Electoral Competition, Political Uncertainty, and Policy Insulation

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Why are government bureaus not necessarily organized to implement policy effectively? One view holds that a main culprit is political uncertainty. Elected officials know that they will not hold office forever, so they use "insulating" structures that constrain bureaucratic discretion, making bureaus less subject to sabotage but also less effective. I revise this theory by modeling how public officials choose administrative structures. I show that in systems with few veto points, groups will be most likely to act cooperatively on policy when political uncertainty is greatest. In contrast, in systems with many veto points, only electorally weak groups will insulate policies from future interference, therefore shifting focus from uncertainty *to* electoral strength. *Because the conditions that lead to policy insulation are rare, electoral competition should not be thought of as a primary cause of bureaucratic inefficiency.*

The frequently voiced complaint that government bureaucracies are both ineffective and inefficient has caused many political scientists to ask why bureaus are not necessarily organized to implement policy effectively. One view holds that in modern democracies, a main culprit is uncertainty resulting from electoral competition. According to this view, because elected officials know that they will not hold office forever, they look for ways to ensure that the policies they enact will survive their tenure. This aspect of democratic politics has led scholars to claim, first, that political uncertainty creates an opportunity and incentive for opposed groups to sabotage each others' policies; second, that this threat leads public officials to legislate organizational structures that "insulate" bureaus from future pressure from opposing groups; and, third, that this insulation makes public organizations relatively ineffective. This conventional account, however, raises several important questions concerning the relationship among electoral uncertainty, policy insulation, and bureaucratic inefficiency. How do the incentives to insulate agencies vary with the degree of political uncertainty? Do these effects vary across types of democratic institutions, such as presidential and parliamentary systems? Given the answers to the two previous questions, to what extent is electoral competition a primary cause of bureaucratic inefficiency?

I examine these questions by modeling how politicians and the groups they represent choose the structures by which policy will be implemented. The analysis makes three contributions to the literature on bureaucratic structure and performance. First, in systems where it is easy to overturn legislation—in other words, in systems with relatively few veto points, such as two-party parliamentary systems—groups are more likely to cooperate on policy when they are *most* uncertain about the likely outcome of elections. For electorally weak groups, cooperating on policy is very attractive; during all of the periods when these groups are out of power, they benefit from cooperation, which they will happily trade in exchange for occasionally giving up some possible benefits when they are in power. Electorally strong groups, however, have precisely the opposite incentives: They are not willing to make the same trade. Unless *all* groups have an incentive to cooperate, cooperation will fail.

As competition becomes more balanced, these incentives are muted. Here, *all* groups value benefits when they are out of power more, and this makes reciprocal threats of being excluded from policy compromises more effective. As competition increases and uncertainty is maximized, policy cooperation, not sabotage, is most likely.

A second result is that when insulation is durable, when multiple veto points make it hard to change administrative structure, only electorally weak groups will attempt to protect their policies. These groups are willing to bear the costs of insulating policies when they are in power, in exchange for some benefits when they are out of power. Electorally strong groups, however, will not have the same incentives. They know that even if their policies are removed when they leave office, they will be back in power and able to reestablish them. They will not be willing to pay the costs of insulating their policies to lock in benefits gained while in office. The model, therefore, predicts that insulation will be observed only under conditions of certainty. It further predicts that even in cases of certainty, groups' incentives to insulate bureaucracies will be asymmetric: Only weak groups will use an idiosyncratic opportunity to lock in programmatic benefits.

These results point to a third contribution, returning to the original question. To what extent can ineffectively designed agencies be ascribed to the effects of electoral competition? Contrary to the literature, the answer offered here is: probably very little. The reason is that in separation of powers systems, groups that are electorally weak are the ones that will choose inefficient structures to insulate their policies. But by definition, these groups rarely gain office. Consequently, little policymaking is likely to be affected by this dynamic. Groups that are more regularly in power, alternatively,

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do not have the same incentives to pay a cost to lock in benefits. Therefore, the incentives described in the theory should only rarely create occasions for insulation from future sabotage.

THE COSTLY INSULATION HYPOTHESIS

Recently, scholars (Horn 1995; McCubbins, Noll, and Weingast 1987, 1989; Moe 1989, 1990, 1991; Rothenberg 1994) have begun to develop a non-formal theory that relates electoral uncertainty, organizational constraints on bureaucracy, and bureaucratic efficiency. According to these scholars, political uncertainty induced by electoral competition means that "today's winners" know that, at some point, they will be out of power. Their loss of control will give opponents an opportunity to undo their policies (Moe 1990). The potential for such destructive behavior means that today's winners will try to protect their policies against the future actions of their opponents (Moe 1989).

Interest groups, working through elected representatives, can protect their favored policies from interference by creating an implementation apparatus—usually, but not exclusively, through organizational structure—that limits policy drift. Among these structural "insulation" mechanisms, politicians can write detailed legislation, emphasize professionalism, limit oversight and other forms of political involvement, assign policies to a "friendly" part of the government hierarchy, and enhance the role of the judiciary (McCubbins, Noll, and Weingast 1987, 1989; Moe 1989, 274–5). Each of these aspects of organizational structure allows politicians to bias agency policies so that, even after their political creators leave office, the agency will run on "autopilot," continuing on its original policy course (McCubbins, Noll, and Weingast 1987).

There is another potential problem, however, for today's winners. As Moe (1989, 1990) explains, the insulating mechanisms themselves could be overturned. How do officials overcome this problem? The answer is legislation. Because of the multiplicity of veto points in the legislative process under a separation of powers system, new laws are extremely difficult to pass, for a minority can block new legislation. This means that when a group can gain enough control to overcome barriers to legislating, it utilizes this "moment in the sun" to formalize not only its mandate but also the insulation of that mandate. This difficulty in passing legislation means that when it can be passed, it is likely to remain in place for a longer time.

This durability of legislated insulation mechanisms in a separation of powers system can be contrasted with legislative durability in a unicameral two-party parliamentary system. As Moe and Caldwell (1994) point out, in a parliamentary system, unitary control means that legislation is not difficult to pass. Therefore, using organizational structure as a means for cementing policies will not be effective in these systems. Insulation of the type found in the United States is not available in parliamentary systems.

The final insight from this literature is that the mechanisms by which a program or agency is insulated from future interference are not costless. By limiting an agency's flexibility and expertise, policy insulation increases the costs to implement policy and reduces an agency's effectiveness. As Moe (1990, 137) summarizes, "The driving force of political uncertainty, then, causes the winning group to favor structural designs it would never favor on technical grounds alone.... The group has to protect itself and its agency from the dangers of democracy, and it does so by imposing structures that appear strange and incongruous indeed when judged by almost any reasonable standards of what an effective organization ought to look like." Thus, bureaucracy is "inefficient by design" (Moe 1991).

Although this literature has significantly advanced our understanding of bureaucracy, inadequately examined claims and implications remain. For example, no systematic account has been provided of variation in electoral competition across time and space. Uncertainty has been greater in the postwar United States than in Japan, for example. Even within the United States, interest groups face differing likelihoods of gaining a "moment in the sun." Compare, for example, the more balanced interest-group competition between business and labor before World War II to that of the oft-cited example of business versus consumers. Scholars have alluded to the importance of this variation (Moe 1990), but the literature has suffered from unclear predictions about the conditions under which the incentives to lock in benefits will outweigh the costs incurred by doing so and from an overemphasis on cases in which "new" groups gain advantage. Similarly, the literature does provide a broad comparison of parliamentary and presidential systems, but it does not explicitly explain how these effects compare at different levels of political uncertainty. Finally, the claim that bureaucratic inefficiency can be accounted for by the dynamics of policy insulation is never supported by an explicit connection between the conditions for policy insulation and the likelihood of observing those conditions.

THE RECIPROCITY GAME

To address these shortcomings, I develop simple formal models of structural choice that capture the spirit of the non-formal theory of policy insulation just described. The intention is to follow the original theory as closely as possible, stating its assumptions formally to understand whether the stated results necessarily follow. To that end, the basic components of the formalization follow the central principles of that theory: that the primary actors are interest groups;[1] that structural choices are "inefficient," meaning that insulation reduces the value of the policy to the implementing group and, conversely, that there can be gains

[1] It is important to note that in an attempt to be true to the theory, and for analytical simplification, I reduce the game to one in which the players are represented to be *interest groups* vying for control over public authority. In fact, this is a close approximation to Moe's (1989, 281) own view of legislative struggles over the politics of structure.

from avoiding these costs; that play is dynamic, so that groups are long-lived and benefits, costs, and strategies are forward-looking; and that uncertainty is inherent to political outcomes. To capture these features, I begin by presenting a model that most closely resembles parliamentary systems: In such systems, legislation is relatively easy to pass for the current holders of public authority (Moe and Caldwell 1994). In this first model, policy stability can be achieved only through acquiescence by all groups. I subsequently present a model that more closely resembles a separation of powers system in which players can implement insulating structures.

The first game is an infinite repetition of a two-player interest-group game. Following Calvert (1989), I call this the *reciprocity game* (*RG*). In each period t, a nonstrategic player called Nature selects either A or B to move. The probability that A is selected in any stage is $\gamma \in (0, 1)$. A substantive interpretation for γ is the probability of A's supporters being elected, so $1 - \gamma$ is the probability of B's supporters being elected. Obviously, the degree of *political uncertainty* increases as γ approaches 0.5.[2] As γ moves toward either of its bounds, a particular group's reelection chances become more and more certain.

Definition 1. ***Political uncertainty*** *is decreasing in* $|\gamma - 0.5|$.

Each player has its "own" program. In each turn in which it is selected, the player implements its program with certainty.[3] Further, if the other player's program is in place, the moving player must decide whether it will remove the other player's program.[4] In these cases, the player has to choose from the action set $A_{it} = \{O; NO\}$, where I denote "overturn" O and "not overturn" NO. If a player chooses O, then the other player's program is not in effect in that stage.

In each stage, a player's payoffs depend on which programs are in place. If A's program is in place by itself, then the payoffs, expressed as $(u_{At}, u_{Bt}) = (A\text{'s payoff}, B\text{'s payoff})$, are $(1, 0)$. If B's program is in place by itself, the payoffs are symmetrically $(0, 1)$. If both players' programs are in place, then both players get a payoff, $\beta \in (0, 1)$ (i.e., the payoffs in the stage are (β, β)).[5] Therefore, if a player chooses NO when given the opportunity, it is accepting a loss of $1 - \beta$ in that iteration. Note that this construction of payoffs is extremely flexible. For example, if $\beta = 0.5$, then choosing NO means that a player splits the available benefits with the other player. Alternatively, if $\beta > 0.5$, then choosing NO is welfare-improving, for the total benefits are greater than one.

A player's payoff is the sum of these stage payoffs, discounted by a factor $\delta \in (0, 1)$ for each stage. Thus, the payoffs for each player can be calculated as

$$U_{it} = \sum_{t=0}^{\infty} \delta^t u_{it}, \qquad i = \{A, B\}.$$

A player's *strategy* describes what a player will do given all possible histories H_τ of the game to that point. Player i's strategy is a function s_i that in each stage maps all possible histories into a *choice* $\{O, NO\}$. In particular, a player's strategy in turn T depends on $N^T = (n_1, n_2, \ldots, n_T)$, which is a record of the random selections made by Nature in each turn t to that point, ${A_A}^T = (A_{A1}, A_{A2}, \ldots, A_{A(T-1)})$ and ${A_B}^T = (A_{B1}, A_{B2}, \ldots, A_{B(T-1)})$.[6] Further, I assume that in all stages there is *complete information.* In other words, players know the structure of the game, including the parameter values represented by the triple (δ, β, γ), the history of the game to that point h_τ, and the strategy being employed by the other player.

The solution concept I employ is subgame perfection. In other words, players will be playing optimal strategies at each point for every point forward. In infinitely repeated games, there invariably exist a multiplicity of equilibria. A number of "folk" theorems have demonstrated that, given sufficiently patient players, every feasible payoff set that is individually rational can be supported as a Nash equilibrium (Fudenberg and Tirole 1991). To analyze these types of games, one conventionally posits a set of equilibrium strategies for the players and then determines under what subsets of the parameters of the game such strategies can be supported as an equilibrium. To obtain these conditions, one must state the expected payoffs to playing a particular strategy and identify the conditions under which playing such a strategy is a best response given the other player's equilibrium strategy.

I am particularly interested in the conditions under which cooperation can be sustained as an equilibrium. Cooperative equilibria are defined as those in which, on the equilibrium path, both players choose NO in every stage. In general, in repeated games in which discounting is not too extreme, strategies exist that can result in sustained cooperation (Bendor and Mookherjee 1987). Following this solution concept, I consider the parameter space under which cooperative equilibria can be

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[2] Although the focus here is on the relationship between electoral probabilities and political uncertainty, one might also be able to interpret γ as the degree of "optimism" (or "pessimism"). Groups are increasingly optimistic as their probability of winning rises. Similarly, one might think of the group with the probability greater than 0.5 as being the optimistic group and, conversely, the group with the probability less than 0.5 as the pessimistic one.

[3] More generally, the payoffs can be interpreted as representing an opportunity for the players to act either in cooperation with the other player or not.

[4] This construction is implicitly two-dimensional because the programs are not exclusive. I consider later the implications of unidimensionality.

[5] The assumption of equal payoffs to both sides is important in establishing Proposition 2, which follows. I employ this assumption for two reasons. First, in some situations, such "splitting of the benefits" will obtain in practice. Second, even if one assumes that the payoffs are not the same for the winner and the loser, as long as there are benefits to cooperation, the results in Proposition 2 will remain substantively the same, as will be shown in the case of spatial utility functions. Further, although γ is assumed to be exogenous, under many types of endogeneity, such as incumbency advantages, the substantive results that follow will hold.

[6] For clarification, $n_t \in \{A, B\}$ and $A_{it} = \begin{cases} \emptyset & \textit{if} \quad i \neq n_t \\ \{O, NO\} & \textit{otherwise} \end{cases}$. So, let $h_t = n_t \times A_{At} \times A_{Bt}$ and $H_t = \{h_1, h_2, \ldots, h_{t-1}, n_t\}$; then for period t, $s_{it}{:}H_t, \rightarrow \{O, NO\}$.

sustained for a punishment strategy commonly referred to as *grim trigger*. Under grim trigger, each player will cooperate only as long as the other player has always cooperated.

Definition 2. *A player* i *plays a* **grim trigger strategy** *if in each stage, it plays NO if the other player has played NO in every turn previously. If the other player has ever played O, then* i *plays O for every turn thereafter, given the opportunity.*

I analyze equilibria under grim trigger for two reasons. First, grim trigger is a particularly suitable strategy to analyze for repeated games of complete and perfect information. The reason is that with perfect information, grim trigger is the most extreme form of punishment that is still subgame perfect (Bianco and Bates 1990). That it is subgame perfect with complete information is straightforward: The punishment strategies are, for the *RG*, simply Nash-reversion strategies, which means that they are subgame perfect off the equilibrium path (Morrow 1994, 266).[7] In this sense, grim trigger is a *test case*, a necessary condition, for cooperation to be a Nash equilibrium. If cooperation cannot be sustained under a grim trigger punishment strategy, it is unsustainable under any feasible strategy. Second, it is reasonable to assume that in practice, players will not play such extreme strategies. However, the results that follow in Propositions 1 and 2 hold for any finite period punishment phase. In other words, even if players punish deviators only for a few periods, the results will be qualitatively the same.[8]

Given this approach, it is possible to characterize cooperative equilibria in the *RG*.[9]

Proposition 1. *Given δ and γ, if β is sufficiently high, cooperation can be sustained.*

Proposition 1 demonstrates that under certain conditions, it is possible to sustain cooperation.[10] In interest-group competition, there are a number of reasons β might be sufficiently high. If groups value *policy continuity*, there will be a payoff to cooperation. Groups might value continuity for one of two reasons: First, they could be *risk averse*; second, policies could be more effective with lower *policy volatility*. Another reason β could be large is that much political bargaining takes place across more than one dimension. If the players care differently about the dimensions—for example, about pork in their home district versus pork in another district—then compromise positions will potentially yield benefits for all players.

That cooperation can be sustained is not very surprising. It has been shown in a number of different repeated games that as long as the penalties for cooperation are not too stiff (expressed here as a sufficiently high β), and the players value the future sufficiently (in other words, if δ is sufficiently high), cooperation can be sustained. Proposition 1, however, allows me to obtain *comparative statics* concerning the relationship between uncertainty and cooperation.

Proposition 2. *As γ approaches 0.5, cooperation can be sustained over a wider range of the parameters.*

Proposition 2, illustrated in Figure 1, contains a surprising result: As political uncertainty *increases*, reciprocity becomes *easier to sustain*.[11] This is interesting for three reasons. First, it is distinct from the many results concerning discount factors in infinitely repeated games. In particular, numerous folk theorems state that as the discount factor increases, as the players place a greater value on future opportunities, cooperation can be sustained over a wider range of the parameter values.[12] This is not the case with the parameter γ. As shown in Figure 1, the parameter values over which cooperation is an equilibrium are not monotonically increasing in γ. Instead, the cooperative space is parabolic, with a vertex at one-half. The source of this pattern is the complementary nature of the reelection parameter. Because *both* players must choose *NO* for a cooperative outcome to be achieved under grim trigger strategies, and an increase in one player's reelection

[7] Further, an analogue of the Fudenberg and Levine theorem applies in this case, since pulling the trigger is the minimax outcome (Fudenberg and Tirole 1991; 161).

[8] As mentioned, we use the solution concept of *subgame perfection*. Some game theorists argue that a more appropriate solution concept for repeated games of this nature is *renegotiation proofness*. The basic concern about subgame perfection is that even if players are playing optimal responses to other players' strategies, *following* a deviation, the punisher could have an incentive to go back to playing the original equilibrium; if players can confer about their strategies during play, it will be in the punisher's interest at least to try a renegotiation. In this game, however, it is possible to construct a set of strategies that are renegotiation proof: Players execute finite punishment periods in which the deviator participates in the punishment. Under these more complex strategies, Propositions 1 and 2 remain substantively the same.

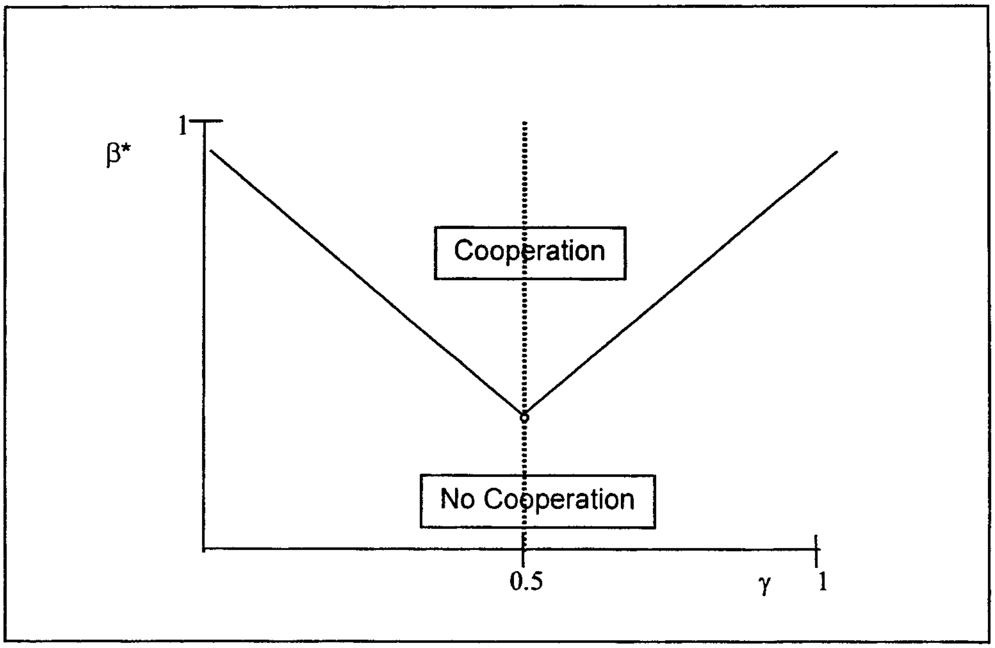
[9] Note that proofs of the propositions appear in the Appendix; proofs of all other results are available from the author upon request.

[10] Note that the cooperative space obtains for a pair (δ, γ) only if $\beta > \frac{1}{2}$. This means that for cooperation to be an equilibrium, the total payoffs under cooperation must be greater than the sum of the payoffs under noncooperation. Thus, there must be either two policies or, as I show later, some degree of risk aversion.

[11] It is interesting to compare these results to those of Calvert (1989). Propositions 1 and 2, with a few caveats, can be considered refinements of Calvert's model. He considers a case in which the probability of one group (say *A*) asking for a favor is extremely low, while the probability of the other group (say *B*) asking for a favor is very high (which would correspond to $\gamma \to 1$ or $\gamma \to 0$ in the *RG*). He finds that in this case, the ratio of *A*'s costs for giving a favor to its benefits for receiving one must be "tiny" for reciprocity to obtain. This result conforms with the intuition behind Propositions 1 and 2. The structure under which these results are obtained has an important difference from my results, however. Whereas in Calvert's model the probabilities of the two players' offering cooperative favors are *independent*, in the *RG* they are dependent (specifically, if one player has a probability γ of winning, then the other has $1 - \gamma$). It is this dependence between the probabilities of having an opportunity (in Calvert's terminology) that generates the parabolic nature of the cooperative parameter space in the *RG*. Further, Calvert's players move simultaneously, whereas control in the *RG* is exclusive to a single player in any stage *t*, which more closely conforms to a situation in which there is winner-take-all competition for public authority. These refinements are important later when insulation decisions are examined. (Calvert 1989, 270–3, 276–9). See also Alesina 1988, Besley and Coate 1998, and Coate and Morris 1999 for models of electoral competition and economic policy.

[12] See Fudenberg and Tirole 1991, T5.1, T5.2, T5.6, and Kreps 1992, Appendix A.

FIGURE 1. Illustrative Equilibria of the Reciprocity Game



chances implies a decrease in the other's, as γ moves toward its extreme values, an increased propensity to cooperate by one player is complemented by a decrease in the other player's likelihood of cooperating. Thus, as reelection probabilities jointly move toward the middle values, the parameter space for cooperation increases.

Second, this result is interesting because it runs counter to the claim made in the literature that uncertainty will create incentives to sabotage previous policies. According to Proposition 2, although increasing uncertainty about retaining political power gives opponents greater opportunities to undo what a currently prevailing group implements, it also gives players a greater payoff for cooperating. Thus, as long as the penalties for cooperation are not prohibitive, uncertainty provides incentives for constructive rather than reciprocally destructive behavior. More generally still, the intuition is powerful: In a democratic institutional structure, repeated play in itself is not sufficient to sustain cooperation. Instead, it is precisely the possibility of losing power that enables players to employ punishment strategies that can effectively engender cooperative outcomes.

Finally, as noted by Moe and Caldwell (1994), in parliamentary systems, legislation is easy to pass for those who hold public authority. This means that, in contrast to presidential systems, legislating insulated agency structures will not tie the hands of those that follow: The legislation that is designed to insulate can itself be overturned by future holders of public authority. This is precisely the situation described by the *RG*, in which the players do not have an option to insulate. In this sense, the *RG* makes an important prediction about cooperation between groups in a parliamentary system: When no dominant group exists, cooperation will be more prevalent. In other words, when there is electoral balance, cooperative, and perhaps even moderate, outcomes will be most likely to obtain.

Before considering the effects of insulation strategies, it is useful to consider the generality of these results. One issue is that in many cases (including many of those described in the literature) competition is on a single dimension—the history of labor, environment, and consumer protection policies, for example, all might be described in this way. This raises the question whether the results still hold where policy competition is so direct.

As long as the players exhibit sufficient aversion to risk, the results in Propositions 1 and 2 hold. Indeed, the degree of "cooperative benefit" represented by β could be interpreted in the traditional setting of negative quadratic spatial preferences in a unidimensional policy space. To see this, consider a case in which the players have normal quadratic-stage game payoffs in a policy space $x \in X \equiv \Re$, represented by the utility function $u_i = -(x - x_i)^2$, $i \in \{A, B\}$. Without loss of generality, the players' ideal points are $x_A = 0$ and $x_B > 0$. Now, when a player holds public authority, it must pick a policy.

In this model, there is a region in X over which each player will be willing to cooperate. Specifically, A will cooperate if B cooperates and if $x \in \{-x_B\sqrt{\delta(1-\gamma)}, x_B\sqrt{\delta(1-\gamma)}\}$. Similarly, B will cooperate if A cooperates and $x \in \{x_B(1-\sqrt{\delta\gamma}), x_B(1+\sqrt{\delta\gamma})\}$. Because cooperative equilibria require both sides to cooperate, these equilibria will exist only if these two regions intersect. In other words, they will exist if the highest policy A would accept in a cooperative equilibrium is higher than the lowest policy B would accept in a cooperative equilibrium. A closer examination of these bounds also reveals that their size increases as γ moves to 0.5. Thus, even if conflict is one-dimensional, Proposition 2 holds. In other words, the assumption of negative quadratic utility functions in a unidimensional policy space is simply a special case of the model presented above.

A second extension considers what happens when control over public authority can be divided. Here I extend the model to analyze a case in which there are k institutions. For simplicity, assume that a policy change requires control of the full set of institutions, or undivided control over public authority. I assume that the probability that a group controls any single institution is the same as before. To provide an intuition, I assume that the probabilities of holding authority over any one of the institutions are independent across k.[13]

With this modification, again the parameter space for which cooperative equilibria is the largest is when political uncertainty is maximal. The logic of this result is that the payoffs of cooperation for both A and B are the same as in the earlier formulation with a single institution. To calculate the payoffs off the equilibrium path, I must first calculate the probabilities of three possible states: undivided control for A, undivided control for B, and split control. These occur with probability γ^k, $(1-\gamma)^k$, and $1-\gamma^k-(1-\gamma)^k$, respectively. In a noncooperative equilibrium, the last policy emerging from undivided control is retained with a higher probability than in the previous formulation. For example, if A's policy is the status quo, then the likelihood that A will be the policy in the following period is the probability that A obtains undivided control or control is divided, or $1-(1-\gamma)^k$. However, if B's policy is the status quo, then the probability that A's program will be implemented is only the probability that A gains undivided control or γ^k, which is lower. In this sense, policy implementation under separation of powers exhibits "stickiness." Further, this stickiness advantages the stronger player: Whoever is more likely to control the institutions on average will have its program in place for an even longer time than in the game with only singular institutions. This means that the stronger player will have an even weaker incentive to comply with any cooperative equilibrium.

The attenuation of incentives has a number of implications. First, the minimum β for which cooperation can be sustained will be weakly higher, meaning that cooperation will be more difficult to obtain. Second, as before, these incentives are dulled when competition is relatively even. The intuition is similar to Proposition 2 above. When a player is extremely strong, it has little incentive to cooperate. With the addition of multiple veto points, this effect becomes magnified; with even smaller increases in the stronger player's electoral chances, the parameter space for cooperation shrinks. In the reverse case, however, as the players become more equal, the incremental effect decreases, making cooperation easier to sustain, as Proposition 2 states. Thus, despite the change in the level of gains from trade required to obtain cooperation, the comparative statics within the institutional structure, that cooperation is easiest to sustain when electoral chances are even, remain the same.

THE INSULATION GAME

The results just presented provide a general context for an analysis of uncertainty, but the extant theory explains that in systems with separated powers, overturn and sabotage are not the only recourse for groups. Through the use of organization structure, groups can waylay such sabotage attempts.

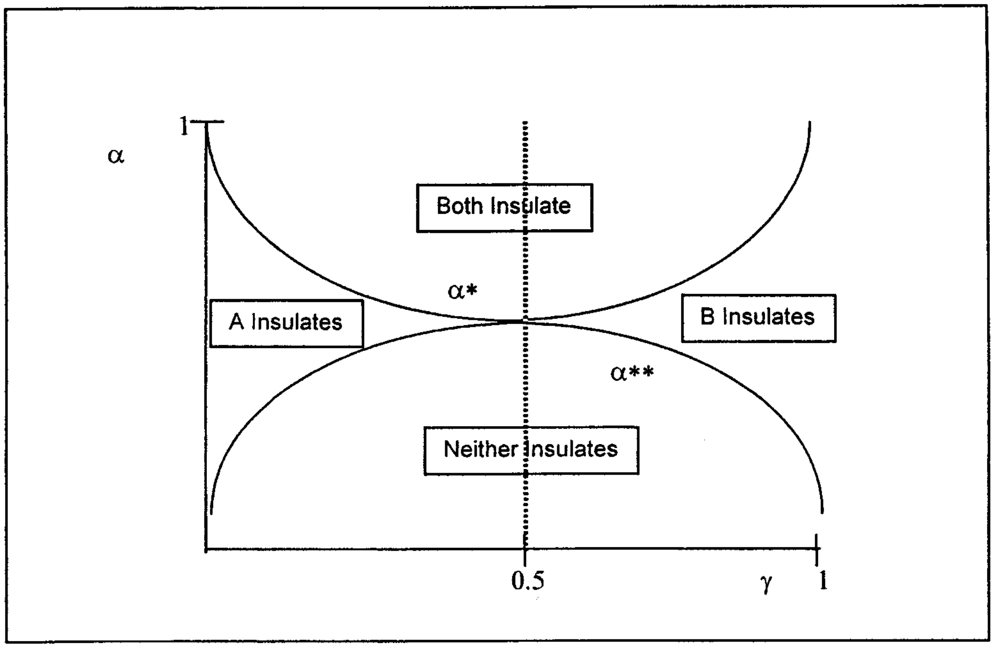
This description points to a further refinement to the RG. I therefore introduce the *insulation game* (IG), in which groups can insulate an agency from sabotage. The structure of the IG is similar to that of the RG. As with the RG, the game is between two players, A and B, and is repeated indefinitely. Again, players implement their proposals with certainty, and, if the other player's program is in place, the moving player has the option of either overturning (O) or not overturning (NO). The players must make an additional strategic choice: whether to insulate their agency or not. When implementing its program, a player must choose from the action set $\{I, NI\}$, in which I denotes insulate and NI denotes not insulate. To capture the notion that this opportunity is available only rarely, a player makes this decision only during the *first* period in which it is recognized.

In each stage, if a player plays NI, then its payoffs are identical to those in the RG. However, if a player chooses I, its payoffs are modified by a factor α that is strictly less than $1 (\alpha < 1)$. The benefit to the player of playing I is that, irrespective of the other players' play from $\{O; NO\}$, the insulating player's program remains in place forever. Thus, if the other player's program is in place, the insulating player receives $\alpha\beta$; otherwise, it receives α (which, by construction, is greater than $\alpha\beta$). In the process of formalization, then, I am able to define more precisely what policy "insulation" means. Specifically, insulation can be thought of in either of two equally valid ways. On the one hand, insulation is a mechanism whereby groups or officials can avoid punishment strategies. Because insulation locks in benefits, groups can act destructively without fear of retribution. On the other hand, insulation mechanisms are those that trade benefits when in power for benefits when out of power; groups can smooth their benefits. This construction allows me to interrogate the conditions under which an agency will be insulated and those under which it will not be. In particular, Propositions 3a, 3b, and 3c characterize equilibrium strategies and outcomes as the cost of insulation, parameterized by α, varies.[14]

[13] Since the probability of controlling all n institutions is a function of γ, the results from Proposition 2 will hold under an assumption of correlation in election results.

[14] For the IG, the strategy that we analyze is a modified version of *grim trigger*. The insulation choice is an element of the action set only at the player's first period of recognition. Regardless of the player's strategy at that node, its strategy is to play grim trigger with respect to the overturn–not overturn choice in every turn it is recognized.

FIGURE 2. Illustrative Equilibria of the Insulation Game



PROPOSITION 3a. *If α is sufficiently large, both players will play {(I, O)}.*

PROPOSITION 3b. *If α is not sufficiently large for both players to play {(I, O)}, then an equilibrium for the IG is either {(I, O); (NI, O)} or {(NI, O); (I, O)} if α is sufficiently large.*

PROPOSITION 3c. *If α is sufficiently small, then neither player will insulate.*

Propositions 3a through 3c show that when insulation is too costly, groups will leave policies unprotected. This is consistent with intuition but also provides a much better understanding of the behavior of competing groups. As the extant theory contends, the prospect of future competition forces groups to insulate and, therefore, can cripple agencies by design. However, the results from the *IG* indicate that this account is incomplete: Only if the cost is relatively minor will agencies be insulated. If the cost is moderate, then, depending on the reelection potential of the group, only one group will choose to insulate. And if the cost is prohibitive, neither agency will insulate and the players will play the reciprocity game.

Propositions 3a, 3b, and 3c allow me to return to the primary question about the relationship between political uncertainty and the decision to insulate. According to the literature, it is the fact of uncertainty that causes groups to insulate. As shown in Proposition 4, electoral uncertainty interacts with the cost of insulation to determine equilibrium behavior.

PROPOSITION 4. *Under the conditions given in Propositions 3a through 3c, as political uncertainty increases, the parameter space over which either both players insulate or neither player insulates increases, while the parameter space for which a single player insulates decreases.*

When combined with Propositions 3a through 3c, Proposition 4 conveys a richer understanding of insulating mechanisms as a structural choice.[15] Under fairly general conditions, we can characterize an equilibrium for the *IG*. As shown in Figure 2, the equilibrium will depend on a combination of both the costs of insulation and the probability of reelection. As the costs of insulation increase (as α decreases), only those with a very small chance of being elected will insulate. Thus, they ensure that they get some benefits on an ongoing basis, an incentive that outweights the cost incurred by overburdening an agency with procedures.

Proposition 4 provides two characterizations of the relationship between political uncertainty and insulation. First, it shows that as long as there is some political uncertainty, public organizations will be less effective than private ones. To see this, compare two cases: an organization operating like a private one, with no electoral uncertainty, and an organization in which uncertainty exists. In the former case, as Proposition 4 shows, insulation will never be employed. In the latter case, uncertainty can give groups an incentive to insulate. Second, as shown in Figure 2, Proposition 4 also allows us to consider how the incentives to insulate change as uncertainty changes. Interestingly, as political uncertainty decreases, one of the groups (that which is

[15] For the purposes of illustration, I describe an equilibrium, here and in Figure 2, that assumes that the triple (δ, β, γ) is such that $\alpha_A^{**} < \alpha_B^*$ when $\gamma < 0.5$, and $\alpha_B^{**} < \alpha_A^*$ when $\gamma > 0.5$.

most commonly out of power) will be willing to bear greater costs, as represented by α, to preserve benefits. As political uncertainty increases, however, we have a mixed result. For some levels of costs, both groups will insulate. For others, neither will insulate. Thus, while political uncertainty might lead to insulation, it might have the exact opposite effect, eliminating any chance of it.[16]

More importantly, Proposition 4 indicates that to explain variation among agencies, focusing on uncertainty is inappropriate. Instead, insulation is most likely in situations where there are electoral asymmetries. Moreover, I can make a more precise statement: Groups that are *electorally weak* will be the most likely to insulate.

This prediction has an important implication. When group power is unbalanced, the policies of the weaker group will be less effectively implemented than those of the dominant group. Because only the weaker group will insulate its policies, only its policies will bear the costs of inefficiency that go with such insulation. In this sense, the relative value and competence of the weaker group will be *self-confirming*: When it gets its moment in the sun, it is not able to implement their policies as effectively as the stronger groups.

The *IG* also illuminates another aspect of agency performance: the degree to which political uncertainty will lead to inefficient agencies. According to Moe, along with political compromise, uncertainty means that bureaucracies are "designed to be inefficient." Propositions 3 and 4, however, clarify the claim that bureaucracy is "inefficient by design." First, they establish a *lower bound* on how inefficient agencies will be due to political uncertainty. If the costs of insulation in terms of program performance are high, groups will choose not to insulate their programs. Second, only groups that have very weak future electoral prospects will insulate. This means that when the usual winners erect agencies, they will not be hampered by such organizational designs. Assuming that the distribution of agency creation is spread evenly over time, *most* agencies will be uninsulated. Therefore, inefficiency cannot be widely attributed to electoral competition.

Once again, it is useful to consider the robustness of these results. One simplification made in the *IG* is the assumption that insulation mechanisms survive for the life of the game. In practice, insulation is subject to repeal. This is reflected in the literature on bureaucratic insulation (Moe 1989, 1990), in which two states are implicitly assumed: divided versus unified control of public authority. When a group has control of all the veto points, it can pass legislation. This means that a group can implement administrative structures that insulate agencies. Undivided control also allows the group to repeal earlier legislation, including insulating mechanisms passed previously. When control is divided, groups cannot pass legislation. Instead, they can affect the direction of policy only when previous policies were not protected. An alternative, and perhaps more realistic, assumption for the *IG*, therefore, is that insulating mechanisms survive only as long as the opposing group does not gain undivided control of the institutional apparatus.

To explore this situation, I modify the *IG*. Assume that there are k institutions, or veto points, each with an independent probability γ of being controlled by group A. If a group insulates its program, it obtains a payoff α until the insulated program is repealed. If a group chooses not to insulate, then its payoffs are a function of the number of institutions j within its power in a given period. For simplicity, I assume that this function is linear in j, taking the form j/k. These assumptions capture two features implicit in the literature (Moe 1989, 1990): First, if a program is not insulated, it will "drift" in the direction of its current institutional overseers via nonstatutory means; second, legislation is hard to pass and is possible only in the rare moments when control is complete.

For this model, it is sufficient to analyze the incentives of a potential insulating group. As before, not surprisingly, as the costs of insulation decrease—as α gets larger—players have a stronger incentive to insulate. More importantly, even when it is assumed that insulating mechanisms can be overturned when new legislation is passed, the level of costs necessary to encourage insulation decreases in γ. In other words, it is still the case that as the probability of winning an electoral contest increases, the incentive to insulate declines, as in Proposition 4.

The intuition for this result can be seen by comparing the expected value for choosing to insulate or not. Formally, the expected payoff for player i from taking either action is

$$\sum_{t=0}^{\infty} \delta^t S(t) \sum_{l=1}^{k} \Pr(j = l) U_i(j = l), \qquad i = \{A, B\},$$

where *S(t)* is the probability that i's opponent does not have unified control up to period t or, alternatively, the probability that i's action "survives" to period t. Note that the two terms on the left side are unaffected by whether or not programs have been protected. The difference under the two choices is the expected value represented by the summation on the right-hand side. In the insulated case, this payoff is always α irrespective of how many veto points j the group controls. But if a group chooses not to insulate when given the opportunity, this payoff depends on how many veto points it holds, which in turn increases with the probability of winning any given veto point. Thus, players are still trading off costs when in power against benefits when out of power. A group that is pessimistic about its future prospects and leaves its program uninsulated will see the program captured by a more powerful group even if that group does not have an opportunity to overturn the legislation. Thus, weak or vulnerable groups will be willing to pay a large cost to secure a smaller ongoing stream of benefits. On the other hand, stronger groups will be more optimistic about their ability to control bureaucratic drift and therefore will be less willing to pay those costs of insulation.

[16] Note that these results broadly hold for zero-sum games as well.

TWO ILLUSTRATIVE EXAMPLES

A few stylized examples illustrate the mechanisms evaluated in the models. Moe (1989, 1990, 1991) and others (e.g., Horn 1995) provide evidence that groups with a tenuous hold on public authority, such as environmentalists and consumers, will try to saddle government agencies and the policy implementation apparatus with mechanisms that reduce the agency's ability to carry out its mandate but also protect it from future interference. Importantly, however, these cases are outliers, since the groups behind these policies were traditionally out of power and act based on a temporary hold on public authority. The models above, however, provide a more general understanding of the relationship between electoral competition and policy insulation. In what follows, therefore, I offer two examples that illustrate these results. Each case illustrates parts of the story that have been overlooked.

Trade Policy

The conclusion of the reciprocity game is that when political uncertainty is high, cooperation is easier to sustain, and when it is low, it is likely to be unsustainable, even when there are benefits for cooperation. The latter is precisely the case with tariff policy from the late nineteenth century until the 1930s.[17] In this period, the Republicans were in control most of the time, although their control was not complete. Of the 30 Congresses from 1871 to 1931, although some elections were close, the Republicans had undivided control of both houses 18 times, the Democrats had undivided control five times, and control was divided seven times (U.S. Department of Commerce, Bureau of the Census 1975, 1083). Because policies survived until there was undivided government, this division of political institutions meant that Republican policies were in place more than 80% of the time, while Democratic policies were in place less than 20% of the time.

The two parties' positions on tariffs were clearly articulated: The Republicans preferred protectionist policies; the Democrats wanted open domestic markets. In this case, with a low degree of political uncertainty, the two sides were unable to coordinate on a cooperative solution. Instead, each side, when in power, either reduced or increased tariffs. As Epstein and O'Halloran (1996, 303) describe, "... [T]ariffs changed regularly in roller-coaster fashion when a new party entered office. High tariffs were followed by low tariffs, which were succeeded by high tariffs. The tariff acts of 1883, 1890, 1894, 1897, 1912, 1922, and 1930 were passed close on the heels of federal elections, with each peak in the tariff rate associated with Republican control and each trough with Democratic control."[18] To understand U.S. tariff policy, Epstein and O'Halloran consider it necessary to take account of partisanship. As they conclude, "... [W]hen strong parties take divergent positions on an issue, changes in the preferences of the median voter that result in a new party taking office will lead to changes in policy outcomes above and beyond those explained by changes in the median voter alone. ... [C]oalitions will aggregate interests in different ways, implying that policy will be biased towards the coalitional base of the party in power" (Epstein and O'Halloran 1996, 302).

While demonstrating that partisan regime change is an important determinant of changes in tariff policy, Epstein and O'Halloran's argument is incomplete in ignoring what enabled this behavior. The results of the reciprocity game suggest that the low degree of uncertainty during this period interacted with partisan shifts to produce changes in tariff policy. It is possible to use the results in Propositions 1 and 2 to posit a counterfactual: If political uncertainty had been high, partisan changes would not have led to significant shifts in tariff policy.

The tariff case also illustrates the results from the insulation game. As mentioned, in the late nineteenth century and early twentieth century, the dominant Republican party would undo any reductions in tariffs made during infrequent periods of Democratic supremacy. When they again were in a position to legislate tariff policy in the 1930s, they faced a familiar problem: How would they make the changes more durable? They found an answer in the Reciprocal Trade Agreements Act (RTAA) of 1934. As Bailey, Goldstein, and Weingast argue, the RTAA ceded control over tariff policy from Congress to the President. Given that presidents were more liberal on trade than legislators, the Democrats would ensure that tariffs would be lower than under the usual Republican Congresses. "... [B]y giving the President agenda-setting power, tariff cuts would be more extensive and durable even if congress were to be taken back by protectionist forces," they explain. "Even Republican Presidents, with their national constituencies, would be more liberal on trade than Republicans in Congress and could use their institutional power to constrain the protectionist impulses of Republicans in Congress" (Bailey, Goldstein, and Weingast 1997, 310).

Two features of this example are important, then, to illustrate the results from the *IG*. First, as predicted, an electorally weak party, the Democrats, was willing to bear the costs of insulating its agenda in return for a steadier stream of expected benefits. Perhaps more importantly, the dominant Republicans did not insulate

[17] One important question is whether this was a zero-sum policy. Although tariff policy represents a single-dimensional policy choice, as I argue above, even in a single dimension, if there is sufficient risk aversion, there will be the possibility of gains from cooperation. In the case of trade policy, these gains almost certainly exist. Take, for example, the case of protected industries. If they adjust the capacity to a constantly changing tariff level, they will either incur significant fixed costs, which will be underutilized, or the benefit of the tariff will be unrealized, as the capacity will be below the optimal level. In this case, even though the tariff involves massive transfers, importers, exporters, and even consumers will place some value on policy stability at the expense of (part of) the distributive benefits and costs to the tariff. Further, even if this were a case in which the gains from cooperation are slight—in other words, the policy is close to zero-sum—the model would predict the same dynamics both when insulation was not yet a possibility and once insulation became possible.

[18] See also Bailey, Goldstein, and Weingast 1997, 5–6. Their Table 1 provides strong evidence of this pattern.

their changes. They were more content to sabotage the Democratic programs when given the opportunity and to continue to implement their programs during their frequent times in power.

Broadcast Radio Regulation

The origins of radio regulation in the United States also present a set of political conditions different from the cases examined in the literature, for radio regulation was demanded by a dominant, largely unopposed coalition. In this case, an administrative structure was erected that was less constrained but also subject to interference.

The two major pieces of legislation that created a formal administrative apparatus for radio regulation were the 1927 Radio Act, which created the Federal Radio Commission (FRC), and the 1934 Communications Act, which created the Federal Communications Commission (FCC). Prior to 1927, federal policy toward radio frequency regulation was governed by a series of legislative acts—the 1887 Interstate Commerce Act, 1910 Mann–Elkins Amendments to the Interstate Commerce Act, 1910 Wireless Ship Act, and 1912 Radio Act—that were designed for management of commercial shipping frequencies and not broadcasting.

With the emergence of broadcast radio, the courts began to rule against the applicability of previous legislation to management of the broadcast frequencies. In a series of court and executive decisions, it became increasingly clear that extant statutes would not be sufficient to manage the new technology (Emery 1971; McMahon 1979; Wollenberg 1989) This gap in the regulatory framework created a strong alignment of interests in the mid-1920s behind the creation of an agency to manage radio frequencies. The relatively unopposed coalition was led by existing or aspiring broadcasters, who saw regulation as a boon in two senses: On the one hand, it was sorely needed to eliminate negative externalities from congestion and lack of coordination; on the other hand, it promised to provide stations with a way to maintain a strong position in growing and potentially competitive markets.

Broadcasters who were demanding regulation had little to fear from opponents in either the short or the long term. In the short term, the growing disorganization of the industry, with no coordination, meant that all segments of interests were clamoring for the government to step in and more actively organize the use of the airwaves: Nascent broadcasters, listeners, religious groups, content providers, and commercial radio operators had a common and intense interest in overcoming congestion, interference, and the lack of coordination. Even in the future, consumer interests were unlikely to play much of a role, as they were largely unorganized. Alternatively, the broadcast industry was very quickly organizing, with the National Association of Broadcasters emerging as an important force driving the development of legislation in the four National Radio Conferences in the 1920s and 1930s.

The lack of opposition, a situation that was likely to hold for the foreseeable future, was reflected in the focus on efficiency rather than insulation. Almost all parties supported removing any jurisdiction from the Interstate Commerce Commission (ICC), which was perceived as being more interested in other domains and lacking sufficient focus. Given that a separate regulatory agency was to be created, the question was how to structure its powers. This classic structural choice, however, was resolved in a way much different than the later debates over the organization of the Environmental Protection Agency (EPA) or Consumer Product Safety Commission (CPSC). In this case, the agency was, in almost every area, given leeway, discretion, and a wide range of authority.

Rather than giving the FRC a highly specific statute to implement, in the 1927 Act "Congress turned essentially all radio regulation over to the new agency, whose discretion was limited mainly by a new requirement that its actions serve the public interest" (Wollenberg 1989, 65; see also Emery 1971, 45–49). Indeed, specific procedures that were considered but summarily discarded highlight the nature of this debate. An example of such an issue is how the commission's decision-making authority over licenses would be structured. One possibility was to house decisions over license appeals in the full body of the agency, which would have lessened the impact any single commissioner might have had on the implementation of policy. Instead, Congress arranged that each commissioner would have full authority over licensing decisions in five regional zones (U.S. Congress 1927, sec. 29). This enhanced the speed and efficiency with which licenses were granted, but it also made these decisions more susceptible to future appointments by potential rivals. This broad mandate meant that the period from 1927 to 1934 featured a sea change in the implementation of radio policy, primarily by a largely unfettered FRC (Wollenberg 1989, 68).

Seven years after the creation of the FRC, Congress passed the 1934 Communications Act. The Act was prompted by the desire to integrate regulation of all communications into a single agency. The 1927 Act had divided control over communications policy between the FRC, which regulated radio, and the ICC, which retained control over common carriage. The 1934 Act eliminated the FRC but transferred control over radio to the newly created FCC.

The broad discretion granted to the FRC in 1927 might have been altered in 1934, with the passage of the Communications Act; however, the procedural constraints on radio regulation remained muted, becoming more stringent only in some limited sense (Krasnow 1982). Title III of the 1934 Act, which governed the licensing of broadcast radio operators, added several provisions to the previous statute, but all were innocuous (Wollenberg 1989).

If anything, the 1934 Act maintained the bureaucracy's discretion while expanding its reach. Under the same discretion as before; the FCC was to have the authority to suspend or revoke the license of any operator (U.S. Congress 1934, sec. 303(m)). Similarly, section 302 of the Act included additional rule-making powers for the FCC to govern chain broadcasting, again with no constraint on the agency's interpretation or implementation except that it be in the public interest. More generally, the issue of the extent of judicial review was also debated as a potential constraint on the agency. During hearings about the Act, several radio broadcasters who had had their licenses revoked objected to the limited extent of review and appeal granted in the 1927 Act (Cass 1989, 86–87; U.S. Congress, Senate Hearings 1934, 56–57). Ultimately, review powers were very limited, as Congress decided to limit the courts and leave discretion to the agency. Further, the Act provided strong discretionary powers for enforcement, allowing for fines and penalties, in addition to revocation of licenses. The use of these powers was left largely to the FCC's discretion. In the end, the main limitation on the FCC was, as with the 1927 Act, a stricture to regulate in the "public interest." This broad standard meant that the agency was granted considerable discretion to manage licenses and promulgate regulations.

The history of early regulation of radio broadcasting shows what happens when enacting groups enjoy more than a "moment in the sun." In both the 1927 Radio Act and the 1934 Communications Act, regulation was initiated not by such a constellation of interests, but by groups that did not fear loss of power in the future. The result was legislation that culminated with an agency enabled to act on its own. As Cass (1989, 90) notes, "The Commission's capacity to shape policy in a manner that responds to changing circumstances and shifting interests is further advanced by the broadly worded authority delegated to the Commission in Titles II and III and by the limited scope of judicial review available."[19] Relaxed procedural and jurisdictional control was made possible precisely by the absence of any fear that the agency would be captured in the future by opposing interests.

DISCUSSION

Structural choices are crucial to both interest groups and legislators. These choices, are made in a process of *strategic interactions* between players set in an institutional context. The existing literature on treatments of these choices is at once instructive and incomplete: Political uncertainty, under certain conditions, can lead to bureaucratic inefficiency, but this occurs only to a point. In many cases, political uncertainty actually discourages inefficient insulation of public policy.

The analysis and examples provided here help, therefore, to clarify unexplored aspects of this literature. In thinking about policy insulation, electoral strength, and not uncertainty, should be seen as the determinative factor. Those with the most to gain by giving up benefits now in exchange for benefits in the future—either through policy cooperation, when insulation is not available, or through costly structural means, when it is—are precisely the groups that will have the least capacity to do so. Accordingly, the claim that bureaucracy is "inefficient by design" must be tempered. For costly insulation to take place, groups must have both the motive and the means. The analysis shows that in most cases, when players have the means—when they are elected frequently—they do not have the incentive to use it, and when they have the motive, they do not have the opportunity to act on their incentives.

More generally, the models illustrate one role of electoral volatility. Frequent turnover among elected officials, depending on the policy in question, can lead to greater cooperation. The critical mechanism that leads to such cooperation is the employment of punishment strategies. Players whose electoral fates are uncertain are more willing to take conciliatory postures toward their opponents when they believe that they will soon have to cede authority to opposing groups. Although I focus on a particular context for reciprocity—the structural choices by interest groups—the implications of my analysis extend beyond this application to general theories of democratic representation and policy implementation. Both models suggest a potentially important avenue of research: the nature and manifestations of reciprocity emerging from democratic institutions.

Finally, an important question in the literature on political institutions concerns the sources of policy stability. Though not comprehensive, the theory developed here posits three processes that can generate stability, albeit in much different ways. First, when policy insulation is not a viable alternative, either because it is not durable, as in parliamentary systems, or because it is extremely costly, stability can occur through cooperation when groups' power is evenly divided. Second, when insulation is not available and the groups are not cooperating, it is likely that one group is dominant. In this case, policies will still be stable, although not as stable as with reciprocity, because one group will be able to impose its policies consistently. Finally, when insulation is available to players, groups that are historically dominant in the electoral arena will not insulate their policies. But since they are in power often, they will be able to maintain the continuity of their policies. Groups that are disadvantaged electorally will insulate their policies, in those occasional political moments when they do rise to control the public apparatus. So although they are infrequently in power, their policies will be stable as well, albeit less effectively implemented.

APPENDIX: PROOFS OF RESULTS

Proof of Proposition 1. In this case, one must only analyze a subgame in which the other player has moved. For A, its choice at any point is whether or not to play O, given B's strategy. Given that the choice at the first stage is identical to that at later stages, one must consider only the first opportunity to overturn. Since B is playing grim trigger, if A plays O, then its expected payoff is

[19] Robinson (1989, 18) provides a similar assessment, "What is remarkable about the communications field is the degree of freedom permitted the agency not merely to adapt its powers to deal with new contingencies, but indeed to expand its jurisdictional reach to concerns wholly different from those that animated the regulation in the first instance."

$$EU_A(A_A = O) = 1 + \frac{\delta\gamma}{1-\delta} = \frac{1-\delta+\delta\gamma}{1-\delta}. \quad \textbf{(1)}$$

Note that I suppress the subscript t and the conditioning on s_B. If A plays NO, however, for all t, its expected payoff is

$$EU_A(A_A = NO) = \frac{\beta}{1-\delta}. \quad \textbf{(2)}$$

Thus, A will cooperate if and only if (2) is greater than (1). Thus, A cooperates if and only if

$$\beta > 1 - \delta + \delta\gamma = \beta_A^* \quad \textbf{(3a)}$$

By symmetry and substituting $1-\gamma$ for γ_1, B will cooperate if and only if

$$\beta > 1 - \delta\gamma = \beta_B^*. \quad \textbf{(3b)}$$

Since cooperation is sustained only if both players do not have an incentive to play O, and both (3a) and (3b) are lower bounds, I therefore can define a condition such that cooperation can be sustained: $\beta > \max(\beta_A^*, \beta_B^*) = \beta^*$. The proposition follows from the fact that β^* is a function of δ and γ. ■

Proof of Proposition 2. Solving for the maximum condition given in Proposition 1, I obtain the following:

$$\beta^* = \begin{cases} 1-\delta+\delta\gamma & \text{if} \quad \gamma > \frac{1}{2}, \\ 1-\delta\gamma & \text{if} \quad \gamma < \frac{1}{2}. \end{cases}$$

The proposition follows from the fact that β^* is a decreasing function of γ if $\gamma < 0.5$ and increasing if $\gamma > 0.5$.[20] ■

Proof of Proposition 3a. To solve for the equilibrium conditions, we again employ the concepts of subgame perfection. Although the insulation choice is a one-shot play, the overturn–not overturn decision is infinitely repeated. We are evaluating the equilibrium under grim trigger strategies, so each player must choose from the action set $A'_{it} = \{(I, O); (I, NO); (NI, O); (NI, NO)\}$.[21] To find the conditions under which a particular set of strategies is an equilibrium, we evaluate the four potential strategy combinations, having fixed the equilibrium strategy of the other player.

To find the conditions under which both players insulate, we evaluate $\{(I, O); (I, O)\}$. Initially, we evaluate when (I, O) is a best response for A given that B is playing (I, O). Note first that if B plays (I, O), (I, O) weakly dominates (I, NO) and strictly dominates (NI, NO) for A. Thus we must compare the expected payoffs for A from (I, O) and (NI, O). If A plays (I, O), its expected payoff is given by

$$\begin{aligned} EU_A(A'_{At} &= \{(I, O)\} \mid A'_{Bt} = \{(I, O)\}) \\ &= \frac{\alpha\gamma(1-\beta)}{1-\delta\gamma} + \frac{\alpha\beta}{1-\delta} - \frac{\alpha\beta(1-\gamma)}{1-\delta+\delta\gamma}. \end{aligned} \quad \textbf{(4)}$$

Similarly, if A plays (NI, O), its expected payoff is

$$\begin{aligned} EU_A(A'_{At} &= \{(NI, O)\} \mid A'_{Bt} = \{(I, O)\}) \\ &= \frac{\gamma(1-\beta)}{1-\delta\gamma} + \frac{\beta\gamma}{1-\delta}. \end{aligned} \quad \textbf{(5)}$$

Solving for the conditions under which (4) is greater than (5) yields

$$\alpha > \frac{(1-\delta+\delta\gamma)(1-\delta+\beta\delta(1-\gamma))}{1-\delta((2-\delta)(1-\beta(1-\gamma))-\gamma(1-\delta)} = \alpha_A^*. \quad \textbf{(6)}$$

Thus, if (6) holds, then A's best response to B's playing (I, O) is (I, O). From the symmetry of the game form and payoffs, we can derive the condition under which B's best response to A's playing (I, O) is (I, O) by substituting $(1-\gamma)$ for γ in (6). We call this cut point α_B^*. Since α must be greater than both α_A^* and α_B^*, we have the result: $\{(I, O); (I, O)\}$ is an equilibrium, $\Leftarrow \alpha > \max(\alpha_A^*, \alpha_B^*) = \alpha^*$, which is the proposition. ■

Proof of Proposition 3b. Consider first that $\alpha < \alpha_B^*$. Then from the proof of Proposition 3a above, we have that, given that A plays (I, O), B's best response is $(NI, \odot)$, so B will not insulate even if A does. We must then compare the expected payoff for A from playing (I, O) versus (NI, O) given that B plays $(NI, \odot)$.

If A plays (I, O), its expected payoff is given by

$$\begin{aligned} EU_A(A'_{At} &= \{(I, O)\} \mid A'_{Bt} = \{(NI, O)\}) \\ &= \frac{\alpha(\gamma - \delta\gamma(1-\gamma) + \delta\gamma\beta(1-\gamma))}{(1-\delta)(1-\delta+\delta\gamma)}. \end{aligned} \quad \textbf{(7)}$$

Similarly, if A plays (NI, O), its expected payoff is

$$EU_A(A'_{At} = \{(I, O)\} \mid A'_{Bt} = \{(NI, O)\}) = \frac{\gamma}{1-\delta}. \quad \textbf{(8)}$$

Solving for the conditions under which (7) is greater than (8) yields

$$\alpha > \frac{1-\delta+\delta\gamma}{1-\delta+\delta\gamma+\delta\beta(1-\gamma)} = \alpha_A^{**}. \quad \textbf{(9)}$$

Thus, if $\alpha < \alpha_B^*$ and (9) holds, then A will insulate, while B will not. By substituting $(1-\gamma)$ for γ, we can derive a similar result in which B will insulate and A will not if $\alpha < \alpha_A^*$.

$$\alpha > \frac{1-\delta\gamma}{1-\delta\gamma+\delta\beta\gamma} = \alpha_B^{**}. \quad \textbf{(10)}$$

Equations (9) and (10) constitute the proposition. ■

Proof of Proposition 3c. This follows directly from conditions (9) and (10) above. If $\alpha < \alpha_A^{**}$, then playing NI is the best response for A if B plays NI. Similarly, if $\alpha < \alpha_B^{**}$, then NI is a best response for B given that A plays NI. Thus if $\alpha < \min(\alpha_A^{**}, \alpha_B^{**})$, then both players playing NI will be an equilibrium. Further, from Proposition 1, we have a condition under which, given that players are playing $\{(NI, \odot), (NI, \odot)\}$, they will overturn if and only if $\beta < \beta^*$. Thus, depending on the value of β, the players that are not insulating will play either O or NO. ■

Proof of Proposition 4. To see this consider the conditions given in Propositions 3a through 3c. First note that from Proposition 3a, we have both players insulating if and only if

$$\alpha > \alpha^* = \begin{cases} \alpha_B^* & \text{if} \quad \gamma < \frac{1}{2}, \\ \alpha_A^* & \text{if} \quad \gamma > \frac{1}{2}. \end{cases} \quad \textbf{(11)}$$

Taking the first derivative of (11), we obtain the following result:

$$\frac{\partial\alpha^*}{\partial\gamma} \begin{cases} < 0 & \text{if} \quad \gamma < \frac{1}{2}, \\ > 0 & \text{if} \quad \gamma > \frac{1}{2}. \end{cases} \quad \textbf{(12)}$$

[20] Since β_A^* and β_B^* are linear in γ, this means that $\beta^*(\delta, \gamma)$ is not differentiable in γ. I ignore this problem by assuming that $\gamma \neq \frac{1}{2}$.

[21] Implicitly, we are evaluating equilibria in which if a player does not want to overturn in the first turn, it will not do so afterward.

From Proposition 3c, we analyze the behavior of cut points α_A^{**} and α_B^{**}. From (9), we analyze α_A^{**} for γ less than 0.5:

$$\frac{\partial \alpha_A^{**}}{\partial \gamma} = \frac{\delta\beta}{(1-\delta+\delta\gamma+\delta\beta(1-\gamma))^2} > 0. \qquad \textbf{(13)}$$

Similarly, if γ is greater than 0.5, we examine α_B^{**}:

$$\frac{\partial \alpha_B^{**}}{\partial \gamma} = \frac{-\delta\beta}{(1-\delta\gamma+\delta\beta\gamma)^2} < 0. \qquad \textbf{(14)}$$

Equations (12), (13), and (14), constitute the proposition. ■

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