The political economy of regulatory risk

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Abstract

I investigate political uncertainty as a source of regulatory risk. Political parties have incentives to reduce regulatory risk actively through institutionalizing politically independent regulatory agencies. Political parties benefit from fully eliminating regulatory risk when political divergence is small or electoral uncertainty is appropriately skewed. In general, the political system allows only an incomplete reduction in regulatory risk and requires regulatory agencies with only partial political independence. The benefits from reducing regulatory risk follow from a fluctuation effect that hurts both parties and an output–expansion effect that benefits at most one party.

1 Introduction

In their survey of strategic business risks, Ernst&Young (2008, p.8) proclaims regulatory risk as "the greatest strategic challenge facing leading global businesses". Their survey Ernst&Young (2010) two years later ranks regulatory risk again on the number 1 spot: "uncertainty over regulation was another problem raised by many panelists this year. Uncertainty both damages investment and the ability of companies to act. Governments need to move fast to remove uncertainty" (p.10). The quote illustrates that practitioners view governments as a major cause of regulatory risk. It begs the question in how far governments have an inherent incentive to reduce or eliminate this risk. The current paper addresses exactly this question.

In a partisan, two–party system with party–specific political preferences, the paper shows that, left unchecked, electoral uncertainty generates regulatory risk. It shows however that partisan parties have a strict incentive to reduce this risk by at least some degree. This leads parties to institutionalize politically independent regulatory agencies rather than dependent ones. Yet, a full elimination of regulatory risk may not be attainable in general. In this case, some degree of regulatory risk persists and the political independence of regulatory agencies is necessarily incomplete.

Hence, the paper relates the independence of regulatory agencies to the political incentives to reduce regulatory risk. The observation of OECD (2002, p.91) that "[o]ne of the most widespread institutions of modern regulatory governance is the so–called independent regulator or autonomous administrative agencies with regulatory powers" is consistent with this view.[1] An explicit connection of regulatory risk and the independence of regulatory agencies is currently raised in the discussion of "regulatory holidays" in the new fibre optic markets. Initiated by threats to hold back on a 3 billion euro (US$3.86 billion) investment in ultra high-speed broadband network, the German government in 2006 isolated Deutsche Telekom from regulatory risk by exempting its new markets from future regulation. After the EU Commission launched infringement proceedings against this decision in 2007,

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[1]See also Gilardi (2005) for an overview of regulatory independence internationally and Epstein and O'Halloran (1997) for an overview focusing on the US.

the European Court of Justice (ECJ) ruled in 2009 against the regulatory holiday.[2] In its judgement, the ECJ clarifies that its ruling against Germany was driven by its concern that the imposition of a regulatory holiday threatened the independence of national regulatory agencies (NRA). The official opinion of the advocate general Poiares Maduroin explicitly connects the independence issue with the problem of regulatory risk: "It may turn out that Germany is correct, and special attention needs to given, as regards new markets, to incentives to infrastructure and innovation. However, assigning such balancing to the national legislature has different consequences from assigning it to the NRAs. NRAs have been set up and given particular powers by the Community regulatory framework for a reason: they are expected to be insulated from certain interests and to reach their decisions governed only by the criteria established in that framework."[3]

I derive my results in the standard regulation framework of Baron and Myerson (1982), where a government regulates a privately informed monopolist with the objective to maximize a weighted sum of consumer surplus and profits.[4] Following Baron (1988), I embed this framework in a political economy model, where two political parties differ in their views about the appropriate weight on producers' surplus. As in Faure-Grimaud and Martimort (2007), these different political views cause a preference for different regulatory policies and, therefore, generate regulatory risk when the election outcome is uncertain. 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. Because as in Baron (1988) the government delegates the regulatory task to a regulatory agency, I interpret such pre–electoral agreements as regulatory agencies with different degrees of political independence. Pre–electoral agreements that eliminate regulatory risk completely represent politically independent agencies. Agreements that leave some regulatory risk represent agencies with only a partial political independence.

The analysis reveals that a party's attitude towards regulatory risk is fully determined by a *fluctuation* and an *output–expansion* effect of regulatory risk as first identified in Strausz (2011). The fluctuation effect hurts both parties unambiguously, whereas the expansion

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[2]Case, C-424/07 European Commission v. Germany, Judgment of 3 December 2009.

[3]http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:62007C0424:EN:HTML

[4]See Armstrong and Sappington (2007) for an introduction to optimal regulation models.

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. The fluctuation effect dominates in particular when the degree of political divergence is small or the winning probability of the party that benefits from the expansion effect is large. In this case, political parties mutually benefit from institutionalizing a politically independent regulatory agency. The paper, moreover, characterize the set of mutually beneficial pre–electoral agreements that reduce but do not fully eliminate regulatory risk. This set turns out to be always non–empty so that there always exist mutually beneficial agreements that reduce regulatory risk. This result implies that political parties always benefit from institutionalizing a regulatory agency with at least some degree of political independence, but this independence may necessarily be incomplete. Finally, I show that results are robust when considering a political competition with endogenous election outcomes.

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 that focuses explicitly on regulatory risk as the degree of uncertainty concerning future regulation is small.[5] Ahn and Thompson (1989) analyze regulatory risk under rate of return regulation. Panteghini and Scarpa (2008) study the effect of regu-

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[5]Part of the literature interprets regulatory risk in a loser, broader sense. An example is Armstrong and Vickers (1996) who models higher regulatory risk as a higher probability of expropriation.

latory 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. The analysis in these papers is not very tractable. In contrast, Strausz (2011) develops a tractable analytical framework to study regulatory risk of which the current paper uses a simplified version. It establishes the expansion and fluctuation effect of regulatory risk that play major role in this paper. Whereas Strausz (2011) treats regulatory risk as exogenous, the current paper focuses exactly on an endogenous cause of regulatory risk — electoral uncertainty in a political economy — and the implicit incentives of the political system itself to reduce it.

Focusing on electoral uncertainty as a source of regulatory risk, the current paper falls in the strand of literature that takes a positive view of regulation and industrial policy based on political considerations. Taking such a view, Baron (1988) studies how the political framework affects regulation outcomes. Because there is no electoral uncertainty, Baron (1988) does not exhibit regulatory risk.

Introducing electoral uncertainty explicitly, Laffont (1996), Boyer and Laffont (1999), and Laffont (2000) point out that politically controlled regulation leads to regulation outcomes that fluctuate with the uncertain election outcome. These fluctuations signify regulatory risk. The studies further point out that these fluctuations are excessive from an overall welfare perspective and subsequently study the welfare effects of reducing fluctuations by limiting the discretionary power of politicians in different ways. In contrast to this welfare orientated approach, I provide a more positive analysis of whether the political system itself has an incentive to limit these fluctuations. Because I show that political parties themselves have an inherent interest to reduce fluctuations actively, the negative welfare effects of fluctuations may be less severe than this literature suggests.

Martimort (2001) and Faure-Grimaud and Martimort (2003) also study the incentives of political parties themselves to limit and affect the fluctuations due to political uncertainty. These papers however focus on the dynamic incentives of incumbent parties to entrench current policies and isolate them from changes by differently minded politicians in the future. Especially with electoral uncertainty, the incumbent party cannot rule out that a different party will rule tomorrow. Electoral uncertainty therefore leads current politicians to con-

sider how their policies affect differently–minded governments in the future. In my static framework, such strategic, dynamic concerns are absent because no ad hoc incumbent party is present. This allows me to focus exclusively on the riskiness of the regulation itself and isolate the attitude of parties towards this risk and their incentives to reduce it.

Focusing on collusive threats, Faure-Grimaud and Martimort (2003, 2007) already identified the stabilizing effect of politically independent regulatory agencies. Faure-Grimaud and Martimort (2003) show that an incumbent party benefits from such stabilization, because of its aforementioned dynamic effect on future governments. Faure-Grimaud and Martimort (2007) demonstrate a positive stabilization effect of independent regulators when independent regulators are more prone to collusion and the transaction cost of collusion is convex. Their analysis not only focuses on the welfare gains from the stabilizing effect but also argues that the parties themselves may prefer independent regulatory agencies, in particular when collusive costs are quadratic. In contrast, my framework abstracts from any collusion possibilities and shows that already without collusion the trade–off between political dependent and political independent regulators is non–trivial and economicly relevant.

3   The Setup

Following Baron and Myerson (1982), I consider a monopolistic firm that produces a publicly provided good x at a constant marginal cost $c \in \{c_l, c_h\}$. 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. The firm's outside option is zero.

Consumers pay a lump–sum transfer t in exchange for the consumption of a quantity x, and obtain a consumer surplus of

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

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. Its sign determines the (local) curvature of the consumers' aggregate demand function.[6]

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. Importantly, the election outcome is uncertain. In particular, party l wins the election with probability $\pi \in (0, 1)$ and party r wins it with probability $1 - \pi$. It is instructive to start by taking the electoral uncertainty as exogenously given. Section 7 endogenizes the electoral uncertainty to show that qualitative results remain unchanged.

I assume that both parties are benevolent and maximize a weighted sum of consumer surplus and profits. In line with the partisan politics literature[7], the parties, however, differ in the weights they attach to profits. In particular, party p's objective function is

$$W_p = \Psi + \alpha_p \Pi, \tag{1}$$

where the parameter $\alpha_p \in [0, 1)$ represents the weight which party p attaches to profits. The underlying idea is that the two parties differ in their perception of the appropriate weight α in society's social choice function or cater to the preferences of heterogeneous voter groups. The difference $\Delta \alpha = \alpha_r - \alpha_l$ is strictly positive so that party r has a more business friendly orientation. In summary, a firm that receives a transfer t and produces a quantity x at marginal costs c_i yields party $p \in \{l, r\}$ a payoff of

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

The triple $(\pi, \alpha_l, \alpha_r)$ describes the *political system*. For a given political system, let $\Delta \alpha \equiv \alpha_r - \alpha_l$ represent the *political divergence* of the system.

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[6]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.

[7]E.g., Baron (1988), Boyer and Laffont (1999), Laffont (2000), Faure-Grimaud and Martimort (2003) and Faure-Grimaud and Martimort (2007)

Following Baron (1988), the government delegates the regulatory task to a regulatory agency by endowing the agency with a specific objective function:

$$W_a = \Psi(x, t) + \alpha_a \Pi(x, t).$$

Hence, the government's decision is the weight α_a with which the agency is to regulate.

By assumption, the only task of the agency is to propose a regulatory schedule to the firm. In particular, the agency does not engage in information acquisition as assumed in papers focusing on collusive issues, e.g. Faure-Grimaud and Martimort (2003). This limited role of the agency makes explicit that the incentives of the political parties whether to grant political independence is driven entirely by consideration of regulatory risk rather than other concerns such as information acquisition or collusion.

In the following, I consider regulatory agencies that differ in their degree of political independence. By definition, *politically dependent agencies* regulate with an objective function that coincides with the one of the winning party p, i.e., $\alpha_a = \alpha_p$. In contrast, *politically independent agencies* regulate with an objective that is independent of the election outcome. Last, *partially independent agencies* regulate with an objective function that depends on the election outcome $p \in \{l, r\}$, but does not coincide with the elected party. The paper's main research question is whether the political system itself benefits from such independent agencies.

Somewhat more formally, we may express the agency's dependence by a pair (α_a^l, α_a^r) with the interpretation that the agency attaches the weight α_a^p to profits when party p wins the election. In particular, the pair $(\alpha_a^l, \alpha_a^r) = (\alpha_l, \alpha_r)$ signifies a politically dependent agency. A pair (α_a^l, α_a^r) with $\alpha_a^l = \alpha_a^r$ signifies a politically independent agency. Last, a pair (α_a^l, α_a^r) with $\alpha_l \neq \alpha_a^l \neq \alpha_a^r \neq \alpha_r$ signifies a partially independent agency. Politically dependent and independent agencies are limit cases of a partially independent agency.

Given a specific weight α_a, the agency offers a regulatory schedule that is optimal given its objective function W_a. Computing the optimal regulatory schedule is standard. 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,

an agency offers a regulatory contract that solves the following maximization problem:

$$P : \max_{x(.),t(.)} \quad \nu W_a(x_l, t_l, c_l) + (1 - \nu)W_a(x_h, t_h, c_h) \qquad (2)$$

$$\text{s.t.} \quad t_h - c_h x_h \geq t_l - c_h x_l \text{ and } t_l - c_l x_l \geq t_h - c_l x_h \qquad (3)$$

$$t_l \geq c_l x_l \text{ and } t_h \geq c_h x_h, \qquad (4)$$

where (3) represents the incentive compatibility conditions that ensure truthtelling and (4) represents the firm's participation constraints.

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. These two insights imply that the following first order conditions characterize the optimal quantity schedules $(\hat{x}_l, \hat{x}_h)$:

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

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. The degree of the distortion and the output $\hat{x}_h$ depend on the parameter α_a.

Applying the implicit function theorem reveals how output $\hat{x}_h$ relates to α_a:

$$\hat{x}'_h(\alpha_a) = -\frac{\psi\Delta c}{v''(\hat{x}_h)} \quad \text{and} \quad \hat{x}''_h(\alpha_a) = -\frac{v'''(\hat{x}_h(\alpha_a))}{v''(\hat{x}_h(\alpha_a))}[\hat{x}'_h(\alpha_a)]^2. \qquad (6)$$

Due to $v'' < 0$, the first expression is positive and, therefore, $\hat{x}_h(\alpha_l) \leq \hat{x}_h(\alpha_r) \leq x_h^{fb}$. This illustrates the intuitive result that the more business friendly party r asks the firm to produce more. The explanation is that more production requires a higher information rent, which party r discounts less than party l. The second expression reiterates the result of Strausz (2011) that the curvature of demand v''' determines the curvature of $\hat{x}_h$ with respect to α_a.

4 Politically Dependent Agencies

By definition, a politically dependent agency operates with the same objective function as the ruling political party. Hence, when party l wins, the agency's weight is α_l and it induces the inefficient firm to produce $x_h(\alpha_l)$. In contrast, a politically dependent agency

induces the inefficient firm to produce $x_h(\alpha_r)$ when party r wins the election. As already noted in Faure-Grimaud and Martimort (2003) and Faure-Grimaud and Martimort (2007), politically dependent agencies lead to a production that fluctuates with the election outcome. In the presence of uncertain election outcomes, this observation leads to regulatory risk.

Proposition 1 *With political uncertainty political dependent agencies induce regulatory risk.*

Politically dependent agencies are the natural outcome of the following political game Γ^d:

$t = 1$: Nature determines the election winner $p \in \{l, r\}$

$t = 2$: The winner of the election chooses the weight α_a of the agency.

$t = 3$: The agency contracts with the firm about the regulatory contract.

Indeed, the previous section shows that, given α_a, the respective subgame in $t = 3$ leads to a production $x_l = \hat{x}_l$ in case of an efficient firm and $x_h = \hat{x}_h(\alpha_a)$ in case of an inefficient firm. Hence, the choice α_a in $t = 2$ yields party p the expected payoff

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

The following lemma confirms the intuitive but helpful property that $\hat{W}_p$ is single–peaked and attains a maximum at α_p.

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

Hence, for the political game Γ^d, politically dependent agencies are a subgame perfect equilibrium outcome. From the perspective of $t = 1$, this then induces regulatory risk. The main idea of this paper is to investigate in how far political parties have an incentive to reduce this regulatory risk by negotiating agreements about institutionalizing a specific agency *before* the election in $t = 1$. The equilibrium outcome of Γ^d represents thereby the disagreement outcome when negotiations fail.

5 Politically Independent Agencies

In this section, I ask whether political parties have an interest in eliminating regulatory risk by institutionalizing a politically independent agency. For such agencies the objective

function is, by definition, independent of the election outcome so that the offered output schedule of such agencies is independent of the election and, as a result, regulatory risk does not occur. I study the incentives of political parties to eliminate regulatory risk, first, from a perspective of classical risk analysis and, second, from a more general bargaining perspective.

5.1 Political Aversion to Regulatory Risk

The first approach starts with the observation that the risky election outcome — weight α_l with probability π and α_r with probability $(1-\pi)$ — is, in the sense of Rothschild and Stiglitz (1970), a mean preserving spread of the deterministic expected weight

$$\alpha_e \equiv \pi\alpha_l + (1-\pi)\alpha_r.$$

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 from regulating with the expected but deterministic weight α_e:

$$\hat{W}_p(\alpha_e) \geq W_p^e(\pi) \equiv \pi\hat{W}_p(\alpha_l) + (1-\pi)\hat{W}_p(\alpha_r). \tag{7}$$

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 α. 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 locally concave.

Lemma 2 *The function $\hat{W}_p(\alpha)$ is concave in the neighborhood of α when*

$$(\alpha_p - \alpha)\psi\Delta c v'''(\hat{x}_h(\alpha)) < [v''(\hat{x}_h(\alpha))]^2. \tag{8}$$

When the local condition (8) holds globally, the function $\hat{W}_p(\alpha)$ is concave globally, which implies that party p dislikes regulatory risk in general. Because the expected policy preference α_e lies in between α_l and α_r, the relevant interval for considering the curvature of $\hat{W}_p(\alpha)$ is $[\alpha_l, \alpha_r]$ rather than the overall domain $[0, 1]$. For $\alpha \in [\alpha_l, \alpha_r]$, all the signs of the different terms in (8) are unambiguously determined except for v'''. We, therefore, obtain the following insights about the attitude towards regulatory risk of the two political parties.

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Proposition 2 *For linear demand ($v''' = 0$), both parties dislike regulatory risk. When demand is globally convex ($v''' > 0$), party l dislikes regulatory risk. When demand is globally concave ($v''' < 0$), party r dislikes regulatory risk.*

In order to understand the intuition behind Proposition 2, it is helpful to decompose the overall effect of regulatory risk in an *expansion effect* and a *fluctuation effect*.

First recall the result at the end of Section 3 that the curvature of demand, v''', determines the curvature of $\hat{x}_h$ with respect to α_a. In particular, the output $\hat{x}_h$ is convex in α_a when the consumer's demand is convex and vice versa.[8] Hence, if we compare the allocation $\hat{x}$ at the expected weight α_e to the expected output under regulatory risk

$$\hat{x}_h^e \equiv \pi \hat{x}_h(\alpha_l) + (1 - \pi)\hat{x}_h(\alpha_r),$$

then, under convex demand, $\hat{x}_h^e \geq \hat{x}(\alpha_e)$. This means that regulatory risk has a positive *expansion effect* on output when demand is convex. For concave demand, we have $\hat{x}_h^e \leq \hat{x}(\alpha_e)$ so that the expansion effect of regulatory risk is negative. For linear demand, $\hat{x}_h^e$ and $\hat{x}(\alpha_e)$ coincide; regulatory risk has no expansion effect.

To understand the *fluctuation effect* of regulatory risk, consider first the case of linear demand where there is no expansion effect: $\hat{x}_h^e = \hat{x}_h(\alpha_e)$. In this case, regulatory risk has only a fluctuation effect in that, with regulatory risk, output fluctuates between $\hat{x}_h(\alpha_l)$ and $\hat{x}_h(\alpha_r)$, whereas without regulatory risk it is fixed at its expected value $\hat{x}_h(\alpha_e) = x_h^e$. Because of the consumers' decreasing marginal utility, the two parties dislike such fluctuations. This explains the statement of Proposition 2 that, with linear demand, both parties dislike regulatory risk.

Now if demand is convex, then the expansion effect is positive so that regulatory risk raises the expected value of the output itself. From the perspective of party l, regulatory risk therefore moves the expected allocation $\hat{x}_h^e$ further from its ideal output $\hat{x}_h(\alpha_l)$ so that the expansion effect hurts party l. Given that also the fluctuation effect is negative, the

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[8]Strausz (2011) provides intuitions for the crucial role of v''', the demand function's curvature. It in particular links it to the literature on precautionary savings (e.g., Leland (1968), Kimball (1990)) by pointing out that the ratio v'''/v'' is similar to the prudence measure that determines the direction of the precautionary savings effect.

two effects reinforce each other and, therefore, party l unambiguously dislikes regulatory risk. This explains the second statement of Proposition 2 that, with convex demand, party l dislikes regulatory risk. In contrast, a 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 $\hat{x}_h(\alpha_r)$. 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 the (now negative) 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 negative is a concave demand and this explains the third statement of the Proposition.

Proposition 2 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 curvature. For such demand functions, the local effect of regulatory risk can change over the relevant domain $[\alpha_l, \alpha_r]$ 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 3 *In any political system $(\pi, \alpha_l, \alpha_r)$ there exists at least one political party that dislikes regulatory risk. If the expansion effect is positive ($\hat{x}_h^e \geq \hat{x}_h(\alpha_e)$), then party l dislikes regulatory risk. If the expansion effect is negative ($\hat{x}_h^e \leq \hat{x}_h(\alpha_e)$), then party r dislikes regulatory risk.*

In the light of the intuition behind Proposition 2, the reasoning behind Proposition 3 is straightforward. As argued, the fluctuation effect impacts the political parties negatively. A positive expansion effect, therefore, reinforces party l's dislike of the fluctuation effect so that this party dislikes regulatory risk. Similarly, a negative expansion effect reinforces the negative impact of the fluctuation effect of party r. Because, the expansion effect is either positive, negative, or zero, there is at least one party for whom the negative impact of the
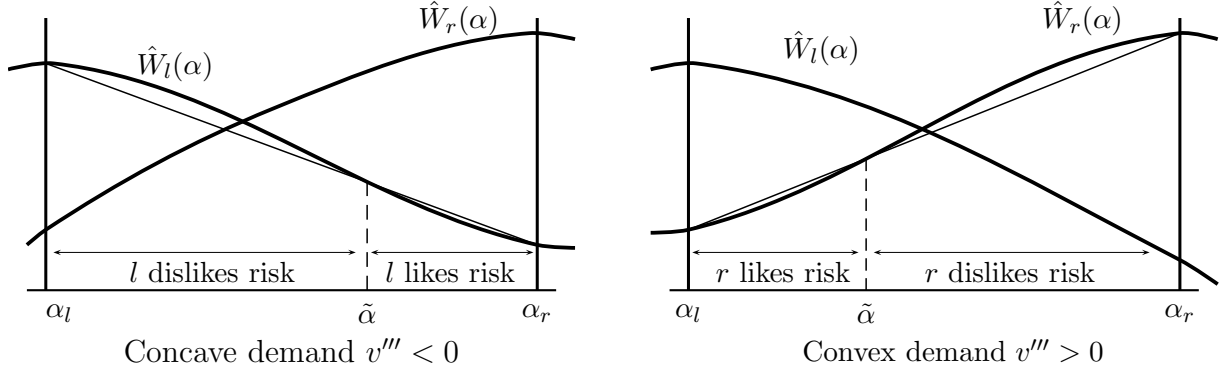
Figure 1: Non–concave payoff functions

fluctuation effect is (weakly) reinforced by the expansion effect. As a consequence, at least one political party that dislikes regulatory risk.

Figure 1 illustrates the role of curvature further. When demand is concave ($v''' < 0$), condition (8) is, due to the output contraction effect, satisfied for any $\alpha < \alpha_p$. This implies that the curve $\hat{W}_p$ is concave for all weights α that are smaller than the party's ideal weight α_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 $[\alpha_l, \alpha_r]$. For $\alpha > \alpha_p$, a party p benefits from the output contraction effect and, for α large enough, condition (8) is violated. As illustrated in the first graph of Figure 1, this implies that there exist a range of $[\tilde{\alpha}, \alpha_r]$ such that party l benefits from regulatory risk. For convex demand, regulatory risk has an output expansion effect that hurts a party p for $\alpha > \alpha_p$ and benefits it for $\alpha < \alpha_p$. As a result, the curve $\hat{W}_p$ is concave for any $\alpha > \alpha_p$ but not necessarily for $\alpha < \alpha_p$. Consequently, party l dislikes regulatory risk for any expected weight α_e, whereas party r may like regulatory risk.

Proposition 3 reveals that at least one *regulatory risk averse party* exists, but Figure 1 illustrates that the other party may or may not like it. Using Lemma 2 we may characterize political systems in which both parties dislike regulatory risk. In order to obtain such results,

let[9]

$$\bar{v} \equiv \min_{x \in [0, \hat{x}_h(1)]} \frac{(v''(x))^2}{|v'''(x)|}. \tag{9}$$

We may then demonstrate the following results.

Proposition 4 *A political system* $(\pi, \alpha_l, \alpha_r)$ *is averse to regulatory risk whenever*

    i) political divergence $\Delta\alpha$ *is small and, in particular, smaller than* $\bar{v}/(\psi\Delta c)$;

    ii) the winning probability of the regulatory risk averse party is small enough;

    iii) the difference in costs Δc *is small and, in particular, smaller than* $\bar{v}/(\psi\Delta\alpha)$;

    iv) the probability that the firm is efficient, ν, *is small and, in particular, smaller than* $\bar{v}/(\bar{v} + \Delta\alpha\Delta c)$.

To understand the intuition behind result i), note that the curve $\hat{W}_p(\alpha)$ is, as Figure 1 illustrates, concave around α_p, because it reaches, by definition, its maximum at α_p. Hence, a party's objective function $\hat{W}_p(\alpha)$ is concave for weights α close to the party's ideal weight α_p. The first result, therefore, confirms the suggestion that a party's payoff tends to be concave over the whole range $[\alpha_l, \alpha_r]$ when this range is small.

The second result shows that a sufficient condition for a political system to be averse to regulatory risk is that the party which is potentially *not* regulatory risk averse is likely enough to win. At first sight this may seem surprising, but the result follows again from the observation that the curve $\hat{W}_p$ is necessarily concave around α_p. When party p has a high enough probability of winning then the expected α_e lies in the neighborhood of α_p and the curve $\hat{W}_p$ is, therefore, also concave in the neighborhood of α_e. This explains that, irrespective of the expansion effect, a party necessarily dislikes regulatory risk, when its probability of winning is high enough.

The economic intuition behind the last two results follows from considering the fundamentals of the regulation problem. When Δc or ν become small, the private information problem disappears and information rents become irrelevant. Because the parties differ only in the way they evaluate these information rents, these differences disappear when the private information problem becomes negligible and the curvature of the two curves must coincide.

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

5.2 Pre–electoral Agreements

When the political system is averse to regulatory risk, both parties benefit from eliminating it by institutionalizing a politically independent agency that attaches the weight α_e to profits. Hence, for such systems, we may expect regulatory risk not to occur, because the political parties themselves strictly benefit from pre–electoral agreements on politically independent agency to prevent regulatory risk.

Yet with the possibility of pre–electoral agreements our focus on the average weight α_e is too limited, because in general nothing prevents the parties from agreeing on institutionalizing a politically independent agency with a different weight than α_e. This becomes especially relevant when we consider political system that are not inherently averse to regulatory risk and for which we cannot expect them to reach agreement on the basis of α_e.

With the possibility of pre–electoral agreements, the relevant question is, therefore, whether parties find it beneficial to agree on institutionalizing a politically independent agency with some weight α_a. In order to answer this question, I extend the political game Γ^d by a stage where political parties have the possibility to agree on a politically independent agency with some fixed weight α_a. In particular, I consider the following extended political game $\Gamma^i(\alpha_a)$:

$t = 0$: Parties may agree on institutionalizing an agency with a weight α^a on profits.

$t = 1$: Nature determines the election winner $p \in \{l, r\}$.

$t = 2$: Without agreement in $t = 0$, the election winner chooses the agency's weight α_a.

$t = 3$: The agency contracts with the firm about the regulatory schedule.

Our task is to characterize, for a given political system $(\pi, \alpha_l, \alpha_r)$, the set of weights α_a for which agreement in $t = 0$ is a subgame perfect equilibrium outcome of the game $\Gamma^i(\alpha_a)$. Such agreement is reached exactly when each party benefits from institutionalizing a politically independent agency with weight α_a rather than go for the risky default option in stage $t = 2$ to use a politically dependent agency that regulates the firm on the basis of the election winner's weight α_p.

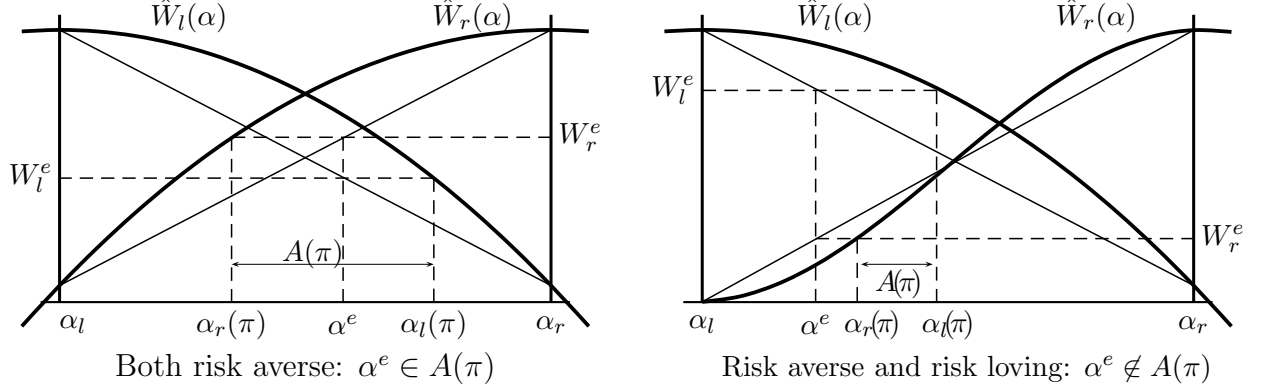Hence, a party p benefits from agreeing on a politically independent agency with weight

Figure 2: Mutual beneficial unconditional pre–electoral agreements $A(\pi)$

α_a in $t = 0$ if it yields party p at least the same payoff as its expected status quo payoff W_p^e:

$$W_p^e = \pi \hat{W}_p(\alpha_l) + (1 - \pi)\hat{W}_p(\alpha_r) \le \hat{W}_p(\alpha_a). \tag{10}$$

Hence, let $\alpha_p(\pi) \in [\alpha_l, \alpha_r]$ satisfy the relation

$$\hat{W}_p(\alpha_p(\pi)) = W_p^e.$$

Because $\hat{W}_p$ is monotone on the interval $[\alpha_l, \alpha_r]$ and W_p^e lies in between $\hat{W}_p(\alpha_l)$ and $\hat{W}_p(\alpha_r)$, the value $\alpha_p(\pi)$ exists and is unique. Moreover, party l strictly prefers a politically in-dependent agency with a weight $\alpha_a < \alpha_l(\pi)$ to the risky default option, because $\hat{W}_l$ is decreasing on $[\alpha_l, \alpha_r]$. Similarly, party r strictly prefers a politically independent agency with a weight $\alpha_a > \alpha_r(\pi)$ to the risky default option. Hence, if $\alpha_r(\pi) < \alpha_l(\pi)$ then for any $\alpha \in (\alpha_r(\pi), \alpha_l(\pi))$ both parties prefer it to the regulatory risk outcome. This reasoning leads to the following result.

Proposition 5 *In a political system $(\pi, \alpha_l, \alpha_r)$, there exist mutually beneficial agreements on politically independent agencies if and only if $\alpha_r(\pi) < \alpha_l(\pi)$. In this case, any $\alpha^a \in A(\pi)$ represents such a politically independent agency where*

$$A(\pi) \equiv (\alpha_r(\pi), \alpha_l(\pi)).$$

17

The first graph in Figure 2 illustrates the construction of $A(\pi)$ 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, $\alpha_r(\pi) > \alpha_l(\pi)$ so that a non–empty set of beneficial regulatory variables exists. Yet, if $\alpha_r(\pi) > \alpha_l(\pi)$ then there does not exist a mutual beneficial α.

For a political system that is averse to regulatory risk, we have, as illustrated in the first graph of Figure 2, $\alpha_e \in A(\pi)$. Hence, in such political systems the set $A(\pi)$ is non–empty and, generally, not a singleton. Proposition 5 shows moreover that the parties also benefit from agreeing on politically independent agencies that attaches a weight different from α_e to profits. A common dislike of regulatory risk is, therefore, a sufficient condition for the existence of beneficial pre–electoral agreements on politically independent agencies, but not a necessary one. The second graph of Figure 2 illustrates that such beneficial pre–electoral agreements may exist even when the politically independent agency that attaches weight α_e on profits is not mutually beneficial.

6   Partially Independent Agencies

The previous section restricted attention to pre–electoral agreements on politically independent agencies whose weight on profits is, by definition, independent of the election outcome. More generally however, political parties may, before the election, also try to reach agreement on regulatory agencies whose weight does, in some way or another, depend on the electoral outcome. This possibility becomes especially relevant if the set $A(\pi)$ is empty so that parties cannot reach a beneficial agreement on some politically independent agency. For this reason, I study the potential benefits of partially independent agencies (α_a^l, α_a^r) that regulate on the basis of the weight α_a^p exactly when party p wins the election.

In order to investigate the political potential of partially independent agencies, I study the following game $\Gamma^p(\alpha_a^l, \alpha_a^r)$:

$t = 0$: Parties may agree on a partially independent agency (α_a^l, α_a^r).
$t = 1$: Nature determines the election winner $p \in \{l, r\}$.

$t = 2$: Without agreement in $t = 0$, the election winner chooses the agency's weight α_a.

$t = 3$: The agency contracts with the firm about the regulatory contract.

Institutionalizing a partially independent agency implies that the political parties do not eliminate regulatory risk, because such agencies induce different output schedules for different election outcomes. I will say that a partially independent agency (α_a^l, α_a^r) *reduces regulatory risk* whenever $\alpha_l < \alpha_a^l \leq \alpha_a^r < \alpha_r$. The expected payoff of party $p \in \{l, r\}$ from a partially independent agency (α_a^l, α_a^r) is

$$W_p^b(\alpha_a^l, \alpha_a^r) \equiv \pi \hat{W}_p(\alpha_a^l) + (1 - \pi)\hat{W}_p(\alpha_a^r).$$

It follows that the set of beneficial partially independent agencies, A^c, that are mutually beneficial and reduce regulatory risk is

$$A^c \equiv \{(\alpha_a^l, \alpha_a^r) \mid \alpha_l < \alpha_a^l \leq \alpha_a^r < \alpha_r \wedge W_l^b(\alpha_a^l, \alpha_a^r) > W_l^e \wedge W_r^b(\alpha_a^l, \alpha_a^r) > W_r^e\}.$$

With this definition I demonstrate the following result.

Proposition 6 *For any political system, there exist partially independent agencies (α_a^l, α_a^r) that are mutually beneficial and reduce regulatory risk. More precisely, $A^c \neq \emptyset$ and any $(\alpha_a^l, \alpha_a^r) \in A^c$ represents a partially independent agency that is mutually beneficial and 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 (α_l, α_r) for the range $\alpha_a^l, \alpha_a^r \in [\alpha_l, \alpha_r]$. From the marginal rate of substitution,

$$MRS_p(\alpha_a^l, \alpha_a^r) = -\frac{\pi \hat{W}_p'(\alpha_a^l)}{(1 - \pi)\hat{W}_p'(\alpha_a^r)} = -\frac{\pi(\alpha_p - \alpha_a^l)\hat{x}_h'(\alpha_a^l)}{(1 - \pi)(\alpha_p - \alpha_a^r)\hat{x}_h'(\alpha_a^r)}, \tag{11}$$

it follows that both indifference curves are falling for this range and have the slope $-\pi/(1-\pi)$ at $\alpha_a^l = \alpha_a^r$, 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 $\alpha_r(\pi) < \alpha_l(\pi)$. As a result and illustrated by the two–sided arrows, any agreement on the 45–degree line with $\alpha_a \in (\alpha_r(\pi), \alpha_l(\pi))$ is a mutually beneficial agreement that eliminates
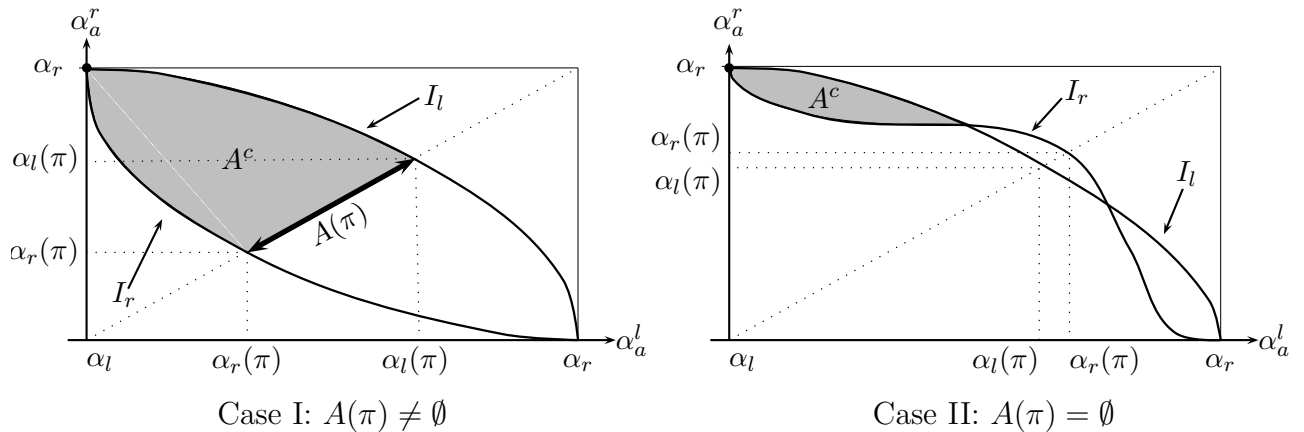
Figure 3: Mutually beneficial, conditional pre–electoral agreements A^c

regulatory risk completely. Hence, in the first graph of Figure 3, the set $A(\pi)$ is non–empty. The second graph illustrates the case where mutually beneficial independent agencies do not exist. It shows that on the 45-degree line there are no allocations (α_a, α_a) that both parties prefer to the risky allocation (α_l, α_r). As depicted, $\alpha_l(\pi)$ exceeds $\alpha_r(\pi)$ implying that $A(\pi)$ is empty. In contrast, the shaded area illustrates that partially independent agencies exist from which both parties benefit. These agreements all lie off the 45–degree line and therefore still imply regulatory risk. Because these allocations lie closer to the 45–degree line, the implied degree of regulatory risk is less than under the original allocation (α_l, α_r).

To see that the shaded area and, therefore, a non–empty set A^c always exists, the slope of the two indifference curves in (α_l, α_r) are crucial. From the marginal rate of substitution (11), it follows that the indifference curves of party l have a zero slope whenever $\alpha_a^l = \alpha_l$, whereas the indifference curves of party r has an infinite, negative slope for $\alpha_a^l = \alpha_r$. Hence, at (α_l, α_r) the indifference curve I_r is always steeper than the indifference curve I_l. This implies that the shaded area A^c always exists and is never empty.

7   Endogenous Election Probabilities

Investigating political uncertainty as the driver behind regulatory risk, the previous sections treated this uncertainty as an exogenous factor. Exogenous uncertainty illustrates the

extreme case where the main issues that interest voters are not primarily related to the regulation problem. In this section, I study the other extreme, where voters are only interested in the regulation outcome. This approach endogenizes the election outcome and, moreover, enables us to analyze the effect that political bargaining affects the winning probabilities of the competing political parties. The previous analysis abstracted from this effect. The main point of this section is to show however that the obtained results are robust to this additional effect.

Following Martimort (2001), I use a median voter model as a micro foundation for uncertain elections.[10] In particular, consider voters whose preferences differ only in one dimension: the weight α attached to profits. The voters' preferences concerning α are distributed according to the cumulative distribution function $F(\alpha|s)$, where s describes the state of the world. When posting their platforms, the political parties do not know the state of the world and are therefore ignorant of the exact distribution of voters. To model this uncertainty explicitly, let $G(s)$ describe the cumulative probability distribution of the state of the world s.

The timing of the political game with endogenous elections, Γ^e, is as follows:

$t = 1$: Each party commits to a platform α^p non–cooperatively.
$t = 2$: Nature determines the distribution of voters $G(\alpha)$.
$t = 3$: Voters determine the winning party by majority vote.
$t = 4$: The winning party p institutionalizes an agency with platform α^p.
$t = 5$: The agency contracts with the firm about the regulatory contract.

In this one–dimensional voting model, the median voter theorem holds so that the median voter determines the election outcome. The median voter rationally votes for the platform closest to his own preferences. When the platforms are the same, he randomizes with probability 1/2. Because the political parties do not know the exact distribution of voters, they

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[10]As an alternative micro foundation for random election outcomes, we can consider an electoral setup with costly voting. E.g., Palfrey and Rosenthal (1983) show that, with intermediate voting costs, the political economy model exhibits a mixed equilibrium, where each individual randomizes concerning his decision whether to vote. Because the analytical tractability of the mixed equilibrium is low, we take an alternative approach because the mixing probability depends on the size of each voting group, the cost of voting.

also do not know the exact preferences of the median voter α^m. Indeed, given platforms (α^l, α^r) the probability that party l wins is

$$\pi = \pi(\alpha^l, \alpha^r) \equiv \Pr\{|\alpha^m - \alpha^l| < |\alpha^m - \alpha^r|\}.$$

Consequently, the expected payoff of party $p \in \{l, h\}$ is

$$W_p(\alpha^p) = \pi(\alpha^l, \alpha^r)\hat{W}_p(\alpha^l) + (1 - \pi(\alpha^l, \alpha^r))\hat{W}_p(\alpha^r). \tag{12}$$

Given these payoff functions, the political parties simultaneously choose their platforms at stage $t = 1$. The pair $(\hat{\alpha}^l, \hat{\alpha}^r)$ forms a Nash equilibrium if $\hat{\alpha}^l$ is a best reply to $\hat{\alpha}^r$ and vice versa.

Further insights obtain when we write $G^m(\alpha^m)$ as the probability that the median voter's preferences do not exceed α^m. This cumulative probability distribution follows logically from the primitives $G(s)$ and $F(\alpha|s)$. Given the parties' platforms (α^l, α^r), the probability that party l wins is

$$\pi(\alpha^l, \alpha^r) = \begin{cases} \Pr\{\alpha^m < (\alpha^l + \alpha^r)/2\} = G^m((\alpha^l + \alpha^r)/2), & \text{if } \alpha^l < \alpha^r \\ 1/2, & \text{if } \alpha^l = \alpha^m \\ \Pr\{\alpha^m > (\alpha^l + \alpha^r)/2\} = 1 - G^m((\alpha^l + \alpha^r)/2), & \text{if } \alpha^l > \alpha^r. \end{cases}$$

For convenience, I assume that the density g^m of G^m is continuous and its support is $[0, 1]$ so that $\pi(\alpha^l, \alpha^r) \in (0, 1)$ for all $\alpha^l, \alpha^r \in (0, 1)$. We may then derive the following result.

Lemma 3 *Any Nash equilibrium $(\hat{\alpha}^l, \hat{\alpha}^r)$ exhibits $\alpha_l < \hat{\alpha}^l < \hat{\alpha}^r < \alpha_r$.*

The lemma shows that, due to the uncertainty about the preferences of the median voter, the parties do not offer identical platforms. Hence, also the framework with political competition induces regulatory risk. The competition, however, reduces regulatory risk to some degree, because $|\hat{\alpha}^l - \hat{\alpha}^h| < |\alpha_l - \alpha_h|$. More specifically, it leads to regulation on the basis of $\hat{\alpha}^l$ with probability $\pi = F((\hat{\alpha}^l + \hat{\alpha}^r)/2)$ and $\hat{\alpha}^r$ with probability $1 - F((\hat{\alpha}^l + \hat{\alpha}^r)/2)$.

From (12) it follows that the first order conditions

$$g^m((\hat{\alpha}^l + \hat{\alpha}^r)/2)[\hat{W}_l(\hat{\alpha}^l) - \hat{W}_l(\hat{\alpha}^r)]/2 = -G^m((\hat{\alpha}^l + \hat{\alpha}^r)/2)\hat{W}_l'(\hat{\alpha}^l)$$

and

$$g^m((\hat{\alpha}^l + \hat{\alpha}^r)/2)[\hat{W}_r(\hat{\alpha}^r) - \hat{W}_r(\hat{\alpha}^l)]/2 = (1 - G^m((\hat{\alpha}^l + \hat{\alpha}^r)/2))\hat{W}_r'(\hat{\alpha}^r),$$

characterize the Nash equilibrium $(\hat{\alpha}^l, \hat{\alpha}^r)$.

Because regulatory risk persists in the presence of political competition, the question whether the political parties have an incentive to reduce it through political bargaining remains relevant also with political competition. To address this question, I follow the approach of the previous sections and extend the political game Γ^e by a stage $t = 0$, where parties can agree on installing some (partially) independent regulator with objectives (α_a^l, α_a^r). The question is what kind of pairs (α_a^l, α_a^r) with $\alpha^l < \alpha_a^l \leq \alpha_a^r < \alpha^r$ the parties find mutually beneficial, i.e., which yield either party more than its payoff in the original game Γ^e.

A first observation is that with respect to politically independent regulatory agencies all previous results remain valid. To see this, suppose political agreement about a politically independent regulatory agency α_a changes the party l's winning probability from $\pi(\alpha^l, \alpha^r)$ to some π'. In this case, party p is better off from agreeing to α_a than entering the political game Γ^e exactly when

$$\pi(\alpha^l, \alpha^r)\hat{W}_p(\alpha^l) + (1 - \pi(\alpha^l, \alpha^r))\hat{W}_p(\alpha^r) \leq \pi'\hat{W}_p(\alpha_a) + (1 - \pi')\hat{W}_p(\alpha_a) = \hat{W}_p(\alpha_a).$$

For $\alpha_a = \pi\alpha^l + (1 - \pi)\alpha^r$ this inequality is identical to (7) and for a general α_a this consideration is identical to (10). It follows that all the results concerning politically independent regulatory agencies extend to political competition. The reason is that, although endogenous election outcomes generate the additional effect that winning probabilities are no longer constant, this effect is irrelevant because with politically independent regulatory agencies the parties are actually indifferent about who wins the election.

I next investigate in how far the results concerning partially independent regulatory agencies are robust to considering endogenous election outcomes. Here the main result was that, independent of the political system, there always exist partially independent regulatory agencies that reduces regulatory risk and are beneficial for both parties.

As argued in the previous section, mutually beneficial partial independent agencies exist, when, for the status quo (α^l, α^r), the (absolute) marginal rate of substitution of party l is

smaller than the (absolute) marginal rate of substitution of party r. Or, equivalently, when the ratio between $|MRS_l(\alpha^l, \alpha^r)|$ and $|MRS_r(\alpha^l, \alpha^r)|$ is smaller than one. Using (11) it follows

$$\frac{|MRS_l(\alpha^l, \alpha^r)|}{|MRS_r(\alpha^l, \alpha^r)|} = \frac{(\alpha^l - \alpha_l)(\alpha_r - \alpha^r)}{(\alpha^r - \alpha_l)(\alpha_r - \alpha^l)}.$$

For the Nash equilibrium $(\hat{\alpha}^l, \hat{\alpha}^r)$ this ratio is indeed smaller than one, because, by Lemma 3, $\hat{\alpha}^l < \hat{\alpha}^r$ so that $\hat{\alpha}^l - \alpha_l < \hat{\alpha}^r - \alpha_l$ and $\alpha_r - \hat{\alpha}^r < \alpha_r - \hat{\alpha}^l$. Hence, if one evaluates the indifference curves of the two parties that run through the point associated with the Nash equilibrium $(\hat{\alpha}^l, \hat{\alpha}^r)$, then the slope of the indifference curve of party r is steeper than the indifference curve of party l at $(\hat{\alpha}^l, \hat{\alpha}^r)$. This implies that, similarly to illustrated in Figure 3, there alwawys exists a non–empty set of (α_a^l, α_a^r) with $\hat{\alpha}^l < \alpha_a^l < \alpha_a^r < \hat{\alpha}^r$ from which both parties benefit. For this reason also this result extends to political competition.

8 Concluding remarks

The analysis shows that political parties have an inherent interest in reducing regulatory risk. Consequently, the incentives of the political system are in line with the concerns of practitioners as mentioned in the motivating paragraph of the introduction. This means, in particular, that political parties have no interest in exacerbating regulatory risk artificially. Yet, while a partial reduction of regulatory risk is always attainable, a full elimination of regulatory risk is only attainable when political divergence is small, when the electoral uncertainty is appropriately skewed, or when the underlying asymmetric information between firm and regulators is small. In the remainder of this section, I discuss possible extensions and implications of these results.

Commitment issues

Following the literature on delegation as initiated by Rogoff (1985), I implicitly assume that political parties can commit not to replace politically independent agencies after the election. Faure-Grimaud and Martimort (2003) point out that this assumption is potentially problematic, because after the election the winning party has an incentive to implement a regulatory schedule that is based on its preferred policy variable. Hence, even though parties benefit from agreements *before* the election, a party has no longer an incentive to abide by it *after* it has won. The political system, therefore, faces a commitment problem

that potentially undermines a credible implementation of mutual beneficial agreements. In this respect, the literature on delegation simply assumes that governments can circumvent such commitment problems through delegation. Even though the ad hoc assumption of "commitment–by–delegation" has intuitive appeal, a clear weakness is that it has no proper micro foundation.

Due to explicit institutional mechanisms, commitment problems in the delegation of regulatory powers are however less severe than at first sight. This is best illustrated by recalling the discussion about regulatory holidays in the introduction. As mentioned, the European Court of Justice repelled the German regulatory holiday exactly because the challenged German law limited the independence of the national regulatory agency. The quotation in the introduction of the advocate general Poiares Maduroin underscores this perspective. Commission (2009) clarifies: "As the guardian of the EC Treaty, the Commission has the option of commencing infringement proceedings, under Article 226 of the EC Treaty, against a Member State, which in the eyes of the Commission infringes Community law, in this case the Directives that make up the telecoms regulatory framework. The Commission can try to bring the infringement to an end, and, if necessary, may refer the case to the Court of Justice". Hence, in the European case an explicit, well established supranational framework exists that can be, and in the example of Germany's regulatory holiday has been, used to safeguard the political independence of regulatory agencies. Similarly, in the US, local states may appeal to the federal government to institutionalize and safeguard the independence of regulatory agencies against local state politics.

If the overall institutional framework is too weak to circumvent commitment problems directly, then, as formalized by the literature on repeated games, dynamic interactions provide an alternative way to circumvent these problems. In the context of political economy, de Figueiredo Jr (2002) provides a fully fledged, formal analysis of the conditions under which such repeated interactions circumvent commitment problems. His framework is especially well suited to study commitment through repeated interactions in my context. It studies a model in which the parties' payoff functions are, *by assumption*, single peaked and concave with respect to a one–dimensional policy variable. Hence, my framework provides a micro foundation for this ad hoc assumption, but also cautions that, for rather natural settings, the concavity assumption may not always be satisfied. In this case, the results of

de Figueiredo Jr (2002) must be adapted.

Political Bargaining

The formal analysis characterizes the set of strictly mutual beneficial agreements and shows that these sets are generally non–empty. Under efficient bargaining political parties will reach a beneficial agreement and agree to institutionalize some (partially) independent regulatory agency. As shown, the set of mutually beneficial agreements is generally not a singleton. This raises the question on which of these agreements the political parties will agree. This question is non–trivial, because within the set of mutually beneficial agreements, the two political parties have diverging preferences. For instance, within the set $A(\pi)$, party l prefers values close to $\alpha_r(\pi)$ whereas party r prefers values close to $\alpha_l(\pi)$. It then depends on the relative bargaining strengths and the specific bargaining procedure which kind of politically independent agency $\alpha_a \in A(\pi)$ the parties will institutionalize. In contrast, the parties' preferences are more aligned with respect to the set A^c. In particular, when the set $A(\pi)$ is not empty, then political parties always mutually prefer some politically independent agency to an agency that has only partial independence. This suggest that if $A(\alpha)$ is non–empty, then, independent of bargaining strengths, political bargaining will lead to fully rather than partially politically independent agencies.

When bargaining is inefficient, political parties will only reach an agreement when the benefits from the agreement outweigh the bargaining costs. Especially when empirically testing the theoretical implications of the model, it is important to point out that bargaining costs limits the applicability of some of our results. For instance, Proposition 4 shows that when the political divergence $\Delta\alpha$ is small, then the political system is averse to regulatory risk. In this case, the set of mutual beneficial agreements $A(\pi)$ is non–empty. However, when there is little political divergence, the gains from these mutual beneficial agreements is also small so that reaching these agreements may not outweigh the bargaining costs when they are substantial.[11]

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 α_{lr}^* that maximizes the common surplus

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[11]I am gratefully for a referee for pointing out this problem.

$\hat{W}_{lr}(\alpha) \equiv \hat{W}_l(\alpha) + \hat{W}_h(\alpha)$. It is straightforward to see that the common surplus function is equivalent to twice the surplus function $\hat{W}_p(\alpha)$ that obtains from an individual party p with the weight $\alpha_p = (\alpha_l + \alpha_r)/2$. It is then immediate that $\alpha_{lr}^* = (\alpha_l + \alpha_r)/2$. The possibility of side payments, therefore, strengthens our positive result that political parties have an incentive to eliminate the regulatory risk, because it follows, by Lemma 1, that the common surplus function has a unique maximum. Because the assumption of efficient side payments seems inappropriate in a political economy context, the analysis concentrated on the case without transferable utility.

Empirical Implications

Boiled down, the paper's main result is that regulatory outcomes fluctuate relatively less than the underlying political outcomes and that this is especially so when the political system is averse to regulatory risk. In this respect, Proposition 4 is helpful deriving explicit testable hypotheses, because it indicates when political systems are likely to be averse to regulatory risk. Note however that for direct empirical testing one needs first to establish an appropriate measure of *relative* fluctuations between political and regulatory outcome instead of an absolute one. For instance, the first result of Proposition 4 states that political systems tend to be risk averse when the political divergence is smaller and therefore suggests that fluctuations in regulatory outcomes are relatively low when political divergence is low. But clearly when political divergence is small, the absolute fluctuations in regulatory outcomes will be small. So the paper's results about "less" fluctuations should be understood in a relative sense. Given such a relative measure one may then relate it to existing measures of political polarization such as in Beck et al. (2001) or Henisz (2011).

A secondary, testable implication of the paper is its result about the independence of regulatory agencies. The survey OECD (2002) notes that independent regulatory agencies are currently "one of the most widespread institutions of modern regulatory governance", which is consistent with this paper's theoretical results. The literature however also notes that the *effective* independence of many regulatory agencies is often incomplete and limited. At the very least, governments can always exchange the agency's directors or change its budget. In the light of my results, such imperfect delegation can be seen as an optimal arrangement to circumvent regulatory risk. In particular, Gilardi (2004) develops empirical measures of the independence for different regulatory agencies in different countries. Consistent with my

theory, Gilardi (2005, p.141) and Gilardi (2005) report that regulatory agencies tend to be more independent in countries where there is frequent turnover between governments with different preferences. A more concrete test is to see whether the independence of regulatory agencies is positively related to the parameter conditions under which the political system is averse to regulatory risk as identified in Proposition 4. For instance, the first result of Proposition 4 leads to the testable hypothesis that the independence of regulatory agencies is higher when political divergence is smaller.[12]

Appendix

Proof of Lemma 1: It follows

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

From (5) it follows

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

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

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

Hence, $\partial \tilde{W}_p/\partial x_h(\hat{x}_h)$ and, therefore, $\hat{W}_p'$ is positive for $\alpha < \alpha_p$ and negative for $\alpha > \alpha_p$. This shows that $\hat{W}_p(\alpha)$ is increasing for $\alpha < \alpha_p$ and decreasing for $\alpha > \alpha_p$. Consequently, $\hat{W}_p$ attains a unique maximum at α_p. Because $\hat{W}_p$ is twice differentiable it holds $\hat{W}_p'(\alpha_p) = 0$ and $\hat{W}_p''(\alpha_p) < 0$. Q.E.D.

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

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[12]As mentioned, a possible complication for testing the results empirically, is inefficiencies in bargaining. For instance, when $\Delta \alpha$ is small, the gains from these mutual beneficial agreements is also small so that reaching these agreements may not outweigh possible bargaining costs, which destroys the monotone relationship between political divergence and the prevalence of independent agencies which one may to test empirically. I thank a referee for pointing out this problem.

We have

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

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

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

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

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

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

$$(\alpha_p - \alpha)\psi\Delta cv'''(\hat{x}_h(\alpha)) < [v''(\hat{x}_h(\alpha))]^2.$$

<div style="text-align: right">Q.E.D.</div>

Proof of Proposition 2: For the special case where demand is convex ($v''' > 0$) it follows, for any $\alpha \in (\alpha_l, \alpha_r)$, that $(\alpha_l - \alpha)\psi\Delta cv'''(x) < 0 < (v''(x))^2$. Hence, inequality (8) is satisfied so that $\hat{W}_l(\alpha)$ is concave and, therefore, $\tilde{W}_l^e$ is smaller than $\hat{W}_l((1-\pi)\alpha_r + \pi\alpha_l)$ for any $\pi \in (0,1)$.

For the special case where demand is concave ($v''' < 0$), it follows, for any $\alpha \in (\alpha_l, \alpha_r)$, that $(\alpha_r - \alpha)\psi\Delta cv'''(x) < 0 < (v''(x))^2$. Hence, inequality (8) is satisfied so that $\hat{W}_r(\alpha)$ is concave and, therefore, $\tilde{W}_r^e$ is smaller than $\hat{W}_r((1-\pi)\alpha_r + \pi\alpha_l)$ for any $\pi \in (0,1)$.

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

<div style="text-align: right">Q.E.D.</div>

Proof of Proposition 3: I first prove the second part of the Proposition. It follows

$$\begin{aligned}
W_r^e - \hat{W}_r(\alpha_e) &= (1-\pi)\hat{W}_r(\alpha_r) + \pi\hat{W}_r(\alpha_l) - \hat{W}_r(\alpha_e) \\
&= (1-\pi)\tilde{W}_r(\hat{x}_l, \hat{x}_h(\alpha_r)) + \pi\tilde{W}_r(\hat{x}_l, \hat{x}_h(\alpha_l)) - \tilde{W}_r(\hat{x}_l, \hat{x}_h(\alpha_e))
\end{aligned}$$

$$
\begin{aligned}
= \ & \left[(1-\pi)\tilde{W}_r(\hat{x}_l, \hat{x}_h(\alpha_r)) + \pi\tilde{W}_r(\hat{x}_l, \hat{x}_h(\alpha_l)) - \tilde{W}_r(\hat{x}_l, \hat{x}_h^e) \right] \\
& + \left[\tilde{W}_r(\hat{x}_l, \hat{x}_h^e) - \tilde{W}_r(\hat{x}_l, \hat{x}_h(\alpha_e)) \right] \\
= \ & (1-\nu)\left[(1-\pi)v(x_h(\alpha_r)) + \pi v(x_h(\alpha_l)) - v(x_h^e) \right] \\
& + \left[\tilde{W}_r(\hat{x}_l, \hat{x}_h^e) - \tilde{W}_r(\hat{x}_l, \hat{x}_h(\alpha_e)) \right].
\end{aligned}
$$

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

Similarly for party l, it follows

$$
\begin{aligned}
W_l^e - \hat{W}_l(\alpha_e) \ = \ & (1-\nu)\left[(1-\pi)v(x_h(\alpha_r)) + \pi v(x_h(\alpha_l)) - v(x_h^e) \right] \\
& + \left[\tilde{W}_l(\hat{x}_l, \hat{x}_h^e) - \tilde{W}_l(\hat{x}_l, \hat{x}_h(\alpha_e)) \right].
\end{aligned}
$$

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

Hence, if party l likes regulatory risk then, necessarily, $\hat{x}_h^e < \hat{x}_h(\alpha_e)$, but party r then dislikes regulatory risk. Similarly, if party r likes regulatory risk then $\hat{x}_h^e > \hat{x}_h(\alpha_e)$, 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 4: From (8) it follows that $\hat{W}_p(\alpha)$ is concave for the range $[\alpha_l, \alpha_r]$ whenever $|\alpha_p - \alpha|\psi\Delta c < [v''(\hat{x}_h(\alpha))]^2/|v'''(\hat{x}_h(\alpha))|$. Because for this range $|\alpha_p - \alpha| < \Delta\alpha$, (9) implies that a sufficient condition for the concavity over this range is $\Delta\alpha\psi\Delta c < \bar{v}$. Comparative static results i), iii) , iv) then follow directly from this condition.

In order to demonstrate ii), first suppose party l is a regulatory risk averse party. Because $W_r(\alpha_r) > W_r(\alpha_l)$, the expression $W_r^e(\pi)$ is strictly decreasing in π and, in particular, $W_r^{e\prime}(1) < 0$. Moreover,

$$
\left.\frac{d\hat{W}_r(\alpha_e(\pi))}{d\pi}\right|_{(1-\pi)=1} = \left.\frac{\partial\hat{W}_r(\alpha_e(\pi))}{\partial\alpha}\frac{\partial\alpha_e(\pi)}{\partial\pi}\right|_{(1-\pi)=1} = \hat{W}_r'(\alpha_r)\alpha_e'(1) = 0,
$$

because $\hat{W}'_r(\alpha_r) = 0$. Because $\hat{W}_r(\alpha_e(1)) = W^e_r(1)$, it then follows that $\hat{W}_r(\alpha_e(\pi)) > W^e_r(\pi)$ for $(1 - \pi) < 1$ but close enough to 1.

If party l is not a regulatory risk averse party, then, by Proposition 3, party r is regulatory risk averse. By a similar argument, one can then show that $d\hat{W}_l(\alpha_e(0))/d\pi = 0$. Because $W^e_l(\pi)$ is strictly increasing in $(1 - \pi)$, it then follows that $\hat{W}_l(\alpha_e(\pi)) > W^e_l(\pi)$ for $(1 - \pi) > 0$ but close enough to 0. $\hfill$ Q.E.D.

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

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

$$V_p(\varepsilon) \equiv W^b_p(\alpha^l_a(\varepsilon), \alpha^r_a(\varepsilon)) = (1 - \pi)\hat{W}_p(\alpha_r - \varepsilon) + \pi\hat{W}_p(\alpha_l + \varepsilon).$$

It follows

$$V'_r(0) = -(1 - \pi)\hat{W}'_r(\alpha_r) + \pi\hat{W}'_r(\alpha_l) = \pi\hat{W}'_r(\alpha_l) > 0,$$

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

$$V'_l(0) = -(1 - \pi)\hat{W}'_l(\alpha_r) + \pi\hat{W}'_l(\alpha_l) = -(1 - \pi)\hat{W}'_l(\alpha_r) > 0,$$

because $\hat{W}'_l(\alpha_l) = 0$ and $\hat{W}'_l(\alpha) < 0$ for $\alpha > \alpha_l$. Hence, for a small enough $\varepsilon > 0$, we have $W^b_p(\gamma(\varepsilon)) > W^e_p$ for both $p \in \{l, r\}$ and $\alpha_l < \alpha^l_a(\varepsilon) < \alpha^r_a(\varepsilon) < \alpha_r$ so that $(\alpha^l_a(\varepsilon), \alpha^r_a(\varepsilon)) \in A^c$ and, therefore, $A^c \neq \emptyset$. $\hfill$ Q.E.D.

Proof of Lemma 3: Suppose, by contradiction, that $\hat{\alpha}^l > \hat{\alpha}^r$ is a Nash equilibrium. It must then hold that $\hat{\alpha}^l > \alpha_l$ or $\hat{\alpha}^r < \alpha_r$. Suppose $\hat{\alpha}^l > \alpha_l$. In this case $\hat{W}_l(\hat{\alpha}^l) < \hat{W}_l(\hat{\alpha}^r)$ so that $W_l(\hat{\alpha}^r|\hat{\alpha}^r) > W_l(\hat{\alpha}^l|\hat{\alpha}^r)$. Hence, $\hat{\alpha}^l$ is not a best reply to $\hat{\alpha}^r$, because already $\alpha^l = \hat{\alpha}^r$ yields party l more. By a similar argument, $\hat{\alpha}^r$ does not maximize $W_r(\alpha^r|\hat{\alpha}^l)$ if $\hat{\alpha}^r < \alpha_r$.

Next, suppose, by contradiction, that $\hat{\alpha}^l = \hat{\alpha}^r$ is a Nash equilibrium. It must then hold that $\hat{\alpha}^l \neq \alpha_l$ or $\hat{\alpha}^r \neq \alpha_r$. The case $\hat{\alpha}^l \neq \alpha_l$ does not represent a Nash equilibrium because it

would then follow $W_l(\alpha_l|\alpha^r) = \pi(\alpha_l, \alpha^r)\hat{W}_l(\alpha_l) + (1 - \pi(\alpha_l, \alpha^r))\hat{W}_l(\hat{\alpha}^r) > \pi(\alpha_l, \alpha^r)\hat{W}_l(\hat{\alpha}^r) + (1 - \pi(\alpha_l, \alpha^r))\hat{W}_l(\hat{\alpha}^r) = \hat{W}_l(\hat{\alpha}^r) = W_l(\alpha^l|\alpha^r)$ so that α_l yields party l strictly more than $\hat{\alpha}^l = \hat{\alpha}^r$. Likewise, the case $\hat{\alpha}^l \neq \alpha_l$ does not represent a Nash equilibrium because α_r would yield party r strictly more that $\hat{\alpha}^r = \hat{\alpha}^l$.

Suppose, by contradiction, that $\hat{\alpha}^l < \hat{\alpha}^r \leq \alpha_l$ is a Nash equilibrium. In this case it follows $W_l(\hat{\alpha}^r|\hat{\alpha}^r) > W_l(\hat{\alpha}^l|\hat{\alpha}^r)$ so that $\hat{\alpha}^l < \alpha^r$ is not a best reply against $\hat{\alpha}^r \leq \alpha_l$. Likewise, $\hat{\alpha}^r > \hat{\alpha}^l \geq \alpha_r$ cannot be a Nash equilibrium.

For any Nash equilibrium it therefore holds $\alpha_l \leq \hat{\alpha}^l < \hat{\alpha}^r \leq \alpha_r$ so that the payoff functions of party l and r simplify to, respectively,

$$W_l(\alpha^l|\alpha^r) = G^m((\alpha^l + \alpha^r)/2)[\hat{W}_l(\alpha^l) - \hat{W}_l(\alpha^r)] + \hat{W}_l(\alpha^r) \tag{13}$$

and

$$W_r(\alpha^r|\alpha^l) = (1 - G^m((\alpha^l + \alpha^r)/2))[\hat{W}_r(\alpha^r) - \hat{W}_r(\alpha^l)] + \hat{W}_r(\alpha^l), \tag{14}$$

Finally, evaluating the derivative of the payoff function of party p with respect to α^p at $\alpha^p = \alpha_p$ reveals that a Nash equilibrium cannot exhibit $\alpha^p = \alpha_p$. Q.E.D.

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