relative to R (the second term) and the relative lobbying of L (the third term) increases the chances of winning. The constant \( d > 0 \) and the constant \( b > 0 \), introduced in (6) and (9) make all terms in (11) dimensionless.

\(^7\)\( \nu \) introduces some noise in the implementation process of the policy platform. It could alternatively be assumed that \( \nu = 1 \) if \( P^L > P^R \), without any noise and the qualitative results would not change.
3 The Political Equilibrium

The timing of events is as follows:
1. At the beginning of period 1, given the regulated price $p_1$ the firm chooses output $q_1 = \psi^{-1}(p_1)$.
2. The firm offers contracts $(s^j, p^j)$ to parties $j = L, R$.
3. The parties independently accept or refuse offers.
4. The firm chooses investment $i$.
5. The election takes place.
6. At the beginning of period 2, the regulator either implements $p_2 = \psi^j$ with probability $\nu(P^j)$ decided at stage 2, for $j = L, R$, or $p_2 = p_2(i)$, where $p_2(i)$ is a solution to $U_2(p_2, i) = 0$, if the elected party refused a contract. Figure 1 shows the extensive form of the game. In this dynamic game of full information, the appropriate equilibrium concept is a subgame perfect equilibrium found by backward induction starting at stage 6:

**Stage 6.**
The regulator implements $\psi^j$ for party $j = L, R$ resulting in profits

$$U_2^j = U_2(\psi^j, i) = (p^j - c)\psi^{-1}(p^j) - k + f(i); j = L, R$$  \hspace{1cm} (13)
If the contract was turned down by the winning party, \( p_2 = p_2(i) \) resulting in 
\[ U_2(p_2(i), i) = 0. \]

**Stage 5.**
The election takes place which the incumbent L party wins with probability \( \nu(P^L) \) where \( P^L \) is given by (11).

**Stage 4.**
If neither party has signed a contract, the firm anticipates that profits will be zero whatever investment is made. Hence \( i = 0 \) in this case. In the political equilibrium we will show that a contract is either signed with both parties, or only with the incumbent L party. If a contract is only signed with the L party, investment is chosen to maximize

\[
(p_1 - c)\psi^{-1}(p_1) - k - i - s^L + \delta\nu(P^L)U^L_2(p^L_2, i)
\]

(14)

Using (13) and the fact that \( P^L \) is independent of investment \( i \) (which turns out to be consistent with the equilibrium - see stage 2, below), the first order conditions for this optimization can be written

\[
1 = \delta\nu(P^L) f'(i)
\]

(15)

to give an investment level \( i = i^L \), say. If any investment occurs, then \( i = i^L \) is chosen; but this is a local maximum. Investment results in a lower regulated price and it may be better for the firm to choose zero investment. In choosing whether to offer the party a political contract, the firm will anticipate the incentives this creates for investment. It will offer a contract \( p^j_j \) with investment \( i = i^L \) iff this is preferable to no contract with zero investment \( (p_2 = p_2(0) = p^*_2, \text{say}); \) i.e., iff

\[
i^L \leq \delta\nu(P^L)[U_2(p^*_2, i^L) - U_2(p^*_2, 0)] = \delta\nu(P^L)U_2(p^L_2, i^L)
\]

(16)

If a contract is signed with the R party as well, investment is chosen to maximize

\[
(p_1 - c)q_1 - k - i - s^L - s^R + \delta[\nu(P^L)U_2(p^L_2) + (1 - \nu(P^L))U_2(p^R_2)]
\]

(17)

Again using (13), the first order conditions for this optimization can be written

\[
1 = \delta f'(i^R)
\]

(18)

resulting in investment \( i = i^R > i^L \), say. The condition for \( i = i^R \) to be preferred to \( i = 0 \) is that

\[
i^R \leq \delta[\nu(P^L)U_2(p^L_2, i^R) + (1 - \nu(P^L))U_2(p^R_2, i^R)]
\]

(19)
Stage 3.
Party L always has the option of refusing the lobby’s offer and then implementing the price $p^*_2$. Then from (11) it captures the share of votes

$$P^* = \frac{1}{2} + a + \theta d[W(p^*_2) - W(p^R)] + (1 - \theta)b(0 - s^R) \quad (20)$$

It follows that if the firm wants to affect the regulated price, it needs to provide the L party with sufficient funds to obtain votes $P^L > P^*$. A similar argument applies to party R. Using (11), (20) and its counterpart for the R party, the condition for party to accept the contract is:

$$s^j \geq \frac{d\theta}{b(1 - \theta)} [W(p^*_2) - W(p^j_2)] ; \quad j = L, R \quad (21)$$

Stage 2.
The firm chooses $(s^j, p^j_2)$ to maximize $\Theta$ given by (12), subject to (21). The latter constraint must bind for $j = L$ if

$$\frac{\partial \Theta}{\partial s^L} = \delta \nu'(P^L) \frac{\partial P^L}{\partial s^L} [U_2(p^L, i) - U_2(p^R, i)] - 1 \leq 0 \quad (22)$$

where from (11) $\frac{\partial P^L}{\partial s^L} = (1 - \theta)b$; i.e., if the marginal benefit from the first dollar of extra contribution to L is not higher than its marginal cost. Similarly (21) binds for $j = R$ if

$$\frac{\partial \Theta}{\partial s^R} = \delta \nu'(P^R)(1 - \theta)b [U_2(p^L, i) - U_2(p^R, i)] - 1 \leq 0 \quad (23)$$

If party L is the more popular party $(a > 0)$, it follows that $P^L > P^R$. Therefore since $\nu'' > 0$, it follows that $\nu'(P^R) < \nu'(P^L)$. Hence from (22) and (23), $\frac{\partial \Theta}{\partial s^R} < \frac{\partial \Theta}{\partial s^L}$ and if (22) holds for party L, condition (23) must hold for the R party too. In what follows we examine equilibria for which $b\nu'(P^j)$ is sufficiently small so as (22) and therefore (23) hold. Then (21) holds with equality and from (20) $P^L = \frac{1}{2} + a$, i.e., $P^L$ is independent of $s^j$ and investment which we have already assumed in the investment decision at stage 2.

There is one more condition to consider. The firm will only offer a contract $(s^j, p^j_2)$ if, in conjunction with anticipated investment, it improves intertemporal rent. The condition for this is

$$s^j \leq \delta \nu(P^j) (U_2(p^j_2, i) - U_2(p^*_2, 0)) = \delta \nu^j U_2(p^j_2, i) ; \quad j = L, R \quad (24)$$
where \( \nu^j = \nu(P^j) = \nu(a + \frac{1}{2}) \) for \( j = L \) and \( 1 - \nu(a + \frac{1}{2}) \) for \( j = R \). Then using (21) with equality, the optimal contract for the firm to offer to party \( j \) implements a price \( p^j_2 = p^j_2 \) to maximize:

\[
\delta \nu^j U_2(p^j_2, i) - s^j = \nu^j U_2(p_2, i) + \frac{d\theta}{b(1 - \theta)} W(p^j_2) + \text{constant}
\]  

subject to (24), i.e., \( \delta \nu^j U_2(p^j_2, i) \geq s^j \).

The first order condition for the unconstrained optimization problem is

\[
\nu^j \frac{\partial U_2}{\partial p^j_2} + \frac{d\theta}{b(1 - \theta)} W'(p^j_2) = 0
\]  

Using the fact that the net consumer surplus is given by

\[
W(p^j_2) = \int_{p^j_2}^{\infty} \psi^{-1}(p') dp'
\]  

we have that \( W'(p^j_2) = -q^j_2 \). Using this result and \( \frac{\partial U_2}{\partial p^j_2} = q^j_2 + (p^j_2 - c) \frac{dq^j_2}{dp^j_2} \), (26) becomes

\[
L^j = \frac{p^j_2 - c}{p^j_2} = \frac{\delta \nu^j b(1 - \theta) - d\theta}{\delta \nu^j b(1 - \theta) \eta(p^j_2)}
\]  

where \( L^j \) is the Lerner index for party \( j \) and \( \eta(p^j_2) = -\frac{q^j_2 dq^j_2}{a^j_2 dp^j_2} \) is the elasticity of demand.

Assume that the elasticity of demand is a constant denoted by \( \eta \). We can now characterize the regulated price and the choice of investment by the firm in a political equilibrium.

\[
\frac{p^j_2}{c} = \frac{\delta \nu^j b(1 - \theta) \eta}{\delta \nu^j b(1 - \theta) (\eta - 1) + d\theta} \quad \text{if} \quad \nu^j U_2(p^j_2, i) \geq s^j \\
= \frac{p^j_2}{c} \quad \text{otherwise}
\]  

We can now identify three possible equilibria depending on the proportion of informed voters:

**Type A** (well-informed voters): \( \theta \in (\hat{\theta}_L, 1] \). Then no contracts are signed, \( p_2 = p^*_2 \), \( U^L = U^R = i = 0 \).

**Type B** (moderately-informed voters): \( \theta \in (\hat{\theta}_R, \hat{\theta}_L] \). Then \( U^L, s^L > 0; U^R = s^R = 0 \). Investment \( i = i^L \) is given by \( 1 = \delta \nu^L f'(i) \), provided the price is sufficiently high that the condition (16) holds, in which case investment is positive but below the
first-best. Otherwise \( i = 0 \). Let \( p_2 = p_2^j(i) \) be the solution to \( \delta \nu^j U_2(p_2, i) = s^j \). Then thresholds \( \hat{\theta}_j, j = L, R \) are given by

\[
p_2^j(i^j) = \frac{\delta \nu^j b(1 - \hat{\theta}_j) \eta}{\delta \nu^j b(1 - \hat{\theta}_j) (\eta - 1) + d \hat{\theta}_j}, \quad j = L, R
\]

This equilibrium exits if \( \hat{\theta}_R < \hat{\theta}_L \). From (30) this condition means

\[
\frac{p_2^L(i^L)}{\nu^L} < \frac{p_2^R(i^R)}{\nu^R}
\]

Although \( \nu^L > \nu^R \), because \( p_2^L(i^L) > p_2^R(i^R) \), (31) may not hold, for example as \( \nu^L \) approaches \( \nu^R \). Then the B equilibrium does not exist.

**Type C** (poorly-informed voters): \( \theta \in (0, \hat{\theta}_R] \). Then \( U^L, s^L > 0 ; U^R, s^R > 0 \) and investment, \( i = i^R \) is higher than in equilibrium B and given by \( 1 = \delta f'(i) \), provided the price is sufficiently high that condition (19) holds, in which case investment is first-best. Otherwise \( i = i^L \) or \( i = 0 \), depending on the conditions given for type B. As the proportion \( \theta \) of informed voters becomes small, the regulated price rises which outweighs any welfare gain to the consumer from higher investment. We summarize these results in the following proposition.

**Proposition 1**

There are three possible equilibria, depending on how well-informed are the voters. In equilibrium A, a well-informed democracy, there are no lobbies and parties choose the regulated price to maximize consumer surplus. Rent is forced to zero and no investment occurs. In equilibrium B with a moderately informed electorate, only the incumbent party is lobbied resulting in a higher regulated price and positive rent if that party is elected. Investment can now be positive, but is below the first-best. In equilibrium C with a poorly informed electorate, the opposition is also lobbied and implements a regulated price with positive rent, though both are less than that offered by the incumbent. Investment can now reach its first-best.

Figure 2 illustrates these equilibria by plotting \( p/c \) against \( \phi = \eta b(1 - \theta)/(d \theta) \) for the case where the price elasticity \( \eta = 1 \), for which the relationship (29) is linear. Then price-contracts are given by \( p^j/c = \nu^j \phi \) for \( j = L, R \) for the two parties.\(^8\) At \( \phi = a, \theta = \hat{\theta}_L \) and if the firm invests at \( i = i^L \), given by \( 1 = \delta \nu^L f'(i) \), it expects a positive rent.\(^9\) However at \( \phi = a \), the L-price is too low for \( i = i^L \) to be preferable

\(^8\)For \( \eta > 1 \), the price-marginal cost curves are concave and are bounded above by the monopoly value \( p/c = 1/(1 - 1/\eta) \).

\(^9\)Note that by differentiating \( \delta \nu^j U(p, \phi^j) = s^j = \frac{\delta \phi}{\nu^j} [W(p^j_2) - W(p)] \) with respect to \( \phi \) we find that this curve is concave in \((p/c, \phi)\) space and cuts the \( p = p_2^j \) at a turning point, as shown in the figure.
Figure 2: The Three Equilibria and Price Mark-up

to \( i = 0 \), and it is not until a higher value of \( \phi \) (and a lower \( \theta \)) at \( \phi = a' \) that condition (16) for \( i = i^L \) is satisfied.

The dashed line in figure 2 shows the movement of the regulated price. For the interval \( \phi \in [0, a'] \) investment remains at zero and the regulated price is \( p_2^s \) where, we recall, \( p_2^s \) is the price at which \( U_2(p_2^s, 0) = 0 \). For \( \phi \in [a', b'] \), \( i = i^L \) is optimal for the firm. The L-price then falls and subsequently moves along \( p^L/c = \nu^L \phi \), until at \( \phi = b' \), the higher investment given by \( i = i^R \), where \( 1 = \delta f'(i) \), becomes preferable to \( i = i^L \). At \( \phi = b' \), the regulated R-price drops and then moves along \( p^R/c = \nu^R \phi \). For \( \phi > b' \) both L and R prices are rising and consumer surplus is falling. Eventually \( \phi \) will reach a threshold at which the average price over the L and P parties exceeds \( p_2^s \) and then disinformation is counterproductive for the consumer. This point is pursued further in the welfare analysis of the next section.

4 Delegation to an Independent Regulator

Now suppose that voters are well-informed (i.e., \( \theta = 1 \)) so no lobbying takes place. In this well-functioning democracy there is under-investment unless the government is able to commit to its regulated price before investment is made. But if no such commitment mechanism is in place, can the under-investment problem be solved?
Following Spulber and Besanko (1992), and Currie, Levine and Rickman (1998), we explore a second-best commitment mechanism in which the pricing decision is delegated to an independent regulator whose preferences do not necessarily coincide with those of the government. The significance of the independence of the regulator is that the choice of regulator and their decisions cannot be over-ruled after the sunk investment has been made by the firm.

The timing of events for the delegation game is as follows:
1. At the beginning of period 1 the price is predetermined by the previous regime and the firm chooses output $q_1 = \psi^{-1}(p_1)$.
2. The firm government delegates price regulation to an independent regulator with objective function:
   \[ W(p_2) + \alpha U_2(\psi(p_2), \delta) \]  
   in period 2, where $\alpha \geq 1$ measures the extent to which the regulator is pro-industry. In the previous political equilibrium if the voters are well-informed, the government responds by maximizing (32) with $\alpha = 0$. If voters own the regulated firm then a utilitarian social welfare with $\alpha = 1$ would be chosen.
3. The firm chooses investment $\delta$.
4. At the beginning of period 2, the regulator chooses $p_2$ to maximize (32).

Solving for a subgame perfect equilibrium, at stage 4 the independent regulator solves the problem:

\[
\text{Given } \delta \text{ maximize w.r.t } q_2 \quad [W(p_2) + \alpha U_2(\psi(p_2), \delta)]
\]  
subject to $U_2(p_2, \delta) = (p_2 - c)q_2 - k - f(\delta) \geq 0$.

The solution to this problem follows as for stage 2 of the political equilibrium. The unconstrained optimization problem leads to a Lerner index
\[
L = \frac{p_2 - c}{p_2} = \frac{\alpha - 1}{\alpha \eta(p_2)}
\]  
As before assume a constant elasticity $\eta(p_2) = \eta$. Then the regulated price is given by
\[
\frac{p_2}{c} = \frac{\alpha \eta}{\alpha(\eta - 1) + 1} \text{ if } U_2(p_2, \delta) \geq 0
\]
\[
= \frac{\hat{p}_2^*}{c} \quad \text{otherwise}
\]  
Clearly $U_2 < 0$ if $\alpha = 1$, the case of a representative regulator. But as $\alpha$ increases, eventually the Lerner price in (35) is high enough to give non-negative rent at some
threshold value $\alpha = \hat{\alpha}(i) > 1$. Given this choice of price at stage 4, at stage 3 if the participation constraint binds in period 2 and $U_2(p_2(i), i) = 0$ irrespective of investment, then the firm does not invest. When $\alpha > \hat{\alpha}(i)$ the constraint ceases to bind and the price $p_2$ is then given by (35). This increases with $\alpha$, which increases the rent. Now an incentive to invest may exist. If the firm does choose to invest it will achieve a local maximum of the 2-period rents

$$ (p_1 - c)\psi^{-1}(p_1) - k - i + \delta[(p_2 - c)\psi^{-1}(p_2) - k - f(i)]$$

(36)
given $p_2$ at $i = i^{FB}$ (the first-best) satisfying

$$ 1 = \delta f'(i) $$

(37)

However $i = i^{FB}$ is preferable to $i = 0$ only if the intertemporal rent

$$ \delta U_2(p_2(i^{FB}), i^{FB}) - i^{FB} > 0 $$

(38)

Then we must have that $\alpha > \overline{\alpha}$, say, for $p_2$ to be high enough for this condition to be satisfied.
Figure 4: The Delegation Game: Price and Rent

Figure 3 illustrates this investment decision. The function $\hat{\alpha}(i)$ is obtained from (34) as

$$\hat{\alpha}(i) = \frac{1}{1 - \eta(p_2(i))}$$

(39)

It is straightforward to show that this function is downward-sloping as shown in the figure. At $\alpha = \hat{\alpha}(i^{FB})$ the participation constraint ceases to bind, but the intertemporal rent, $\delta U_2 - i$, is negative and the firm does not invest. The weight $\alpha$ must rise to $\alpha = \bar{\alpha}$ before $\delta U_2 - i \geq 0$ and an incentive to invest emerges.

Figures 4, 5, and 6 provide some numerical solutions of the delegation equilibrium for the functional form and particular parameter values shown. In figure 4, for $\alpha < \bar{\alpha}$, investment and rent are zero and the price is given by $p_2^* = p_2^*(0) > p_2(i^{FB})$. For $\alpha \in [\hat{\alpha}(i^{FB}), \bar{\alpha})$, $p_2$ rises until the rent in period 2 is sufficient to satisfy condition (38) and induce the optimal level of investment. In figure 5, if the government inadvertently chooses a more pro-industry regulator, the regulated price rises and consumer surplus falls until at another threshold $\bar{\alpha}$, for $\alpha > \bar{\alpha}$ delegation becomes counterproductive. In figure 6 the social welfare is utilitarian and the threshold increases. Proposition 2 summarizes these results.

10Functional forms and parameter values are: $f(i) = i^\gamma$; $A = 2$, $\gamma = 0.5$, $c = k = 1$, $\eta = 1.1$, $\delta = 0.95^5$, $b = d = 1$. In our 2-period model, this choice of $\delta$ can be interpreted as an annual 5% discount rate over a 5-year regulatory review period.
**Figure 5: The Delegation Game: Welfare=W(p)**

**Proposition 2**

Delegation to a sufficiently pro-industry regulator with \( \alpha > \bar{\alpha} > \hat{\alpha}(i^{FR}) > 1 \) results in the first-best investment outcome, but at a price exceeding the first-best. For some interval, \( \alpha \in [\bar{\alpha}, \bar{\alpha}] \), welfare under delegation is higher than that under a representative regulator. For \( \alpha > \bar{\alpha} \), delegation is counterproductive.

Finally, we note an exact equivalence between the political and delegation equilibria for the case where the incumbent party has no advantage. Then \( a = 0 \), \( \nu_L = \nu_R = \frac{1}{2} \) and the same contract is signed with both parties. By equating (28) and (34) we can see that all details of the two equilibria in the second period are identical if the pro-industry regulator is chosen with \( \alpha = b(1 - \theta)\nu/d\theta \), and if lobbying costs are negligible.

We can use this equivalence result to interpret figures 5 and 6 in terms of both political and delegation equilibria. From figure 5, if social welfare is defined as consumer net surplus, then \([\bar{\alpha}, \bar{\alpha}] = [1.8, 2.4]\). From figure 6, with a utilitarian welfare function this interval becomes \([\bar{\alpha}, \bar{\alpha}] = [1.8, 3.7]\). Using the mapping \( \alpha = b(1 - \theta)\nu/d\theta \), these translate into the following approximate intervals for the proportion of informed voters: \([0.30, 0.36]\) and \([0.21, 0.36]\). The results can be summarized in the form of the following equivalence proposition:
Figure 6: The Delegation Game: Welfare=$W(p) + U(p, i)$

Proposition 3
If the incumbent party has no advantage and $\nu_L = \nu_R = \frac{1}{2}$, then the political and delegation equilibria are equivalent, apart from lobbying costs incurred by the firm, if $\alpha = b(1 - \theta)\nu / d\theta$

5 Empirical Evidence

In this section, we present the empirical implications of the model, relate them to the recent empirical literature and present some illustrative evidence.

5.1 Empirical Implications

The theoretical results for a political equilibrium where a proportion of voters are uninformed and the regulator is in effect the government, and a delegation equilibrium where the regulator is independent, has the following empirical implications: first, commitment, rationed information and regulatory independence are substitutes. In the presence of sunk costs that must be covered by regulated prices, the ability of both the regulator and the firm to commit to future policies delivers first best price and investment. Commitment may be achieved through constitutional constraints or through the development of a judicial tradition, such as the
'fair' rate of return tradition in the U.S. The theoretical literature that examines trigger-strategy equilibria, reviewed in the introduction, shows that the commitment outcome may be sustained as 'reputational' equilibrium even in the absence of these constraints. However there are logical problems with these equilibria. Then under-investment may be alleviated through an optimal degree of voters' information or through regulatory independence. Regulatory independence may deliver higher welfare than the information mechanism (which depends on wasteful rent-seeking activities). However, it is our conjecture that in some countries independence may not be credible or sustainable, and hence the relevance of the "voters' information" case.

Second, in the absence of commitment, capture or regulatory independence become more necessary to alleviate under-investment the larger the returns to investment and the higher the discount factor. If the investment in regulated sectors is crucial for the development of a country, some mechanism to alleviate under-investment becomes necessary. On the contrary, if the country already has a high level of physical infrastructure, the mechanisms to alleviate under-investment become less important. Moreover, when agents attach a high value to the future (due to political stability or to low interest rates, for example) the welfare-enhancing properties of the information mechanism or regulatory independence become more evident.

The institutional mix in every country develops endogenously depending on more primitive political and economic parameters. The model presented lays the preliminary theoretical foundations of a research agenda that makes more precise the idea that effective regulation depends on the institutional endowment of each country (see Levy and Spiller, 1996).

5.2 Relationship with the Empirical Literature

Wallsten (1999) and Bortolotti et al. (1998) are the only papers known to the authors that quantify the effects of a separate regulatory authority in a cross-section of countries. However, they acknowledge that the lack of detail in their measure of institutional characteristics is an important limitation of their conclusions. Wallsten concludes that privatization combined with a separate regulatory authority (which is interpreted as signalling a move towards regulatory reform and is measured as a dummy variable that does not distinguish between independent separate authorities and non-independent separate authorities) has a significantly positive effect on network expansion and labour productivity in telecommunications. Bortolotti et
al find that regulatory independence in electricity (measured as a dummy variable that can take only two extreme values), when included in an index of regulatory certainty together with access regulation and the existence of a wholesale market, has a positive effect on privatization revenues, as capturing a reduction in regulatory risk.

Henisz and Zelner (2000) use an index of political commitment which has a positively significant effect on network deployment. Their index is not specific to the regulated network sectors, although they use it to test the hypothesis for the telecommunications industry. Consequently, they admit that a more detailed study of the regulatory institutions is warranted.

Besley and Coate (2000) test a model where regulators that are directly elected by the voters are pro-consumer. Their evidence shows that prices are lower in those US states that elect their regulator than in those where the regulator is appointed by politicians. They also show that investment is higher in states that appoint the regulator. Although this study does not deal with the issue of regulator independence and its validity is limited to the US case, it shows the potential of empirically testing the effect of institutional choices on prices and investment. In common with our approach they also stress the effect of voters’ information on lobbying and policy determination.

Although the empirical evidence is scarce (especially when compared to the literature on Central Bank Independence), the general conclusion is that isolating regulators from political pressures can have a positive effect on private investment, which is consistent with the delegation model presented above.

5.3 Case Studies

It has been stressed above that there is some degree of substitutability between regulator independence, commitment and information rationing. The availability of potential regulators with different preferences and the difficulties of sustaining the regulatory independence model can best be seen in the British case. In other regions, the administration of the information given to voters has emerged from our political model as a possible role for non-independent, separate regulatory authorities. We consider these cases in turn.

5.3.1 The Independent Regulators in the U.K.

The British case shows the plausibility of one of the assumptions of our model, namely the availability of regulators with different preferences. The British system
of separate regulatory offices that decide on licences and prices according to the different privatization acts has been proclaimed as an example of regulatory independence. Regulators have wide discretion and longer terms in office than governments, and when governments select a regulator they can choose between potential regulators with clearly discernible preferences, according to their public track record.

Table 1 shows examples of the reaction of stock prices to changes in the identity of the regulator, as further evidence of the existence of regulators with different preferences vis-a-vis industry rents. It reports the abnormal returns (A.R.), i.e., the difference between the percentage change in the firm’s or sector’s shares and the percentage change of a benchmark portfolio. In this case, and following the standard techniques in the event study literature, the abnormal returns are computed as the difference between company or sector returns and market returns for two ‘event windows’: the announcement date and the day after, and the period between announcement day and the subsequent 30 days. This gives a measure of the fraction of the stock returns that is caused by the event of interest and not by normal market fluctuations. t-statistics are computed using the standard deviation of the time series of the difference between company or portfolio returns and market index returns for a time period that goes between 400 days and 50 days before the event (the ‘estimation window’).

<table>
<thead>
<tr>
<th>Industry</th>
<th>Regulator</th>
<th>Date</th>
<th>2 day A.R.$^a$ (t)</th>
<th>1 month A.R. (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telecom</td>
<td>David Edmonds</td>
<td>23-3-98</td>
<td>-4 (-1.81)</td>
<td>-3.56 (-0.34)</td>
</tr>
<tr>
<td>Energy</td>
<td>Callum McCarthy</td>
<td>24-9-98</td>
<td>0.4 (0.28)</td>
<td>1.6 (0.12)</td>
</tr>
<tr>
<td>Water</td>
<td>Philip Fletcher</td>
<td>23-6-00</td>
<td>0.08 (0)</td>
<td>-2.26 (-0.30)</td>
</tr>
<tr>
<td>Railways</td>
<td>Tom Winsor</td>
<td>24-3-99</td>
<td>-1 (-0.34)</td>
<td>-23 (-1.75)</td>
</tr>
</tbody>
</table>

a: The A.R.’s in each case are those of BT, FTSE Electricity, FTSE Water, and Railtrack. The market index used is FTSE All Share. Stock market data is obtained from Sequencer.

The examples suggest that governments can certainly choose between regulators with different preferences. All the appointments in the table were made by the British government in the period 1998-2000. They are illustrative of the delegation policy followed by New Labour.

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$^a$See Armitage (1995).

$^{12}$Biographical data has been obtained from the web pages of the Departments of Trade and Industry and Transport, Environment and the Regions.
Telecommunications. Mr. Edmonds was appointed by the then Secretary of Trade and Industry, Margaret Beckett. He had a career both as a civil servant and in business. Between 1966 and 1984 he had been in the Department of the Environment and then became the Chief Executive of the Housing Corporation. In 1991 he joined the Natwest Group where he was appointed Managing Director of Group Central Services in 1995. He was also Chairman of CRISIS, the national charity for the single homeless and was also involved in other charitable and related functions in the Natwest Group. The incumbent firm, BT, reacted with a significant (at the 10% level) negative abnormal return to his appointment, probably interpreting that his background was not a guarantee of a pro-industry or pro-incumbent stance. However, the overall effect one month later was neutral, so that probably when BT investors had more time to learn about his background they did not anticipate a significant change in the effect of regulation on the firm’s value.

Energy. Although Mr. McCarthy was appointed by a different Secretary of Trade and Industry, namely Peter Mandelson, his track record was similar to that of Mr. Edmonds. He also had a career as a civil servant and in finance. He had a PhD in Economics and his last position had been as Chief Executive Officer of Barclays Bank in Japan and North America. The post of new energy Regulator had been advertised in The Sunday Times and The Economist. The effect of his appointment on the stock price of the companies was neutral.

Water. The announcement of the appointment of Mr. Fletcher by Deputy Prime Minister John Prescott as water regulator was also accompanied by the statement that it was “following an open competition.” He was at that time the Receiver for the Metropolitan Police District. As such, he was the procurement authority for the Metropolitan Police. Before that, he had been a civil servant in the Department of the Environment. His biographical note in OFWAT claims that he had gained wide experience in partnerships between government, business and voluntary sectors. He was promoted to Under-Secretary in 1986 as Director of Central Finance, Department of the Environment, where he took part in discussions leading up to the privatisation of the water industry. The reaction of the industry to his appointment was neutral.

Railways. John Prescott appointed Mr. Winsor as Rail Regulator, with a key role in determining the level and structure of Railtrack’s access charges and reviewing the company’s investment programme. The new regulator was a lawyer. His last position had been as a Partner of Denton Hall since 1991 where he was involved in the privatisation of the Northern Ireland Electricity Industry. He had already worked for the Office of the Rail Regulator as Chief Legal Adviser and General Counsel to the
Rail Regulator. Significantly Mr. Winsor had advised a number of train operating companies who had to pay the access charges to Railtrack. Although the initial reaction of Railtrack’s shares was fairly neutral, it became clearly negative (the one month abnormal return is significantly negative at the 10% level) in the subsequent weeks, after the new regulator had made a number of statements announcing a tough regulatory climate for Railtrack.

Interestingly, three of the four regulators whose appointment has been analyzed were 54 years old. The fourth, Mr. Winsor, was much younger: 41. This is consistent with the idea that successful delegation requires the appointment of regulators with well-known track records, in terms of preferences and competence, something difficult to achieve with younger regulators. With the exception of the rail regulator, and the immediate response to the appointment in telecoms, the effect of the New Labour’s appointments was fairly neutral on the value of the companies. This is suggestive of a successful delegation strategy, taking into account that the previous regulators had been appointed by the Conservative government. A plausible conjecture is that the politicians were appointing regulators with more pro-industry preferences than their own.

It is important to observe that there are limits to the regulator’s independence. In the particular case of the UK, for example, majorities can change all (they can certainly change the degree of regulator independence), and there are no significant checks and balances as in the US. The windfall tax passed by the Labour government immediately after winning the 1997 election is an example of the powers still reserved to the government. In 2000, the government was trying to pass a Utilities Bill in the Parliament that was deemed to reduce regulatory independence.

5.3.2 Countries without an Independent Regulator

We use the example of some countries to show, first, that governments may find it difficult to create genuinely independent regulatory agencies (the cases of Peru and Argentina); and second, that either commitment without an independent regulator or lobbying with disinformation (the latter mechanism, at the cost of high prices and wasteful rent-seeking) can play an equally important role in the attempts to alleviate the underinvestment problem (the cases of Chile, Spain, Mexico). Non-

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13The existence of agencies that claim to be independent but lack some of the attributes of genuine independence suggests the need for an accurate and realistic measure of regulatory independence. We leave this for future research. The fact that the dividing line between independent and non-independent regulators is ambiguous motivates the stress we place on the background and profile of ‘independent’ regulators.
independent separate regulatory authorities can play an important role either as commitment devices to best practice or as institutions that decide on the amount of information to be provided to voters. As it can be seen, all these mechanisms have their own problems and are subject to tensions. What we stress is that governments face choices (subject to national constraints), and that there are different imperfect mechanisms to achieve similar results in terms of investment in a dynamic environment.

In Peru, following the recommendations of international institutions and experts, the government appointed a so-called independent regulatory commission for telecoms, but the separation of powers between the regulator and the government is ill-defined and the conflicts have been frequent. The governmental ministry has a more technical profile and the regulator a more economic one, but the frontier is ambiguous. The lack of a truly transparent and democratic political system reduces the credibility of the arrangement, although it has not prevented a foreign operator, Spanish Telefonica, from staying as the main telecommunications investor in the country in the last 10 years. See Barrionuevo and Lahera (1998).

In Argentina, there is a significant difference between the institutional arrangements in telecommunications and in electricity. The telephone system was privatized by divesting two regional monopolies, without creating an independent regulatory authority. Some safeguards to the investors were introduced after privatization, following the lack of transparency and accusations of corruption in the privatization process. Bortolotti et al. (1999) argue that these changes increased the regulatory risk faced by investors. The attempts by the government to introduce competition in local telephony in 2000 led to the incumbents launching a campaign against the new Communications Secretary (the main regulatory authority and a member of the government), Enoch Aguiar, who is accused of having connections with the US new entrants. According to Bortolotti et al, the electricity sector was privatized following (and learning from) the telecommunications experience: the regulatory compact was well established before privatization, creating a competitive electricity market regulated by an independent authority.

In Spain, Miguel Ángel Fernández Ordóñez, the Chairman of the Electricity agency since it was created in 1995, was an economist and politician with a well-known track record as a pro-competition advocate. He had previously been the Chairman of the antitrust authority. He gave a high profile to the electricity agency, although it had very limited powers. One of the priorities of the agency was to disseminate as much information as possible about the industry and to operate as a think tank in the defense of consumer interests. He pushed for a fast liberalization
and was involved in very serious controversies with the government in the years 1997 and 1998, involving the concentration of the electricity industry and the securitization of the stranded costs. The government was criticized for colluding with the large electricity firms. Fernández Ordóñez eventually resigned and was replaced in 1999 by a regulator with a lower profile. In terms of our model, a plausible interpretation is that the government thought that the regulator was giving too much information to the electorate and that a regulator with a lower profile would transmit less information. Similarly, the agency in telecommunications has some powers but the government reserves to itself the final word.

In Chile, the government has made no attempts to appoint independent regulators. However, during the key stages of regulatory reform, the minister in charge of Energy was a liberal in the center left coalition, very much in favour of liberalization (Alejandro Jadresic). The regulatory structures are under-staffed and weak confronting the companies. The Constitution, the legislation and the presidential system with numerous checks and balances provide a remarkable level of protection of property rights in regulated sectors. In economic terms, this is an example of commitment, and neither regulatory independence nor information rationing were actually needed. The long presence of a centre-left government, however, coinciding with economic crises and droughts, has triggered popular unrest in demand of a tougher regulatory regime (see Trillas, 2000, and references therein), which places doubts on the sustainability of the present commitment mechanisms.

In Mexico, the current telecoms regulator is Jorge Nicolín, a technocrat appointed in 1999 by the then incumbent PRI government. The government tries to give an image of independence to the regulatory authority, but this is hardly credible given the privileged position of the incumbent, Telmex, whose main shareholder, Carlos Slim, was until recently one of the main contributors to the (until 2000) ruling party, the PRI. It is an example of a country without commitment (as reflected by consumer leverage, patronage, free connection to the electricity network in poor areas), high capture in telecommunications and stalled privatization in electricity. In telecommunications, it is interesting to note the coincidence of both high investment and high incumbent’s rents. The context was of political stability

\footnote{In the absence of commitment, capture or sustainable regulator independence, the involvement of the private sector may become impossible. See Levy and Spiller (1996). This may be reflected in the impossibility to privatize a nationalized company or in the strategy of a private company to spin off the regulated assets as stand alone companies (not necessarily for profit, as the proposal of the water company Kelda in 2000 in the UK, for the mutualization of the infrastructure assets, shows).}
(slow transition to democracy) and high investment returns, which as predicted by our model increases the gains to be obtained from capture.

6 Conclusions

We have compared two settings, one with a politically constrained regulator and one with an independent ‘pro-industry’ regulator, and shown that there is an equivalence among them, given that the ‘right’ type of regulator can be found and that the ‘right’ amount of voters are informed about regulatory policies. The model illustrates under which conditions and at what price the under-investment problem in the absence of regulatory commitment can be alleviated. In both cases, political constraints and regulatory independence, the price to be paid for re-establishing first best investment is a higher price than the first best and high rents for the regulated firm. The strategic value of keeping a fraction of voters uninformed and of appointing a pro-industry regulator increases with the returns to investment and with the discount factor.

Our results throw some light on how a regulatory regime might achieve effective regulation whether through government-dependent or independent regulators. Effective regulation must achieve: first, the freedom to respond to the latest information regarding the industry; i.e., it must involve discretion on the part of the regulator. Of course, as remarked in the introduction, this is not a requirement in our complete information set-up, but does apply in a more realistic setting where the regulator is continually up-dating her model of the firm and its environment and needs to adjust policy accordingly. Second, it should achieve socially optimal levels of both investment and effort. This latter rules out direct controls or ‘rate of return’ regulation. Third, the consumer should benefit from higher investment through lower prices. Our paper shows that with discretion, a government-dependent regulator that provides the public with just the right amount of information, or delegation to an independent regulator of just the right type will achieve these objectives.

This in a sense is a positive rather than normative result. If we observe good regulation it could be coming about through either of these mechanisms. To derive normative conclusions we note that we have relocated the problem as one of choosing the correct $\alpha$ or $\theta$. The former problem seems easier to solve. As we have argued regulators have track records; those who have achieved the three objectives above must have the right $\alpha$. New regulators should be aware of the problem posed in our model and be prepared to build up a reputation for achieving the ‘right balance
between the needs of consumers and the firm’ (i.e., a reputation for having the right α). Some formal modelling of this process might be worthwhile in future work.

The setting presented here has focused on very stylized regulatory characteristics. We have studied regulation under complete information, but our delegation approach is also appropriate where the firm possesses asymmetric information. Then even without the investment issue, delegation can alleviate the ‘ratchet effect’ (see Currie et al., 1999); with investment delegation addresses both the ratchet effect and the under-investment problem (see Levine and Rickman, 2001). Finally it is apparent that the empirical literature on regulatory regimes is in its infancy. Following the example of monetary policy and central bank independence, closer links between theoretical and empirical research would be beneficial. Then one direction for research would be the development of indices of ‘good regulatory practice’ comparable to measures of political and legal central bank independence, which could be tested as predictors of good industry performance.

References


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15 This could build on the regulatory assessment framework developed by Stern and Holder (1999) applied to the utilities of a selection of Asian economies


