Political Stabilization
by an
Independent Regulator*

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This Version: November, 2005

ABSTRACT

This paper analyzes the relationship between elected partisan political principals with partisan objectives and their regulators when those regulators can be captured by an interest group, namely the firm they are supposed to regulate. Independence of the regulator stabilizes regulatory policies and avoids much of the fluctuations induced by an exogenous political uncertainty on the electoral outcomes: a *stabilization effect*. However, independence also increases the cost of preventing regulatory capture: an *agency cost effect*. Even when both effects are taken into account, regulatory independence still increases ex ante social welfare. We also investigate how the independence of the bureaucracy affects electoral outcomes when political uncertainty is endogenized by modeling the decision of forward-looking voters who compare the policy platforms offered by competing political principals. Endogenizing political uncertainty reinforces the stabilization effect.

JEL Classification Nos.: D82, L51.
Keywords: Regulation, Bureaucracy, Organization of the Government, Partisan Politics.

1 Introduction

There seems to be a consensus, not only amongst political scientists but also between politicians and the electorate, to recognize that economic policies remain relatively stable even though political parties alternate in power. This phenomenon also appears to be more pronounced in areas where political powers engage in substantial delegation to more or less independent agencies. Delegation is indeed prevalent in many countries for a wide range of economic decisions. A large body of empirical literature focusing on the American case has documented extensive delegation from Congress to administrative non-elected agencies.[1] Out of a data set of 257 important pieces of legislation between 1947 and 1990, which on average comprehend 45 major provisions, Epstein and O'Halloran (1997) computed for instance delegation ratios by counting the percentage of provisions of these bills which one way or the other involved delegation of authority by Congress. Eighty-one percent of all laws delegated authority to at least one cabinet department, thirty-eight percent to independent regulatory agencies, sixteen percent to independent commissions. Fifty-two percent of the laws in their sample created at least one new agency, board or commission to whom substantial authority was delegated. If the European Central Bank remains the most spectacular example of delegation to a new European institution, the European Union has also created a dozen of independent agencies over the last thirty years or so. Those agencies differ greatly in terms of the procedural requirements, the membership of their management board and the role of member states in the nomination of directors. For instance, in the field of merger control, the European Commission was delegated the competence to regulate mergers under the 1989 Merger Control Regulation.[2]

This paper provides an explanation for a possible link between the degree of independence of a regulatory agency and policy stabilization. The first key-ingredient of our model is the possibility of capture of these agencies by the interest groups they regulate. Indeed, in a world of informational asymmetries, regulators accumulate information about the welfare effect of different policies and they can be bribed for manipulating information. The second ingredient is political uncertainty. The extent to which an agency is affiliated to a political party affects the likelihood that this particular regulator remains in place as political powers alternate in office. The status of the regulatory agency changes thus significantly the collusive opportunities between this regulator and the industry.

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[1]See Kiewet and McCubbins (1991).

[2]Another well-known example of delegation is given by environmental policy. When passing the *Clean Air Act,* the U.S. Congress did not establish exactly what concentrations of harmful substances are permissible in the air but, instead, delegated to the Environmental Protection Agency the authority to do so. In the U.S., other examples of independent agencies include The Interstate Commerce Commission made independent in 1889, the Federal Trade Commission (1914), the Federal Communication Commission (1934), the Securities and Exchange Commission (1972), the Consumer Product Safety Commission (1972) and the Nuclear Regulatory Commission (1974).

In a nutshell, we argue below that regulatory independence, although it stabilizes policies and avoids unnecessary fluctuations due to pressures by politically elected principals, also increases the scope for regulatory capture. Nevertheless we can identify circumstances where the first effect dominates, justifying the constitutional choice of this institutional mode.

Interestingly, this set of results might shed new light on one of the most documented episode of merger regulation in Europe: the *De Haviland* case. After a complete two-stage investigation, the Merger Task Force recommended in September 1991 that the merger between the Franco-Italian ATR and De Haviland be rejected on grounds that it would create a dominant position for the combined firm in the relevant market. Even though this stance was heavily criticized at the time by both the French and Italian governments, the mechanisms available to these countries to control bureaucratic drift[3] were weak and Commissioner Leon Brittan could argue that *"nobody wanted a system that only served the interests of the countries that shout loudest"*[4] signifying thereby the degree of formal independence of the Merger Task Force vis-à-vis member states and advocating de facto its depolitization. However and beyond the *De Haviland* case, other critics of the European Union merger control have alson documented the lack of transparency of its decisions and its lax enforcement,[5] two ingredients which clearly point at the possible capture of this agency.

In our model, we examine two possible status for regulatory agencies, capturing stylized views of real life institutions. First, the regulator may be *affiliated* to his political principals and be removed from office each time a new political principal is elected. Second, the regulator may be *independent* and keeps office whoever political principal gets elected.[6] This difference in the independence degree of an agency affects the set of collusive agreements which can be signed between the interest group and his regulator. In the first case, collusion can only occur *ex post*, once political principals have been elected. In the second case, collusion can also occur *ex ante*, before the political principals get elected. This latter possibility enlarges the set of collusive agreements and thus increases the agency cost of capture.

In this context, our main result is that an independent regulator plays a stabilizing role in the political process. When collusive side-contracting suffers from some *transaction*

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[3]On this issue see Weingast and Moran (1983) and McCubbins, Noll and Weingast (1987, 1989).

[4]Quotation taken from Pollack (1996, p. 294).

[5]See Wilks and McGowan (1995)

[6]Most of the time, in the real world, the board of regulatory agencies is made of a fixed number of members with staggered terms who are removed by the elected government once those terms are finished. Our dichotomy can also correspond to policy implementation by different types of agencies. As documented before, there is some variance in the delegation ratios according to the type of agency to whom policies are delegated. For instance, there is no doubt that the cabinet departments are less independent from political powers than the Federal Trade Commission.

costs which are *convex* with the size of the bribe exchanged,[7, 8] the independent agency wants to smooth the possible bribes it may receive over the possible electoral outcomes. The agency cost of capture depends now on *an average* between the regulatory stakes that either principal would like to implement. To react to the threat of capture of this independent regulator, political principals with different preferences ex ante offer regulatory policies which are close to each other. In comparison to the affiliated case, bureaucratic independence has thus two main consequences:

• Because ex ante collusion enlarges the set of feasible collusive agreements between the regulator and the interest group, the agency cost of capture unambiguously increases: an *agency cost effect.*

• Political parties anticipate this new feature of the agency cost and adjust their political platforms accordingly. When a political principal gets elected, he tends to implement policies which look closer to what the other political principal would like to implement: a *stabilization effect.*

To derive those effects, we model a government as a three tier regulatory hierarchywith the regulator being an intermediary between partisan political principals and the interest group. Following the partisan politics literature,[9] two political principals having different preferences over the optimal rent-efficiency trade-off may alternate in office. Under asymmetric information about the industry they are supposed to regulate, different partisans political principals implement second best regulations reaching different balances between allocative efficiency and the extraction of costly information rents which accrue to the regulated industry.[10] A "rightist" (resp. "leftist") party puts a relatively high (resp. low) weight on these rents. Thus, the policies implemented definitely fluctuate with the identity of the elected political principal. The choice of the agency legal status balances a *higher bureaucratic bias* coming from the possibility for an independent regulator to increase the scope for capture and a *stronger political bias* as parties implement more biased policies when regulators are affiliated. An independent regulator acts as a safeguard against excessive political fluctuations and as such improves ex ante social welfare. We provide some comparative statics suggesting that the gains of independence are greater when society is more polarized, when political variance is large and when asymmetric

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[7]For instance, these transaction costs can be viewed as a reduced form for the possibility that collusion may be detected which could result in collusive partners facing heavy penalties. Our assumption is then that the probability of detection increases with the size of the bribes exchanged. Implicit in this formulation is the idea that bigger frauds are more easily detected by the principal.

[8]In Faure-Grimaud and Martimort (2001), we offer microfoundations for this assumption. Here, we take as given the technology of side-contracting and do not derive it from more fundamental assumptions. This short-cut turns out to be necessary to introduce political uncertainty in a simple way.

[9]See Alesina (1987) among others.

[10]Both partisan political principals would implement the same first best policy under complete information. Fluctuations in regulatory policy would not exist in a first best world.

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information distortions increase.

Despite the importance of the concept of agency independence in administrative law,[11] theories justifying it are scarce. In complete information models, Spulber and Besanko (1992) for environmental policies and Rogoff (1989) for monetary policies argue that a social planner may get more credibility by delegating, or more exactly giving up, policy-making to a bureaucrat with biased preferences. Like in these papers, the starting point of our model is the recognition that delegation entails some loss of control. We depart from previous studies in that we do not take delegation to lead to a total absence of control on the bureaucracy.[12] We look instead at changes in the agency cost of delegation coming from variations in the legal status of the agency. We view asymmetric information, political uncertainty and capture as the three important motivations behind independence. To do so, our paper merges into an integrated framework two strands of the literature dealing with the impact of informational issues on politically oriented regulatory outcomes. On the one hand, Laffont and Tirole (1993), Laffont and Martimort (1999) and Martimort (1999) analyze how a bureaucracy endowed with discretionary power can use its information advantage to foster its own interests under the threat of capture by interest groups. These papers emphasize control of this captured bureaucracy by a social planner and are thus purely normative. On the other hand, Baron (1989), Laffont (1995), Boyer and Laffont (1999) and Martimort (2001) analyze how biased political principals induce fluctuations in regulatory or taxation policies under asymmetric information. These papers are nevertheless silent on the relationship between these political principals and their bureaucracy. Unifying the two approaches highlights how the agency cost of capture changes in a world of political uncertainty. Faure-Grimaud and Martimort (2003) analyzed such relationships in a dynamic model. The model are obviously close enough but the present paper addresses issues related to the impact of this relationship on the political game which were not addressed in our previous paper.

Section 2 presents the model. Section 3 derives the cost of capture with affiliated regulators and shows that both political principal can implement their most preferred policy. Section 4 analyzes the case of an independent regulator and in particular the difference between ex post and ex ante side-contracting. We characterize the different contractual equilibria of the game. Section 5 derive several comparative statics concerning equilibrium outputs. Section 6 highlights the costs and benefits of granting political independence to the regulator. For most of our analysis, political uncertainty is exogenous.

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[11]Kahn (1988, Vol 2, pp. 93) argues that the main question raised by this literature is *"whether the administrative commissions sought to retain as much as their traditional formal independence or whether they ought not, instead, be more closely integrated into the executive branch of the government and subjected more directly to the control and responsability of the presidency."* This is precisely the issue of this paper.

[12]Typically, the Congress will still choose the agency's budget or suggest some broad guidelines for policy-making.

Section 7 nevertheless discusses what is the impact of the agency's status in the case of endogenous political uncertainty, i.e., when political principals choose policy platforms affecting their probability of being elected. Our previous results might now be reinforced by an electoral effect. Section 8 concludes. All proofs are relegated to an Appendix.

2 The Model

We model the relationship between elected political principals, a regulator and a regulated firm. The political principal can be thought of as the Legislative branch of the government. In the case of merger control in the European Union, political principal can be viewed as the member states delegating the day to day control of merger policy to the Merger Task Force.

2.1 Information

The firm has some private information about its marginal cost. This efficiency parameter θ is drawn from a common knowledge distribution on $\Theta = \{\underline{\theta}, \bar{\theta}\}$ ($\Delta\theta = \bar{\theta} - \underline{\theta} > 0$) with respective probabilities ν and $1 - \nu$. The firm is efficient (resp. inefficient) when $\theta = \underline{\theta}$ (resp. $\theta = \bar{\theta}$).

The political principal is supposed to be too far away from the day-to-day control of the firm which is left to a regulator. This regulator acquires information relevant to design regulatory policies. This regulator (affiliated or not) bridges the information gap on θ. We denote by σ the hard information signal received by the regulator on θ and also learned by the firm. The monitoring technology is such that, conditionally on the firm being efficient, the regulator observes with probability ϵ the firm's type. Otherwise, he observes nothing. Hence, $\sigma = \underline{\theta}$ with probability $\nu\epsilon$ and $\sigma = \emptyset$ with probability $1 - \nu\epsilon$.

2.2 Preferences

• **Political Principals:** Asymmetric information between the uninformed government and the informed firm at the time of contracting introduces a well-known trade-off between efficiency and the extraction of the regulated firm's information rent.[13] Political principals have different preferences regarding this trade-off depending on whether they defend a "leftist" or a "rightist" constituency.[14] Political principal P_i's objective function writes

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[13]See Baron and Myerson (1982).

[14]One can view the political principal as the median voter in Congress as in Baron (1989). In this case, political fluctuations come from change in the identity of this median.

as:

(1)
$$SW_i = S(q_i) - s_i - t_i + \alpha_i u_i,$$

where $S(\cdot)$ $(S'(\cdot) > 0, S''(\cdot) < 0)$ is the consumers surplus.[15] t_i (resp. s_i) is the transfer given to the firm (resp. regulator) and u_i its information rent. $\alpha_i < 1$ is the weight that the principal puts on the firm's profit.[16] As $\alpha_i < 1$, both political principals dislike giving up rents to firms. However, α_i changes with the identity of the elected political principal. We denote by $\Delta\alpha = \alpha_R - \alpha_L > 0$ the degree of polarization of this society. The rightist (resp. the leftist) government gets elected with an exogenous probability β (resp. $1-\beta$).[17] For further references, we define also a measure of aggregate social welfare as:

$$SW = S(q) - s - t + \hat{\alpha} u,$$

where $\hat{\alpha} = \beta\alpha_R + (1-\beta)\alpha_L$.

• **Firm:** The firm is risk-neutral. The regulated firm's expected profit writes as

$$u = \beta u_R + (1-\beta)u_L$$

where $u_i = t_i - \theta q_i$ (resp. q_i) is profit when principal P_i gets elected.

• **Regulator:** An independent regulator R, receives a budget s_i from P_i to perform the regulatory control. The regulator's expected utility writes thus as:

$$s = \beta s_R + (1-\beta)s_L.$$

If the regulator, say R_i, is affiliated to P_i and comes to office only when P_i gets elected he receives only a budget s_i following this event.

2.3   Regulatory Contracts

The *grand-contract* GC_i between the political principal P_i, the regulator and the firm consists of a budget for the regulator, a transfer and an output target for the firm. Without loss of generality, grand-contracts are direct mechanisms of the form: $GC_i = \{q_i(\hat{\sigma}_i, \hat{\theta}_i); t_i(\hat{\sigma}_i, \hat{\theta}_i); s_i(\hat{\sigma}_i, \hat{\theta}_i)\}$ where $\hat{\sigma}_i$ and $\hat{\theta}_i$ are respectively the regulator and the firm's date i reports on their respective information. Note that σ_i being hard information, the firm's report is useful when $\hat{\sigma}_i = \emptyset$.

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[15]$|S''(\cdot)|$ is sufficiently large to ensure strict concavity of the political principal's objective function in all circumstances.

[16]The agency has no weight in the principal' objective function, capturing the fact that redistributing wealth to bureaucrats as such is not part of the government's objective. Alternatively, civil servants represent a group with a negligible social weight. The main insights of our analysis are robust to the case where parties' objective functions give the same positive (but less than one) weight to the regulator's utility.

[17]Section 7 endogenizes this probability.

2.4   Collusion Technology and Side-Contracts

The *side-contract* between the agency and the firm consists of secret side-transfers τ_i paid by the efficient firm to the informed regulator. These bribes are offered when P_i is elected to prevent the regulator from reporting he has learned an informative signal $\sigma = \underline{\theta}$. For simplicity, we assume that the regulator has all the bargaining power in designing side-contracts.

• **Affiliated Regulators**: These regulators come in power if the party they are affiliated to gets elected. Informative signals are learned by R_i only after P_i has been elected and GC_i has been offered. A secret side-contract can only be offered ex post, i.e., once $\sigma = \underline{\theta}$ has been learned.

• **Independent Regulator:** This regulator is in power regardless of the election outcome. He can still mimic the behavior of affiliated regulators and ask for a bribe τ_i once the P_i has been elected and has subsequently offered his own contract. We will denote by *Ex Post Collusion* this possibility. However, there is now also the possibility of an *Ex Ante Collusion* with the firm since the regulator may find optimal to commit to hide information to both principals before the election outcome is known.

We suppose that the side-contract is enforceable. This is a standard simplifying assumption that allows us to study collusion without providing a fully fledged analysis of the exact game that would sustain it (possibly in a repeated setting similar to the one in Martimort (1999)).[18]

Crucially, we suppose that there exist some transaction costs of side-contracting meant to capture the fact that side-contracts are not perfectly enforceable. The exchange of τ units of bribes only yields to the regulator a private benefits from holding office $k(\tau) = k\tau - \frac{r}{2}\tau^2$ where $r > 0$. The existence of such costs has already been recognized.[19] The specificity of our model comes from the fact that those transaction costs $(\tau - k(\tau))$ are convex. There are several reasons to think that this may be so. Intuitively, one could argue that there is some technology to detect collusion in the background, and that convexity of transaction costs of collusion simply means that the detection probability, say $p(\tau)$, is sufficiently increasing in the size of the bribes exchanged: bribe exchanges suffer from some expected loss equal to $p(\tau)\tau$ and we assume that $p''\tau + 2p' > 0$. But the convexity

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[18]We assume that the enforceability of a collusive agreement between the firm and its regulator is not affected by the agency status. In particular we should be careful in appealing to reputational incentives as a way to sustain collusion because presumably the alternation of regulators in the case of affiliation would make collusion more difficult (e.g. sustainability could require a higher discount factor than with an independent regulator as shown in Martimort (1999)). This would not go against our results though, as in our model it is already the case that an independent regulator has greater opportunities to collude than an affiliated one. Another justification for our reduced form could also be that collusion is enforced through the pressure imposed by some social norms and that those are unrelated to agency status.

[19]See Tirole (1992) for a first discussion of the origins of these transaction costs.

of those costs can also be justified from first principles. Faure-Grimaud and Martimort (2001) consider a setting where a risk averse supervisor can extract a rent from his ability to sub-contract with a productive agent. The supervisor has to be induced to offer the best possible delegated contract from the principal's point of view, a problem akin to a moral hazard situation. If the supervisor is risk averse, some rents have to be given up to induce proper behavior and those rents are proportional to those the productive agent can guarantee for himself (the collusive stake). Risk aversion implies that when the collusive stake is higher, the supervisor obtains higher rents but at a decreasing rate, as collusion (understood as not offering the contract that the principal wishes) is then a more profitable, but riskier, activity. Therefore convex transaction costs of collusion can result from the risk aversion of (some of) the colluding parties.[20]

Values of the various parameters of the model are such that possible bribes remain on the increasing part of $k(\cdot)$.[21] To justify the use of the regulator in the first place, we assume that using the regulator is less costly than asking the firm directly for its type against some information rent. A sufficient condition for this is that $k < 1 - \alpha_R = min_i(1 - \alpha_i)$.

Finally, note that as the transaction costs $\tau - k(\tau) = \frac{r}{2}\tau^2$ are convex in bribes, an independent regulator facing changing political conditions wants to smooth the bribes he receives to save on the dead-weight loss of collusion.[22]

2.5   Benevolent Regulators

The first best policy obtained in the absence of any information constraint requires the firm to produce $\underline{q}^{FB}$ and $\bar{q}^{FB}$ such that respectively $S'(\underline{q}^{FB}) = \underline{\theta}$, and $S'(\bar{q}^{FB}) = \bar{\theta}$. Whatever the type of the firm and the majority in power, the firm obtains no rents. Even though principals put different weights $\alpha_i < 1$ on the firm's utility, they both dislike giving up rents.

Following Baron and Myerson (1982), let us now consider the second best regulatory policies which are implemented by a political principal P_i in the absence of any political uncertainty. For ease of notations, we denote thereafter by $\underline{t}_i = t_i(\emptyset, \underline{\theta})$, $\bar{t}_i = t_i(\emptyset, \bar{\theta})$

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[20]This is related to the argument proposed in Spagnolo (1999) who studies collusion between firms that interact in a multi-market set up. He shows that collusion is easier when firms are risk averse. A risk averse firms' evaluation of profits in one market depends on profits in other markets. The threat of retaliation after a deviation from a collusive strategy has therefore more bite than in the risk neutral case.

[21]The lessons of this quadratic model still hold in the general case if the uncertainty $\Delta\theta$ is small. Indeed, for any functional forms, the costs and benefits of independence can be derived with Taylor expansions which take quadratic expressions similar to the present ones.

[22]Note that transaction costs are independent of the agency legal status. It is a priori as easy to capture an independent regulator as an affiliated one. What will change with the institutional setting is the set of collusive side-contracts between the firm and the regulator.

the regulatory transfers and $\underline{q}_i = q_i(\emptyset, \underline{\theta})$, $\bar{q}_i = q_i(\emptyset, \bar{\theta})$ the output targets for both types of firm when the regulator has observed nothing. The efficient (resp. inefficient) firm's information rent is accordingly $\underline{u}_i = \underline{t}_i - \underline{\theta}\underline{q}_i$ (resp. $\bar{u}_i = \bar{t}_i - \bar{\theta}\bar{q}_i$).

We shall simplify presentation by observing that there is no need to pay the regulator if he claims having reported nothing. Instead, let $s_i = s_i(\underline{\theta})$ be the regulator's wage when he reports an informative signal $\hat{\sigma}_i = \underline{\theta}$. In that case, since its type is perfectly known, the firm's profit is then zero and its output is necessarily first-best $\underline{q}^{FB}$.[23]

As it is standard in two-type adverse selection models, the following constraints are of a particular importance when the regulator reports an uninformative signal $\hat{\sigma}_i = \emptyset$:[24]

• Incentive compatibility constraints for an efficient firm:

(2)
$$\underline{u}_i \geq \bar{u}_i + \Delta\theta\bar{q}_i,$$

• Participation constraints for an inefficient firm:

(3)
$$\bar{u}_i \geq 0.$$

• Participation constraint for the informed regulator:

(4)
$$s_i \geq 0.$$

The characterization of the optimal grand-contract offered by P_i is standard. There is no need to pay a benevolent regulator whether he gets informed or not. Optimal outputs are respectively equal to the first best when the firm is efficient, $\underline{q}_i^{SB} = \underline{q}^{FB}$, and downward distorted below the first best when the firm is inefficient, $\bar{q}_i^{SB} < \bar{q}^{FB}$ where:

(5)
$$S'(\bar{q}_i^{SB}) = \bar{\theta} + \frac{\nu}{1-\nu}\Delta\theta(1-\alpha_i)(1-\epsilon).$$

At the optimum, only the efficient firm gets a strictly positive information rent $\underline{u}_i^{SB} = \Delta\theta\bar{q}_i^{SB}$ when the regulator has not observed its cost. The inefficient firm's output is downward distorted to limit this information rent. However, rent extraction is less a concern for a principal with a high α_i and the firm's rent is larger with α_i. Under

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[23]There is here a slight loss of generality in our formulation. Indeed, the firm and the (independent) regulator accept contracts before the outcome of an election. All that matters to write participation constraint are the firm's expected rent of that firm which must remain non-negative conditionally on the information available to (affiliated or not) regulators and the expected wage of an independent regulator. The presentation is simplified by focusing on the case where, ex post i.e., once the identity of the elected principal is known, participation constraints of both the firm and the independent regulator are still satisfied. This amounts indeed to assuming that the firm and the supervisor have a positive albeit very small degree of risk-aversion and must be insured against political fluctuations.

[24]When the two constraints below are binding, it is easy to show that the incentive compatibility constraint of an inefficient firm and the participation constraint of an efficient one are also strictly satisfied.

asymmetric information, second best policies depend now on the identity of the principal in power.

Finally, the policy chosen by a unbiased social planner is obtained by just substituting in (5) α_i by $\hat{\alpha}$. A simple inspection of the formula reveals that a rightist (resp. leftist) government chooses too high (resp. too low) a production level.

2.6 Timing

The timing of the regulatory game with affiliated regulators is as follows:

• $T = 1$. The regulated firm learns his productivity parameter θ and σ. The regulators learn σ. [25]

• $T = 2$. Both political candidates propose non-cooperatively their respective electoral platforms, i.e., commit to a grand-contract for their affiliated regulators and the firm. The firm accepts both or none of the contracts. The affiliated regulators accept or refuse only the contract offered by their own principal.

• $T = 3$. Political uncertainty is resolved. The preferences of the elected political principal are revealed.

• $T = 4$. **Ex Post Collusion Stage**: The regulator offers a side-contract to the firm. The firm accepts or refuses this side-contract.

• $T = 5$. Production and transfers (both official and possibly hidden) take place.

Importantly, with affiliated regulators the regulator and the firm cannot agree on a side-contract before political uncertainty is resolved. With an independent regulator, the timing of the game is almost as above. However, an independent regulator and the firm can now also agree on an *ex ante side-contract*. To model this issue, we introduce an intermediate stage between dates 2 and 3. The timing of the game is otherwise exactly the same as previously from date 3 on. In particular, the independent regulator learns σ at date 1 and accepts now both or none of the contracts at date 2.

• $T = 2, 5$. **Ex Ante Collusion Stage**: The independent regulator offers a menu of side-contracts to the firm. These contracts consist of side-transfers contingent on the identity of the principal who will be elected. The firm accepts or refuses this ex ante collusion.[26]

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[25]The assumption that affiliated regulators learn also information on the industry before being in office makes sense when those regulators are specialists coming from the industry.

[26]If bribes can only be paid to the empowered regulator, ex ante collusion for affiliated regulators cannot improve on ex post collusion and our focus on this timing for coalition formation in the case of affiliated regulators is warranted. This is particularly relevant if the identity of the affiliated regulator is not known before the election of the corresponding political principal. Note also that, even if his identity was known and bribes could be credibly promised to the un-elected regulator, firms might find it too

3 Affiliated Regulators

When the regulator is affiliated to one particular political principal, he holds office if and only if this principal gets elected. Suppose then that the second best grand-contract without collusion is offered by P_i. An efficient firm is willing to bribe a regulator who has learned $\sigma = \underline{\theta}$ up to the level of its rent $\underline{u}_i = \Delta\theta\bar{q}_i$. Since the regulator has all the bargaining power at the side-contracting stage, the private benefits he draws from colluding with the firm are worth the regulatory stake minus the transaction costs dissipated in the course of side-contracting, i.e., $k(\Delta\theta\bar{q}_i)$.

The Collusion-Proofness Principle holds in this context.[27] There is no loss of generality in having political principal P_i offering direct revelation mechanisms which are immune to the formation of the coalition between R_i and the firm. Indeed, because $\frac{k(\tau)}{\tau} = k - \frac{r}{2}\tau \leq 1 - \alpha_R$, it is always socially cheaper to pay the regulator to induce him to report an informative signal rather than obtaining this information directly from the firm. Therefore any contractual offer that would possibly induce collusion along the equilibrium path could be replicated at a cheaper cost for the principal by a contract that would deter collusion. From the Collusion-Proffness Principle, we only need to focus on contracts such that the following collusion-proofness constraint hold:

(6) $$s_i \geq k(\Delta\theta\bar{q}_i).$$

Note that the collusion-proofness constraints that each principal considers are not linked in the case of affiliated regulators.

With respect to the benchmark analyzed in Section 2.5,

The equilibrium platforms offered by the political principals are obtained as best responses to each other given the set of incentive and participation constraints.[28]

Proposition 1 : *All Nash equilibria with affiliated agencies entail:*

- *The collusion-proofness constraint (6) are binding.*

- *The optimal output of the efficient firm is always equal to its first best value:* $\underline{q}_i^{A*} = \underline{q}_i^A = \underline{q}^{FB}$.

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onerous to engage in ex ante collusion with *both* regulators if the value of smoothing bribes was not too large. Indeed, this form of ex ante collusion with affiliated regulators would require colluding with both regulators while only one is elected. The total amount of bribes that those two regulators could extract would be limited by incurring twice the, admittedly smaller, transaction costs of collusion. If the reduction in transaction costs coming from the ability to smooth bribes is not too large, ex ante collusion for affiliated regulators remains a dominated strategy.

[27]See Laffont and Tirole (1993, Chapter 11) for a proof in the case of a constant returns to scale technology of side-contracting. Changing this assumption has no consequence for this result.

[28]See the Appendix for details.

- *The optimal output of the inefficient firm is downwards distorted with respect to its second best value: $\bar{q}_i^A < \bar{q}_i^{SB} < \bar{q}^{FB}$ with:*

(7) $$S'(\bar{q}_i^A) = \bar{\theta} + \frac{\nu}{1-\nu}\Delta\theta((1-\alpha_i)(1-\epsilon) + \epsilon k'(\Delta\theta\bar{q}_i^A)).$$

- *The leftist government implements a greater distortion of output: $\bar{q}_L^A < \bar{q}_R^A$.*

Since the right-hand side of (6) is increasing with output, it is more costly to satisfy the collusion-proofness constraint as the regulatory stake $\bar{u}_i = \Delta\theta\bar{q}_i$ increases. Each principal wants to reduce the wage given to his affiliated regulator and does so by reducing output below its second best value. The optimal contracts move towards simpler bureaucratic rules leaving less discretion to the affiliated regulators as supervisory information is more informative.

With affiliated regulators, there is no linkage between the regulatory policies proposed by different parties. Whoever gets elected implements a policy reflecting only his own preferences and the cost of preventing capture with an affiliated regulator.

4   Stabilization with an Independent Regulator

4.1   Ex Ante Collusion

An independent regulator who has learned $\sigma = \underline{\theta}$ can always mimic the behavior of the affiliated regulators and propose side-contracts SC_i once GC_i has already been offered. Again, preventing this sort of collusions requires that the ex post collusion-proofness constraints (6) for $i \in \{R, L\}$ are both satisfied. On top of these possibilities, the independent regulator can now also commit to an *ex ante side-contract* before political uncertainty resolves. With such a side-contract, the regulator promises to hide informative reports whoever gets elected against a pair of contingent bribes (τ_R, τ_L) which extract all the efficient firm's expected information rent:

(8) $$\beta\tau_R + (1-\beta)\tau_L = \beta\underline{u}_R + (1-\beta)\underline{u}_L.$$

From the binding incentive compatibility and participation constraints, the right-hand side above is $\Delta\theta(\beta\bar{q}_R + (1-\beta)\bar{q}_L)$.

To minimize the expected transaction costs of side-contracting which are convex functions of bribes, the optimal ex ante side-contract should smooth bribes over the realization of political uncertainty. This requires a constant bribe

$$\tau^* = \Delta\theta(\beta\bar{q}_R + (1-\beta)\bar{q}_L).$$

Because the efficient firm is risk-neutral, it accepts this ex ante side-contract even if it may correspond to a loss when the left gets elected and offers a regulatory stake $\Delta\theta\bar{q}_L$ smaller than the bribe τ^*. This loss is, on average, covered by the gain obtained when the right comes to power and offers an information rent $\Delta\theta\bar{q}_R$ larger than τ^*.[29]

The optimal ex ante side-contract consists thus in a commitment to the following bribing and reporting strategies:

- The regulator reports $\hat{\sigma}_R = \hat{\sigma}_L = \emptyset$ when

$$\beta s_R + (1 - \beta)s_L < k(\Delta\theta(\beta\bar{q}_R + (1 - \beta)\bar{q}_L))$$

and receives bribes τ^* whoever gets elected.

- The regulator reports $\hat{\sigma}_R = \hat{\sigma}_L = \underline{\theta}$ when

$$\beta s_R + (1 - \beta)s_L \geq k(\Delta\theta(\beta\bar{q}_R + (1 - \beta)\bar{q}_L))$$

and gets wages s_i if P_i gets elected. He receives no bribe.

To avoid ex ante collusion, the following *ex ante collusion-proofness* constraint must be satisfied:

$$(9) \qquad \beta s_R + (1 - \beta)s_L \geq k(\Delta\theta(\beta\bar{q}_R + (1 - \beta)\bar{q}_L)).$$

Due to the ability of the independent regulator to smooth bribes, the collusion-proofness constraint (9) depends now on the *expected* information rent of a good firm $\beta\underline{u}_R + (1 - \beta)\underline{u}_L = \Delta\theta(\beta\bar{q}_R + (1 - \beta)\bar{q}_L)$. The independent regulator still extracts a private benefit from being captured on an ex ante basis. However, the relevant regulatory stake which matters to evaluate this benefit is now averaged over political outcomes. The ability of the independent regulator to commit to an ex ante side-contract implies that both political principals assess now in the same way the agency costs of capture as a function of the *average* output of a high cost firm.

4.2 Equilibria

The independent regulator accepts now both political platforms before the electoral outcome.

That the Collusion-Proofness Principle still holds in this context with a non-cooperative implementation of contracts is not a priori clear. Indeed, it could be that paying the regulator a wage s_i high enough so that, on top of (6), (9) is also satisfied is more costly

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[29]Of course, the possibility that the firm would be risk-averse would undermine bribe smoothing but it would not completely destroy its benefits. As long as the firm is relatively not too risk-averse, it would agree to smooth bribes exchanges with the regulator.

for principal P_i than giving up to the efficient firm a rent $\Delta\theta\bar{q}_i$ necessary to induce the revelation of its type. Nevertheless, next Proposition shows that this is always true for a class of so-called *interior equilibria*.

The next step is to find out whether the ex post (6) and/or the ex ante (9) collusion-proofness constraints are binding in equilibrium. Indeed, three sorts of equilibria are a priori feasible depending on whose principal bears the greatest cost of preventing the ex ante collusion-proofness constraint. *Interior equilibria* are such that only (9) is binding in equilibrium. *Corner equilibria* are such that an ex post and the ex ante collusion-proofness constraints are both binding. The latters may not always exist and when they exist, they yield a lower expected social welfare as we show in the Appendix. Hence, in what follows, we focus on interior equilibria. For those equilibria, both principals find optimal to satisfy only (9), (6) being slack for both principals.

Proposition 2 : *There exists a set of interior Nash Equilibria of the contractual game (Class 1) such that:*

- *The efficient firm produces the first best output: $\underline{q}_i^I = \underline{q}^{FB}$ for all $i \in \{R, L\}$.*

- *The inefficient firm is asked to produce either $\bar{q}_R^I$ or $\bar{q}_L^I$ (depending on the outcome of the election), jointly defined as the solutions to:*

  (10) $\quad S'(\bar{q}_R^I) = \bar{\theta} + \dfrac{\nu}{1-\nu}\Delta\theta((1-\alpha_R)(1-\epsilon) + \epsilon k'(\Delta\theta(\beta\bar{q}_R^I + (1-\beta)\bar{q}_L^I)).$

  (11) $\quad S'(\bar{q}_L^I) = \bar{\theta} + \dfrac{\nu}{1-\nu}\Delta\theta((1-\alpha_L)(1-\epsilon) + \epsilon k'(\Delta\theta(\beta\bar{q}_R^I + (1-\beta)\bar{q}_L^I)).$

- *These interior equilibria differ with respect to the wages offered by both principals. Any equilibrium pair of wages (s_R^I, s_L^I) satisfy the ex ante collusion-proofness constraint (9) with equality and both ex post collusion-proofness constraints (6) are slack.*

- *Collusion-proofness is obtained in equilibrium for a non-empty set of wages (s_R^I, s_L^I) such that (9) is binding and*

  (12) $\quad s_R^I < \min\left((1-\alpha_R)\Delta\theta\bar{q}_R^I, \dfrac{k(\Delta\theta(\beta\bar{q}_R^I + (1-\beta)\bar{q}_L^I)) - (1-\beta)k(\Delta\theta\bar{q}_R^I)}{\beta}\right).$

  (13) $\quad s_L^I < \min\left((1-\alpha_L)\Delta\theta\bar{q}_L^I, \dfrac{k(\Delta\theta(\beta\bar{q}_R^I + (1-\beta)\bar{q}_L^I)) - \beta k(\Delta\theta\bar{q}_R^I)}{1-\beta}\right).$

All those equilibria correspond to the same allocative distorsions but differ with respect to the payoff distribution between the principals. More exactly, this distribution

depends on their respective contributions to satisfy the ex ante collusion-proofness constraint (9) provided that those contributions themselves are smaller than the cost of giving up information rents to the firm, i.e., we must have $s_i^I < (1 - \alpha_i)\Delta\theta\bar{q}_i^I$ to still insure that both principals want to offer collusion-proofness contracts.

Let us focus on the worst payoff distribution from the point of view of P_R. This equilibrium is obtained when (12) is binding. Consider first the behavior of P_L, taking as given s_R and $\bar{q}_R^I$. To deter collusion, P_L offers a wage s_L which just makes the ex ante collusion-proofness constraint binding and leaves his ex post collusion-proofness constraint slack (at least weakly). Reducing such a wage would automatically trigger collusion ex post if P_L gets elected. This wage depends of course on the output that P_L wants to implement. Maximizing with respect to output yields $\bar{q}_L^I$ as the best level of output offered by P_L when only (9) is binding. Now, a best response of P_R to the contract offered by P_L is, for P_R, to offer a relatively high wage s_R which just makes the ex ante collusion-proofness constraint binding, and leaves P_R's ex post collusion-proofness constraint strictly satisfied as long as it is less costly than giving to the firm some informational rent. The optimal output is then also $\bar{q}_R^I$.

Only the *average* wage of the regulator and the equilibrium outputs are fully determined for an interior equilibrium. Indeed, when only the ex ante collusion-proofness is binding for *both* principals, those principals consider the average collusion stake as the relevant one, independently of the exact wages offered by each principal to their common regulator. The possibility of collusion still leads both principals to downward distort production below the outcome they would implement with a benevolent regulator. This downward distortion is now needed to reduce the *average* regulatory stake which becomes relevant to assess the independent regulator's benefits of capture.

5 Comparative Statics

Proposition 3 : *Politically induced output fluctuations are reduced with an independent regulator. With respect to the case of affiliated regulators, the leftist (resp. rightist)government asks for a higher (reps. lower) output level when the firm is inefficient:*

$$\bar{q}_R^A \geq \bar{q}_R^I \geq \bar{q}_L^I \geq \bar{q}_L^A.$$

As previously discussed, the cost of ensuring ex ante collusion-proofness depends now on the average output which obviously lies between the outputs implemented by a leftist government and a rightist one. Consider first the point of view of a leftist government.

Given the policy included in the rightist electoral platform which typically stipulates a higher output than what the left would like, the leftist government has now to consider the average collusion stake which is typically higher than if he wins for sure the election. Compared to the affiliated case, the convexity of transaction costs imply that *at the margin*, the leftist party finds now relatively less costly to increase production than in the case of affiliated regulators. Conversely, the rightist party regards as given the leftist policy, which from its point of view calls for too low an output level. This means that the rightist government faces a cost of preventing ex ante collusion which increases relatively more quickly with output than in the affiliated case. Compared to the case of affiliated regulators where parties would simply ignore the platform of their defeated rival, there is now *less polarization* in economic policy. Granting independence to the bureaucracy induces some *convergence* in the platforms. The independent regulator stabilizes the implemented policy making it less sensitive to the actual preferences of elected principals.

To get further insights, we now assume that $S(\cdot)$ is quadratic, i.e., $S(q) = \lambda q - \frac{\mu}{2}q^2$ for $\mu > \frac{\epsilon r \nu \Delta \theta^2}{1 - \nu}$ to insure concavity of the principal's problem in all circumstances and λ sufficiently large with respect to $\bar{\theta}$ and $\Delta \theta$ so that equilibrium outputs remain always positive.

It is easy to rewrite the outputs emerging with affiliated regulators as:

$$(14) \qquad \left(\mu - \frac{\epsilon r \nu \Delta \theta^2}{1 - \nu}\right) \bar{q}_i^A = \lambda - \bar{\theta} - \frac{\nu}{1 - \nu} \Delta \theta ((1 - \epsilon)(1 - \alpha_i) + \epsilon k).$$

With an independent regulator, we get instead:

$$(15) \qquad \left(\mu - \frac{\epsilon r \nu \Delta \theta^2}{1 - \nu}\right) \bar{q}_i^I = \lambda - \bar{\theta} - \frac{\nu}{1 - \nu} \Delta \theta ((1 - \epsilon)(1 - \tilde{\alpha}_i) + \epsilon k)$$

where $\tilde{\alpha}_R = \alpha_R - \frac{(1-\beta)\nu(1-\epsilon)}{\mu(1-\nu)}\Delta\alpha\Delta\theta$ and $\tilde{\alpha}_L = \alpha_L + \frac{\beta\nu(1-\epsilon)}{\mu(1-\nu)}\Delta\alpha\Delta\theta$. Direct observations of these formula yields:

Proposition 4 : *Assume that $S(\cdot)$ and $k(\cdot)$ are both quadratic, then we have:*

• *The average output of an inefficient firm under independence is the same than with affiliated regulators:*
$$\beta\bar{q}_R^I + (1 - \beta)\bar{q}_L^I = \beta\bar{q}_R^A + (1 - \beta)\bar{q}_L^A.$$

• *The average output of an inefficient firm with an independent regulator is just equal to the optimal output level, $\bar{q}_{\hat{\alpha}}$, that a benevolent social planner would choose:*
$$\beta\bar{q}_R^I + (1 - \beta)\bar{q}_L^I = \bar{q}_{\hat{\alpha}}.$$

• *The variance of output diminishes under independence:*
$$\bar{q}_R^I - \bar{q}_L^I = \frac{\nu(1 - \epsilon)}{\mu(1 - \nu)}\Delta\alpha\Delta\theta < \bar{q}_R^A - \bar{q}_L^A = \frac{\nu(1 - \epsilon)}{\left(\mu - \frac{\epsilon r \nu \Delta \theta^2}{1 - \nu}\right)(1 - \nu)}\Delta\alpha\Delta\theta.$$

The rightist government (resp. leftist) decreases (resp. increases) the production of a high cost firm compared to the case of an affiliated bureaucracy. Everything happens as if the trade-off between rent and efficiency that is reached by either principal is modified with the status of the regulator. The elected political principal shifts his own preferences towards the non-elected minority. Even if a political principal does not get elected, he has some impact on the policy implemented by the winner of the elections, however this influence diminishes with the probability that he does not get elected. Hence, an independent bureaucracy also allows the preferences of the minorities to be incorporated into actual policies in a way which reflects the "stochastic" political influence of these minorities.

The new welfare weights $\tilde{\alpha}_i$ that principals give to the regulated sector capture this phenomenon. Those new weights depend now also on the degree of polarization of the society ($\Delta\alpha$) and on the probability that the corresponding party *does not* get elected. With more polarization, the independent regulator's desire to insure himself against political uncertainty becomes greater and correcting terms are more important. When the probability that a given political principal loses the election increases, the regulation he implements is shifted more significantly towards that offered by his rival.

Interestingly, in this quadratic case, the average equilibrium output under bureaucratic independence is just *equal* to the optimal output that would be chosen by a benevolent social planner having to rely on a bureaucracy to implement his regulatory policy. As such, the cost of ensuring collusion-proofness under partisanship but political independence is equal to its value for a social planner. Both principals modify their policies towards the socially optimal middle-road policy. This convergence towards the socially optimal outcome will turn out to have important welfare implications.

6   Constitutional Design

So far, we have shown that independence allows the regulator to enlarge the set of collusive agreements with the interest group but also that the variance of output diminishes, keeping a constant average. To further assess the consequences of the regulator's legal status on ex ante social welfare, first note that the efficient firm's production is always equal to the first best whatever the institution and the principal in charge. Thus, we can omit the terms depending on $\underline{q}^{FB}$ in the expression of social welfare and focus our analysis on the consequences of changes in the output $\bar{q}$ of an inefficient firm. Let us thus consider:

$$SW_{\hat{\alpha}}(\bar{q}) = (1 - \nu)(S(\bar{q}) - \bar{\theta}\bar{q}) - \nu(1 - \hat{\alpha})(1 - \epsilon)\Delta\theta\bar{q} - \nu\epsilon k(\Delta\theta\bar{q}).$$

$SW_{\hat{\alpha}}$ is thus the part of expected social welfare which is a function of $\bar{q}$ only. Let us also denote by $SW_{\hat{\alpha}}^I$ (resp. $SW_{\hat{\alpha}}^A$) the expected value of this function in the case of an independent (resp. affiliated) regulators. We have:

$$SW_{\hat{\alpha}}^I = \beta SW_{\hat{\alpha}}(\bar{q}_R^I) + (1-\beta)SW_{\hat{\alpha}}(\bar{q}_L^I)$$

and

$$SW_{\hat{\alpha}}^A = \beta SW_{\hat{\alpha}}(\bar{q}_R^A) + (1-\beta)SW_{\hat{\alpha}}(\bar{q}_L^A).$$

These expressions are useful to compare both institutions. Indeed, the social welfare difference between the cases of independence and non-independence writes as:

$$\Delta SW_{\hat{\alpha}} = \underbrace{\left(SW_{\hat{\alpha}}^I - SW_{\hat{\alpha}}^A\right)}_{\text{A=Stabilization Effect}}$$

$$+ \underbrace{\nu\epsilon(\beta k(\Delta\theta\bar{q}_R^I) + (1-\beta)k(\Delta\theta\bar{q}_L^I) - k(\Delta\theta(\beta\bar{q}_R^I + (1-\beta)\bar{q}_L^I)))}_{\text{B=Agency Cost Effect}}.$$

- **The Stabilization Effect:** The first bracketed term (A) represents the difference in social welfare which would be obtained if the cost of ensuring collusion-proofness under independence was computed as with affiliated regulators *but* with the equilibrium outputs of the independent case. The second bracketed term (B) represents thus the difference between the cost of ensuring collusion-proofness with an independent regulator and that with affiliated ones when that cost has been computed with the outputs implemented by an independent regulator. We observe that:

$$A = \beta(SW_{\hat{\alpha}}(\bar{q}_R^I) - SW_{\hat{\alpha}}(\bar{q}_R^A)) + (1-\beta)(SW_{\hat{\alpha}}(\bar{q}_L^I) - SW_{\hat{\alpha}}(\bar{q}_L^A)).$$

This first term is positive since $SW_{\hat{\alpha}}(\bar{q})$ is a concave function of $\bar{q}$ which is maximum for $\bar{q}_{\hat{\alpha}}$ in the quadratic case and outputs converge towards this socially optimal target with an independent regulator. This *stabilization effect* yields therefore some *benefits* from an ex ante welfare point of view. The nature of this benefit is clear. Indeed, incentive constraints convexify the set of payoffs that can be achieved by both political principals. With affiliated regulators, outputs fluctuate quite a lot and the expected social welfare corresponds to a point of this utility space which lies in the interior of this set. With an independent regulator, outputs are better stabilized and less sensitive to political fluctuations. Expected social welfare moves closer to the Pareto frontier of the set of implementable utility levels.

- **The Agency Cost Effect:** For a given pair of policies, the cost of preventing collusion with an independent regulator is nevertheless greater than with affiliated ones:

$$B = \nu\epsilon(\beta k(\Delta\theta\bar{q}_R^I) + (1-\beta)k(\Delta\theta\bar{q}_L^I) - k(\Delta\theta(\beta\bar{q}_R^I + (1-\beta)\bar{q}_L^I))) < 0$$

from the *strict concavity* of $k(\cdot)$. Stabilization of output is achieved at the cost of an increase in the agency's budget needed to satisfy the ex ante collusion-proofness constraint. Comparing with the case of affiliated regulators, an independent regulator benefits from greater slacks. As a whole, political principals lose some control over an independent regulator.

6.1 Ex Ante Social Welfare

Combining the stabilization and the agency cost effects, we find that:

Proposition 5 *: Assume that $S(\cdot)$ and $k(\cdot)$ are both quadratic, then expected social welfare is greater with an independent regulator:*

$$(16) \qquad \Delta SW_{\hat{\alpha}} = \frac{r\beta(1-\beta)\nu^3\epsilon(1-\epsilon)^2(\Delta\alpha)^2(\Delta\theta)^4}{2(1-\nu)^2\mu\left(\mu - \frac{\epsilon r\nu\Delta\theta^2}{1-\nu}\right)} > 0.$$

$\Delta SW_{\hat{\alpha}}$ *is thus increasing in the convexity of transaction costs of side-contracting r, the political variance $\beta(1-\beta)$, the degree of polarization $\Delta\alpha$, and the incentive distortion $\frac{\nu}{1-\nu}\Delta\theta$.*

The reduction in output fluctuations improves expected social welfare. Less political control of the administrative branch of the government is better when the information rents given up both to the firm and the regulator (these terms being increasing in $\Delta\theta$) are relatively large. When rent extraction becomes more of a concern, policies fluctuate more and society is better off with an independent bureaucracy.

Using (16), we observe that the welfare gain of independence depends monotonically on a number of parameters. When $k(\cdot)$ becomes more concave, the bureaucrat's demand for bribes smoothing increases and the stabilization effect is reinforced. Similarly, more political variance ($\beta(1-\beta)$ greater) increases the attractiveness of this smoothing strategy. More polarization ($\Delta\alpha$ greater) means also a larger difference between the regulatory policies implemented by a rightist and a leftist government. This justifies to further stabilize output by using regulatory independence. Lastly, when $\frac{\nu}{1-\nu}\Delta\theta$ - a measure of the second best distortion due to asymmetric information - increases, output fluctuations have a greater amplitude and this information motive reinforces also the desire for stabilization.

6.2 The Political Principals' Gains from Stabilization

Once elected, both principals dislike independence. Even though delegation to an independent regulator is individually costly for political principals since it induces further

agency costs with respect to a more politicized regulation, the independent regulator significantly stabilizes policies and makes these policies less sensitive to the identity of who gets elected. This stabilization is good from an ex ante social welfare point of view as we have seen above. To some extent it may even be desirable for biased principals at the ex ante stage, i.e., *before* the election takes place. Indeed, if a given political principal loses the elections, his rival will implement a policy less different from what he would have done himself. Moreover, if political principals can exchange lump sum transfers at the ex ante constitutional stage, they can certainly both benefit from the increase in expected welfare associated to regulatory independence. Of course, the relative gain of each of these principals may depend on the bargaining power of each constituency at this ex ante stage when the legal status of the agency is chosen.

Corollary 1 : *Assume that $S(\cdot)$ and $k(\cdot)$ are both quadratic, then both political principals prefer an independent regulator from an ex ante point of view.*

Let us now assume that the bargaining power of one of the principal, say the rightist one, at this ex ante stage is null so that this constituency should bear all the increase in the agency cost of capture in case the regulator is independent. We show below that this principal would nevertheless prefer to let the regulator be independent. Let us also denote by $SW_{\alpha_R}^I$ (resp. $SW_{\alpha_R}^A$) the expected value of the rightist political principal's objective function in the case of an independent (resp. affiliated) regulators. We have:

$$SW_{\alpha_R}^I = \beta SW_{\alpha_R}(\bar{q}_R^I) + (1-\beta)SW_{\alpha_R}(\bar{q}_L^I)$$

and

$$SW_{\alpha_R}^A = \beta SW_{\alpha_R}(\bar{q}_R^A) + (1-\beta)SW_{\alpha_R}(\bar{q}_L^A)$$

where $SW_{\alpha_R}(\bar{q})$ has a definition which is similar to that of $SW_{\hat{\alpha}}(\bar{q})$ with α_R replacing $\hat{\alpha}$. With this definition, the social welfare difference between the cases of independence and non-independence writes as:

$$\Delta SW_{\alpha_R} = \Delta SW_{\hat{\alpha}}$$

$$+(1-\beta)\nu\Delta\alpha(1-\epsilon)\Delta\theta(\beta\bar{q}_R^I + (1-\beta)\bar{q}_L^I - (\beta\bar{q}_R^A + (1-\beta)\bar{q}_L^A))$$

where the last term represents the conflict of interest between the rightist political principal and the social planner in evaluating the firm's expected information rent. In fact, thanks to Proposition 4, this latter term is zero under the assumption of quadratic functional forms and with this ex ante criterion, the rightist constituency also favors the choice of an independent regulator since it measures the difference in welfare levels corresponding to both institutions just as a social planner does.

6.3 Impact on the Regulated Firm

From Proposition 4, independence stabilizes output at the same average level than with affiliated regulators. Since the firm's information rent is proportional to output, the next corollary immediately follows:

Corollary 2 : *Assume that $S(\cdot)$ and $k(\cdot)$ are both quadratic, then the regulated firm's expected rent does not depend on the legal status of the agency.*

The interest group is unlikely to lobby for a particular design of the agency. This design remains just an issue concerning only the political principals and the bureaucracy. The firm is neutral with respect to the choice of the regulator's legal status.[30]

6.4   The Agency Cost of Independence

We have already observed that the agency cost under independence is *greater* than its expected value with affiliated regulators *if equilibrium outputs were taken as fixed*. Hence, the independent regulator's ability to commit to a side-contract increases a priori the agency cost of delegation. Of course, optimal ouputs differ across regimes and one might want to know if the bureaucracy as a whole is also better off in equilibrium. The next result shows that, at least in the quadratic case, the agency prefers being independent from political principals.

Corollary 3 : *Assume that $S(\cdot)$ and $k(\cdot)$ are both quadratic, then the expected wage of the independent regulator is strictly greater than the expected wages given to affiliated regulators.*

An independent agency is better able to push its own interest than affiliated agencies. Moreover, since an independent regulator implements partisan policies closer to the socially optimal one, he becomes a representative of the general interest even though part of the benefit of stabilization is immediately pocketed by the regulator himself.

7   Endogenous Political Uncertainty

Let us now endogenize political uncertainty by assuming that forward-looking voters decide of their ballot by comparing the expected payoffs they obtain with each party. Voters

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[30]Had the firm been risk-averse, its own demand for insurance may favor the choice of the institutions with the lower variance in output and information rent but risk aversion also weakens the ability of the regulator and the firm to smooth their bribe exchanges and thus would certainly undermine the stabilization effect.

are ideologically differentiated with respect to the trade-off they would like to implement between efficiency and rent extraction, i.e., with respect to their α.[31] The distribution of those α over $[0,1]$ varies with a distribution of its median α_m having a cdf $F(\cdot)$ with density $f(\cdot)$.

- **Affiliated Regulators:** Let us first consider the case of affiliated regulators. The agent α^A being indifferent between a rightist policy $\bar{q}_R$ and a leftist policy implementing $\bar{q}_L$ must get the same expected payoff with both policies. α^A is thus such that

$$SW_{\alpha^A}(\bar{q}_R) = SW_{\alpha^A}(\bar{q}_L).$$

Using the quadratic specification yields:

$$\frac{\nu(1-\epsilon)(1-\alpha^A)\Delta\theta}{1-\nu} = \lambda - \bar{\theta} - \frac{\nu\epsilon k \Delta\theta}{1-\nu} - \frac{1}{2}\left(\mu - \frac{r\nu\epsilon\Delta\theta^2}{1-\nu}\right)(\bar{q}_R + \bar{q}_L).$$

α^A is finally a function of $\bar{q}_R + \bar{q}_L$ only. The probability that the right gets elected is thus $\beta^A = 1 - F(\alpha^A(\bar{q}_R + \bar{q}_L))$. For further references, note that $\frac{\nu(1-\epsilon)(1-\alpha^A)\Delta\theta}{1-\nu}\frac{\partial\alpha^A}{\partial q_R} = \frac{1}{2}\left(\mu - \frac{r\nu\epsilon\Delta\theta^2}{1-\nu}\right) > 0$. As outputs increase, the swing voter moves up, increasing the probability that the left gets elected. Indeed, as the output proposed by the right and the left increase by the same amount, the payoff of a given voter with the right increases slower than with the left: $\bar{q}_R$ is always greater than $\bar{q}_L$ and the result obtains by concavity of his objective function. This makes more likely to have this voter prefer the left.

In a Nash equilibrium of the choice of platforms, P_R chooses $\bar{q}_R$ so that it maximizes

$$(1 - F(\alpha^A(\bar{q}_R + \bar{q}_L)))SW_{\alpha_R}(\bar{q}_R) + F(\alpha^A(\bar{q}_R + \bar{q}_L))SW_{\alpha_R}(\bar{q}_L).$$

P_R takes now into account the impact of its policy choice on the probability of getting elected. The corresponding first-order condition writes now as:

$$(17) \qquad \left(\mu - \frac{\epsilon r\nu\Delta\theta^2}{1-\nu}\right)\bar{q}_R^A = \lambda - \bar{\theta} - \frac{\nu}{1-\nu}\Delta\theta((1-\epsilon)(1-\alpha_R) + \epsilon k)$$

$$\underbrace{-\frac{\nu(1-\epsilon)\Delta\theta f(\alpha^A)}{(1-\nu)(1-F(\alpha^A))}\frac{\partial\alpha^A}{\partial q_R}(\bar{q}_R^A - \bar{q}_L^A)(\alpha_R - \alpha^A)}_{\text{Electoral Effect} < 0}$$

where $\alpha_R > \alpha^A$ since the swing voter has preferences within the interval $[\alpha_L, \alpha_R]$. A similar equation would be obtained by permuting indices for the leftist party.

Direct observations show that the electoral effect is negative with the right and positive with the left. Indeed, reducing (resp. increasing) output increases now the probability that the right (resp. left) gets elected and, for this reason, the right offers a platform shifted downwards.

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[31]This may capture differences in ideologies.

• **Independent Regulator:** The agent α^I being indifferent between a rightist policy $\bar{q}_R$ and a leftist policy $\bar{q}_L$ must get the same expected payoff with both policies. To simplify, we focus on the case where both parties pay the same wage $k(\Delta\theta(\beta\bar{q}_R + (1-\beta)\bar{q}_L))$ to the independent regulator in an interior equilibrium, i.e., we posit a particular distribution of the gains from dealing with a common bureaucrat. The identity of the swing voter α^I is now such that

$$SW_{\alpha^A}(\bar{q}_R) + \nu\epsilon k(\Delta\theta\bar{q}_R) = SW_{\alpha^A}(\bar{q}_L) + \nu\epsilon k(\Delta\theta\bar{q}_L).$$

Using the quadratic specifications again yields:

$$\frac{\nu(1-\epsilon)(1-\alpha^I)\Delta\theta}{1-\nu} = \lambda - \bar{\theta} - \frac{\nu\epsilon}{1-\nu}k\Delta\theta - \frac{1}{2}\mu(\bar{q}_R + \bar{q}_L).$$

α^I is still a function of $\bar{q}_R + \bar{q}_L$ only. The probability that the right gets elected is now $\beta^I = 1 - F(\alpha^I(\bar{q}_R + \bar{q}_L))$. Nevertheless, we have now $\frac{\partial\alpha^I}{\partial q_R} > \frac{\partial\alpha^A}{\partial q_R}$. Hence, the swing voter becomes more sensible to changes in the regulatory policy with an independent bureaucrat than with affiliated regulators. Indeed, both parties fight collusion in the same way with an independent agency and the swing voter is only determined by the difference in their preferences over the pure trade-off between efficiency and the firm's rent. The swing voter is the same as if the bureaucracy was not corrupted at all. In this case, the voter's objective function would be less concave and more sensitive to output variations.

In a Nash equilibrium, P_R chooses $\bar{q}_R$ so that it maximizes

$$(1 - F(\alpha^I(q_R + \bar{q}_L)))(SW_{\alpha_R}(\bar{q}_R) + \nu\epsilon k(\Delta\theta\bar{q}_R)) + F(\alpha^I(q_R + \bar{q}_L))(SW_{\alpha_R}(\bar{q}_L) + \nu\epsilon(k(\Delta\theta\bar{q}_L))$$

$$-\nu\epsilon k(\Delta\theta((1 - F(\alpha^I(q_R + \bar{q}_L)))\bar{q}_R + F(\alpha^I(q_R + \bar{q}_L))\bar{q}_L)).$$

The corresponding first-order condition becomes:

$$\left(\mu - \frac{\epsilon r\nu\Delta\theta^2}{1-\nu}\right)\bar{q}_R^I = \lambda - \bar{\theta} - \frac{\nu}{1-\nu}\Delta\theta\left((1-\epsilon)(1-\alpha_R) + \epsilon\left(k + r\Delta\theta(1-\beta)(\bar{q}_R^I - \bar{q}_L^A)\right)\right)$$

$$\underbrace{-\frac{\nu(1-\epsilon)\Delta\theta f(\alpha^I)}{(1-\nu)(1-F(\alpha^I))}\frac{\partial\alpha^I}{\partial q_R}(\bar{q}_R^I - \bar{q}_L^I)(\alpha_R - \alpha^I)}_{\text{Previous Electoral Effect} < 0}.$$

(18) $$\underbrace{+\frac{\nu\epsilon\Delta\theta f(\alpha^I)}{(1-\nu)(1-F(\alpha^I))}\frac{\partial\alpha^I}{\partial q_R}(\bar{q}_R^I - \bar{q}_L^I)k'(\Delta\theta(\beta^I\bar{q}_R + (1-\beta^I)\bar{q}_L))}_{\text{New Electoral Effect} > 0}.$$

For both parties, the electoral effect still includes a term having the same form as with affiliated regulators. However, a new term appears which captures the impact of the choice of the platform on the agency cost of delegation to the independent agency. Since the agency cost depends only on the average output, both parties have an incentive to affect

the probabilities of winning in such a way that the leftist party wins more often to have a low average output and reduce agency cost. This creates a motive for both principals to raise outputs. This favors the election of the leftist party. However, when the marginal efficiency of side-contracting $k'(\cdot)$ is small relative to the polarization $\alpha_R - \alpha^I$, this effect is unlikely to introduce any significant change in the analysis. More importantly, the greater sensitivity of the swing voter to output variations under independence might increase the convergence of the platforms towards middle-road policies. This would reinforce our previous findings that the independent bureaucracy makes policies converge further one towards the other.

8   Concluding Remarks

Regulatory independence increases the agency cost between political principals and this bureaucracy. It makes thus any change in policy less easily implementable. Political principals must concede more freedom to the independent regulator who becomes a better representative of the general interest. An independent bureaucracy becomes then an institutional check against expropriation of the minority by the elected majority.

This research could be pursued along several lines. First, our view of the government and the election system is quite simplistic. We could, for instance, introduce divided governments or coalitional behavior in multi-parti systems. It has often been argued that those features may increase political uncertainty. This suggests that the benefits of independence are greater with parlimentary systems, a fact which should be assessed both on the theory and on the empirical sides. Second, our model could be extended to a dynamic environment with elections taking place at different dates. In a companion paper, Faure-Grimaud and Martimort (2003), we take a first step towards such an analysis and develop a two period model having a regime switching taking place for sure. The regulator's desire for bribes smoothing over the results of political uncertainty is then replaced by the desire for bribes smoothing over time. We then investigate the conditions under which a party may want to enact an independent agency to strategically commit to affect future policies. Of course, the value of commitment will be affected by political uncertainty as well. Finally, with the quadratic specifications used in this paper, it appears that the interest group is indifferent with respect to the kind of agency it is facing. Generalizing our findings is likely to give insights on the conditions under which an interest group prefers to be controlled by an independent agency and will thus lobby for it at the constitutional level stage.

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Appendix

Benchmark: Benevolent Regulators. For further references, we define the expected welfare of P_i when the grand-contract GC_i is offered as:

$$SW(GC_i, \alpha_i) = \nu\epsilon(S(\underline{q}^{FB}) - \underline{\theta}\underline{q}^{FB}) + \nu(1-\epsilon)(S(\underline{q}_i) - \underline{\theta}\underline{q}_i) + (1-\nu)(S(\bar{q}_i) - \bar{\theta}\bar{q}_i)$$

$$-\nu\epsilon s_i - (1-\alpha)(\nu(1-\epsilon)\underline{u}_i + (1-\nu)\bar{u}_i).$$

The optimal contract solves the following problem:

$$\max_{GC_i} SW(GC_i, \alpha_i)$$

subject to (2)-(3) and (4).

The solution to this problem is described in the text.

Proof of Proposition 1: The grand-contract offered by P_R must solve the following problem:[32]

$$\max_{GC_R} \beta SW(GC_R, \alpha_R) + (1 - \beta)SW(GC_L, \alpha_R)$$

subject to (2)-(3) and now (6).

Similarly, we could define the programme (P_L) by simply permuting indices.

Inserting the values of the transfers from all those binding constraints into P_i's objective function and optimizing with respect to outputs gives (7). Finally, the fact that q_i^A is monotonic in α_i is derived from the concavity of $S(\cdot)$.

Proof of Propositions 2 and 6: For a given contract offered by P_L, P_R wants to find a best response which solves the following problem (denoted thereafter by (P_R)):

$$\max_{GC_R} \beta SW(GC_R, \alpha_R) + (1 - \beta)SW(GC_L, \alpha_R)$$

subject to (2)-(3)–(6) and (9).

One can already see that P_L's contract has distributive consequences on P_R's payoff through its impact on (9).

Then the proof proceeds through several stages. First, we construct the best responses of both political principals to the other's contract under the condition that each principal prefers to offer a collusion-proof contract than letting collusion occur between the independent regulator and the firm. We analyze there *monotonic equilibria* where, as in the case of affiliated regulators, the leftist principal implements a lower output than the rightist one. Second, we construct the three different classes of equilibria. Third, we check that both principals find optimal to offer a collusion-proof contract.

Best Responses: For further reference, we also denote by $\bar{q}_i^*(\bar{q}_j)$ the unique solution to:

$$(19) \qquad S'(\bar{q}_i^*(\bar{q}_j)) = \bar{\theta} + \frac{\nu}{1 - \nu}\Delta\theta((1 - \alpha_i)(1 - \epsilon) + \epsilon k'(\Delta\theta(\beta\bar{q}_j + (1 - \beta)q_i^*(\bar{q}_j)))).$$

Let us also define $\hat{\bar{q}}_i(s_j, \bar{q}_j)$ as the output solution to

$$\beta s_j + (1 - \beta)k(\Delta\theta\bar{q}_i) = k\left(\Delta\theta\left(\beta\bar{q}_j + (1 - \beta)\bar{q}_i\right)\right)$$

---

[32]The fact that (6) is binding (as it is the case at the optimum) may introduce some non concavity in the principal's objective function with respect to output. To avoid these uninteresting technicalities, we assume that $|S''(\cdot)|$ is sufficiently large, typically, greater than $\frac{r\nu\epsilon\Delta\theta^2}{1-\nu}$.

for $i \neq j$. For a given pair $(s_j, \bar{q}_j)$, $\hat{\bar{q}}_i(s_j, \bar{q}_j)$ is the value of output for which both the ex post and the ex ante collusion proofness constraints are binding in (P_i).

● **Leftist Principal:** Observe that $\phi(x) = (1-\beta)k(\Delta\theta x) - k(\Delta\theta(\beta\bar{q}_R + (1-\beta)x)) + \beta s_R$ is such that $\phi'(x) = (1-\beta)\Delta\theta(k'(\Delta\theta x) - k'(\Delta\theta(\beta\bar{q}_R + (1-\beta)x)))$ and, from the concavity of $k(\cdot)$, $\phi(\cdot)$ is thus increasing over the interval $[0, \bar{q}_R]$. Note that $\phi(\hat{\bar{q}}_L(s_R, \bar{q}_R)) = 0$.

Hence, when $\bar{q}_L \geq \hat{\bar{q}}_L(s_R, \bar{q}_R)$ and $\bar{q}_L \leq \bar{q}_R$, (6) for $i = L$ implies (9) and (6) is thus the harder collusion-proofness constraint to satisfy in (P_L). For those outputs, (6) for $i = L$ is in fact binding in (P_L) since collusion-proofness must be implemented at minimal cost by this principal. Inserting the corresponding value of s_L into P_L's concave objective function and optimizing with respect to the inefficient firm's output over the set of relevant outputs yields the following best response for $\bar{q}_L \geq \hat{\bar{q}}_L(s_R, \bar{q}_R)$ and $\bar{q}_L < \bar{q}_R$:

$$\bar{q}_L = max(\hat{\bar{q}}_L(s_R, \bar{q}_R), \bar{q}_L^A).$$

Similarly, observe also that, when $\bar{q}_L \leq \hat{\bar{q}}_L(s_R, \bar{q}_R)$, (9) implies now (6) for $i = L$ and (9) is thus the harder collusion-proofness constraint to satisfy in (P_L). (9) is then binding if collusion-proofness is implemented at minimal cost by this principal. Inserting the corresponding value of s_L into P_L's objective function and optimizing with respect to the inefficient firm's output over the set of relevant outputs yields now the following best response for $\bar{q}_L \leq \hat{\bar{q}}_L(s_R, \bar{q}_R)$:

$$\bar{q}_L = min(\hat{\bar{q}}_L(s_R, \bar{q}_R), \bar{q}_L^*(\bar{q}_R)).$$

● **Rightist Principal:** Similarly, observe that

$$\psi(x) = \beta k(\Delta\theta x) - k(\Delta\theta(\beta x + (1-\beta)\bar{q}_L)) + (1-\beta)s_L$$

is such that

$$\psi'(x) = \beta\Delta\theta(k'(\Delta\theta x) - k'(\Delta\theta(\beta x + (1-\beta)\bar{q}_L)))$$

and, from the concavity of $k(\cdot)$, $\psi(\cdot)$ is thus decreasing over the interval $[\bar{q}_L, \infty]$. Note that $\psi(\hat{\bar{q}}_R(s_L, \bar{q}_L)) = 0$.

Hence, when $\bar{q}_R \leq \hat{\bar{q}}_R(s_L, \bar{q}_L)$ and $\bar{q}_R \geq \bar{q}_L$, (6) for $i = R$ implies (9) and (6) is thus the harder collusion-proofness constraint to satisfy in (P_R). For those outputs, (6) for $i = R$ is in fact binding in (P_R) since collusion-proofness must be implemented at minimal cost by this principal. Inserting the corresponding value of s_R into P_R's concave objective function and optimizing with respect to the inefficient firm's output over the set of relevant outputs yields the following best response for $\bar{q}_R \leq \hat{\bar{q}}_R(s_L, \bar{q}_L)$ and $\bar{q}_R \geq \bar{q}_L$:

$$\bar{q}_R = min(\hat{\bar{q}}_R(s_L, \bar{q}_L), \bar{q}_R^A).$$

Similarly, observe also that, when $\bar{q}_R \geq \hat{\bar{q}}_R(s_L, \bar{q}_L)$, (6) for $i = R$ is implied by (9) and (9) is thus the harder collusion-proofness constraint to satisfy in programme (P_R). Inserting the corresponding value of s_R into P_R's objective function and optimizing with respect to inefficient firm's output over the set of relevant outputs yields now the following best response for $\bar{q}_R \geq \hat{\bar{q}}_R(s_L, \bar{q}_L)$:

$$\bar{q}_R = max(\hat{\bar{q}}_R(s_L, \bar{q}_L), \bar{q}_R^*(\bar{q}_L)).$$

Of course, for both the leftist and the leftist principals, the optimization of their objective functions still results in the first best output being always offered to the efficient firm.

● **Three Different Equilibria Classes:**

First note that
$$\bar{q}_L^A < \bar{q}_L^I < \bar{q}_R^I < \bar{q}_R^A$$
as we show in the proof of Proposition 3 below.

Interior Equilibria: Consider first the case where the equilibrium wages s_L and s_R are such that:

(20) $$\bar{q}_L^A \leq \bar{q}_L^I \leq \hat{\bar{q}}_L(s_R, \bar{q}_R^I)$$

and simultaneously

(21) $$\bar{q}_R^A \geq \bar{q}_R^I \geq \hat{\bar{q}}_R(s_L, \bar{q}_L^I).$$

These two inequalities imply respectively that

(22) $$\phi(\bar{q}_L^I) = (1 - \beta)k(\Delta\theta\bar{q}_L^I) - k(\Delta\theta(\beta\bar{q}_R^I + (1 - \beta)\bar{q}_L^I)) + \beta s_R < 0$$

and

(23) $$\psi(\bar{q}_L^I) = \beta k(\Delta\theta\bar{q}_R^I) - k(\Delta\theta(\beta\bar{q}_R^I + (1 - \beta)\bar{q}_L^I)) + (1 - \beta)s_L < 0.$$

When conditions (22) and (23) are both satisfied by a pair of wages (s_R, s_L), each principal finds optimal to offer wages such that only the ex ante collusion-proofness constraint (9) is binding and both ex post collusion-proofness constraints (6) for $i = L, R$ are slack. The equilibrium outputs are thus given as fixed points of (10) and (11).

The last point to show to prove that there exist interior equilibria is that there exist equilibrium wages s_R and s_L such that both ex post collusion-proofness constraints (6) for $i = L, R$ hold and such that the inequalities (22) and (23) also hold simultaneously. Summing those latter two inequalities and taking into account that (9) is binding in Class 1 equilibria, we obtain:

(24) $$\beta k(\Delta\theta\bar{q}_R^I) + (1 - \beta)k(\Delta\theta\bar{q}_L^I) - k(\Delta\theta(\beta\bar{q}_R^I + (1 - \beta)\bar{q}_L^I)) < 0$$

But from concavity of $k(\cdot)$, the latter inequality holds. Finally, there exist wages s_R (resp. s_L) such that (22) and (6) for $i = R$ (resp. (23) and (6) for $i = L$) hold since the concavity of $k(\cdot)$ ensures that the following inequalities define a non-empty set for s_R^I and s_L^I:

$$-(1-\beta)k(\Delta\theta\bar{q}_L^I) + k(\Delta\theta(\beta\bar{q}_R^I + (1-\beta)\bar{q}_L^I)) > \beta s_R^I > \beta k(\Delta\theta\bar{q}_R^I)$$

and

$$-\beta k(\Delta\theta\bar{q}_R^I) + k(\Delta\theta(\beta\bar{q}_R^I + (1-\beta)\bar{q}_L^I)) > (1-\beta)s_L^I > (1-\beta)k(\Delta\theta\bar{q}_L^I).$$

Note that the latter two left-hand side nequalities characterize a priori also some upper bounds for the equilibrium values of s_R^I and s_L^I in an interior equilibrium. However, since (24) holds, it is easy to check that all pairs (s_R^I, s_L^I) such that both (9) is binding and (6) for $i = R, L$ are slack can be part of an equilibrium.

Consider now the case where the wages s_L and s_R are such that each principal optimizes his objective function at a kink respectively $\bar{q}_L = \hat{\hat{q}}_L(s_R, \bar{q}_R)$ for the leftist principal and $\bar{q}_R = \hat{\hat{q}}_R(s_L, \bar{q}_L)$ for the rightist one. In this case, we should have

(25) $$\bar{q}_L^A \leq \hat{\hat{q}}_L(s_R, \bar{q}_R) \leq \bar{q}_L^I$$

and simultaneously

(26) $$\bar{q}_R^I \geq \hat{\hat{q}}_R(s_L, \bar{q}_L) \geq \bar{q}_R^A.$$

If each principal is at a kink of his objective function, both (9) and (6) are binding for each principal. In particular, since (6) are both binding for $i = R, L$, the equilibrium wages must thus satisfy:

(27) $$\beta s_R + (1-\beta)s_L = \beta k(\Delta\theta\bar{q}_R) + (1-\beta)k(\Delta\theta\bar{q}_L)$$

$$< k(\Delta\theta(\beta\bar{q}_R + (1-\beta)\bar{q}_L))$$

from the concavity of $k(\cdot)$ if $\bar{q}_R > \bar{q}_I$. Hence, (9) is not satisfied and it cannot be that both (6) are binding for each principal. Therefore, there does not exist an equilibrium where each principal is at a kink of his objective function and they offer different policies.

Corner Equilibria:

Proposition 6 : *When $\Delta\theta$ is small enough, there exist two other classes of corner Nash Equilibria of the game such that:*

- *In the first class of equilibria (Class 2), both (6) and (9) are binding in P_L's programme and only (9) is binding in P_R's programme. The optimal output of the inefficient firm $\bar{q}_L^I$ implemented by P_L belongs to $[\bar{q}_L^A, \bar{q}_L^I]$ and is equal to $\bar{q}_L^I = \hat{\hat{q}}_L(s_R, \bar{q}_R^I)$. The output of the inefficient firm implemented by P_R is $\bar{q}^R =^I \bar{q}_R^*(\bar{q}_L^I)$.*

- *Collusion-proofness is obtained in equilibrium when $\Delta\theta$ is small enough.*

- *Class 3 of corner equilibria is obtained by permuting the roles of P_L and P_R. The output of the inefficient firm $\bar{q}_R^I$ implemented by P_R belongs to $[\bar{q}_R^I, \bar{q}_R^A]$*

Consider the case where the equilibrium wages s_R is such that the leftist principal optimizes his objective function at a kink $\bar{q}_L = \hat{\bar{q}}_L(s_R, \bar{q}_R)$. For that to be a best response we must have:

$$(28) \qquad \bar{q}_L^A \leq \hat{\bar{q}}_L(s_R, \bar{q}_R) \leq \bar{q}_L^I.$$

In this case, s_L is such that both (9) and (6) for $i = L$ are binding. From the concavity of $k(\cdot)$, (6) for $i = R$ is necessarily slack and P_R optimizes his objective function with s_R given by the binding collusion-proofness constraint (9). Inserting this value of the regulatory wage into P_R's objective function and optimizing, we find that this latter principal offers an optimal output to the inefficient firm which is $\bar{q}_R = \bar{q}_R^*(\bar{q}_L)$ where $\bar{q}_L = \hat{\bar{q}}_L(s_R, \bar{q}_R)$.

A last condition is needed to be sure that P_R optimizes his objective function with s_R given by the binding collusion-proofness constraint (9): deviations by P_R such that (6) for $i = R$ is binding should not be profitable. A suffficient condition for this to be the case is that:

$$(29) \qquad \hat{\bar{q}}_R(s_L, \bar{q}_L) \leq \bar{q}_R^*(\bar{q}_L) \leq \bar{q}_R^A.$$

But the first inequality above is satisfied when $\psi(\bar{q}_R^*(\bar{q}_L)) < 0$, i.e., when:

$$\beta k(\Delta\theta \bar{q}_R^*(\bar{q}_L)) - k(\Delta\theta(\beta \bar{q}_R^*(\bar{q}_L) + (1-\beta)\bar{q}_L)) + (1-\beta)s_L < 0$$

but (6) for $i = L$ being binding $s_L = k(\Delta\theta \bar{q}_L)$ and the latter inequality follows from the concavity of $k(\cdot)$.

A last class of corner equilibria (Class 3) is obtained by permuting the roles of P_R and P_L.

• **Collusion-Proofness:** So far, we have derived the equilibria above under the assumption that both principals find optimal to pay the independent regulator for his information rather than to ask the firm directly for its type against some information rent. For an interior equilibrium, these conditions amount respectively to:

$$(30) \qquad s_L^I < (1-\alpha_L)\Delta\theta \bar{q}_L^I$$

and

$$(31) \qquad s_R^I < (1-\alpha_R)\Delta\theta \bar{q}_R^I$$

for all equilibrium values of (s_R^I, s_L^I) satisfying (9) with equality and both (6) constraints. These latter inequalities are automatically satisfied for a non-empty subset of (s_R^I, s_L^I) when

$$\beta(1-\alpha_R)\Delta\theta \bar{q}_R^I + (1-\beta)(1-\alpha_L)\Delta\theta \bar{q}_L^I > k(\Delta\theta(\beta \bar{q}_R^I + (1-\beta)\bar{q}_L^I))$$

but this inequality is true because the left-hand side above is bounded below by $(1 - \alpha_R)\Delta\theta(\beta\bar{q}_R^I + (1 - \beta)\bar{q}_L^I)$ and, by our assumption on the technology of side-contracting, this term is greater than $k(\Delta\theta(\beta\bar{q}_R^I + (1 - \beta)\bar{q}_L^I))$.

Let us now consider corner equilibria in Class 2. First, P_L finds optimal to offer a collusion-proof allocation. Since (6) for $i = L$ is binding, we have indeed:

$$s_L = k(\Delta\theta\bar{q}_L) < (1 - \alpha_L)\Delta\theta\bar{q}_L$$

by assumptions made on $k(\cdot)$. Second, P_R finds optimal to offer a collusion-proof allocation when:

$$s_R = \frac{k(\Delta\theta(\beta\bar{q}_R^*(\bar{q}_L) + (1 - \beta)\bar{q}_L) - (1 - \beta)k(\Delta\theta\bar{q}_L)}{\beta} < (1 - \alpha_R)\Delta\theta\bar{q}_R^*(\bar{q}_L)$$

for the equilibrium output $\bar{q}_L \in [\bar{q}_L^A, \bar{q}_L^I]$. This latter inequality holds when $\Delta\theta$ small enough since then $\bar{q}_R^*(\bar{q}_L)$ and $\bar{q}_L$ are then close one from the other.

• **Equilibrium Selection:** In any equilibrium with an independent regulator, (9) is binding and expected welfare differs only with respect to the various equilibrium outputs which are implemented. Moreover, in Class 1 and Class 2, those outputs describe a whole interval $\bar{q}_L \in [\bar{q}_L^A, \bar{q}_L^I]$. Expected welfare can be written as follows (up to terms which are the same for both principals):

$$SW_{\hat{\alpha}}(\bar{q}_L) = (1 - \nu)(\beta(S(\bar{q}_R^*(\bar{q}_L)) - \bar{\theta}\bar{q}_R^*(\bar{q}_L)) +$$

$$(1 - \beta)(S(\bar{q}_L) - \bar{\theta}\bar{q}_L)) - \nu(1 - \epsilon)(1 - \hat{\alpha})\Delta\theta(\beta\bar{q}_R^*(\bar{q}_L) + (1 - \beta)\bar{q}_L)$$

$$-\nu\epsilon k'(\Delta\theta(\beta\bar{q}_R^*(\bar{q}_L) + (1 - \beta)\bar{q}_L)).$$

Computing the derivative with respect to $\bar{q}_L$ of this expression and using the envelope theorem yields:

$$SW_{\hat{\alpha}}'(\bar{q}_L) = -\beta(1 - \beta)\nu(1 - \epsilon)\Delta\theta\frac{\partial q_R^*}{\partial q_L})$$

$$+(1 - \beta)((1 - \nu)(S'(\bar{q}_L) - \bar{\theta})) - \nu(1 - \epsilon)(1 - \hat{\alpha})\Delta\theta - \nu\epsilon k'(\Delta\theta(\beta\bar{q}_R^*(\bar{q}_L) + (1 - \beta)\bar{q}_L)).$$

For a quadratic surplus function, we have:

$$\left(\mu - \frac{\epsilon r\beta\nu\Delta\theta^2}{1 - \nu}\right)\bar{q}_R^*(\bar{q}_L) = \lambda - \bar{\theta} - \frac{\nu}{1 - \nu}\Delta\theta((1 - \epsilon)(1 - \alpha_R) + \epsilon(k - r\Delta\theta(1 - \beta)\bar{q}_L).$$

Hence, $\bar{q}_R^*(\bar{q}_L)$ is linear in $\bar{q}_L$ with $0 < \frac{\partial q_R^*}{\partial q_L} = \frac{\frac{\epsilon r(1-\beta)\nu\Delta\theta^2}{1-\nu}}{\mu - \frac{\epsilon r\beta\nu\Delta\theta^2}{1-\nu}} < 1$. Moreover, $SW_{\hat{\alpha}}'(\bar{q}_L)$ is linear in $\bar{q}_L$ with a positive derivative for $\bar{q}_L^I$ which is worth $\beta(1 - \beta)\Delta\alpha\left(1 - \frac{\partial q_R^*}{\partial q_L}\right) > 0$. Hence, the optimal output is found at $\bar{q}_L = \bar{q}_L^I$, i.e., for interior equilibria.

Proof of Propositions 3 and 4: From the definitions of $\bar{q}_R^I$ and $\bar{q}_L^I$:

$$(32) \qquad -S'(\bar{q}_R^I) + S'(\bar{q}_L^I) = \frac{\nu(1-\epsilon)}{1-\nu}\Delta\theta\Delta\alpha > 0.$$

Hence, $\bar{q}_R^I > \bar{q}_L^I$. This latter inequality implies also that : $k'(\Delta\theta\bar{q}_L^I) > k'(\Delta\theta(\beta\bar{q}_R^I + (1-\beta)\bar{q}_L^I)) > k'(\Delta\theta\bar{q}_R^I)$. This yields:

$$S'(\bar{q}_L^I) < \bar{\theta} + \frac{\nu}{1-\nu}\Delta\theta\left((1-\alpha_L)(1-\epsilon) + \epsilon k'(\Delta\theta\bar{q}_L^I)\right)$$

and

$$S'(\bar{q}_R^I) > \bar{\theta} + \frac{\nu}{1-\nu}\Delta\theta\left((1-\alpha_R)(1-\epsilon) + \epsilon k'(\Delta\theta\bar{q}_R^I)\right).$$

Using the concavity of $S(\cdot)$, we obtain immediately that $\bar{q}_R^I < \bar{q}_R^A$ and $\bar{q}_L^I > \bar{q}_L^A$.

- We observe that:

$$\beta S'(\bar{q}_R^I) + (1-\beta)S'(\bar{q}_L^I) = \bar{\theta} + \frac{\nu}{1-\nu}\Delta\theta\left((1-\hat{\alpha})(1-\epsilon) + \epsilon k'(\Delta\theta(\beta\bar{q}_R^I + (1-\beta)\bar{q}_L^I))\right).$$

Similarly, we have:

$$\beta S'(\bar{q}_R^A) + (1-\beta)S'(\bar{q}_L^A) = \bar{\theta} + \frac{\nu}{1-\nu}\Delta\theta\left((1-\hat{\alpha})(1-\epsilon) + \epsilon(\beta k'(\Delta\theta\bar{q}_R^A) + (1-\beta)k'(\Delta\theta\bar{q}_L^A))\right).$$

When $S'(.)$ and $k'(\cdot)$ are both linear, we have thus:

$$\beta\bar{q}_R^I + (1-\beta)\bar{q}_L^I = \beta\bar{q}_R^A + (1-\beta)\bar{q}_L^A = \bar{q}_{\hat{\alpha}}$$

where

$$\lambda - \mu\bar{q}_{\hat{\alpha}} = \bar{\theta} + \frac{\nu}{1-\nu}\Delta\theta\left((1-\hat{\alpha})(1-\epsilon) + \epsilon(k - r\Delta\theta\bar{q}_{\hat{\alpha}}).\right).$$

Proof of Proposition 5:

- Since $\bar{q}_{\hat{\alpha}}$ maximizes $SW_{\hat{\alpha}}(q)$ which is quadratic in q, we have:

$$A = \frac{(1-\nu)}{2}\left(\mu - \frac{r\nu\epsilon\Delta\theta^2}{1-\nu}\right)(\beta((\bar{q}_R^A - \bar{q}_{\hat{\alpha}})^2 - (\bar{q}_R^I - \bar{q}_{\hat{\alpha}})^2) + (1-\beta)((\bar{q}_L^A - \bar{q}_{\hat{\alpha}})^2 - (\bar{q}_L^I - \bar{q}_{\hat{\alpha}})^2)).$$

But using the quadratic specifications, we have also: $\left(\mu - \frac{r\nu\epsilon\Delta\theta^2}{1-\nu}\right)(\bar{q}_R^A - \bar{q}_{\hat{\alpha}}) = \frac{(1-\beta)\nu\Delta\theta\Delta\alpha(1-\epsilon)}{1-\nu}$ and $\mu(\bar{q}_R^I - \bar{q}_{\hat{\alpha}}) = \frac{(1-\beta)\nu\Delta\theta\Delta\alpha(1-\epsilon)}{1-\nu}$. Hence, we get:

$$A =$$

$$(33)\frac{(1-\nu)}{2}\left(\mu - \frac{r\nu\epsilon\Delta\theta^2}{1-\nu}\right)\beta(1-\beta)\frac{\nu^2}{(1-\nu)^2}(1-\epsilon)^2\Delta\theta^2\Delta\alpha^2\left(\frac{1}{\left(\mu - \frac{r\nu\epsilon\Delta\theta^2}{1-\nu}\right)^2} - \frac{1}{\mu^2}\right).$$

- Using that $k(\cdot)$ is quadratic, we can also express:

$$B = \nu\epsilon\frac{r}{2}\Delta\theta^2((\beta\bar{q}_R^I + (1-\beta)\bar{q}_L^I)^2 - \beta(\bar{q}_R^I)^2 - (1-\beta)(\bar{q}_L^I)^2).$$

$$= -\frac{\nu \epsilon r}{2} \Delta \theta^2 [\beta (\bar{q}_R^I - \bar{q}_\alpha)^2 + (1 - \beta)(\bar{q}_L^I - \bar{q}_\alpha)^2]$$

Simplifying, we get:

(34) $\qquad B = -\dfrac{r\nu\epsilon\beta(1-\beta)\Delta\theta^2}{2}(\bar{q}_R^I - \bar{q}_L^I)^2 = -\dfrac{r\nu^3\epsilon(1-\epsilon)^2\Delta\theta^4\beta(1-\beta)\Delta\alpha^2}{2\mu^2(1-\nu)^2}.$

Adding up (33) and (34) yields (16).

Proof of Corollary 3: First, with quadratic functional forms, note that $\beta\bar{q}_R^I + (1-\beta)\bar{q}_L^I = \beta\bar{q}_R^A + (1-\beta)\bar{q}_L^A = \bar{q}_{\hat{\alpha}}$. Hence, the expected cost of the regulator's wage under independence is worth $k(\bar{q}_{\hat{\alpha}})$ which is greater than $\beta k(\bar{q}_R^A) + (1 - \beta)k(\bar{q}_L^A)$ from the concavity of $k(\cdot)$.