The Political Economy of Regulatory Risk

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Abstract

This paper investigates political uncertainty as a source of regulatory risk. It shows that political parties have incentives to reduce regulatory risk actively: Mutually beneficial pre–electoral agreements that reduce regulatory risk always exist. Agreements that fully eliminate it exist when political divergence is small or electoral uncertainty is appropriately skewed. These results follow from a fluctuation effect of regulatory risk that hurts parties and an output–expansion effect that benefits at most one party. Due to commitment problems, regulatory agencies with some degree of political independence are needed to implement pre–electoral agreements.

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Keywords: regulation, regulatory risk, political economy, electoral uncertainty, independent regulatory agency.

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1 Introduction

This paper investigates political uncertainty as a source of regulatory risk, which a recent survey on strategic business risk proclaimed in 2008 as "the greatest strategic challenge facing leading global businesses".[1] It demonstrates in a two–party system with party–specific political preferences that electoral uncertainty generates such risk, but political parties have incentives to eliminate or at least reduce it by committing to pre–electoral agreements. In particular, at least one of the two parties is averse to regulatory risk in the classical sense of mean preserving spreads. The other party's risk preferences depend on a trade–off between a negative fluctuation and a positive output–expansion effect of regulatory risk. The negative effect dominates when the party's odds of winning are unfavorable or when differences between the parties are relatively small. In this case, both political parties prefer implementing the expected regulatory objective with certainty over waiting for the uncertain election outcome. Under efficient bargaining, one may expect that parties eliminate political uncertainty as a source of regulatory risk with pre–electoral agreements.

When political divergences are large and wining probabilities are appropriately skewed, there do not exist mutually beneficial agreements that eliminate regulatory risk. In this case, however, parties still have a strict incentive to reduce regulatory risk by at least some degree. In particular, there always exist mutually beneficial agreements that implement a regulatory schedule which still depends on the election outcome, but for which the implied degree of regulatory risk is smaller than the original one.

These results suggest that, with political bargaining, politically motivated regulatory risk is less problematic than seems at first sight. A potential time–inconsistency problem may, however, undermine this optimistic view and turn political bargaining into an ineffective institution for implementing mutual beneficial reductions of regulatory risk. This is so, because even though both political parties have, from an *ex ante* point of view, an incentive to agree on a mutually beneficial agreement, a party has no incentive to implement it after winning the election. When parties anticipate such *ex post* myopic behavior, pre–electoral

[1]The Ernst&Young 2008 survey on strategic business risk confirms the importance of regulatory risk. Already a EUI survey from 2005 revealed that risk managers view regulatory risk as the most important risk.

agreements are not credible and unable to achieve the mutually beneficial outcome. Following the literature on delegation, I argue that parties can circumvent this commitment problem by institutionalizing a politically independent regulatory agency and endowing it with the objective to regulate according to the pre–electoral agreement. My theory, therefore, provides a first formal rationale for the prevalence of politically independent regulatory agencies.[2] Moreover, mutually beneficial agreements may require that the regulatory outcome still depends on the election outcome. Political parties can implement such conditional pre–electoral agreements by granting regulatory agencies limited political independence. For instance, the parties may limit the broad objectives of the regulatory agency, but give the winning party control over its exact budget or the nomination of the agency's chairman. Hence, the puzzling observation that in some countries the delegation to independent regulatory agencies is only partial may actually be seen as part of an optimal institutional arrangement to reduce regulatory risk.

I derive my results in the standard regulation framework of Baron and Myerson (1982), where a government tries to regulate a privately informed monopolist with the objective to maximize a weighted sum of consumer surplus and profits.[3] I embed this framework in a political economy model, where two political parties run for election before regulating the firm. Both parties are benevolent but differ in their views about the appropriate relative weights between the consumers' and producers' surplus. These different political views cause a preference for different regulatory policies and, thereby, generate regulatory risk. In order to evaluate the parties' incentives for reducing this risk, I compare their expected payoffs with regulatory risk to their payoffs under different pre–electoral agreements.

The analysis reveals, first of all, that a party's attitude towards regulatory risk is fully determined by a *fluctuation* and an *output–expansion* effect. The fluctuation effect hurts both parties unambiguously, whereas the expansion effect benefits one party, while it hurts the other. As a result, at least one party unambiguously dislikes regulatory risk, whilst the other party likes regulatory risk only when the expansion effect outweighs the fluctuation effect. I show that the fluctuation effect dominates when the degree of political divergence

[2]E.g., OECD (2002) reports that independent regulatory agencies are currently "one of the most widespread institutions of modern regulatory governance".

[3]See Armstrong and Sappington (2008) for an introduction to optimal regulation models.

is small or the winning probability of the party that benefits from the expansion effect is large. In this case, pre–electoral agreements exist that lead to a full elimination of regulatory risk. I, moreover, characterize the set of pre–electoral agreements that reduce regulatory risk and yield larger expected payoffs for both parties. This characterization shows that this set is always non–empty so that there always exist mutually beneficial agreements that reduce regulatory risk.

The rest of the paper is organized as follows. In the next section I discuss the related literature. Section 3 sets up the framework in which I analyze the paper's research questions. In Section 4, I characterize optimal regulation and its comparative statics. Section 5 studies how electoral uncertainty induces regulatory risk and how the different political parties evaluate this risk. Section 6 then analyzes the potential of pre–electoral agreements to reduce regulatory risk. Section 7 identifies a time–inconsistency problem in implementing pre–electoral agreements and discusses delegation as a way to circumvent it. The paper closes in Section 8 with a short discussion of the different policy implications of my results. For those propositions that do not follow directly from the text, formal proofs are collected in the appendix.

2 Related Literature

The theoretical literature on regulatory risk is small. Chang and Thompson (1989) analyze regulatory risk under rate of return regulation. Panteghini and Scarpa (2008) study the effect of regulatory risk on investment by comparing price–caps to profit–sharing rules. Both these papers compare ad–hoc regulation schemes rather than studying regulatory risk under optimal regulation. In contrast, Strausz (2009) develops a tractable analytical framework to study regulatory risk in optimal monopoly regulation under asymmetric information. The current paper uses a specific version of this framework.[4]

Although an extensive literature investigates the multi–faceted connections between political economy and regulation, the literature has not addressed the specific relation between

[4]A part of the literature models increases in regulatory risk as direct increases in the probability of expropriation or tougher regulation rather than only pure changes in risk in the sense of mean preserving spreads (e.g., Armstrong and Vickers 1996).

political economy and regulatory risk. Closest related is Laffont (2000), who analyzes the welfare trade–offs between an inflexible, constitutionally fixed regulatory schedule and a flexible schedule that reacts to changes in the marginal cost of public funds but underlies political capture by two different consumer groups. In contrast to the current paper, Laffont's framework is not cast in terms of regulatory risk.[5] A further difference is that my paper presents a positive rather than a normative analysis.

The literature on political economy is well aware of the benefits of delegation due to commitment problems. My contribution to this literature is to combine two standard approaches, time–inconsistent behavior and electoral uncertainty, in a novel way. To explain this in more detail, it is helpful to clarify first that the literature on political economy effectively considers two fundamentally different commitment problems. First, there is the time–inconsistency of Kydland and Prescott (1977), which shows that a decision maker is hurt when he cannot commit to its future, short run decisions. The problem here is a lack of *self–commitment*. Without self–commitment, the decision maker benefits from delegating future decisions to a third party in order to bind himself.[6] Note that in this literature electoral uncertainty actually reduces the relevance of the commitment problem, because it increases the chance that today's holder of public authority is different from tomorrow's holder of authority.

In contrast, the strand of the literature that explicitly connects delegation with political uncertainty concentrates on a fundamentally different commitment problem: The inability of current holders of public authority (e.g., current voters or elected politicians) to constrain the decisions of future holders of public authority. An extensive literature studies the implications of this commitment problem (e.g., Glazer 1989, Persson and Svensson 1989, Alesina and Tabellini 1988, 1990; Tabellini and Alesina 1990). For this literature, the problem is not one of self–commitment but one of "other–commitment". Moe (1990, p.229), for example, argues that political uncertainty induces current public authority holders to use delegation as "protective devices for insulating agencies from political enemies". Vogel (1996, p.131) applies this view directly to regulation when he observes that "Thatcher administration offi-

[5] Strausz (2009) shows that stochastic changes in the marginal cost of public funds also generate regulatory risk.

[6] A prominent example in the context of monetary policy is the argument in favor of central bank independence (Rogoff 1985).

cials favored independent regulators because of the dynamics of alternance in British politics. The party in power wants to be able to infiltrate the bureaucracy, but by the same token wants to guard it from future infiltration by the other party."

Because I consider a self–commitment problem which is only relevant with electoral uncertainty, my paper links commitment problems with electoral uncertainty in a novel way.[7] In other words, my paper shares with the literature on time–inconsistency that delegation circumvents a self–commitment problem. A crucial difference is, however, that in my framework the self–commitment problem is unproblematic without political uncertainty. With the literature on electoral uncertainty, it shares the view that electoral uncertainty causes a commitment problem, but the role of delegation is not to commit future public authority holders.

3 The Setup

Consider the seminal Baron and Myerson (1982) setup of a monopolistic firm that produces a publicly provided good x at a constant marginal cost. There are no fixed costs. Given marginal costs c, the firm's profit from producing a quantity x for a lump–sum transfer t is

$$\Pi(t, x|c) \equiv t - cx.$$

Marginal costs are c_l with probability ν and c_h with probability $1-\nu$, where $\Delta c \equiv c_h - c_l > 0$. The firm, however, is perfectly informed about its marginal costs c.

When consumers pay a lump–sum transfer t in exchange for the consumption of a quantity x, they obtain the consumer surplus

$$\Psi(t, x) \equiv v(x) - t.$$

The term $v(x)$ expresses the consumers' overall utility from the consumption of a quantity x of the good. I follow the standard assumption that consumer's marginal utility of the good x is positive but decreasing, i.e., $v' > 0$ and $v'' < 0$. Moreover, I assume that v''' exists, but

[7] Gilardi (2005a) examines the explanatory power of the two different types of commitment problems for the political independence of regulatory agencies.

make no assumptions about its sign. Because v' represents the consumers' (inverse) aggregate demand function, the third derivative v''' determines the curvature of the consumers' aggregate demand function.[8] As a consequence, the demand function is convex exactly when v''' is non–negative. The regulatory framework is a special version of Strausz (2009), which provides the general insight that the curvature of the demand function plays a crucial role in how regulatory risk affects regulatory outcomes.

Before regulation takes place, there is a general election between a party l and a party r. The election determines the ruling party that runs the government and, ultimately, decides about the regulation. I assume that the election exhibits some randomness which, for simplicity, I take as exogenous: Party r wins the election with probability $\alpha \in (0, 1)$ and party l wins it with probability $1 - \alpha$.[9] After the election, the winning party's task is to regulate the monopolistic firm.

I assume that both parties are benevolent in that they maximize an objective function W that is a weighted sum of the consumer surplus and the firm's profits:

$$W = \Psi + \lambda_p \Pi, \tag{1}$$

where the parameter $\lambda_p \in [0, 1)$ represents the weight which party p attaches to profits. The only difference between the two parties is that $\lambda_l \neq \lambda_r$. One interpretation is that the two parties differ in their perception of the appropriate weight λ in society's social choice function or cater to the preferences of heterogeneous voter groups. Without loss of generality, I assume that the party r has a more business friendly orientation so that $\Delta\lambda \equiv \lambda_r - \lambda_l > 0$. In particular, a firm that receives a transfer t and produces a quantity x at marginal costs

[8] The consumer's demand $x(p)$ solves $\max_x v(x) - px$ and satisfies the first order condition $v'(x(p)) = p$. By the implicit function theorem, differentiating twice and rearranging terms yields $x''(p) = -v'''(x(p))x'(p)^2/v''(x(p))$. Due to $v'' < 0$, the sign of v''' fully determines the curvature of demand.

[9] In principle, α could be determined by a more elaborate political economy model. The crucial assumption is that there is at least some uncertainty about the election outcome so that $\alpha \in (0, 1)$. This obtains, for instance, when the preferences of the electorate exhibit some randomness, when the outcome of the elections depend on other uncertain political issues than the regulatory problem alone, or when voting is costly so that voters, in equilibrium, use mixed strategies for whether to vote. Essentially, the model takes seriously that elections in real life always have at least some degree of uncertainty.

c_i yields party $p \in \{l, r\}$ a payoff of

$$W_p(x, t, c_i) \equiv \Psi(x, t) + \lambda_p \Pi(x, t) = v(x) - \lambda_p c_i x + (1 - \lambda_p)t.$$

To summarize, the triple $(\alpha, \lambda_l, \lambda_r)$ describes the *political system.* For a given political system, I define $\Delta\lambda \equiv \lambda_r - \lambda_l$ as the measure of *political divergence* of the system.

4 Optimal Regulation

In this section, I calculate the optimal regulatory schedule for a given objective function W. From the revelation principle, it follows that the optimal regulation contract is a direct mechanism (t_l, x_l, t_h, x_h) that gives the firm an incentive to report its true cost type c_i. Consequently, the optimal regulatory contract is a solution to the following maximization problem:

$$\begin{aligned} P: \max_{x(.),t(.)} \quad & \nu W_p(x_l, t_l, c_l) + (1 - \nu) W_p(x_h, t_h, c_h) && (2) \\ \text{s.t.} \quad & t_h - c_h x_h \geq t_l - c_h x_l \text{ and } t_l - c_l x_l \geq t_h - c_l x_h && (3) \\ & t_l \geq c_l x_l \text{ and } t_h \geq c_h x_h, && (4) \end{aligned}$$

where (3) represents the incentive compatibility conditions that ensure truthtelling and (4) represents the firm's participation constraints and reflect the implicit assumption that both types of firm are required to operate.

As is well known, only the incentive compatibility of the efficient firm c_l and the individual rationality constraint of the inefficient firm c_h are binding. Solving for these two constraints yields the transfers $t_h = c_h x_h$ and $t_l = c_l x_l + \Delta c x_h$. Substituting out the transfers, problem P simplifies to maximizing the expression

$$\tilde{W}_p(x_l, x_h) \equiv \nu[v(x_l) - c_l x_l - (1 - \lambda_p)\Delta c x_h] + (1 - \nu)[v(x_h) - c_h x_h]$$

with respect to the quantities x_l and x_h.

The first order conditions that characterize the optimal quantity schedules $(\hat{x}_l, \hat{x}_h)$ are

$$v'(\hat{x}_l) = c_l \text{ and } v'(\hat{x}_h) = c_h + (1 - \lambda)\psi\Delta c, \tag{5}$$

where $\psi \equiv \nu/(1-\nu)$. Hence, we obtain the standard result that the allocation of the efficient type coincides with the first best and the allocation of the inefficient type is distorted downwards. Consequently, only the output $\hat{x}_h$ depends on the parameter λ.

The optimal regulatory schedule for a given profit–weight λ yields party p the payoff

$$\hat{W}_p(\lambda) \equiv \tilde{W}_p(\hat{x}_l, \hat{x}_h(\lambda)).$$

The following lemma confirms the intuitive but helpful property that $\hat{W}_p$ attains a maximum at λ_p.

Lemma 1 *The function $\hat{W}_p$ is increasing for $\lambda < \lambda_p$ and decreasing for $\lambda > \lambda_p$. It attains a unique maximum at λ_p so that $\hat{W}_p'(\lambda_p) = 0$ and $\hat{W}_p''(\lambda_p) < 0$.*

Using the implicit function theorem and differentiating expression (5) with respect to λ yields

$$\hat{x}_h'(\lambda) = -\frac{\psi \Delta c}{v''(\hat{x}_h)}. \tag{6}$$

Due to $v'' < 0$, the derivative $\hat{x}_h'(\lambda)$ is positive and, therefore, $\hat{x}_h(\lambda_l) \leq \hat{x}_h(\lambda_r) \leq x_h^{fb}$. This illustrates the intuitive result that the more business friendly party r asks the firm to produce more. The explanation is that more production leads, due to higher information rent, to higher profits, which party r discounts less than party l.

Further differentiation with respect to λ and a rearrangement of terms yields

$$\hat{x}_h''(\lambda) = -\frac{v'''(\hat{x}_h(\lambda))}{v''(\hat{x}_h(\lambda))}[\hat{x}_h'(\lambda)]^2. \tag{7}$$

The expression shows that the sign of $\hat{x}_h''(\lambda)$ coincides with the sign of v'''. Because v''' represents the curvature of the consumer's demand function, the schedule $\hat{x}_h(\lambda)$ is convex when the consumer's demand is convex. If the demand function is concave, then the schedule $\hat{x}(\lambda)$ is concave. Hence, if we compare the allocation $\hat{x}(\lambda_e)$ at the expected

$$\lambda_e \equiv \alpha\lambda_r + (1-\alpha)\lambda_l$$

with the expected output under regulatory risk

$$\hat{x}_h^e \equiv \alpha \hat{x}_h(\lambda_r) + (1-\alpha)\hat{x}_h(\lambda_l),$$

then, with convex demand, $\hat{x}_h^e \geq \hat{x}(\lambda_e)$. This means that regulatory risk has a positive *expansion effect* on output when demand is convex. For concave demand, we have $\hat{x}_h^e \leq \hat{x}(\lambda_e)$ so that the expansion effect of regulatory risk is negative. Strausz (2009) shows that the one–to–one relationship between the sign of the expansion effect and the curvature of demand holds more generally and is not particular to the binary character of asymmetric information.

5 Incentives for Reducing Regulatory Risk

Electoral uncertainty implies that the high cost firm will produce output $\hat{x}_h(\lambda_r)$ with probability α and the output $\hat{x}_h(\lambda_l)$ with probability $1-\alpha$. Hence, uncertain elections generate uncertain regulation outcomes and, therefore, regulatory risk. In this section, I ask how this regulatory risk impacts the political parties and whether they have incentives to reduce or even eliminate it. I study these questions, first, from the perspective of classical risk analysis and, second, from a more general bargaining perspective.

The first approach rests on the observation that the risky election outcome that the firm will be regulated under the parameter λ_r with probability α and λ_l with probability $1-\alpha$ is a mean preserving spread of the deterministic expected outcome λ_e in the sense of Rothschild and Stiglitz (1970). Hence, in line with classical risk analysis I say that a political party *dislikes regulatory risk* when its expected payoff with the risk is smaller than its payoff under the expected policy:

$$\hat{W}_p(\lambda_e) \geq W_p^e(\alpha) \equiv \alpha \hat{W}_p(\lambda_r) + (1-\alpha)\hat{W}_p(\lambda_l). \tag{8}$$

In contrast, a party likes regulatory risk when the inequality is reversed. From classical risk analysis it then follows that the curvature of $\hat{W}_p$ determines party p's attitude towards risk. In particular, party p dislikes regulatory risk, when its payoff $\hat{W}_p$ is concave in λ. In contrast, the political party likes the risk, when its payoff function $\hat{W}_p$ is convex. The following lemma establishes a sufficient condition under which a party's payoff $\hat{W}_p$ is concave around λ.

Lemma 2 *The function $\hat{W}_p(\lambda)$ is concave around λ when*

$$(\lambda_p - \lambda)\psi\Delta c v'''(\hat{x}_h(\lambda)) < [v''(\hat{x}_h(\lambda))]^2. \tag{9}$$

When the local condition (9) holds globally, the function $\hat{W}_p(\lambda)$ is concave globally, which implies that party p dislikes regulatory risk in general. Because the expected policy preference λ_e lies in between λ_l and λ_r, the relevant interval for considering the curvature of $\hat{W}_p(\lambda)$ is $[\lambda_l, \lambda_r]$ rather than the overall domain $[0, 1]$. For $\lambda \in [\lambda_l, \lambda_r]$, all the signs of the different terms in (9) are unambiguously determined except for v'''. We, therefore, obtain the following insights about the parties' risk preferences.

Proposition 1 *When demand is globally concave ($v''' < 0$), party r dislikes regulatory risk. When demand is globally convex ($v''' > 0$), party l dislikes regulatory risk. For linear demand ($v''' = 0$), both parties dislike regulatory risk.*

Proposition 1 gives a definite answer about risk preferences for demand functions that are either globally convex or globally concave. It is, however, uninformative about risk preferences for demand curves with a changing sign of curvature. For such demand functions, the local effect of regulatory risk can change over the relevant domain $[\lambda_l, \lambda_r]$ and we have to consider the overall global effect of regulatory risk directly. For this reason, the following proposition extends the previous one. It shows that, independent of the demand curve, at least one political party dislikes regulatory risk.

Proposition 2 *In any political system $(\alpha, \lambda_l, \lambda_r)$ there exists at least one political party that dislikes regulatory risk. If the expansion effect is positive ($\hat{x}_h^e \geq \hat{x}_h(\lambda_e)$), then party l dislikes regulatory risk. If the expansion effect is negative ($\hat{x}_h^e \leq \hat{x}_h(\lambda_e)$), then party r dislikes regulatory risk.*

In order to understand the intuition behind Proposition 1 and 2, it is helpful to decompose the overall effect of regulatory risk in an *expansion effect* and a *fluctuation effect*. The previous section introduced the expansion effect of regulatory risk and showed how the curvature of the demand function determines its sign. To understand the fluctuation effect of regulatory risk, consider first the case where there is no expansion effect: $\hat{x}_h^e = \hat{x}_h(\lambda_e)$. In this case, regulatory risk has only a fluctuation effect in that, with regulatory risk, output fluctuates between $\hat{x}_h(\lambda_l)$ and $\hat{x}_h(\lambda_r)$, whereas without regulatory risk it is fixed at its expected value $\hat{x}_h(\lambda_e) = x_h^e$. Because of the consumers' decreasing marginal utility, the two parties dislike such fluctuations. This explains the statement of Proposition 1 that, with lin-

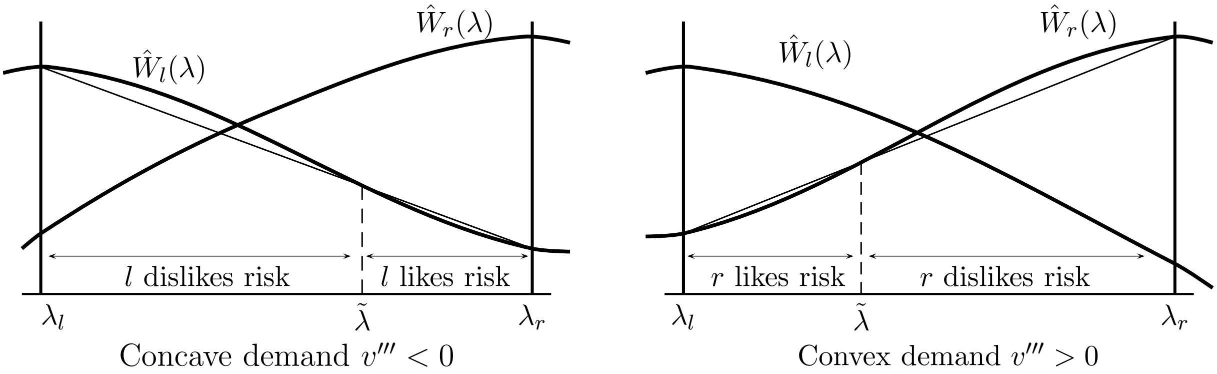


Figure 1: Non–concave payoff functions

ear demand, both parties dislike regulatory risk, because, as shown in the previous section, the expansion effect is zero when demand is linear.

When the expansion effect is positive, regulatory risk has the additional effect that it raises the expected value of the output itself. In this case, regulatory risk moves the expected allocation $\hat{x}_h^e$ further from party l's ideal output $\hat{x}_h(\lambda_l)$. This hurts party l. Given that also the fluctuation effect is negative, the two effects reinforce each other and, therefore, party l unambiguously dislikes regulatory risk. This explains not only the second statement of Proposition 2, but also the second statement in Proposition 1, because a convex demand implies that the expansion effect is positive. In contrast, the positive expansion effect has a positive effect on party r, because it moves the expected output $\hat{x}_h^e$ closer to its ideal value $\hat{x}_h(\lambda_r)$. Hence, from party r's perspective, a positive output expansion effect counteracts the fluctuation effect. If the former is strong enough, party r actually likes regulatory risk.

The opposite logic holds when the expansion effect is negative so that output contracts. In this case, party r unambiguously dislikes regulatory risk, because it is hurt by both the fluctuation and expansion effect. For party l, however, the contraction in output is beneficial. If it is strong enough to outweigh the fluctuation effect, it induces party l to like regulatory risk. A sufficient condition for the expansion effect to be positive is a convex demand.

Figure 1 illustrates the role of curvature further. When demand is concave ($v''' < 0$), condition (9) is, due to the output contraction effect, satisfied for any $\lambda < \lambda_p$. This implies that the curve $\hat{W}_p$ is concave for all weights λ that are smaller than the party's ideal weight λ_p. As illustrated in the first graph of Figure 1, this implies for party r that its payoff function $\hat{W}_r$ is concave for the entire range $[\lambda_l, \lambda_r]$. For $\lambda > \lambda_p$, a party p benefits from the output contraction effect and, for λ large enough, condition (9) is violated. As illustrated in the first graph of Figure 1, this implies that there exist a range of $[\tilde{\lambda}, \lambda_r]$ such that party l benefits from regulatory risk. For convex demand, regulatory risk has an output expansion effect that hurts a party p for $\lambda > \lambda_p$ and benefits it for $\lambda < \lambda_p$. As a result, the curve $\hat{W}_p$ is concave for any $\lambda > \lambda_p$ but not necessarily for $\lambda < \lambda_p$. Consequently, party l dislikes regulatory risk for any expected weight λ_e, whereas party r may like regulatory risk.

Proposition 2 reveals that at least one political party dislikes regulatory risk, but Figure 1 illustrates that the other party may or may not like it. I next characterize political systems in which both parties dislike regulatory risk. I define such systems as *political systems that are averse to regulatory risk*.

Because the curve $\hat{W}_p(\lambda)$ reaches, by definition, its maximum at λ_p, it is necessarily concave at λ_p. Hence, a party's objective function $\hat{W}_p(\lambda)$ is concave for weights λ close to the party's ideal weight λ_p. This reasoning suggests that a party's payoff tends to be concave over the whole range $[\lambda_l, \lambda_r]$ when this range is small. Hence, the degree of political divergence, $\Delta\lambda$, seems to play an important role in determining the risk attitude of political systems. To make the connection between risk attitudes and the political divergence more precise, define[10]

$$\bar{\lambda} \equiv \min_{x \in [0, \hat{x}_h(1)]} \frac{(v''(x))^2}{|v'''(x)|\psi \Delta c}. \tag{10}$$

This definition leads to the following result.

Proposition 3 *A political system $(\alpha, \lambda_l, \lambda_r)$ is averse to regulatory risk whenever political divergence $\Delta\lambda$ is small and, in particular, smaller than $\bar{\lambda}$.*

According to Proposition 2 at least one party dislikes the regulatory risk. When we denote this party as the *regulatory risk averse party*, it follows that the other party dislikes regulatory risk when the winning probability of this party is not too large. This leads to the following result.

[10] If $v'''(x) = 0$ for all $x \in [0, \hat{x}_h(1)]$, then $\bar{\lambda} = \infty$.

Proposition 4 *A political system* $(\alpha, \lambda_l, \lambda_r)$ *is averse to regulatory risk whenever the winning probability of the regulatory risk averse party is small enough.*

The proposition shows that a sufficient condition for a political system to be regulatory risk averse is that the party that is not regulatory risk averse is likely enough to win. This implies that a necessary condition for this party to like regulatory risk is that it is relatively unlikely to win the election. At first sight this may seem surprising, but Figure 1 illustrates the intuition behind the result. When the party that may potentially prefer regulatory risk is likely to win, its payoff function is necessarily concave around the expected value λ_e. Therefore, also this party has a tendency to dislike regulatory risk.

6 Pre–electoral Agreements

When the political system is averse to regulatory risk, it has an interest in eliminating it. One way of doing so is to institutionalize a procedure of *pre–electoral bargaining* which allows political parties to agree on future regulation before the election takes place. In political systems that are averse to regulatory risk, efficient pre–electoral bargaining leads to an elimination of regulatory risk, because the political parties themselves strictly benefit from regulating the firm on the basis of the expected regulatory variable λ^e rather than waiting for the uncertain election outcome. General pre–electoral bargaining procedures may, however, also allow and lead to agreements on other regulatory variables than the expectation λ^e. In this section, I characterize the conditions under which mutual beneficial agreements exist that reduce regulatory risk. I, thereby, distinguish between two types of agreements: unconditional and conditional ones.

I first concentrate on pre–electoral bargaining over agreements on a single regulatory variable λ^b. Such agreements eliminate regulatory risk completely, because they lead to a deterministic regulatory schedule despite the electoral uncertainty. In particular, the agreement does not condition the regulatory rule on the final election outcome. I, therefore, call such agreements *unconditional*. Restricting attention to unconditional agreements, I fully characterize the set of unconditional agreements λ^b from which both parties benefit.

A party p benefits from agreeing to some regulatory variable λ^b if it yields party p at

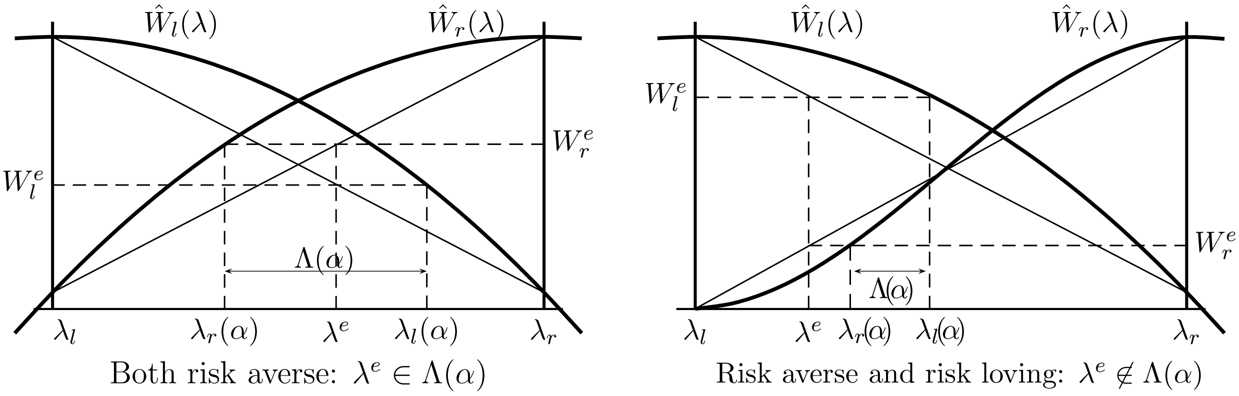


Figure 2: Mutual beneficial unconditional pre–electoral agreements $\Lambda(\alpha)$

least the same payoff as its expected status quo payoff W_p^e. Hence, let $\lambda_p(\alpha) \in [\lambda_l, \lambda_r]$ satisfy the relation

$$\hat{W}_p(\lambda_p(\alpha)) = W_p^e.$$

Because $\hat{W}_p$ is monotone on the interval $[\lambda_l, \lambda_r]$ and W_p^e lies in between $\hat{W}_p(\lambda_l)$ and $\hat{W}_p(\lambda_r)$, the value $\lambda_p(\alpha)$ exists and is unique. Moreover, party l strictly prefers regulation on the basis of any $\lambda < \lambda_l(\alpha)$ to the regulatory risk outcome, because $\hat{W}_l$ is decreasing on $[\lambda_l, \lambda_r]$. Similarly, party r strictly prefers regulation on the basis of any $\lambda > \lambda_r(\alpha)$ to the regulatory risk outcome. Hence, if $\lambda_r(\alpha) < \lambda_l(\alpha)$ then for any $\lambda \in (\lambda_r(\alpha), \lambda_l(\alpha))$ both parties prefer it to the regulatory risk outcome. This reasoning leads to the following result.

Proposition 5 *In a political system $(\alpha, \lambda_l, \lambda_r)$ there exist mutually beneficial, unconditional pre–electoral agreements if and only if $\lambda_r(\alpha) < \lambda_l(\alpha)$. In this case, any $\lambda^b \in \Lambda(\alpha)$ is beneficial with*

$$\Lambda(\alpha) \equiv (\lambda_r(\alpha), \lambda_l(\alpha)).$$

The first graph in Figure 2 illustrates the construction of $\Lambda(\alpha)$ in the case where both parties dislike regulatory risk. The second graph illustrates the case where one party actually likes regulatory risk. In both cases, $\lambda_r(\alpha) > \lambda_l(\alpha)$ so that a non–empty set of beneficial regulatory variables exists. Yet, if $\lambda_r(\alpha) > \lambda_l(\alpha)$ then there does not exist a mutual beneficial λ.

For a political system that is averse to regulatory risk, we have, as illustrated in the first graph of Figure 2, $\lambda^e \in \Lambda(\alpha)$. Hence, in such political systems the set $\Lambda(\alpha)$ is non–empty and, in general, not a singleton. Proposition 5 shows moreover that the parties also benefit from regulating on the basis from other regulatory variables than the expected value λ^e. A common dislike of regulatory risk is, therefore, a sufficient condition for the existence of beneficial pre–electoral agreements, but not a necessary one. The second graph of Figure 2 illustrates that beneficial pre–electoral agreements may exist even if regulating on the basis of the expected value λ^e is not mutually beneficial.

Clearly, within the set $\Lambda(\alpha)$, the two parties have diverging preferences. In particular, party l prefers values close to $\lambda_r(\alpha)$ whereas party r prefers values close to $\lambda_l(\alpha)$. It then depends on the relative bargaining strengths and the specific bargaining procedure which $\lambda \in \Lambda(\alpha)$ the parties will agree on.

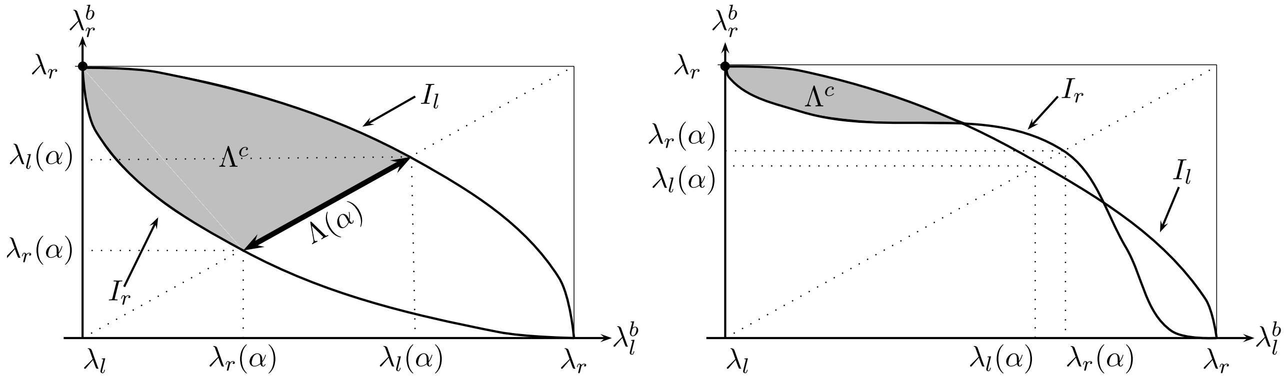
Until now I restricted attention to agreements on a single regulatory variable λ^b. In particular, parties were unable to bargain over agreements that implement a different regulatory variable for different election outcomes. In this subsection, I study the potential benefits of *conditional agreements* $(\lambda_l^b, \lambda_r^b)$ which implement the regulatory variable λ_p^b exactly when party p wins the election. An unconditional agreement λ^b is a special, trivial case of a conditional agreement with $\lambda_l^b = \lambda_r^b = \lambda^b$.

When parties agree explicitly on a conditional agreement with $\lambda_l^b \neq \lambda_r^b$, then this agreement does not eliminate regulatory risk completely. I will say that a conditional agreement $(\lambda_l^b, \lambda_r^b)$ *reduces regulatory risk* whenever $\lambda_l < \lambda_l^b \leq \lambda_r^b < \lambda_r$. The expected payoff of party $p \in \{l, r\}$ from a conditional agreement $(\lambda_l^b, \lambda_r^b)$ is

$$W_p^b(\lambda_l^b, \lambda_r^b) \equiv \alpha \hat{W}_p(\lambda_r^b) + (1-\alpha)\hat{W}_p(\lambda_l^b).$$

It follows that the set of mutually beneficial, conditional agreements Λ^c that reduce regulatory risk is

$$\Lambda^c \equiv \{(\lambda_l^b, \lambda_r^b) \mid \lambda_l < \lambda_l^b \leq \lambda_r^b < \lambda_r \wedge W_l^b(\lambda_l^b, \lambda_r^b) > W_l^e \wedge W_r^b(\lambda_l^b, \lambda_r^b) > W_r^e\}.$$



Case I: $\Lambda(\alpha) \neq \emptyset$ Case II: $\Lambda(\alpha) = \emptyset$

Figure 3: Mutually beneficial, conditional pre–electoral agreements Λ^c

With this definition I demonstrate the following result.

Proposition 6 *For any political system, there always exist mutually beneficial, conditional agreements* $(\lambda_l^b, \lambda_r^b)$ *that reduce regulatory risk. More precisely,* $\Lambda^c \neq \emptyset$ *and any* $(\lambda_l^b, \lambda_r^b) \in \Lambda^c$ *is a mutually beneficial, conditional agreement that reduces regulatory risk.*

Figure 3 demonstrates the intuition behind the proposition by drawing the party's indifference curves, I_l and I_r, associated with the risky allocation (λ_l, λ_r) for the range $\lambda_l^b, \lambda_r^b \in [\lambda_l, \lambda_r]$. From the marginal rate of substitution

$$MRS_p(\lambda_l^b, \lambda_r^b) = -\frac{(1-\alpha)\hat{W}_p'(\lambda_l^b)}{\alpha \hat{W}_p'(\lambda_r^b)} = -\frac{(1-\alpha)(\lambda_p - \lambda_l^b)\hat{x}_h'(\lambda_l^b)}{\alpha(\lambda_p - \lambda_r^b)\hat{x}_h'(\lambda_r^b)}, \tag{11}$$

it follows that both indifference curves are falling for this range and have the slope $-(1-\alpha)/\alpha$ at $\lambda_l^b = \lambda_r^b$, where there is no longer any regulatory risk. The first graph illustrates the case where both parties dislike regulatory risk. In this case, the indifference curves of party l is concave, whereas the indifference curves of party r is convex. These curvatures imply $\lambda_r(\alpha) < \lambda_l(\alpha)$. As a result and illustrated by the two–sided arrows, any agreement on the 45–degree line with $\lambda^b \in (\lambda_r(\alpha), \lambda_l(\alpha))$ is a mutually beneficial agreement that eliminates regulatory risk completely. Hence, in the first graph of Figure 3, the set $\Lambda(\alpha)$ is non–empty. The second graph illustrates the case where there do not exist mutually beneficial agreements that eliminate regulatory risk completely. It shows that on the 45-degree line there are no allocations (λ^b, λ^b) that both parties prefer to the risky allocation (λ_l, λ_r). As depicted, $\lambda_l(\alpha)$ exceeds $\lambda_r(\alpha)$ so that $\Lambda(\alpha)$ is empty. The shaded area illustrates, however, that there still exist conditional agreements from which both parties benefit. These agreements all lie off the 45–degree line and therefore still imply regulatory risk, but the implied degree of regulatory risk is less than under the original allocation (λ_l, λ_r), because the allocations lie closer to the 45–degree line.

To see that the shaded area (and, therefore, a non–empty set Λ^c) always exists, the slope of the two indifference curves in (λ_l, λ_r) are crucial. From the marginal rate of substitution (11), it follows that the indifference curves of party l have a zero slope whenever $\lambda_l^b = \lambda_l$, whereas the indifference curves of party r has an infinite, negative slope for $\lambda_l^b = \lambda_r$. Hence, the indifference curve I_r is always steeper than the indifference curve I_l. This implies that we can always find a non–empty shaded area Λ^c.

7 Commitment Problems

If both parties dislike regulatory risk, each gains from regulating the firm on the basis of some common deterministic policy variable $\lambda^b \in \Lambda(\alpha)$ rather than waiting for the uncertain election outcome. Moreover, even if one party likes regulatory risk, then, according to Proposition 6, there still exist mutually beneficial agreements that reduce regulatory risk. Under efficient bargaining, one may, therefore, expect the political parties to reduce or even eliminate regulatory risk completely.

A problem is, however, that, after the election, the winning party p has an incentive to implement a regulatory schedule that is based on its preferred policy variable λ_p. Hence, even though parties benefit from agreements *before* the election, the winning party has no longer an incentive to abide by it *after* the election; it would break any agreement to bring regulation fully in line with its political preferences. Such *ex post* changes undermine the pre–electoral agreement and make them non–credible. The political system, therefore, faces a commitment problem that hinders the implementation of mutual beneficial agreements.

Economic literature points to two institutional arrangements for overcoming commitment problems: commitment sustained by *delegation* or by *repeated interaction*. Political parties may circumvent the time–inconsistency problem by creating a politically independent institution and give it the responsibility to regulate the firm on the basis of some policy variable. The parties can implement an unconditional agreement by writing into the by–laws of the regulatory agency the exact objective function by which the agency is to regulate. Conditional agreements can be implemented with by–laws that stipulate only a broad objective, whose details are left under the control of the government.[11]

The idea of delegation squares well with regulatory governance in practise. For instance, an OECD 2002 report notes that independent regulatory agencies are currently "one of the most widespread institutions of modern regulatory governance". The commitment problem which I identified provides an explanation for this observation. Moreover, the effective independence of many regulatory agencies is often incomplete and somewhat limited.[12] For instance, governments can influence the behavior of regulatory agencies by selecting a different director or changing its budget. In the light of my results, this imperfect delegation may actually be seen as a way of implementing conditional agreements rather than unconditional ones. The explanation is also consistent with the observation that regulatory agencies tend to be more independent in countries where there is frequent turnover between governments with different preferences (Gilardi 2005a, p.141 and Gilardi 2005b).

A second approach to overcome commitment problems is cooperation by repeated interaction. It is well known that the effectiveness of repeated interactions depend crucial on the available punishment strategies towards non–cooperating parties. Intuitively, these punishment serve as a threat that keeps players from deviating from cooperative agreements and the harsher the available punishments, the stronger the potential for such cooperation. To apply these ideas to my model, it is, therefore, crucial to know how political parties can

[11]To implement a concrete conditional agreement $(\lambda_l^b, \lambda_r^b)$ in our theoretical framework, parties may, before the election, institutionalize an independent regulatory agency with rules that allows only regulation for $\lambda \in (\lambda_l^b, \lambda_r^b)$. The winner of the election is, then, allowed to select the actual λ within this set. In this case, party r would select λ_r^b after winning the election, whereas party l would select λ_l^b. Hence, this scheme implements the conditional agreement $(\lambda_l^b, \lambda_r^b)$.

[12]Gilardi (2004) measures the degree of independence for different regulatory agencies in different countries.

discipline potential deviators from violating agreements.[13] A proper analysis should, in particular, include all possible ways that political parties can punish each other. Because such an analysis goes beyond the narrow setup I consider here, I can only but note that repeated interaction may alleviate the commitment problem. Note however that the two solutions towards the commitment problem should be seen as complements rather than mutually exclusive substitutes. If it is harder to change policies when they are delegated, it is also easier to achieve cooperation by repeated interactions with delegation than without delegation.

8 Conclusion and Discussion

Recent business surveys make strong claims that regulatory risk poses a major threat to modern economies. This paper shows that one obvious cause of regulatory risk, political uncertainty, actually generates less regulatory risk than one may initially suspect. It demonstrates in particular that political parties have a natural tendency to reduce and even eliminate it. Political parties face, however, a commitment problem that undermines their attempts to reduce regulatory risk. This provides a rationale for the prevalence of independent regulatory agencies in practise. These institutions can be understood as a way to reduce the regulatory risk problem by third party delegation.

The formal analysis identifies the two driving forces that determine the attitude of political parties towards regulatory risk: a fluctuation and an output–expansion effect. The fluctuation effect hurts both parties, whereas exactly one party benefits from the output–expansion effect. When the negative fluctuation effect dominates, regulatory risk hurts both parties. This is the case when the political divergence between the two parties is not too large or when the winning probability of the party who benefits from the output–expansion effect is large enough. In this case, political parties have an incentive to eliminate regulatory risk completely.

Because the paper identifies the two driving forces that determine attitudes towards regulatory risk, its results also imply that parties have no incentive to increase regulatory

[13] See De Figueiredo (2002) for a formal analysis of cooperation by repeated interactions in a political economy model with electoral uncertainty.

risk artificially. Hence, even if independent regulatory agencies are created for different reasons than for a lack of commitment, political parties still have an incentive to endow the agency with robust and stable objective functions that reduce rather than increase regulatory risk.

I considered a setup where political parties are unable to use direct side payments to facilitate bargaining. If one allows such side payments then efficient bargaining leads to a regulation on the basis of a regulatory variable λ_{lr}^* that maximizes the common surplus $\hat{W}_{lr}(\lambda) \equiv \hat{W}_l(\lambda) + \hat{W}_h(\lambda)$. It is straightforward to see that the common surplus function is equivalent to twice the surplus function $\hat{W}_p(\lambda)$ that obtains from an individual party p with the weight $\lambda_p = (\lambda_l + \lambda_r)/2$. It is then immediate that $\lambda_{lr}^* = (\lambda_l + \lambda_r)/2$. Therefore, also with side payments political parties have an incentive to eliminate the regulatory risk that political uncertainty generates. The result is even stronger, because it is independent of whether the common surplus function $W_{lr}(\lambda)$ is concave or convex. It follows because, by Lemma 1, the common surplus function has a unique maximum. Yet, in the context of political economy, the assumption of efficient side payments seems inappropriate. For this reason the analysis concentrated on the case without transferable utility.

Appendix

Proof of Lemma 1: It follows

$$\hat{W}_p'(\lambda) = \frac{\partial \tilde{W}_p}{\partial x_h}(\hat{x}_h)\frac{\partial \hat{x}_h}{\partial \lambda}(\lambda).$$

From (5) it follows

$$v''(\hat{x}_h)\partial \hat{x}_h/\partial \lambda = -\psi \Delta c$$

so that, due to $v'' < 0$, we have $\partial \hat{x}_h/\partial \lambda > 0$. The sign of $\hat{W}_p'(\lambda)$, therefore, coincides with the sign of $\partial \tilde{W}_p/\partial x_h(\hat{x}_h)$. Note that

$$\frac{\partial \tilde{W}_p}{\partial x_h}(\hat{x}_h) = -\nu(1-\lambda_p)\Delta c + (1-\nu)(v'(\hat{x}_h) - c_h) = -\nu(1-\lambda_p)\Delta c + (1-\nu)(\psi \Delta c) = (\lambda_p - \lambda)\Delta c.$$

Hence, $\partial \tilde{W}_p/\partial x_h(\hat{x}_h)$ and, therefore, $\hat{W}_p'$ is positive for $\lambda < \lambda_p$ and negative for $\lambda > \lambda_p$. This shows that $\hat{W}_p(\lambda)$ is increasing for $\lambda < \lambda_p$ and decreasing for $\lambda > \lambda_p$. Consequently, $\hat{W}_p$

attains a unique maximum at λ_p. Because $\hat{W}_p$ is twice differentiable it holds $\hat{W}_p'(\lambda_p) = 0$ and $\hat{W}_p''(\lambda_p) < 0$. Q.E.D.

Proof of Lemma 2: The function $\hat{W}_p(\lambda)$ is concave around λ if $\hat{W}_p(\lambda)$ is concave with respect to some interval $[\underline{\lambda}, \overline{\lambda}]$ around λ. A sufficient condition for this is that $\hat{W}_p''(\lambda) < 0$.

We have

$$\hat{W}_p(\lambda) \;=\; \nu[v(\hat{x}_l) - c_l\hat{x}_l - (1-\lambda_p)\Delta c\hat{x}_h(\lambda)] + (1-\nu)[v(\hat{x}_h(\lambda)) - c_h\hat{x}_h(\lambda)].$$

Using (5), differentiation of $W_p(.)$ yields

$$\begin{aligned}\hat{W}_p'(\lambda) &= -\nu(1-\lambda_p)\Delta c\hat{x}_h'(\lambda) + (1-\nu)[v'(\hat{x}_h(\lambda)) - c_h]\hat{x}_h'(\lambda) \\ &= -\nu(1-\lambda_p)\Delta c\hat{x}_h'(\lambda) + (1-\nu)(1-\lambda)\psi\Delta c\hat{x}_h'(\lambda).\end{aligned}$$

Using the definition of ψ, (6), and (7), a further differentiation of $W_p(.)$ yields

$$\begin{aligned}\hat{W}_p''(\lambda) &= [-\nu(1-\lambda_p)\Delta c\hat{x}_h''(\lambda) + (1-\nu)(1-\lambda)\psi\Delta c\hat{x}_h''(\lambda)] - (1-\nu)\psi\Delta c\hat{x}_h'(\lambda) \\ &= (\lambda_p-\lambda)\nu\Delta c\hat{x}_h''(\lambda) - (1-\nu)\psi\Delta c\hat{x}_h'(\lambda) \\ &= (1-\nu)\left[(\lambda-\lambda_p)\psi\Delta c\frac{v'''(\hat{x}_h(\lambda))}{v''(\hat{x}_h(\lambda))} + v''(\hat{x}_h(\lambda))\right]\hat{x}_h'(\lambda)^2.\end{aligned}$$

Hence, $\hat{W}_p''(\lambda) < 0$ exactly when

$$(\lambda_p - \lambda)\psi\Delta c v'''(\hat{x}_h(\lambda)) < [v''(\hat{x}_h(\lambda))]^2.$$

Q.E.D.

Proof of Proposition 1: For the special case where demand is convex ($v''' > 0$) it follows, for any $\lambda \in (\lambda_l, \lambda_r)$, that $(\lambda_l - \lambda)\psi\Delta c v'''(x) < 0 < (v''(x))^2$. Hence, inequality (9) is satisfied so that $\hat{W}_l(\lambda)$ is concave and, therefore, $\tilde{W}_l^e$ is smaller than $\hat{W}_l(\alpha\lambda_r + (1-\alpha)\lambda_l)$ for any $\alpha \in (0,1)$.

For the special case where demand is concave ($v''' < 0$), it follows, for any $\lambda \in (\lambda_l, \lambda_r)$, that $(\lambda_r - \lambda)\psi\Delta c v'''(x) < 0 < (v''(x))^2$. Hence, inequality (9) is satisfied so that $\hat{W}_r(\lambda)$ is concave and, therefore, $\tilde{W}_r^e$ is smaller than $\hat{W}_r(\alpha\lambda_r + (1-\alpha)\lambda_l)$ for any $\alpha \in (0,1)$.

For the linear demand case ($v''' = 0$), we have $\hat{x}_h^e = \hat{x}_h(\lambda_e)$. I showed that, for this case, both party r and party l dislike regulatory risk. Q.E.D.

Proof of Proposition 2: I first prove the second part of the Proposition. It follows

$$\begin{aligned}
W_r^e - \hat{W}_r(\lambda_e) &= \alpha \hat{W}_r(\lambda_r) + (1-\alpha)\hat{W}_r(\lambda_l) - \hat{W}_r(\lambda_e) \\
&= \alpha \tilde{W}_r(\hat{x}_l, \hat{x}_h(\lambda_r)) + (1-\alpha)\tilde{W}_r(\hat{x}_l, \hat{x}_h(\lambda_l)) - \tilde{W}_r(\hat{x}_l, \hat{x}_h(\lambda_e)) \\
&= \left[\alpha \tilde{W}_r(\hat{x}_l, \hat{x}_h(\lambda_r)) + (1-\alpha)\tilde{W}_r(\hat{x}_l, \hat{x}_h(\lambda_l)) - \tilde{W}_r(\hat{x}_l, \hat{x}_h^e)\right] \\
&\quad + \left[\tilde{W}_r(\hat{x}_l, \hat{x}_h^e) - \tilde{W}_r(\hat{x}_l, \hat{x}_h(\lambda_e))\right] \\
&= (1-\nu)\left[\alpha v(x_h(\lambda_r)) + (1-\alpha)v(x_h(\lambda_l)) - v(x_h^e)\right] \\
&\quad + \left[\tilde{W}_r(\hat{x}_l, \hat{x}_h^e) - \tilde{W}_r(\hat{x}_l, \hat{x}_h(\lambda_e))\right].
\end{aligned}$$

Due to $v'' < 0$, the first term in squared brackets is negative. The second term in square brackets is non–positive, because $\hat{x}_h^e \leq x_h(\lambda_e) < \hat{x}_h(\lambda_r)$ and $\partial \tilde{W}_r / \partial x_h > 0$ for $x_h < x_h(\lambda_r)$ imply $\tilde{W}_r(\hat{x}_l, \hat{x}_h^e) \leq \tilde{W}_r(\hat{x}_l, \hat{x}_h(\lambda_e)$. As a result the overall expression is negative and, therefore, party r dislikes regulatory risk.

Similarly for party l, it follows

$$\begin{aligned}
W_l^e - \hat{W}_l(\lambda_e) &= (1-\nu)\left[\alpha v(x_h(\lambda_r)) + (1-\alpha)v(x_h(\lambda_l)) - v(x_h^e)\right] \\
&\quad + \left[\tilde{W}_l(\hat{x}_l, \hat{x}_h^e) - \tilde{W}_l(\hat{x}_l, \hat{x}_h(\lambda_e))\right].
\end{aligned}$$

Due to $v'' < 0$, the first term in squared brackets is negative. The second term in square brackets is non–positive, because $\hat{x}_h^e \geq x_h(\lambda_e) > \hat{x}_h(\lambda_l)$ and $\partial \tilde{W}_l / \partial x_h < 0$ for $x_h < x_h(\lambda_l)$ imply $\tilde{W}_l(\hat{x}_l, \hat{x}_h^e) \leq \tilde{W}_l(\hat{x}_l, \hat{x}_h(\lambda_e)$. As a result the overall expression is negative and, therefore, party l dislikes regulatory risk.

Hence, if party l likes regulatory risk then, necessarily, $\hat{x}_h^e < \hat{x}_h(\lambda_e)$, but party r then dislikes regulatory risk. Similarly, if party r likes regulatory risk then $\hat{x}_h^e > \hat{x}_h(\lambda_e)$, but party l then dislikes regulatory risk. Hence, we cannot have that both parties like regulatory risk and if some party likes risk then the other party dislikes it. Q.E.D.

Proof of Proposition 3: We show that for $\Delta\lambda < \bar{\lambda}$ condition (9) is satisfied for any $\lambda \in (\lambda_l, \lambda_r)$ so that $\hat{W}_p(\lambda)$ is concave for the whole interval $[\lambda_l, \lambda_r]$.

Consider first party r: For any $\alpha \in (0,1)$, it follows

$$\begin{aligned}
&(\lambda_r - \lambda_e)\psi\Delta c v'''(\hat{x}_h(\lambda_e)) = (1-\alpha)\Delta\lambda\psi\Delta c v'''(\hat{x}_h(\lambda)) \leq (1-\alpha)\Delta\lambda\psi\Delta c|v'''(\hat{x}_h(\lambda))| \leq \\
&\Delta\lambda\psi\Delta c|v'''(\hat{x}_h(\lambda))| \leq \bar{\lambda}\psi\Delta c|v'''(\hat{x}_h(\lambda))| \leq \frac{(v''(\hat{x}_h(\lambda)))^2}{|v'''(\hat{x}_h(\lambda))|\psi\Delta c}\psi\Delta c|v'''(\hat{x}_h(\lambda))| = v''(\hat{x}_h(\lambda)))^2.
\end{aligned}$$

A similar result holds for party l: For any $\alpha \in (0,1)$, it follows $0 < \lambda_l < \lambda_e < \lambda_r < 1$ and therefore

$$(\lambda_l - \lambda_e)\psi\Delta c v'''(\hat{x}_h(\lambda_e)) = -\alpha\Delta\lambda\psi\Delta c v'''(\hat{x}_h(\lambda)) \leq |\alpha\Delta\lambda\psi\Delta c v'''(\hat{x}_h(\lambda))| =$$
$$\alpha\Delta\lambda\psi\Delta c|v'''(\hat{x}_h(\lambda))| \leq \Delta\lambda\psi\Delta c|v'''(\hat{x}_h(\lambda))| \leq$$
$$\bar{\lambda}\psi\Delta c|v'''(\hat{x}_h(\lambda))| \leq \frac{(v''(\hat{x}_h(\lambda)))^2}{|v'''(\hat{x}_h(\lambda))|\psi\Delta c}\psi\Delta c|v'''(\hat{x}_h(\lambda))| = v''(\hat{x}_h(\lambda)))^2.$$

Hence, for $\Delta\lambda < \bar{\lambda}$ both $\hat{W}_l(\lambda)$ and $\hat{W}_r(\lambda)$ are concave over the interval $[\lambda_l, \lambda_r]$. Q.E.D.

Proof of Proposition 4: First, suppose party l is a regulatory risk averse party. Because $W_r(\lambda_r) > W_r(\lambda_l)$, the expression $W_r^e(\alpha)$ is strictly decreasing in α and, in particular, $W_r^{e\prime}(1) < 0$. Moreover,

$$\left.\frac{d\hat{W}_r(\lambda_e(\alpha))}{d\alpha}\right|_{\alpha=1} = \left.\frac{\partial\hat{W}_r(\lambda_e(\alpha))}{\partial\lambda}\frac{\partial\lambda_e(\alpha)}{\partial\alpha}\right|_{\alpha=1} = \hat{W}_r'(\lambda_r)\lambda_e'(1) = 0,$$

because $\hat{W}_r'(\lambda_r) = 0$. Because $\hat{W}_r(\lambda_e(1)) = W_r^e(1)$, it then follows that $\hat{W}_r(\lambda_e(\alpha)) > W_r^e(\alpha)$ for $\alpha < 1$ but close enough to 1.

If party l is not a regulatory risk averse party, then, by Proposition 2, party r is regulatory risk averse. By a similar argument, one can then show that $d\hat{W}_l(\lambda_e(0))/d\alpha = 0$. Because $W_l^e(\alpha)$ is strictly increasing in α, it then follows that $\hat{W}_l(\lambda_e(\alpha)) > W_l^e(\alpha)$ for $\alpha > 0$ but close enough to 0. Q.E.D.

Proof of Proposition 5: Lemma 1 shows that $\hat{W}_l$ is decreasing on $[\lambda_l, \lambda_r]$. Hence, $\hat{W}_l(\lambda) > \hat{W}_l(\lambda_l(\alpha)) = W_l^e$ if and only if $\lambda < \lambda_l(\alpha)$. Similarly, $\hat{W}_r(\lambda) > \hat{W}_r(\lambda_r(\alpha)) = W_r^e$ if and only if $\lambda > \lambda_r(\alpha)$, because $\hat{W}_r$ is increasing on $[\lambda_l, \lambda_r]$. Hence, $\hat{W}_l(\lambda) > W_l^e$ and $\hat{W}_r(\lambda) > W_r^e$ if and only if $\lambda \in \Lambda(\alpha)$. Therefore, pre–electoral agreement is potentially beneficial if and only if $\Lambda(\alpha)$ is not empty which is equivalent to $\lambda_r(\alpha) < \lambda_l(\alpha)$. Q.E.D.

Proof of Proposition 6: Consider the pair $(\lambda_l^b(\varepsilon), \lambda_r^b(\varepsilon)) \equiv (\lambda_l + \varepsilon, \lambda_r - \varepsilon)$ with $\varepsilon > 0$. The payoff of party $p \in \{l, r\}$ from the conditional agreement is

$$V_p(\varepsilon) \equiv W_p^b(\lambda_l^b(\varepsilon), \lambda_r^b(\varepsilon)) = \alpha\hat{W}_p(\lambda_r - \varepsilon) + (1-\alpha)\hat{W}_p(\lambda_l + \varepsilon).$$

It follows

$$V_r'(0) = -\alpha\hat{W}_r'(\lambda_r) + (1-\alpha)\hat{W}_r'(\lambda_l) = (1-\alpha)\hat{W}_r'(\lambda_l) > 0,$$

because $\hat{W}_r'(\lambda_r) = 0$ and $\hat{W}_r'(\lambda) > 0$ for $\lambda < \lambda_r$. Moreover,

$$V_l'(0) = -\alpha \hat{W}_l'(\lambda_r) + (1-\alpha)\hat{W}_l'(\lambda_l) = -\alpha \hat{W}_l'(\lambda_r) > 0,$$

because $\hat{W}_l'(\lambda_l) = 0$ and $\hat{W}_l'(\lambda) < 0$ for $\lambda > \lambda_l$. Hence, for a small enough $\varepsilon > 0$, we have $W_p^b(\gamma(\varepsilon)) > W_p^e$ for both $p \in \{l, r\}$ and $\lambda_l < \lambda_l^b(\varepsilon) < \lambda_r^b(\varepsilon) < \lambda_r$ so that $(\lambda_l^b(\varepsilon), \lambda_r^b(\varepsilon)) \in \Lambda^c$ and, therefore, $\Lambda^c \neq \emptyset$. Q.E.D.

References

Alesina, Alberto and Tabellini, Guido. 1988. "Credibility and politics," *European Economic Review*, 32: 542–550.

Armstrong, M. and D. Sappington. 2008. "Recent Developments in the Theory of Regulation." In *Handbook of Industrial Organization Vol 3*, ed. Mark Armstrong and David E.M. Sappington, 1557–1700. New York: Elsevier.

Armstrong, M. and J. Vickers. 1996. "Regulatory Reform in Telecommunications in Central and Eastern Europe." *Economics of Transition*, 4: 295–318.

Baron, David and Roger Myerson. 1982. "Regulating a Monopolist with Unknown Costs." *Econometrica*, 50: 911-930.

Chang, Mo-Ahn and Howard Thompson. 1989. "An analysis of some aspects of regulatory risk and the required rate of return for public utilities." *Journal of Regulatory Economics*, 1(3): 241-257.

De Figueiredo, Rui J. P. 2002. "Electoral Competition, Political Uncertainty, and Policy Insulation, *American Political Science Review,* 96(2): 321-333.

Gilardi, Fabrizio. 2004. "Delegation in the Regulatory State. Origins and Diffusion of Independent Regulatory Agencies in Western Europe", PhD dissertation, Université de Lausanne.

Gilardi, Fabrizio. 2005a. The Formal Independence of Regulators: A Comparison of 17 Countries and 7 Sectors, *Swiss Political Science Review*, 11(4): 139-167.

Gilardi, Fabrizio. 2005b. The Institutional Foundations of Regulatory Capitalism: The Diffusion of Independent Regulatory Agencies in Western Europe, *Annals of the American Academy of Political and Social Science*, 598: 84-101.

Glazer, Amihai. 1989. "Politics and the Choice of Durability" *The American Economic Review,* 79 (5): 1207-1213

Kydland, Finn and Edward Prescott. 1977. "Rules rather than discretion: The inconsistency of optimal plans, *Journal of Political Economy,* 85: 473-490.

Laffont, Jean-Jacques. 2000. "Political Economy and Industrial Policy," Chapter 5 in *Incentives and Political Economy (Clarendon Lectures in Economics)*, Oxford University Press, USA.

Moe, Terry M. 1990. "Political institutions: The neglected side of the story," *Journal of Law, Economics, and Organization,* 6: 213-53.

OECD. 2002. *Regulatory Policies in OECD Countries. From Interventionism to Regulatory Governance.* Paris: OECD.

Panteghini, Paolo M. and Carlo Scarpa. 2008. "Political Pressures and the Credibility of Regulation: Can Profit Sharing Mitigate Regulatory Risk?", *International Review of Economics* 55, 253–274.

Persson, Torsten and Lars Svensson. 1989. "Why a stubborn conservative would run a deficit: Policy with time–consistent preferences," *Quarterly Journal of Economics,* 104: 325–345.

Rogoff, Kenneth. 1985, "The optimal degree of precommitment to an intermediate monetary target", *Journal of International Economics*, 18: 1169-1190.

Rothschild, Michael and Joseph E. Stiglitz. 1970. "Increasing risk: I. A definition." *Journal of Economic Theory,* 2: 225-243.

Strausz, Roland. 2009. "Regulatory Risk under Optimal Incentive Regulation." mimeo Humboldt–Universität Berlin.

Tabellini, Guido and Alesina, Alberto. 1990. "Voting on the Budget Deficit," *American Economic Review*, 80(1): 37-49.

Vogel, S.K. 1996. *Freer Markets, More Rules. Regulatory Reform in Advanced Industrial Countries* Ithaca: Cornell University Press.

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