PRIVATIZATION and CORRUPTION[1]

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Preliminary Version

Abstract

This paper offers a theory of how the degree of corruption that prevails in a society responds to changes in the ownership structure of major public service providers. We show that there are cases where private ownership, even though it fosters investments in infrastructure, also opens the door to more corruption. The public dissatisfaction towards privatization is crucially affected by this degree of corruption. Our model thus helps understand the seemingly paradoxical situation prevailing in Latin America, where most studies find that privatizations have been efficiency-enhancing and have fostered investments and, at the same time, popular dissatisfaction with the process is extremely high. We show that this line of explanation is supported by stylized facts from surveys in the region.

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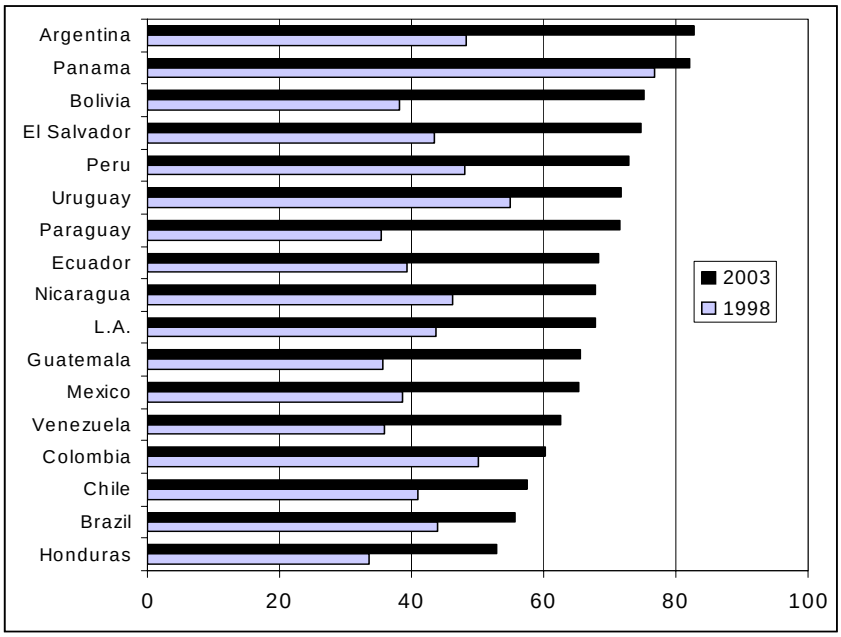
1 Introduction

Since the second half of the 1980s, Latin America has been the leading region in attracting private participation in infrastructure projects, from telecommunication and energy (electricity and natural gas) to transport (roads, railways, ports and airports) and water (potable water and sewage). Between 1990 and 2001, this type of investments in the Latin American and Caribbean region amounted to $361 bn., approximately 48% of the total for developing countries.[1] Looking from a different angle, in Latin America the proceeds from privatization in the period 1990-99 summed up to $178 bn. (equivalent to 56.3% or total privatization revenues in the developing world).[2] As a result, the share of Latin American State-owned-enterprises (SOE's) as a percentage of GDP declined from 10% in 1985 to around 5.5% in 1997[3] Strikingly, by the early 2000s there is in most Latin American countries a strong and rising public discontent with the outcome of privatization, a decline in private investors' interest and an often open defiance from newly elected governments. By now, the optimistic mood of the 1990s is largely forgotten, and some even question the validity of the privatization paradigm that once was a cornerstone of reforms in the region. Talks of renationalization are even sometimes heard.

Figure 1: Percentage of respondents who (strongly) disagree that privatization has been beneficial for their country



Source: Latinobarometro 2001 and 2003.

[1] See Harris (2003).

[2] This should be compared, for instance with $65 bn. in Eastern Europe and Central Asia, and $44 bn. in East Asia and the Pacific (Chong and López-de-Silanes, 2004).

[3] See Sheshinski and López-Calva (2003).

As far as public perceptions are concerned, the main evidence comes from Latinobarometro, a survey of public opinion conducted yearly in several Latin American countries[4] since 1995. As of 2003, in the 17 countries surveyed, negative views of privatization ranged from 53% in Honduras to 83% in Argentina, for a Latin American average above 67%. Furthermore, negative opinions had increased significantly since 1998, going for example from below 50% to 83% in Argentina, from 38% to 75% in Bolivia and from 48% to almost 73% in Peru (see Figure 1)[5].

On the other hand, most evaluations of the impact of privatization point to improvements in financial and operating performance.[6] For instance, Chong and Lopéz-de-Silanes (2004), in a recent effort to overcome the sample selection bias inherent to reduced sample studies and to get comparable data across seven Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Mexico, Peru), document improvements in profitability (net income to sales, operating income to sales), in operating efficiency (cost per unit, sales to assets and sales to employee ratio), and in output after the change in ownership.

Additionally, a number of studies[7] have focused on the impact of those privatizations on fiscal balance,[8] social welfare,[9] prices,[10] employment, and wages.[11] In a nutshell, it appears that to date, and despite a relatively adverse economic phase in the late 90s, privatization improved fiscal stability and had mostly neutral to positive effects on welfare and social outcomes,[12] while the two areas in which some negative effects are observed are prices and employment. The available evidence shows that prices may have increased in about half of the privatization cases, to bring heavily subsidized prices in line with marginal costs, attract much needed investments and quality improvements, as well as allow tariff changes when cross-subsidies were eliminated. As for employment, substantial initial job losses in the privatized firms were limited as a percentage of the total workforce and tended to be (at least partially) reversed in the medium run.

Given this, there is little discussion that the relatively mixed balance on prices and employment is unlikely by itself to explain the surge in discontent throughout the region. This suggests either a massive communication failure regarding the positive effects of

[4] See www.latinobarometro.org (last visited 18/10/05).

[5] Dissatisfaction is computed as the sum of the shares of respondents who declare that they disagree or strongly disagree with the statement "Privatizations of state enterprises have been beneficial to the country". Unfortunately, the questions' wording regarding satisfaction with privatizations was changed in 2004, making comparisons difficult.

[6] See La Porta and Lopéz-de-Silanes (1999), Megginson and Netter (2001), Kikeri and Nellis (2002) *inter alia*).

[7] These papers are summarized and discussed in more details in Martimort and Straub (2005).

[8] See Davis, Ossowski, Richardson and Barnett (2000).

[9] Galiani, Gertler and Schargrodsky (2005), and McKenzie and Mookherjee (2003).

[10] McKenzie and Mookherjee (2003), Lora and Panizza (2002).

[11] Kikeri and Nellis (2002), López-Calva and Rosellón (2002), and La Porta and López-de-Silanes (1999).

[12] Such as infant mortality in the case of water.

reforms, or that some of the negative effects that shape the public disapproval have gone unnoticed.

A dimension of the problem that has been largely overlooked though, when trying to understand public perceptions of privatizations has to do with corruption and the perceived transparency of the privatization process on the one hand, and the way resulting gains and losses in terms of income distribution have affected different social groups.

While there is some evidence that petty corruption in the day-to-day operations of former public utilities may have decreased as a consequence of privatization,[13] in particular because of better service coverage (less rationing), there is also a strong presumption that grand-level corruption may have been fuelled by the privatization process. This could seriously undermine its potential benefits by shifting the distribution of potential rents and also by possibly modifying the actual composition of the reform process.[14]

It is important to note that, as the ownership structure is modified, the groups likely to benefit from or to pay the cost of corruption change. As already noticed by Shleifer and Vishny (1994), while taxpayers are likely to suffer the primary burden of political subsidies and bribes under public ownership, the cost shifts to consumers of the specific services with private ownership. These different groups also have different levels of organization, homogeneity and costs of organizing themselves as active political actors. This in turn may have an impact on how much they would invest in uncovering and controlling corruption or, alternatively, on how much political pressure they would exert as constituencies.[15] As corruption has consistently been ranked as a top preoccupation in the region, this shift in corruption patterns is likely to constitute an important explanation of the massive upsurge in dissatisfaction with privatizations.

Our theory shows how the degree of corruption responds to changes in the ownership structure of major public service providers. Our main conclusion is that there are cases where private ownership, even though it fosters investments also opens the door to more corruption. In turn, public dissatisfaction towards privatization is crucially affected by this degree of corruption. More precisely, we shall argue that, although public and private ownerships are both subject to corruption, these corruptions are of a different kinds, have different likelihoods in equilibrium, and might be perceived quite differently by the general public. The important point we want to stress is that corruption between non-benevolent public officials and the firm might emerge more easily, precisely for the very reasons that make privatization socially beneficial, namely *a harder budget constraint* due to restricted

[13] See Clarke and Xu (2004).

[14] See Rose-Ackerman (1999) and Martimort and Straub (2005), for a discussion of the channels through which corruption may destroy the benefits from privatizations. These include the use of inside information at the pre-award stage, renegotiations (Guasch, Laffont and Straub, 2003 and 2005; Engel, Fischer and Galetovic, 2003), and obstacles to the introduction of competition.

[15] See Olson (1971).

transfers between the State and the firm. A hardened budget constraint under private ownership fosters investments but shifts also the burden of corruption on consumers. Our model will thus explain a seemingly paradoxical situation where both efficiency and investments are fostered and, at the same time, corruption and dissatisfaction are more pronounced.

Let us see in more details how the ownership structure and the kinds of control rights exerted by public officials affect both the patterns of investments and corruption. Since Kornai (1956), it is by-now well known that public firms suffer from the so-called *soft-budget constraint.* As an owner, the Government cannot refrain from siphoning the Treasury to cover the cost overruns of a public firm. Anticipating these extra subsidies, the managers of public firms have little incentives to cut on costs. Under-investment in cost-reducing infrastructure prevails under public ownership. The other consequence of allowing direct transfers between the Government and the public firms is that any kind of collusion between public officials and the manager of the public firm takes the form of inflated subsidies which siphon the Treasury to please private interests. Those manipulations are thus perceived as a burden only by taxpayers and do not appear significant to consumers.

On the other hand, it has often been argued that a key benefit of private ownership comes from the fact that the government stays at arm's length with the private firm. By committing itself not to use lump-sum transfers to finance cost overruns, the government hardens the firm's budget constraint. This fosters cost-reducing investments and improves welfare. Indeed, in the absence of public funds, the manager of a private firm can only cover costs with the firm's revenues. However, raising price mark-ups to cover inefficient fixed costs also dampens demand. Under a hard-budget constraint, consumers discipline the firm. This increases incentives to invest in cost-reducing infrastructure. However, the hidden side of this *hard budget constraint* is that collusion between public officials and the firm takes now the form of softened price regulation. Consumers might be quite sensitive to the corresponding price increases. The burden of corruption is thus quite different under private ownership and, as a result, the extent to which society perceives corruption changes with the ownership structure.

Literature Review: Our definition of ownership is standard. It relies on the unrestricted exercise of residual rights of control which stems from the ability to use transfers to finance (or refinance) the firm under public ownership. This definition is thus the same as in Schleifer and Vishny (1994) and Bennedsen (2000). However, because it is based on *informational asymmetries* to justify first the existing information rent of firms, second, the discretion of public officials, our model provides solid micro-foundations for the stakes of corruption. It does not a priori differentiate between corruption between a private or a public manager and a public official as those previous studies. Any such difference comes

from the existing differences in incentives that arise under both governance modes.

Although the soft versus hard budget constraint debate has by-now been put on firmer theoretical grounds,[16] no one has to the best of our knowledge analyzed the consequences of tightening the firm's budget on the stakes and degrees of corruption that may emerge. Nevertheless, our paper bears some similarity with Coate and Morris (1995) who argue that inefficient redistributive tools may be used to transfer resources towards private interests. A similar phenomenon arises here: because it suppresses direct transfers from taxpayers to the public firm, privatization may change the collusive stakes between the public official and the firm, sometimes increasing that stake and making corruption more likely.

The paper is organized as follows. Section 2 presents our theoretical model. Section 3 analyzes the benchmark of a benevolent public official. We focus there on the benefits of private ownership in hardening the firm's budget constraint and its positive impact on investment. Section 4 introduces the possibility of corruption and derives its consequences both for public and private ownership. Section 5 discusses the incentives of consumers to react to an increase in their own perception of corruption. Section 6 presents and discusses stylized facts from surveys in Latin America supporting the analysis put forward in the theoretical model. Section 7 concludes. Proofs are relegated to an Appendix.

2 The Model

We investigate the impact of the ownership structure on the degree of corruption that prevails in the economy. To distinguish between the objectives of society as a whole and those of the potentially corrupt politician (decision-maker) in charge of designing the firm's regulation, we will use a three-tier model of incentive regulation, general public/government/firm, along the lines of Laffont and Tirole (1993, Chapters 13 and following).

♦ **Ownership structures:** We shall analyze two different ownership structures:

- **Public ownership:** The decision-maker can use the general Treasury to make monetary transfers to the firm.[17] An incentive regulation of a public firm stipulates both the value of these transfers and the firm's output.
- **Private ownership:** No such direct transfers can be used. The private firm must cover its costs from its revenue. Although private, the firm is still subject to some

[16] See Dewatripont and Maskin (1995), Kornai, Maskin and Roland (2002) and Segal (1999) for more recent contributions.

[17] See Schleifer and Vishny (1994) for a similar assumption.

type of regulation in the form of quantity/price restrictions which affects the firm's revenue and its ability to cover its fixed-cost.

The basic difference between private and public ownerships comes thus from the government's inability to make direct transfers to the firm in the latter. This view is consistent with the host of evidence on the so-called soft-budget constraint faced by public firms. As an owner, the Government cannot refrain from siphoning the general budget to cover cost overruns of public firms. Instead, the Government, when its sole role consists in regulating a private firm, can no longer uses the Treasury to increase the firm's revenues. Of course, this difference in the firm's budget constraint has also implications on the latter's ex ante incentives to reduce fixed-cost. We shall address the implications of different ownership structures on investments in Section 3.

♦ **Preferences:** Let us turn to a description of the objective functions of each player. Social welfare incorporates the utilities of consumers, taxpayers and shareholders of the firm.[18] It writes as:

$$W = S(q) - P(q)q - (1+\lambda)(t+s) + U + V, \tag{1}$$

where $S(q) - P(q)q$ is the consumers' net surplus from consuming q units of the good, t is the transfer from the general budget to the firm and U is the firm's profit. The cost of public funds λ will play an important role in the forthcoming analysis. It measures the extend of the Government's budgetary problems.

The political decision-maker's utility can be written as:

$$V = s \geq 0, \tag{2}$$

where s is the share of the overall budget that this decision-maker can grasp for himself. The politician must of course obtain a positive utility from holding office.

One should not take too literally this term and view it only as the potential wage of holding office that a public official may secure. This may also stand for all the perquisites, prestige, career concerns that the politician may have. Note also that including the politician's utility into the social objective function may be warranted even though the politician by himself is negligible. For instance, he may represent a group (tribe, interest group, family with large economic stakes etc.) whose interests follow closely his own and are, at large, not negligible.

[18] In the case of a public firm, one can assume that shares are equally distributed among the public, whereas only owners hold such shares in the case of private ownership. In both cases, the expression of social welfare remains of course the same.

The firm's profit, whether private or public, can be written as:

$$U = t + P(q)q - \theta q - K(I) \geq 0, \tag{3}$$

where we normalize at zero the firm's outside opportunities.

This profit is made any direct transfer from the government, the firm's revenue and is net of the production cost. This entails a fixed-cost related to the size of an ex ante investment I performed by the firm. This fixed-cost may for instance be viewed as the cost of building an electricity, telecoms or water network. We will assume that $K'(I) < 0$ with $K''(I) > 0$, so that a greater investment reduces the operating fixed-cost and does so at an increasing rate.

We will also assume that the investment I is non-verifiable although observable by both parties.[19] For instance, the government does not have the ability to commit beforehand to any regulatory scheme. The firm's investment is thus under the threat of regulatory hold-up.

For further references, it may be useful to rewrite social welfare as

$$W = S(q) + \lambda P(q)q - (1+\lambda)(\theta q + K(I)) - \lambda(U+V) - I.$$

♦ **Information structure:** Asymmetric information is a key-ingredient of our modeling in two respects. First, it will justifying the existence of information rents that the firm may get from holding private information. These rents are the engine of investment under private ownership.[20] Second, the desire to keep those rents also creates a motive for capturing the politician and having them exert discretion to favor the firm rather than the general public.

Following the lessons of the New Regulatory Economics,[21] the firm has private information on its marginal cost parameter θ. For simplicity, we adopt a simple discrete framework: The efficiency parameter may only take two values, $\theta \in \Theta = \{\underline{\theta}, \bar{\theta}\}$, with respective probabilities ν and $1-\nu$.

Bridging this information gap between the rest of society which remains uninformed and the firm, the politician observes a hard information signal $\sigma \in \Sigma = \{\underline{\theta}, \emptyset\}$ with respective probabilities $\nu\varepsilon$ and $1-\nu\varepsilon$. The firm and the politician both know σ. By hiding evidence that the firm is efficient, the politician may thus let the firm enjoy some rent. This discretion opens the door to the possibility that the politician get corrupted.

[19] This is a standard assumption in the incomplete contract literature, see Hart (1995).
[20] See Riordan (1990) and Schmidt (1996) for similar arguments.
[21] See Laffont (1994).

♦ **Corruption:** We shall assume that when the firm offers x dollars of bribes to the politician, the latter benefits only from a fraction kx of this amount. The non-negative parameter $k \leq 1$ reflects thus the efficiency of a collusive side-deal. This parameter captures whether norms of collusive behavior can easily be sustained or not, the degree of "corruption culture", the more or less important psychological costs from being corrupted, etc.[22]

We shall assume that k and is drawn according to a CDF $F(\cdot)$ with everywhere positive density $f(\cdot)$ on $[0,1]$. Moreover, the following monotone hazard rate property is assumed to hold:

$$\frac{d}{dk}\left(\frac{F(k)}{f(k)}\right) > 0.$$

The collusion technology is known to both the firm and the politician but not to the general public.

It is important to stress that the randomness of k renders invalid the Collusion-Proofness Principle.[23] For a given regulatory contract which determines the possible stake of collusion between the politician and the firm, collusion may or may not happen depending on the prevailing technology. If the wage received by behaving and reporting socially valuable information exceeds the benefits of colluding, collusion does not occur and vice-versa. In standard models of collusive behavior[24] Raising the public official's wage above these collusive benefits is enough to always preventing collusion. When the benefits from colluding are uncertain, raising that wage above the maximal benefit corresponding to $k = 1$ may be too costly. Indeed reducing this wage induces some corruption for the most efficient collusive technologies whereas corruption is still prevented for the least efficient ones; but doing so reduces also the budgetary burden that those wages induce on society. Hence allowing some corruption in equilibrium is always optimal.

The timing of the game is in Figure 2.

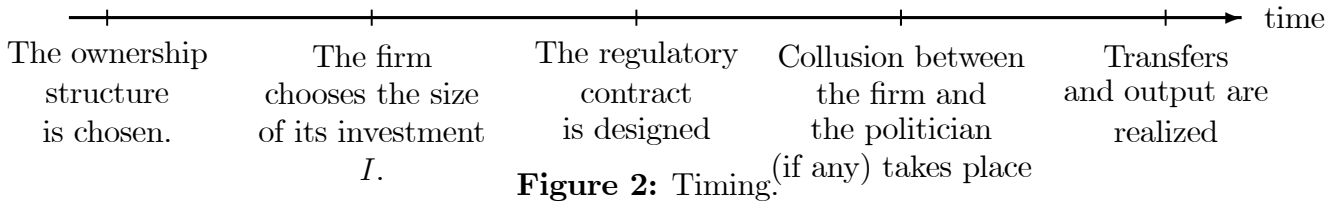


Figure 2: Timing.

[22] See Faure-Grimaud, Laffont and Martimort (2002) for further motivations behind this parameter.

[23] See Tirole (1986) for a proof of this Principle. Tirole (1992) also analyzes a model where the collusion technology k is unknown but may take only two values. He shows that collusion may be an equilibrium phenomenon when the efficient technology of collusion is unlikely.

[24] See again Tirole (1986, and 1992).

From the Revelation Principle,[25] the most general class of contracts which are feasible given the information structure is of the form

$$\left\{s(\hat{\theta},\hat{\sigma});\ t(\hat{\theta},\hat{\sigma});\ q(\hat{\theta},\hat{\sigma})\right\}_{\hat{\theta}\in\Theta,\,\hat{\sigma}\in\Sigma}$$

where $\hat{\theta}$ is the firm's report on its cost and $\hat{\sigma}$ is the politician's report on the signal he has got on the firm's cost. For the sake of simplifying notations, we will denote

$$\left\{(\underline{s}^*,\underline{t}^*,\underline{q}^*);\ (\underline{s},\underline{t},\underline{q});\ (\bar{s},\bar{t},\bar{q})\right\}$$

such a contract. $(\underline{s}^*,\underline{t}^*,\underline{q}^*)$ are respectively the politician benefits from holding office, the firm's transfer and its output when $\underline{\sigma}=\underline{\theta}$ (and thus $\theta=\underline{\theta}$). $(\underline{s},\underline{t},\underline{q})$ and $(\bar{s},\bar{t},\bar{q})$ are the same variables when $\sigma=\emptyset$ and respectively $\theta=\underline{\theta}$ and $\theta=\bar{\theta}$. Similar notations are used for the firm's profit $\underline{U}^*,\underline{U}$ and $\bar{U}$ in each state of nature.

3 Benchmark: Benevolent Politician

A benevolent politician uses any piece of private information he may have learned on the firm to maximize social welfare and does not need to be paid any positive wage for doing so. Alternatively, with a benevolent politician, everything happens as if the efficiency of collusive deals k was identically null.

♦ **Public Ownership:** When $\sigma=\underline{\theta}$ is observed and reported by the politician, the firm enjoys a profit

$$\underline{U}^*=\underline{t}^*+(P(\underline{q}^*)-\underline{\theta})\underline{q}^*-K(I)\geq 0. \tag{4}$$

When the uninformative signal $\sigma=\emptyset$ is instead observed by the politician, a regulatory mechanism is incentive-feasible when it satisfies the following incentive and participation constraints:

$$\underline{U} = \underline{t}+(P(\underline{q})-\underline{\theta})\underline{q}-K(I)\geq \bar{t}+(P(\bar{q})-\underline{\theta})\bar{q}-K(I)=\bar{U}+\Delta\theta\bar{q}, \tag{5}$$

$$\bar{U} = \bar{t}+(P(\bar{q})-\bar{\theta})\bar{q}-K(I)\geq 0. \tag{6}$$

In two-types adverse selection problems as the present one where transfers are allowed, it is standard to show that only the efficient firm's incentive constraint and the inefficient one's participation constraint are relevant.[26] We will see below that, when transfers are

[25] See Green and Laffont (1977) and Myerson (1979).

[26] See Laffont and Martimort (2002, Chapter 2).

not allowed (i.e., the firm is private), the following inefficient firm's incentive constraint also matters:[27]

$$\bar{U} \geq \underline{U} - \Delta\theta \underline{q}. \tag{7}$$

The optimal regulation with a benevolent politician under public ownership is summarized in the next proposition:

Proposition 1 *: Under public ownership and with a benevolent politician, the optimal outputs are respectively given by the following Ramsey formula:*

⋆ *For an efficient firm,* $\underline{q}^B_{Pu} = \underline{q}^{*B}_{Pu}$*, such that*

$$P\left(\underline{q}^B_{Pu}\right) - \underline{\theta} = -\frac{\lambda}{1+\lambda} P'\left(\underline{q}^B_{Pu}\right) \underline{q}^B_{Pu}; \tag{8}$$

⋆ *For an inefficient firm,*

$$P\left(\underline{q}^B_{Pu}\right) - \left(\bar{\theta} + \frac{\nu}{1-\nu}\frac{\lambda}{1+\lambda}\Delta\theta\right) = -\frac{\lambda}{1+\lambda} P'\left(\bar{q}^B_{Pu}\right) \bar{q}^B_{Pu}. \tag{9}$$

Only the efficient firm gets an information rent when $\sigma = \emptyset$*. This rent does not depend on its ex ante investment:*

$$\underline{U}^B_{Pu} = \Delta\theta \bar{q}^B_{Pu} > 0 = \bar{U}^B_{Pu} = \underline{U}^{*B}_{Pu}. \tag{10}$$

The public firm does not invest, $I_{Pu} = 0$*.*

Outputs follow traditional Ramsey formulas in this model with costly public funds. However, because of asymmetric information, the true cost of an inefficient firm $\bar{\theta}$ must be replaced by its virtual cost $\bar{\theta} + \frac{\nu}{1-\nu}\frac{\lambda}{1+\lambda}\Delta\theta$, which is greater. This reduces the output of an inefficient firm but also, and this is the benefit of doing so, the information rent that an efficient one can get.

It is important to note that the rent of the efficient firm does not depend on its investment under public ownership. Indeed, any reduction in the fixed-cost that such investment would trigger is passed on to the taxpayers under public ownership. Those taxpayers reduce indeed by the same amount the taxes they would pay to cover the firm's cost and have the firm at least break even. Nothing of this cost reduction is passed on to the firm itself which cannot internalize any of its investment. There is a complete dichotomy between the output decision, which depends only on variable costs, and the

[27] In particular (5) and (7) altogether imply that necessarily $\underline{q} \geq \bar{q}$ for any incentive relation, with and without transfer. Under private ownership, both incentive constraints will be binding and $\underline{q} = \bar{q}$.

investment decision. In other words, under public ownership the source of the firm's information rent lies in its marginal cost only and the firm's incentives to invest are unrelated to its rent.

Because he cannot refrain from using those transfers and cannot commit to reward investment which is non-verifiable, the politician is unable to induce any investment from the public firm.

♦ **Private ownership:** Under private ownership, transfers are no longer available. The number of instruments which can be used for screening purposes is thus reduced. As a result, only pooling mechanisms which stipulate a constant output $\bar{q} = \underline{q}$ are available when the politician is uninformed, i.e., when $\sigma = \emptyset$. Of course, an optimal regulation can still set a different output $\underline{q}^*$ when the politician is instead informed and $\sigma = \underline{\theta}$.

Proposition 2 *: Under private ownership and a benevolent regulator, the optimal outputs are respectively given by the following formula:*

⋆ *For* $\sigma = \underline{\theta}$*,*

$$P\left(\underline{q}_{Pr}^{*B}\right) - \underline{\theta} = -\frac{\lambda^*(I)}{1+\lambda^*(I)} P'\left(\underline{q}_{Pr}^{*B}\right) \underline{q}_{Pr}^{*B}, \tag{11}$$

where $\lambda^*(I)$ *is strictly decreasing in* I *and determined by the zero-profit condition*

$$P\left(\underline{q}_{Pr}^{*B}\right) = \underline{\theta} + \frac{K(I)}{\underline{q}_{Pr}^{*B}}; \tag{12}$$

⋆ *For* $\sigma = \emptyset$*,* $\bar{q}_{Pr}^B = \underline{q}_{Pr}^B$ *such that*

$$P\left(\bar{q}_{Pr}^B\right) - \bar{\theta} = -\frac{\tilde{\lambda}(I)}{1+\tilde{\lambda}(I)} P'\left(\bar{q}_{Pr}^B\right) \bar{q}_{Pr}^B. \tag{13}$$

where $\tilde{\lambda}(I)$ *is strictly decreasing in* I *and determined by the zero-profit condition for an inefficient firm*

$$P\left(\bar{q}_{Pr}^B\right) - \bar{\theta} = \frac{K(I)}{\bar{q}_{Pr}^B}. \tag{14}$$

Only the efficient firm gets an information rent

$$\underline{U}_{Pr}^B = \Delta\theta \bar{q}_{Pr}^B, \quad \text{and} \quad \underline{U}_{Pr}^{*B} = \bar{U}_{Pr}^B = 0. \tag{15}$$

The firm invests a positive amount I_{Pr}^B *given by:*

$$\nu\Delta\theta \frac{\partial \bar{q}^B}{\partial I}(I_{Pr}^B) = 1. \tag{16}$$

The intuition behind this Proposition is straightforward. When regulatory transfers are banned, the only way that the firm's budget constraint can be satisfied is by decreasing output, raising the price mark-up (equations (11) and (13)) in such a way that revenues cover the fixed-cost. Of course, doing so is easier and requires less output distortion when the fixed-cost itself is small enough (the multipliers of the binding zero-profit constraints decrease in I). The output distortions, and thus the rent that an efficient firm gets, are now directly linked to the size of the investment. This desire for securing enough rent ex post creates the firm's ex ante incentives to invest. Private ownership comes with a harder budget constraint and more ex ante investment.[28]

4 Corruption

let us now consider the case of a non-benevolent politician who can thus be corrupted by the industry. Contrary to most of the existing literature on capture,[29] there exists a whole distribution of non-benevolent politicians, who differ in terms of their willingness to collude with private interests, or to put it differently, in terms of the transaction costs of collusive behavior that they face when engaging in side-deals. This assumption ensures that corruption is always an *equilibrium phenomenon*; i.e., at the social optimum, there is always some positive probability that the public official is corrupted.

To see that point formally, observe that the stake of corruption in our model is the rent $\Delta\theta\bar{q}_i (i \in \{Pu, Pr\})$ that the firm can secure whenever the informed politician ($\sigma = \underline{\theta}$) reports instead having observed nothing ($\hat{\sigma} = \emptyset$). Whenever his benefits of doing so exceed the gains $\Delta\theta\bar{q}_i$ from being corrupted, the politician reports publicly the hard information on the firm being efficient and pockets the corresponding reward s_i^*. This occurs with probability

$$\Pr\left\{\tilde{k}\Delta\theta\bar{q}_i \leq s_i^*\right\} = F\left(\frac{s_i^*}{\Delta\theta\bar{q}_i}\right).$$

Instead, when the collusion technology is sufficiently efficient, namely when $\tilde{k}\Delta\theta\bar{q}_i > s_i^*$, the politician hides evidence on the type of the firm and prefers to accept its favor rather than behaving.

When corruption is possible, we may write expected welfare under any ownership

[28] Although this result has the flavor of a those found in Riordan (1990), Schmidt (1996) and Faure-Grimaud (2001), it should also be contrasted with those papers along several lines. In our model, the difference between the ownership structures comes from the different contracting abilities of the Government as an owner and the Government as a simple regulator, not from differences in the information structures as it is assumed (in the first two pieces) or derived (in the last one) in these works. Also, investment in the previous literature affects the distribution of marginal cost not the fixed-cost as here.

[29] See Laffont and Tirole (1993, Chapter 15) for instance.

regime i ($i \in \{Pu, Pr\}$) as:

$$\begin{aligned}
\underset{(\theta,\sigma)}{E}(W_i) &= \nu\varepsilon F\left(\frac{s_i^*}{\Delta\theta\bar{q}_i}\right)\left(S(\underline{q}_i^*) - \underline{\theta}\underline{q}_i^* - \lambda(\underline{t}_i^* + s_i^*)\right) \\
&+\nu\varepsilon\int_{\frac{s_i^*}{\Delta\theta\bar{q}_i}}^{1}\left(S(\underline{q}_i) - \underline{\theta}\underline{q}_i - \lambda\underline{t}_i + (\tilde{k}-1)\Delta\theta\bar{q}_i\right)f(\tilde{k})dk \\
&+\nu(1-\varepsilon)\left(S(\underline{q}_i) - \underline{\theta}\underline{q}_i - \lambda\underline{t}_i\right) \\
&+(1-\nu)\left(S(\bar{q}_i) - \bar{\theta}\bar{q}_i - \lambda\bar{t}_i\right) - K(I) - I_i, \qquad (17)
\end{aligned}$$

where $\underset{(\theta,\sigma)}{E}(\cdot)$ is the expectation operator.

This expression shows that, whenever corruption happens, the politicians enjoys the benefits $\tilde{k}\Delta\theta\bar{q}_i$ and the firm, when public, receives a transfer $\underline{t}_i$ from the general budget even though the signal σ learned by the politician is informative. In that case, the firm gets no rent since the politician has all the bargaining power in negotiating bribes with the firm. Note also that, when corruption is an equilibrium phenomenon, the regulatory scheme is still designed to induce information revelation from the firm, but of course, this is costly in terms of information rent left to the firm and finally pocketed (at least partially) by the politician.

The optimal incentive regulation with corruption must maximize (17) subject to the incentive and participation constraints (4) to (7).

Of particular importance is the optimization with respect to s_i^*, the politician's wage. To understand the corresponding first-order condition, it is useful to stress two different impacts of raising s_i^*. On the one hand, raising s_i^* indeed increases the probability that the politician prefers not to be corrupted. On the other hand, doing so is of course socially costly.

To better understand this optimization, let us define $k_i^* = \frac{s_i^*}{\Delta\theta\bar{q}_i}$ as a new optimization variable which replaces s_i^*. k_i^* is a threshold in the efficiency of the collusive technologies above which corruption occurs in equilibrium. The corresponding first-order condition with respect to k_i^* becomes:[30]

$$\left\{\left[S(\underline{q}_i^*) - \underline{\theta}\underline{q}_i^* - (S(\underline{q}_i) - \underline{\theta}\underline{q}_i)\right] + \Delta\theta\bar{q}^i - \lambda[\underline{t}_i^* - \underline{t}_i] - (1+\lambda)k_i^*\Delta\theta\bar{q}_i\right\}f(k_i^*) = \lambda F(k_i^*)\Delta\theta\bar{q}_i. \qquad (18)$$

This condition can be simplified further by using the property of the optimal regulatory contract in each ownership regime. This is this task to which we turn now.

[30] This condition is also sufficient thanks to the monotonicity of the hazard rate, which ensures quasi-concavity with respect to k_i^*.

4.1 Public Ownership

Consider the case of public ownership. Two remarks are in order.

First, Proposition 1 shows that production is first-best, i.e., $\underline{q}_{Pu} = \underline{q}^*_{Pu}$ at the optimal contract if the politician is benevolent. It is easy to check that this condition still holds[31] if the politician is corruptible.

Second, still using the fact that (4) and (5) are binding at the optimal contract, we get the following difference between the firm's transfers between the case where its type is reported by the politician and the case where it is not:

$$\underline{t}_{Pu} - \underline{t}^*_{Pu} = \Delta\theta \bar{q}_{Pu}.$$

Intuitively, when the politician is not corrupted and informed, he helps society to extract the efficient firm's rent $\Delta\theta\bar{q}_{Pu}$. This reduces the burden of incentive regulation on taxpayers by the same amount.

Finally, using the two remarks above, we can simplify (18) to get that k^*_{Pu} solves:

$$k^*_{Pu} + \frac{\lambda}{1+\lambda}\frac{F}{f}\frac{(k^*_{Pu})}{(k^*_{Pu})} = 1. \tag{19}$$

Because the monotone hazard rate property holds, the left-hand side of (19) is strictly increasing and this equation admits a unique solution in $]0,1[$ so that corruption is *always* an equilibrium phenomenon.

Proposition 3 *: The probability of corruption* $1 - F(k^*_{Pu})$ *is always positive with public ownership and it increases with the cost of public funds* λ*.*

Indeed, as λ increases, fighting corruption by raising s^*_{Pu} becomes increasingly costly from a social viewpoint. It is then preferable to let more corruption occur at equilibrium.

The other impact of corruption is that it changes the firm's output pattern and the distribution of rents, without nevertheless affecting the incentives to invest.

Proposition 4 *: Under public ownership and with a corruptible politician, the efficient firm always produces efficiently* $\underline{q}^c_{Pu} = \underline{q}^{*c} = \underline{q}^B_{Pu}$*, whereas the inefficient firm output becomes:*

$$P(\bar{q}^c_{Pu}) - \left(\bar{\theta} + \frac{\lambda\nu}{(1+\lambda)(1-\nu)}\left(\varepsilon\left(\lambda k^* F(k^*) + \int_{k^*}^{1}(1-\tilde{k})d\tilde{k}\right) + 1\right)\Delta\theta\right) = \frac{-\lambda}{1+\lambda}P'(\bar{q}^c_{Pu})\bar{q}^c_{Pu}. \tag{20}$$

[31] See the Appendix for details.

Only the efficient firm obtains a rent $\underline{U}^c_{Pu} = \Delta\theta \bar{q}^c_{pu}$*, which does not depend on the investment level so that still the public firm has no incentives to invest and* $I^c_{Pu} = 0$*.*

Everything happens now as if the virtual cost parameter of an inefficient firm was now

$$\bar{\theta} + \frac{\lambda}{(1+\lambda)} \frac{\nu}{(1-\nu)} \left(1 + \varepsilon \left(\lambda k^* F(k^*) + \int_{k^*}^{1} (1-\tilde{k}) d\tilde{k}\right)\right) \Delta\theta.$$

Compared with the case of a benevolent politician, this virtual cost is of course greater. This captures the fact that now distortions automatically arise when the political is informed. Those distortions have two sources: first, they come from the fact that a socially costly wage is given to the politician to ensure that he behaves; second, they are related to the benefit taken from the firm and pocketed by the corrupted politician, which however is less than the benefit that would accrue to the firm thanks to the existing transaction costs of side-contracting. Indeed, even when he colludes with the firm, the politician is not paid and only enjoys a fraction k of the rent. This is less than the full amount that society must give up in the absence of this politician. The marginal benefit of using the politician is thus the average transaction cost $1-k$ over the highest values of k, those for which corruption occurs.

Still, even with corruption, the public firm's expected rent does not depend on its investment, so that again public ownership goes hand in hand with some underinvestment.

4.2 Private Ownership

With private ownership, transfers cannot be used and outputs are pooling when no informative signal is revealed by the politician ($\sigma = \emptyset$), namely $\underline{q}^* > \underline{q} = \bar{q}$.

Condition (18) can now be simplified to get the new expression of the cut-off:

$$k^*_{Pr} + \frac{\lambda}{1+\lambda} \frac{F(k^*_{Pr})}{f(k^*_{Pr})} = \frac{S(\underline{q}^*_{Pr}) - \underline{\theta q}^*_{Pr} - [S(\bar{q}_{Pr}) - \bar{\theta}\bar{q}_{Pr}]}{(1+\lambda)\Delta\theta\bar{q}_{Pr}}. \tag{21}$$

Again $\underline{q}^*_{Pr}$ and $\bar{q}_{Pr}$ take the same values as in (12) and (14), i.e., just help the firm to cover its fixed-cost in each state of nature.

To better understand (21) and compare it with (19), let us assume that $\Delta\theta$ is small enough. In that case, $\lambda^*(I)$ and $\tilde{\lambda}(I)$ are close to each other; denote $\lambda(I)$ the common

value. The right-hand side of (21) can now be approximated by:

$$\begin{aligned}\frac{1}{(1+\lambda)\Delta\theta\bar{q}_{Pr}}\left\{\Delta\theta\bar{q}_{Pr}+(P(\underline{q}^*_{Pr}-\underline{\theta})(\bar{q}_{Pr}-\underline{q}^*_{Pr})\right\}&=\frac{1}{(1+\lambda)\Delta\theta}\left\{\Delta\theta+\frac{K(I_{Pr})}{\underline{q}^*_{Pr}\bar{q}_{Pr}}(\bar{q}_{Pr}-\underline{q}^*_{Pr})\right\}\\&=\frac{1}{1+\lambda\Delta\theta}\{P(\underline{q}^*_{Pr})-P(\bar{q}_{Pr})\}=-\frac{P'(\underline{q}^*_{Pr})(\underline{q}^*_{Pr}-\bar{q}_{Pr})}{(1+\lambda)\Delta\theta}\\&=\frac{P'(\underline{q}^*_{Pr})}{(1+\lambda)\left(P'(\underline{q}^*_{Pr})+\frac{K(I_{Pr})}{\underline{q}^*_{Pr}\bar{q}_{Pr}}\right)}=\frac{1+\tilde{\lambda}(I)}{1+\lambda},\end{aligned}\tag{22}$$

where the last equality uses (11) and (12).

Finally, we obtain:

$$k^*_{Pr}+\frac{\lambda}{1+\lambda}\frac{F(k^*_{Pr})}{f(k^*_{Pr})}\approx\frac{1+\tilde{\lambda}(I)}{1+\lambda}<1\quad\Leftrightarrow\quad\tilde{\lambda}(I)<\lambda.$$

This gives immediately:

Proposition 5 *: Assume $\Delta\theta<\Delta\theta_0$ for some $\Delta\theta_0$ small enough, then the probability of corruption $1-F(k^*_{Pr})$ under private ownership is larger than the probability of corruption $1-F(k^*_{Pu})$ under public ownership if and only if $\tilde{\lambda}(I)>\lambda$.*

To understand the intuition behind this proposition, note that, under private ownership, the gains from having a non-corrupted politician are no longer pocketed by taxpayers but by consumers, who pay a lower price for the firm's output when it is efficient and the politician is informed. For $\Delta\theta$ small enough this gain on the consumers' surplus can be approximated by $(1+\tilde{\lambda}(I))\Delta\theta\bar{q}_{Pr}$. This is nothing else that the information rent of an efficient firm conveniently weighted by the factor $1+\tilde{\lambda}(I)$ to capture the impact that a truthful report of the politician has on hardening the efficient firm's break-even constraint.

As the firm's investment decreases and breaking even becomes harder for that firm, the multiplier $\tilde{\lambda}(I)$ increases. By the same token, the probability of corruption increases as well. This points at a negative correlation between investment and corruption under private ownership.

However, our model is consistent with the possibility that a positive investment under private ownership also comes with more corruption than under public ownership. Indeed, when the cost of public funds λ is not too large, for instance because the Government's deficit is small or because the taxation system is relatively efficient, the probability of corruption under public ownership is small. It can be made even smaller than under private ownership.

To understand the impact of the ownership structure on corruption, first note that transferring one more dollar from society, and most specifically taxpayers, to a politician

in order to prevent corruption has a cost $1+\lambda$ on the general budget of the State where λ is the cost of public funds. This extra dollar prevents the public firm from siphoning public funds at the same rate. Instead, under private ownership, public funds can no longer be siphoned that way. Consumers now bear the cost of corruption in terms of higher prices. The transfer of wealth from society, and now more specifically from consumers, to the politician has a cost $1+\tilde{\lambda}(I)$ where $\tilde{\lambda}(I)$ is actually the shadow cost of the private firm's budget constraint, which, of course, depends on its investment I. However, fighting corruption by raising the wage of the public officials still requires to withdraw $1+\lambda$ from the State's budget.

Comparisons between the impact of the two different ownership structures on corruption follow immediately. Indeed, when $\tilde{\lambda}(I) < \lambda$, there is less equilibrium corruption under private ownership than under public ownership. It becomes relatively difficult to transfer resources for corrupted activities and fighting them is comparatively easier. Instead, when $\tilde{\lambda}(I) > \lambda$, private ownership also generates more corruption. The degree of equilibrium corruption is greater when efficiency and investments are themselves greater.

Our model predicts also that a shift towards private ownership may thus increase corruption when $\tilde{\lambda}(I)$ is much larger than λ, i.e., for regulated sectors which, when public, benefited from large subsidies from the rest of the economy, or sectors which involve large fixed-costs and require significant output distortions and large mark-ups to help private firms to break-even. This indicates when the paradoxical situation in which investment and corruption go hands in hands more likely prevails. Sectors like water and transport are typical candidates for that paradox since these sectors tend to be net recipients of transfers from the state[32] and involve large sunk investments.

For completeness, let us analyze the impact of corruption on outputs and investment in the case of private ownership.

Proposition 6 *: Under private ownership and with a corruptible politician, outputs are again only defined by the firm's break-even conditions, so that formula (11) to (14) still hold. The investment I^c_{Pr} solves:*

$$\nu(1-\varepsilon)\Delta\theta\frac{\partial\bar{q}}{\partial I}(I^B_{Pr}) = 1. \tag{23}$$

Both when the politician is not corrupted and reports publicly this information and when he is corrupted and pockets the rent for himself, the private firm is expropriated by the politician from the rent he may get in state $\sigma = \underline{\theta}$. This reduces the benefits of investing for the private firm (term $1-\varepsilon$).

[32] See Guasch, Laffont and Straub (2003).

5 Countervailing Powers and the Perception of Corruption

The ownership structure has important implications for the reactions of individuals as well as interest groups faced with the threat of corrupt activities. For instance, some interest groups may form as effective watchdogs. These interest groups may reduce the likelihood of corruption through different channels. First, they may themselves gather information and make it available to the general public. Second, they may induce more coverage by medias of instances of misbehavior by public officials. Individuals can react to the threat of corruption by voting against the tenured official if it appears likely that corruption was at play in the past and if they expect higher utility levels under alternative and uncorrupted political regimes.

Individuals' incentives to react to the occurrence of corruption are of course related to the per-capita stake of doing so as well as to various transaction or psychological costs. In the case of group formation, the probability of corruption is reduced by the active role of smaller, more homogeneous, less disperse groups facing lower transaction costs of organizing themselves.[33] For less organized individuals, acting politically against the threat of corruption requires acquiring enough education to understand the terms of the political debate and the basic trends at play. In any case, various factors may influence the desire of interest groups and individuals to intervene.

For the purpose of our discussion, it is useful to distinguish the exogenous versus endogenous determinants of these incentives to react to corruption. On the one hand, individuals in a given population might be differentiated according to a number of exogenous aspects, including in particular their income level and their geographical location.

On the other hand, the political stakes of different individuals are endogenously determined in our model by the difference in regulatory policies and utilities, which follow from different behaviors of the politicians.

To capture formally the role of these different groups/individuals (excluded consumers, served consumers, taxpayers) as disciplinary devices for politicians, we will assume that they may check ex post, i.e., once the politician has already reported $\hat{\sigma} = \emptyset$, whether that report is truthful or not.

Formally, let us denote by x the probability that a group/individual acquires ex post information on σ conditionally on $\hat{\sigma}$ being uninformative. We will assume that, if he successfully reacts, he learns $\sigma = \underline{\theta}$ with probability one. As discussed above, for each group/individual j the probability of investigation in ownership regime i is a function of

[33] See Olson (1971).

its stake S_i^j, namely:

$$x_i^j = G^j(S_i^j).$$

with $G_S^j > 0$ and $G^j(0) = 0$. This function itself depends on the group/individual j to capture some fundamental heterogeneity.

As a change in ownership occurs, the probability that different groups uncover corruption changes. For instance, taxpayers are by definition inactive under private ownership and are active under public ownership. This is the reverse for consumers. Their respective evaluation of the benefits of the privatization process is then a function of Δx_i, as well as other outcomes of the privatization process like changes in access, prices, quality, etc. In particular, a higher perceived increase in corruption decreases satisfaction.[34]

To see further that point, observe that, under public ownership, only taxpayers may suffer from the possible corruption of the politician. An increase in the tax burden due to corruption can be easily disguised as coming from deteriorating macroeconomic conditions, which harden as well the Government's budget constraint. On the other hand, whether there is some corruption of officials or not, an efficient firm must be paid an incentive compatible transfer for revealing information but its output remains efficient. Consumers have no incentives to intervene because they pay the same price for the firm's output whether $\hat{\sigma} = \underline{\theta}$ or $\hat{\sigma} = \emptyset$ and $\hat{\theta} = \underline{\theta}$. Corruption is not perceived by the customer.

More precisely, under public ownership, the stake S_{Pu} of taxpayers for intervening and check potential corrupt behavior is given by the following dead-weight loss of corruption which is borne by the general budget of the State:

$$S_{Pu} = \nu\varepsilon \int_{k^*}^{1} (1 - \tilde{k}) \Delta\theta \bar{q}_{Pu} f(\tilde{k}) dk.$$

This is on average the difference between paying a wage which ensures that a politician whose technology of collusion is k does not collude with the industry and paying directly to the firm the rent needed to induce information revelation when corrupted officials hide informative signals.

Under private ownership, corruption is more easily readable by the general public, who, as consumers, observe a significant (average) price increase and may suspect from that the existing corruption. The consumer's expected stake for checking the politician's behavior is now given by:

[34] Following our discussion in the Introduction, it is likely that, in practice, for groups that already had access to the service prior to privatization, the factors mentioned remain second order with respect to the effects of corruption, as mostly neutral to positive overall effects seem to arise in terms of welfare. However, the fact that some groups gain access to the service is likely to exert a important and positive effect on their own perception of the process. Empirically, access by new customers makes up the bulk of the positive welfare impact observed in most sectors (McKenzie and Mookherjee, 2003).

$$S_{Pr} = \nu\varepsilon(1 - F(k^*))(S(\underline{q}^*_{Pr}) - P(\underline{q}^*_{Pr})\underline{q}^*_{Pr} - (S(\bar{q}_{Pr}) - P(\bar{q}_{Pr})\bar{q}_{Pr}))$$

where $1-F(k^*)$ is the probability of corruption and $\bar{q}_{Pr}$ is the expected output level given this level of corruption.

A politician caught being corrupted loses both the benefit of the bribe he would have received otherwise and the benefits of holding office s^* (because he may not be reelected or he may be put in jail and lose his reputation and prestige). Under private ownership, as consumers are the only checks on politician misbehavior, (17) becomes thus:

$$\begin{aligned}
\underset{(\theta,\sigma)}{E}(W_{Pr}) &= \nu\varepsilon F\left[\frac{s^*_{Pr}}{\Delta\theta\bar{q}_{Pr}}\right]\left(S(\underline{q}^*_{Pr}) - \underline{\theta}\underline{q}^*_{Pr} - \lambda s^*_{Pr}\right) \\
&\quad + \nu\varepsilon(1 - x^{cons}_{Pr})\int_{\frac{s^*_{Pr}}{\Delta\theta\bar{q}_{Pr}}}^{1}(S(\bar{q}_{Pr}) - \underline{\theta}\bar{q}_{Pr} - (1-\tilde{k})\Delta\theta\bar{q}_{Pr})f(\tilde{k})d\tilde{k} \\
&\quad + \nu\varepsilon x^{cons}_{Pr}\int_{\frac{s^*_{Pr}}{\Delta\theta\bar{q}_{Pr}}}^{1}(S(\underline{q}^*_{Pr}) - \underline{\theta}\underline{q}^*_{Pr})f(\tilde{k})d\tilde{k} \\
&\quad + \nu(1-\varepsilon)(S(\bar{q}_{Pr}) - \underline{\theta}\bar{q}_{Pr}) + (1-\nu)(S(\bar{q}_{Pr}) - \bar{\theta}\bar{q}_{Pr}) - K(I_{Pr}) - I_{Pr}.
\end{aligned}$$

In optimizing social welfare, we will assume that $\underline{q}^*_{Pr}$ and $\bar{q}_{Pr}$ are still given by the zero profit constraints of the firm (12) and (14),[35] so that the probability x that corruption is detected and does not occur is taken as fixed.

The cut-off value k^*_{Pr} now solves the following equation:

$$k^*_{Pr} + \frac{\lambda}{1+\lambda}\frac{F(k^*_{Pr})}{f(k^*_{Pr})} = \frac{(1 - x^{cons}_{Pr})(S(\underline{q}^*_{Pr}) - \underline{\theta}\underline{q}^*_{Pr} - [S(\bar{q}_{Pr}) - \bar{\theta}\bar{q}_{Pr}]) - x^{cons}_{Pr}k_{Pr}\Delta\theta\bar{q}_{Pr}}{(1+\lambda)\Delta\theta\bar{q}_{Pr}}, \tag{24}$$

with the following approximation when $\Delta\theta$ is small enough

$$\left(1 + \frac{x}{1+\lambda}\right)k^*_{Pr} + \frac{\lambda}{1+\lambda}\frac{F(k^*_{Pr})}{f(k^*_{Pr})} = \left(\frac{1 + \tilde{\lambda}(I_{Pr})}{1+\lambda}\right)(1-x). \tag{25}$$

The impact of consumers' ex post check is straightforwardly seen from (25): It unambiguously reduces the threat of corruption. Two effects are nevertheless at work. On the one hand, output is raised from $\bar{q}_{Pr}$ to $\underline{q}_{Pr}$ in case the corruption is detected. This increases welfare and makes it more attractive to reduce the probability of corruption. On the other hand, there is no longer any need to reward indirectly the politician through bribes.

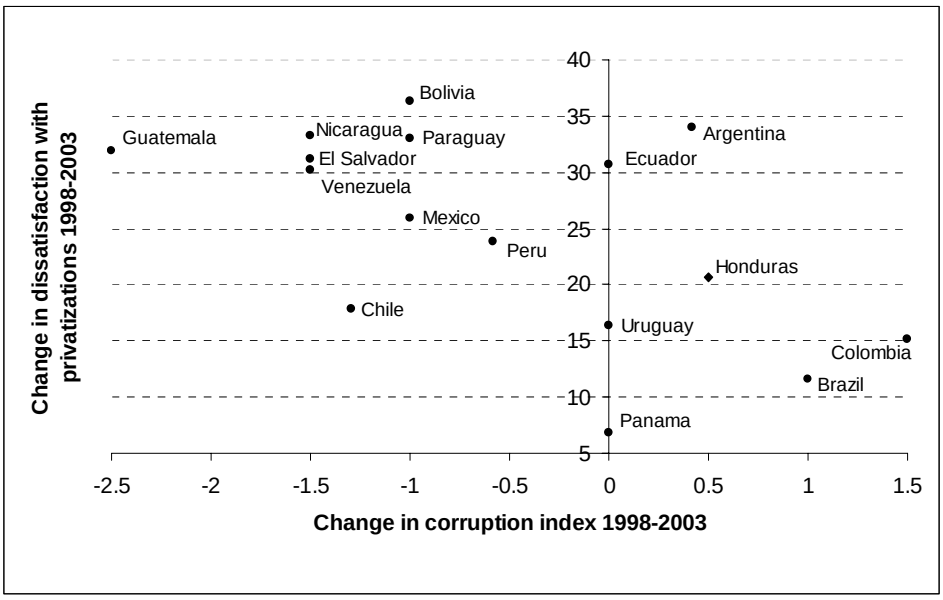
[35] This will typically be the case when x is small enough.

6 Stylized Facts and Discussion

We have shown that a move to private ownership of key regulated industries is likely to result in a situation characterized both by increased efficiency and more corruption. In what follows, we present stylized facts documenting the link between corruption, the perception thereof, and the public expressions of distrust toward the benefits of privatization.

Figures 3 and 4 present simple scatter plots of changes in the degree of dissatisfaction with privatization over the period 1998-2003 versus either the change or the absolute level of a corruption index[36]. The correlation coefficients are -0.58 and -0.51 respectively.

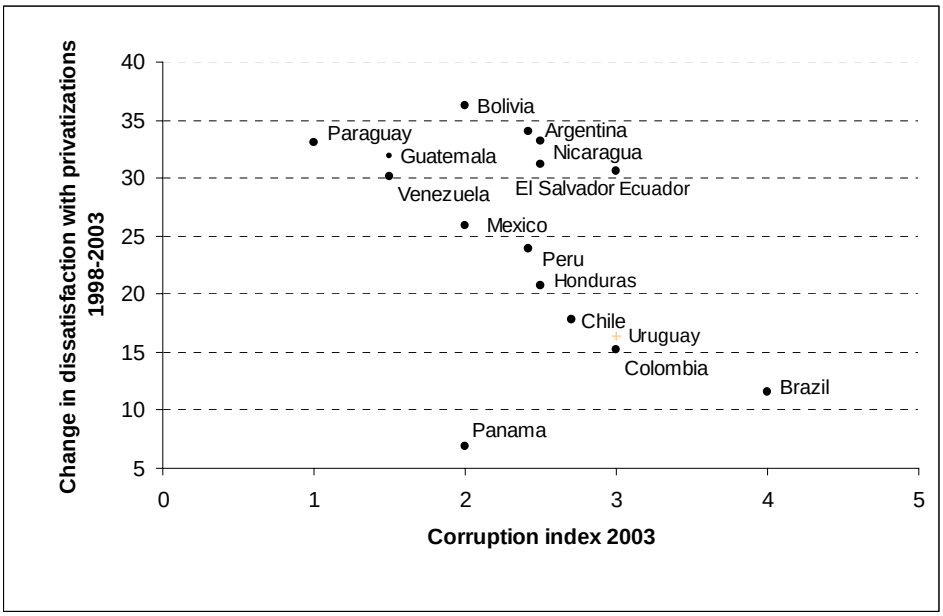
Figure 3: Correlation between changes in dissatisfaction with privatizations and changes in corruption, 1998-2003.



Sources: Latinobarometro and International Country Risk Guide

[36] Dissatisfaction figures are from Latinobarometro (see footnote 5). The corruption index used is from Political Risk Service.

Figure 4: Correlation between changes in dissatisfaction with privatizations, 1998-2003, and corruption, 2003.



Sources: Latinobarometro and International Country Risk Guide

These correlations are consistent with a wealth of anecdotal evidence on the long tradition of corruption that has plagued Latin American economic policy making, especially when it comes to the sale of public firms.[37] In many cases, like the corruption scandal that resulted in the eviction of the Brazilian president Fernando Collor de Mello in 1992 or the revelation on some of the deals made under the Menem presidency in Argentina, the whole privatization process came under suspicion and this created a deep public distrust in this type of policy intervention and in market reforms more generally. Moreover, anti-privatization lobbies often capitalized on such cases, thus giving high visibility to the issue.

Although these correlations do of course not establish a causal link between the feeling that corruption has increased, or has not been addressed properly, and the dissatisfaction with privatization, it is possible to further document the relationship between both in the respondents' answer to the successive surveys. First, note that corruption is consistently perceived as a major issue by respondents across Latin America. In 1998, 94.9% overall (96% in 2000) consider it to be a serious or very serious problem[38].

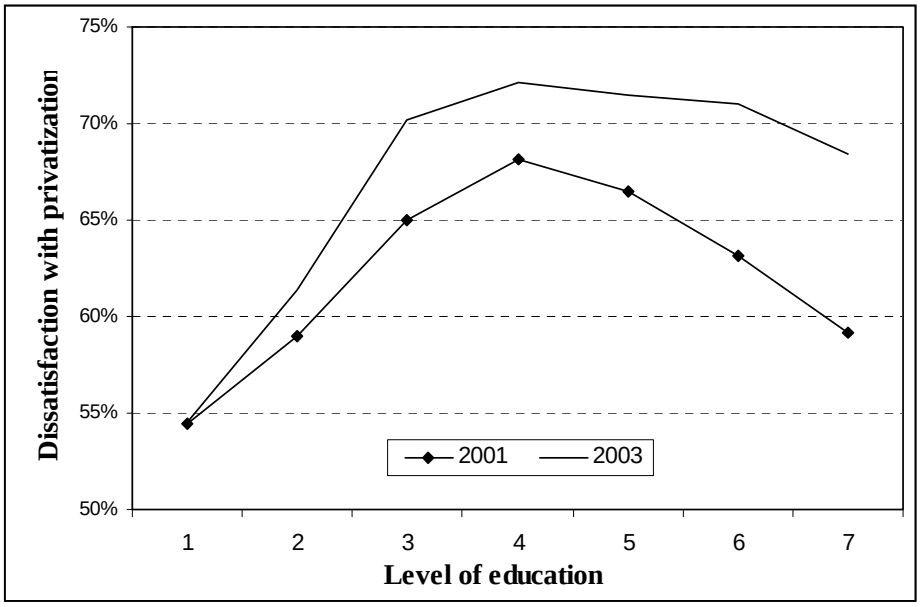
As for the link between perceptions, in 2003, people were asked whether they considered that progress was made in reducing corruption[39]. Dissatisfaction with privatization

[37] See Manzetti (1999) and Tulchin and Espach (2000).
[38] The question was not included again in this form in later surveys.
[39] People were asked whether there had been a lot/some/little or no progress.

is higher among those answering that little or no progress was made (69.5% and 71.2% respectively), than among more optimistic respondents considering that a lot or some progress was made (58.5% and 60.3% respectively). Thus, a similar pattern is obtained using individual survey answers on corruption rather than country level subjective indices.

Moreover, perceptions of corruption are linked to the political economy of the process and the shifts that privatizations induce in the distribution of costs and benefits. Indeed, another striking figure coming out of opinion polls is the fact that the middle class is in general more critical of privatization than any other group. Looking at education levels, Latinobarometro data show that dissatisfaction is stronger among those with some secondary or technical education than among the groups with either no education or complete college education (Figure 5).

Figure 5: Dissatisfaction with privatizations by level of education

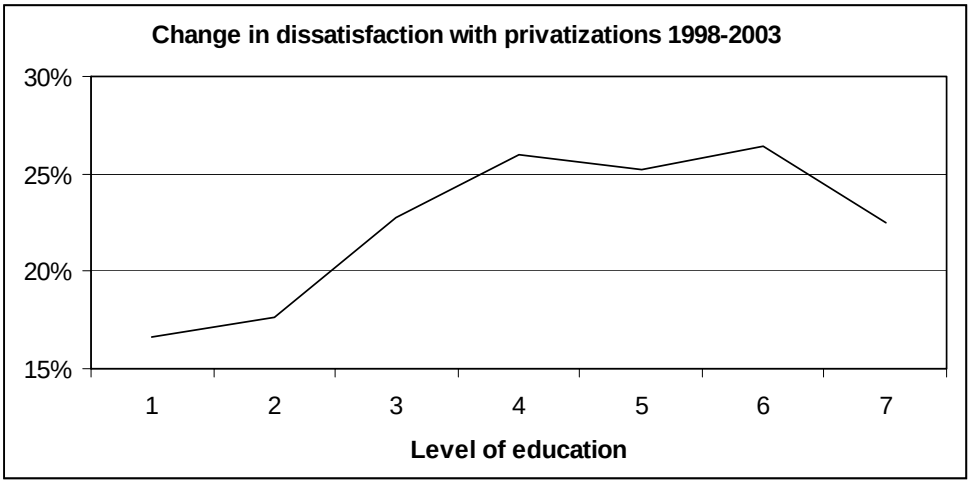


Levels of education: 1.= illiterate; 2 Basic incomplete; 3 = Basic complete; 4 = Secondary, medium, technical incomplete; 5 = Secondary, media, technical complete; 6 = Superior incomplete; 7 = Superior complete.

Source: Latinobarometro 2001 and 2003.

Furthermore, from 1998 to 2003, the biggest increase in dissatisfaction with privatizations was recorded for groups with intermediate education levels (see Figure 6).

Figure 6: Change in dissatisfaction with privatizations by level of education

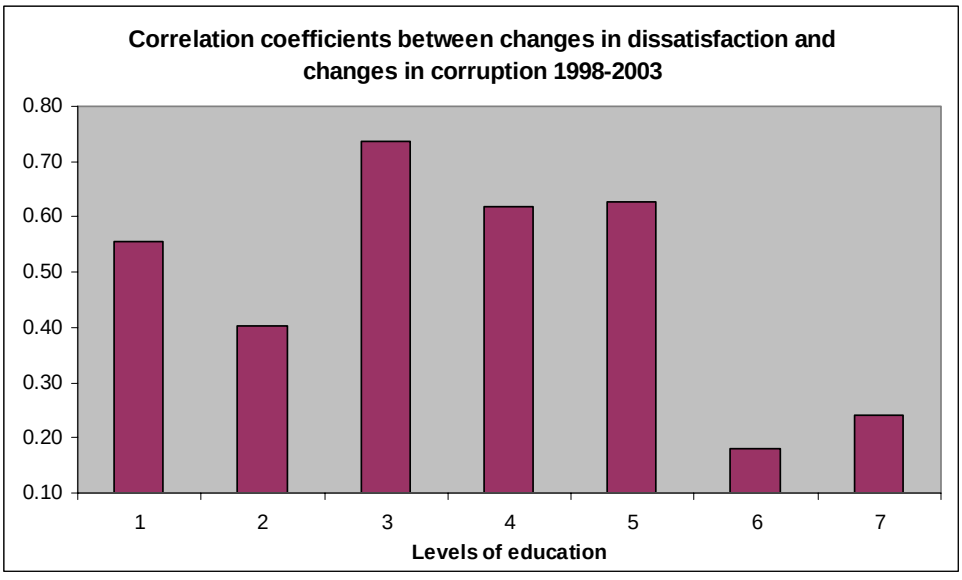


Levels of education: 1.= illiterate; 2 Basic incomplete; 3 = Basic complete; 4 = Secondary, medium, technical incomplete; 5 = Secondary, media, technical complete; 6 = Superior incomplete; 7 = Superior complete.

Source: Latinobarometro 1998 and 2003.

Finally, for the groups that express the highest levels of dissatisfaction and have increased their criticisms the most, we also observe strong correlation coefficients across countries between these changes in dissatisfaction and the changes in corruption, meaning that the correlation observed in Figures 3 and 4 above are mainly driven by dissatisfaction among the middle class (Figure 7).

Figure 7: Correlation coefficients between changes dissatisfaction and in corruption



Source: Latinobarometro 1998 and 2003

It is easy to see to make sense of these facts. Indeed, we expect individuals' incentives to form groups and actively engage in watchdog activities, and therefore their awareness of the level of corruption, to be related to the per-capita stake as well as to their transaction costs of doing so. First, individuals have exogenous characteristics, which are unlikely to be substantially modified by the occurrence of privatizations[40].

A pervasive characteristic of infrastructure services is the fact that some geographical areas are more expensive to serve for a variety of reasons, including distance to the existing network, low population density and low levels of consumption. Consumers in these areas also have a lower likelihood to engage in monitoring activities and express concerns about privatizations. Moreover, under public ownership, electricity, telecommunication or water networks in Latin America have typically failed to provide universal service to such less profitable categories of consumers, general located in poor rural communities as well as some less developed urban areas. The fact that many of them have gained access to the service after the change in ownership is likely to exert a important and positive effect on their perception of the benefits of the process[41].

On the other hand, middle class consumers have higher incentives to care about corruption, both for exogenous reasons linked to their characteristics and tradition, and because they face higher stakes of doing so, as shown in the model. As they interpret any evidence of corruption as operating a transfer, through higher prices, of a chunk of the efficiency gains from them to corrupt politicians and firm managers, they should indeed express stronger dissatisfaction with the privatization process[42].

Summarizing, stylized facts suggest first that the absolute impact of changes in ownership in infrastructure sectors on operating efficiency, prices, employment and income distribution is unlikely to explain the extremely high level of discontent observed throughout Latin America. They rather indicate that the political economy of the process may matter, in the sense that the fraction of the population representing the middle class, urban employees appears to be much more critical of privatizations, probably on the ground that they perceive the reforms as having been the opportunity for corrupt deals and, for this reason, consider themselves as the big losers in this occasion.

As the theoretical model shows one channel for this is the fact that the hardening of the soft-budget constraint of public firms consecutive to the move to private ownership has shifted the burden of corruption from the general budget and therefore taxpayers, to

[40] McKenzie and Mookherjee (2003) show that even the medium run effect of privatization on income is in general relatively small and is likely to be second order compared to the impact of other economic events.

[41] Empirically, access by new customers makes up the bulk of the positive welfare impact observed in most sectors (McKenzie and Mookherjee, 2003).

[42] See further evidence on the biased distribution of efficiency gains in Estache, Guasch and Trujillo (2003).

the price of services, affecting middle class consumers directly and more visibly. So, the mixed results in terms of prices have fuelled discontent among the middle class, not so much because of a huge impact on these households' budget, but because their failure to decrease to reflect much publicized efficiency gains was interpreted as evidence of a corrupt allocation of efficiency gains in favor of firms and politicians.

7 Conclusion

We have built a model to analyze how both public and private ownership structures affect the incentives of corrupt politicians to engage in side deals with firms. In particular, we show that depending on the comparative cost of public funds versus the shadow cost of raising the prices charged by utilities, it may well be the case that privatization implies both more investment, higher efficiency and more corruption. Furthermore, we have shown that different social groups have different incentives to monitor and try to uncover corruption. In particular, middle class consumers appear to be more sensitive to the possibility of corruption.

This model helps understand the skyrocketing discontent with privatizations expressed by citizens all over Latin America and the Caribbean region in Latinobarometro opinion surveys. As a matter of fact, this discontent appears to be strongly correlated with both changes and absolute levels of corruption perceptions at the country level. Moreover, this correlation is mostly driven by middle class groups, consistently with a framework in which they are both directly affected by corrupt deals that drive prices up and they are the more likely to organize and try to control wrongdoings in the privatization process.

References

Auriol, E. and P. Picard (2004), "Privatizations in Developing Countries and the Government's Budget Constraint", mimeo IDEI.

Bennedsen, M. (2000), "Political Ownership", *Journal of Public Economics*, 76: 559-581.

Chong A. and F. López-de-Silanes, (2004), "Privatization in Latin America: What Does the Evidence Say?" Economía, 4: 37-111.

Clarke G. and L. Xu, (2004), "Privatization, Competition, and Corruption: How Characteristics of Bribe Takers and Payers Affect Bribes to Utilities", *Journal of Public Economics*, 88: 2067-2097.

Coate, S. and S. Morris, (1995), "On the Form of Transfers to Special Interests", *Journal of Political Economy*, 103: 1210-1235.

Davis, F., O. Rossowski, T. Richardson and S. Barnett, (2000), "Fiscal and Macroeconomic Impact of Privatization", International Monetary Fund. Occasional Paper No. 194. Washington, D.C.

Dewatripont, M. and E. Maskin (1995), "Credit and Efficiency in Centralized and Decentralized Economics", *Review of Economic Studies*, 62: 541-556.

Engel E. , R. Fischer and A. Galetovic, (2003), "Privatizing Highways in Latin America: Fixing what Went Wrong", *Economia*, 4: 129-164.

Estache A., L. Guasch and L. Trujillo, (2003), "Price Caps, Efficiency Payoffs, and Infrastructure Contract Renegotiation in Latin America", World Bank Policy Research Working Paper 3129, Washington D.C.

Faure-Grimaud, A. (2002), "Using Stock Price Information to Regulate Firms", *Review of Economic Studies*, 69: 169-190.

Faure-Grimaud, A., J.J. Laffont and D. Martimort, (2002), "Risk Averse Supervisors and the Efficiency of Collusion", http://www.bepress.com/bejte/contributions/vol2/iss1/art5, *Contributions in Theoretical Economics.*

Galiani S., P. Gertler and E. Schargrodsky, (2005), "Water for Life: The Impact of Privatization of Water Services on Child Mortality", forthcoming *Journal of Political Economy.*

Green, J. and J.J. Laffont, (1977), "Characterization of Strongly Individually Incentive Compatible Mechanisms for the Revelation of Preferences for Public Goods", *Econometrica*, 45: 427-438.

Guasch J.L. J.J. Laffont and S. Straub, (2003), "Renegotiation of Concession Contracts in Latin America", World Bank Policy Research working paper 3011.

Guasch J.L. J.J. Laffont and S. Straub, (2005), "Concession of Infrastructure in Latin America: Government-Led Renegotiations", World Bank Policy Research working paper 3749.

Harris, C., (2003), "Private Participation in Infrastructure in Developing Countries. Trends, Impacts, and Policy Lessons", World Bank Working Paper No.5, Washington D.C.

Hart, O., (1995), *Firms, Contracts and Financial Structure*, Oxford University Press.

Kikeri S. and J. Nellis, (2002), "Privatization in Competitive Sectors, the Record to date", World bank Policy Research Working Paper 2860.

Kornai, J., (1986), "The Soft Budget Constraint", *Kyklos*, 39: 3-30.

Kornai, J., E. Maskin and G. Roland, (2003), "Understanding The Soft Budget Constraint", *Journal of Economic Literature*, 59: 1095-1136.

La Porta R. and F. López-de-Silanes, (1999), "The Benefits of Privatization: Evidence from Mexico", *Quarterly Journal of Economics*, 114: 1193-1242.

Laffont, J.J. (1994), The New Economics of Regulation Ten Years After, *Econometrica*, 62: 507-537

Laffont, J.J. and D. Martimort (2002), *Incentive Theory. The Principal-Agent Model*, Princeton University Press.

Laffont, J.J. and J. Tirole, (1993), *A Theory of Incentives in Procurement and Regulation*, MIT Press.

López-Calva L. and J. Rosellón, (2002), "The Distributive Impact of Privatization: The Case of Mexico", IPD working paper 2003-3, Puebla, Mexico: Universidad de las Américas.

Manzetti L., (1999), *Privatization South American Style*, Oxford University Press.

Martimort D. and S. Straub (2005), "The Political Economy of Private Participation, Social Discontent and Regulatory Governance", mimeo, Inter-American Development Bank, Washington D.C.

McKenzie D. and D. Mookherjee, (2003), "The Distributive Impact of Privatization in Latin America: Evidence from Four Countries", *Economia*, 3: 161-233.

Meggison W. and J. Netter, (2000), "From State to Market: A Survey of Empirical Studies on Privatization", *Journal of Economic Literature*, 39: 321-389.

Myerson, R., (1979), "Incentive Compatibility and Bargaining", *Econometrica*, 47: 61-73.

Olson, M., (1971), *The Logic of Collective Action: Public Goods and the Theory of Groups*, Harvard University Press.

Riordan, M., (1990), "What is Vertical Integration", in M. Aoki, B. Gustaffson and O. Williamson, eds., *The Firm as a Nexus of Treaties*, Sage Publications.

Schmidt, K., (1996), "The Costs and Benefits of Privatization: An Incomplete Contract Approach", *Journal of Law, Economics and Organization*, 12: 1-24.

Segal, I., (1998), "Monopoly and Soft Budget Constraint", *Rand Journal of Economics*, 29: 596-609.

Shleifer, A. and R. Vishny, (1994), "Politicians and Firms", *Quarterly Journal of Economics*, 109: 599-617.

Tirole, J., (1986), "Hierarchies and Bureaucracies: On the Role of Collusion in Organizations," *Journal of Law, Economic and Organization,* 2: 181-214.

Tirole, J., (1992), "Collusion and the Theory of Organizations," in *Advances in Economic Theory, Sixth World Congress, vol. 2* , ed. J.J. Laffont, 151-206, Cambridge University Press, Cambridge.

Tulchin J.S. and R. Espach eds., (2000), *Combating Corruption in Latin America*, Washington: Woodrow Wilson Center Press.

Appendix

• **Proof of Proposition 1:** Let us first write expected welfare as:

$$\begin{aligned}\underset{(\theta,\sigma)}{E}(W) &= \nu\varepsilon(S(\underline{q}^*)+\lambda P(\underline{q}^*)\underline{q}^*-(1+\lambda)(\underline{\theta}\underline{q}^*)-\lambda(\underline{U}^*+\underline{V}^*))\\ &\quad+\nu(1-\varepsilon)(S(\underline{q})+\lambda P(\underline{q})\underline{q}-(1+\lambda)(\underline{\theta}\underline{q})-\lambda(\underline{U}+\underline{V}))\\ &\quad+(1-\nu)(S(\bar{q})+\lambda P(\bar{q})\bar{q}-(1+\lambda)(\bar{\theta}\bar{q})-\lambda(\bar{U}+\bar{V}))\\ &\quad-(1+\lambda)K(I)-I, \qquad \text{(A1)}\end{aligned}$$

where I is the observable investment choice made by the firm.

The optimal contract offered to a public firm by a benevolent regulator maximizes (A1) subject to (4),

$$\underline{V}^*=\underline{V}=\bar{V}=0, \qquad \text{(A2)}$$

since there is no need to pay the benevolent politician in any state of nature, and (5)-(7),[43] and constraints (4), (5) and (6).

All those constraints are of course binding at the optimum. Hence, (10).

Inserting the corresponding values of the rent into the objective function and optimizing with respect to outputs yields (8) and (9).

Finally, the firm chooses to invest so that

$$I^e=\arg\max_{I\geq 0}\nu\epsilon\Delta\theta\bar{q}^B_{Pu}-I=0. \qquad \text{(A3)}$$

■

• **Proof of Proposition 2:** Expected social welfare can now be written as:

$$\underset{(\theta,\sigma)}{E} = \nu\varepsilon(S(\underline{q}^*)-\underline{\theta}\underline{q}^*)+\nu(1-\varepsilon)(S(\underline{q})-\underline{\theta}\underline{q})+(1-\nu)(S(\bar{q})-\bar{\theta}\bar{q})-K(I)-I \qquad \text{(A4)}$$

Under private ownership, the optimal regulatory contract maximizes (A4) subject to (5), (7) and the participation constraints of both types of firm:

$$\underline{U}^* = (P(\underline{q}^*)-\underline{\theta})\underline{q}^*-K(I)\geq 0, \qquad \text{(A5)}$$

$$\bar{U} = (P(\bar{q})-\bar{\theta})\bar{q}-K(I)\geq 0, \qquad \text{(A6)}$$

where (A5) now replaces (4) and (A6) replaces (6).

Finally, (5) implies that, when $\sigma=\emptyset$, a $\underline{\theta}$-firm makes a positive profit.

[43] Again (6) is slack at the optimum.

To simplify the analysis we also assume that $K(I)$ is not too large so that (A5) and (A6) define non-empty constrained sets.

Of course, (A5) and (A6) are necessarily binding at the optimum (denote $\lambda^*(I)$ and $\tilde{\lambda}(I)$ the corresponding multipliers and note that increasing I reduces $K(I)$ and relaxes the constraints so that $\lambda^*(\cdot)$ and $\tilde{\lambda}(\cdot)$ decrease with I).

Similarly, setting $\underline{q}$ such that $P(\underline{q}) = \underline{\theta}$ violates also the incentive constraint (5) which is again binding so that

$$(P(\underline{q}) - \bar{\theta})\underline{q} = (P(\bar{q}) - \bar{\theta})\bar{q}, \tag{A7}$$

and thus $\underline{q} = \bar{q}$. Indeed, since we have $\bar{q}^B_{Pr} > \bar{q}^M$ where $\bar{q}^M$ is the monopoly output such that $P(\bar{q}^M) - \bar{\theta} = -P'(\bar{q}^M)\bar{q}^M$, from $\tilde{\lambda}(I) > 0$, we may have a solution $\tilde{\underline{q}} < \bar{q}^M$ to (A7). However, this solution is always dominated from a social welfare point of view since, when $\bar{q}^M < \underline{q}^{FB}$ (where $(P(\underline{q}^{FB}) = \underline{\theta})$, we have:

$$S(\bar{q}^B_{Pr}) - \underline{\theta}\bar{q}^B_{Pr} > S(\bar{q}^M) - \underline{\theta}\bar{q}^M > S(\tilde{\underline{q}}) - \underline{\theta}\tilde{\underline{q}}.$$

Note that $\bar{q}^B_{Pr}$ is lower when $K(I)$ increases, i.e., when I decreases.

The firm chooses ex ante an investment level I_{Pr} such that

$$I_{Pr} = \max_{I \geq 0} \ \nu \Delta\theta \bar{q}^B_{Pr}(I) - I,$$

where we make explicit the dependence of $\bar{q}^B_{Pr}$ on I. This yields (16). ■

• **Proof of Proposition 3:** Note from (19) that $k^*_{Pu} \in]0,1[$. Moreover making explicit the dependence on λ:

$$\frac{dk^*_{Pu}}{d\lambda} = -\frac{1}{(1+\lambda^2)} \frac{F(k_{Pu})}{f(k^*_{Pu}) \left[1 + \frac{\lambda}{1+\lambda} \frac{d}{dk} \left(\frac{F}{f} \right) \Big|_{k^*_{Pu}} \right]} < 0$$

and thus $1 - F(k^*_{Pu})$ increases with k.

Suppose that

$$\frac{F_1(k)}{f_1(k)} > \frac{F_2(k)}{f_2(k)} \qquad \forall k \in [0,1].$$

Then, denoting k^{*1}_{Pu} and k^{*2}_{Pu} the corresponding cutoffs, we have:

$$1 = k^{*1}_{Pu} + \frac{\lambda}{1+\lambda} \frac{F_1(k^{*1}_{Pu})}{f_1(k^{*1}_{Pu})} > k^{*1}_{Pu} + \frac{\lambda}{1+\lambda} \frac{F_2(k^{*1}_{Pu})}{f_2(k^{*1}_{Pu})}.$$

Using the monotonicity of $\frac{F_2}{f_2}(\cdot)$ we get immediately $k^{*1}_{Pu} < k^{*2}_{Pu}$ and hence the result. ■

• **Proof of Proposition 4:** We optimize (18) subject to (4)-(5) and (6).[44] Those constraints are obviously binding, inserting their expression as function of outputs and optimizing with respect to outputs yields the result. ■

• **Proof of Proposition 5:** Direct from the text. ■

• **Proof of Proposition 6:** Taking again (18) as the objective and optimizing subject to (A5) and (A6) gives the result. ■

[44] Neglecting (7), which can be checked ex post.