Policy Decay and Political Competition *

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November 22, 2025

Abstract

Modern political systems exist not in a vacuum but in a world of continuous technological, social, and economic change. This change means policies designed for today's world will fit only imperfectly tomorrow, a phenomenon we refer to as *policy decay*. In principle, policymakers could legislate to remove decay and restore the status quo. In practice, however, the need for "something to be done" creates opportunities for the majority party to leverage their proposal power and for the minority party to obstruct to gain an electoral advantage. We consider a classic agenda-setter model and show how the combination of decay and political competition alters the underlying logic of policymaking. Policy changes frequently in this setting, even when moderate, contra to the notion of legislative gridlock. Yet legislation to remove decay is not always struck, leaving all policymakers worse off. Moreover, the agreements that are struck are often to the benefit of the minority party, reversing the classic logic of agenda setting power.

*The authors thank Peter Buisseret for helpful discussant comments; seminar audiences at Emory, Kellogg Strategy, Harvard, LSE, USC, UNSW, MPSA, APSA, CSLPE, Princeton,

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1 Introduction

Change is a constant of our economic and social environment. As time passes, populations grow, age, and evolve. Social networks form and fray. New technologies are developed, and economies evolve in structure and scope.

Policymaking is not immune from this reality. As the world changes, so too do the consequences of government policy. A policy written for today will not fit as well tomorrow, and as the fit of policy worsens, so too does the quality of outcomes it produces. Copyright laws written in the 20th century, for example, are ill-suited to govern the use of copyrighted material to train large language models; antitrust laws designed to limit the growth of 19th century trusts have been ineffectual in reining in modern tech giants. We refer to this process as *policy decay*. Policy decay is akin to entropy in physical systems. It is inevitable and inexorable, and, left unchecked, generates growing inefficiency.

Nevertheless, policy decay on its own need not pose a threat. By passing new legislation, policymakers can counter the effects of decay and restore efficiency in policy implementation.[1] That they can do this does not mean that they will do it. Decay occurs in a strategic environment, and the very fact that new legislation must be passed presents policymakers with an opportunity to exploit decay for their own advantage.

This opportunity is most evident when decay is large. By imposing pain on policymakers, decay creates a threat-point that an agenda setter can *leverage* for her own benefit. This incentive was famously captured by Rahm Emanuel, then White House chief of staff, when he quipped: "You never let a serious crisis go to waste. And what I mean by that [is] it's an opportunity to do things you think you could not do before."[2] By threatening to leave decay in place — by not updating legislation — the agenda setter can extract policy concessions that, as Emanuel acknowledges, wouldn't otherwise be possible.

The opportunity created by decay is, however, not one-sided. Decay imposes pain on voters as well as policymakers, and if voters respond to this pain — as it is well-documented that they do (e.g., Erikson et al., 2002) — by punishing the majority party for not doing something about it, then an opposition can benefit by obstructing efforts to remove decay.

The dual incentives of leverage and obstruction work in opposing directions, and the interaction between them give rise to a rich dynamic and a set of subtle strategic choices. How should the agenda setter leverage decay? When should the opposition obstruct? What

[1]Our notion of efficiency is the best-known, rather than best-possible, implementation of a given policy, and thus can accommodate the possibility that policymakers may not have complete knowledge of the mapping between choices and outcomes.

[2]Interview with the *Wall Street Journal*, November 19, 2008. `https://www.youtube.com/watch?v=_mzcbXi1Tkk`

do these choices imply for political behavior and policy outcomes?

The answers to these questions are not straightforward. Allowing decay to accumulate would increase the agenda setter's leverage, but at the same time it would make obstruction more attractive to the opposition. How these incentives balance is important to understanding legislative policymaking in an evolving world.

In this paper, we develop a novel model of policymaking to find answers to these questions, and we explore what it means for policy outcomes, political transitions, and the life and death of governments.

A Modeling Approach

To capture these ideas formally, we build upon the canonical "setter" model of Romer and Rosenthal (1978) in which a policymaker is endowed with agenda setting power and proposes a take-it-or-leave-it offer to a second policymaker. To this structure, we add two elements.

First, we follow Callander and Martin (2017) in allowing for the possibility of policy decay. Decay arrives exogenously and stochastically in each period. Decay can be large, small, or even zero, and regardless of size, decay lowers the quality of the policy that is in place. Unless actively removed by new legislation, decay remains in place and accumulates over time. Formally, this requires that we add an efficiency dimension to the traditional ideological dimension of policy in the setter model and that we extend the model dynamically over time.

Second, we incorporate the possibility for obstruction and political transitions. Although a common tactic in practice (Wawro and Schickler, 2007, 2010), electorally-oriented obstruction of the sort we describe does not appear in formal models of policymaking. We represent obstruction in the literal sense of rejecting or blocking a policy proposal, and reward the obstructor with improved electoral prospects. We prove our results for electoral transition rules that increase in the magnitude of decay: the obstructor wins power with a higher probability, the higher is decay. For clarity, we focus our presentation on the limit case in which the failure to remove decay leads with *certainty* to the transition of power. In this case, obstruction is maximally effective, and thus political power is maximally fragile.

A premise of our modeling approach is that voters punish the incumbent, and not the obstructor, when policy decay is not removed.[3] Such behavior is well-grounded in the large literature in political science which studies the attributions of responsibility made by voters. Voters punish incumbents for events outside their control (Healy and Malhotra, 2010) and attribute blame for policy changes to the wrong level of government (Sances, 2017). More-

[3]Developing this logic formally to provide a micro-foundation for the behavioral assumption in our model would be relatively straightforward, but this is not our focus here.

over, and more pertinently to our premise, there is a fairly substantial body of evidence that voters attribute blame for economic conditions to the incumbent government (e.g., Erikson et al., 2002; Healy and Lenz, 2014).[4] Politicians also seem to believe that there is an electoral benefit of denying policy "wins" to their political opponents,[5] a belief which is consistent with the electoral response to bargaining failures that we assume in our model.

Overview of Results

The combination of decay and obstruction has a stark effect on policymaking. As Callander and Martin (2017) show, decay on its own allows policy to change even when it lies within the classic gridlock interval. Without the possibility to obstruct, policy monotonically converges to and stabilizes at the agenda setter's ideal point, regardless of where it begins. We show that adding obstruction to decay leads to much richer policy dynamics. Policy can move to the left and the right, without necessarily being obstructed nor power transitioning between the policymakers. Moreover, policy never stabilizes, perpetually evolving in a fluid and dynamic way.

This dynamic runs contra to the classic logic of agenda setting power. A fundamental lesson of the setter model, and the large literature that has followed (including Callander and Martin (2017)), is that agenda setting power is positive. The agenda setter can shape policy in her favor, pulling it toward her own ideal point. We show that the opposite is often true in the presence of decay and obstruction. In fact, agenda setting power can be negative: the agenda setter uses her power to shift policy closer to her opponent's ideal point and further from her own. This result casts a new light on the day-to-day logic of political bargaining, implying that it may be the nominally weaker party that benefits from policy compromise.

Although negative proposal power is possible, on average the value of agenda setting power remains positive. Indeed, the rationale for negative proposal power depends on it. The agenda setter is willing to concede on policy today precisely so that she retains power and benefits from positive proposal power in expectation tomorrow.

Agenda setting power is positive when decay is large and negative when decay is small. This ranking is intuitive but far from obvious. On one hand, large decay is more costly to endure and the opposition is more willing to accept a bad policy to remove it. On the other hand, if large decay is not removed today, it provides an even greater opportunity tomorrow, thus increasing the value of obstruction. This creates a delicate trade-off that can be teased apart at the extremes of small and large decay but that is difficult to pin down for

[4] A fully attentive public with a clear understanding of how the legislature operates could avoid these pitfalls. But this is a difficult task to expect voters to perform; we take the position that voters generally lack either sufficient attention or understanding to do this well.

[5] See e.g. (Lee, 2013, p. 776) on the politics of debt ceiling fights in the US.

intermediate ranges.

The dynamic flow of policy in equilibrium is not symmetric, even with the same policymaker holding power. Decay is large only occasionally, and thus the agenda setter benefits only occasionally, but when she does, policy jumps toward her ideal point. More frequently she finds herself conceding on policy, albeit only incrementally. This creates an asymmetric dynamic of small steps away from the agenda setter's ideal policy and large jumps back. Nevertheless, over time, the distribution of policy outcomes is more favorable to the agenda-setter than to the opposition.

The flow of policy represents bargaining success. Each update to legislation removes decay and policymaking is efficient (statically if not dynamically). Policy does not always respond to decay, however. The opposition obstructs at some policies such that legislative bargaining breaks down. When it does, decay persists on the equilibrium path and power transitions to the opposition. Surprisingly, the opposition obstructs when it is strong on policy rather than weak. When it is weak, policy is far from its ideal and there is always a deal to move policy closer that it will accept. In contrast, when policy is near its ideal point and decay is small, the opposition prefers to live with decay and gain the power to propose. This represents a bargaining failure, as all policymakers would be better off were decay removed. This failure is novel in models of bargaining, a point we return to later in the paper.

Another way to understand this result is to turn it around. One may see the transition of power as interesting not because it occurs, but because it doesn't occur all of the time. In the limit case in which power is maximally fragile, all it takes for the opposition to assume power is to vote no on a single piece of legislation. Yet in equilibrium the opposition exercises that power only infrequently. Instead, it uses the threat of obstruction to extract policy concessions from the incumbent and avoids the inefficiency of decay. This power sharing arrangement operates tacitly through policy bargaining rather than explicitly through the ballot box, and only breaks down when the agenda setter has shared power too well and the opposition is strong on policy.

The model we develop is deliberately parsimonious, including only the minimal set of institutional features to capture legislative policymaking in the face of decay and obstruction. A benefit of this parsimony is that the model can be interpreted broadly. For concreteness, we will view the model through the lens of bargaining in a presidential system, such as the U.S. Congress, under divided government. The model can alternatively be interpreted as bargaining in a parliamentary system within the governing party or coalition. Seen through this lens, obstruction and the transfer of agenda setting power corresponds to a change of government.

Decay, Leverage, and Obstruction in Practice

To illustrate the forces at work in our model and how they might map to a real-world policy environment, we consider several recent examples. The first is immigration policy in the US. The surge in illegal immigration into the United States during the presidency of Joe Biden, particularly at the US-Mexico border, led to a widespread belief that government policy was no longer working and that a response was needed. The Bipartisan Border Security Bill (2023-2024) was to be that fix. The bill was supported by President Biden and negotiated with Senate Republicans. James Lankford, Republican of Oklahoma, was deputized by minority leader, Mitch McConnell, to lead negotiations for Republicans. Notably, the bill included significant concessions by President Biden that shifted policy in favor of long-held Republican goals: it would reduce the number of migrants who could claim asylum at the border, expand detention and new "border emergency shutdown authority," and provide more money for Customs and Border Protection officials, asylum officers, immigration judges and scanning technology at the border for rapid processing of asylum claims. Despite this, the bill was blocked by Republicans in the Senate in February 2024, and when it did come to a vote in May 2024, all but one Republican voted against it, causing the bill to fail.[6]

This example captures the key features of our model. Existing immigration policy began to produce worse outcomes given changes in the external environment, and a policy change was proposed that, seemingly, made both parties better off while conceding to the opposition. Yet the minority party—the Opposition in our model—voted against the updated legislation. As in our model, they blocked the legislation for electoral reasons. The initial Republican support crumbled when the presumptive Republican presidential nominee, Donald Trump, came out against the bill, arguing starkly that passage of the bill would help Joe Biden in the upcoming presidential election, an election that Trump ultimately won.[7]

This is but one example of the stark incentives that policy decay gives rise to. The underlying forces are ever-present, if typically less transparent. The frequent standoffs in negotiations between the President and Congress over the debt ceiling provide a second example.[8] Lee (2013, p. 779) documents multiple instances in which policy shifted in favor of the opposition, arguing, "Put more starkly, it matters whether members of Congress have

[6]See Kapur and Santaliz (2024) for details.

[7]As an editorial in the *Wall Street Journal* put it, "Do Republicans want to better secure the U.S. border, or do they want to keep what has become an open sore festering for another year as an election issue?" (Wall Street Journal Editorial Board, 2024)

[8]Indeed, the regular recurrence of the standoffs matches the dynamics that drive our model. That the debt ceiling is raised and not removed, or set to a level that does not bind, ensures that decay predictably reemerges, consistent with the notion that politicians see a benefit in the need to update legislation that decay generates.

a political interest in seeing a president succeed or not."[9]

These dynamics are not limited to the US, but emerge in other political systems as well. In parliamentary systems, legislative bargaining is typically between partners in a governing coalition. The negotiations by Teresa May's U.K. government to implement the Brexit agreement provide a third example. After invoking Article 50 to leave the European Union, a two year clock began at the end of which a chaotic "no deal" Brexit would occur unless a deal was struck beforehand. A deal required an act of the British Parliament to be confirmed, and the prospect of significant decay in the absence of legislative action created a need for something to be passed. Prime Minister May's attempts to forge a legislative agreement were obstructed by the splinter hard-Brexit wing of the Conservative Party, in particular by Foreign Secretary Boris Johnson, who resigned his Cabinet position during this period. The Johnson-led opposition led to the government's legislation failing, and Theresa May stepping down as leader of the Conservative party, replaced by Johnson himself who then succeeded May as Prime Minister (without need for a general election).

Related Literature

The literature on legislative policymaking is large and diverse. The setter model has been extended and applied broadly to a variety of contexts. Our work is distinguished from this literature in the combination of decay and obstruction. To Callander and Martin (2017), we add the ability for the opposition to obstruct and for power to transition.[10] Obstruction has contemporaneously been incorporated into models of policymaking that don't include decay. Jeon and Hwang (2022) endogenize voter weights and recognition probabilities in a dynamic model of divide-the-dollar bargaining, although their focus is very different to ours (the emergence of oligarchies). Gieczewski and Li (2022) model a form of obstruction as policy "sabotage" in which an opposition take actions outside formal legislative institutions to damage a specific policy change. Patty (2016) develops a model of obstruction as signaling, whereas in our model information is symmetric.

An emerging strand of the literature on bargaining with an endogenous status quo does allow for exogenous changes to policy, although in the existing literature the change is conceived of as shocks that shift policy to the left or to the right in a standard ideological policy space (see, for instance, Callander and Krehbiel (2014), Dziuda and Loeper (2016), Buisseret and Bernhardt (2017), and Chen and Eraslan (2017)). Horizontal ideological shocks like this — what Callander and Krehbiel (2014) refer to as policy *drift* — differ substantively

[9]It is notable that much of the political theater surrounding debt limit fights revolves around who voters should blame for the problem.

[10]Independently, Parihar (2023) extends Callander and Martin (2017) with an alternative transition rule, a different conception of decay, and a model in which policymakers operate with limited foresight.

from the impact of decay in our model. In particular, horizontal shocks do not change the fundamental logic of gridlock. In those papers, legislative action can only occur when shocks are big enough to move policy outside the classic gridlock interval, and, typically, the bigger the shock, the greater the shift of policy back inside the gridlock interval such that further change is even less likely to occur.

Our work is also related to models in which policy choice in one period shapes the outcomes attainable in future periods. Milesi-Ferretti (1995) shows how high debt levels can tip voter preference toward the incumbent. Closer to our model, Callander and Raiha (2017) shows that when policy is durable, investment at strategically chosen ideologies and levels can create a wedge between the future choices of the parties that favor the incumbent. In our model in contrast, obstruction is the tool to swing election outcomes and, therefore, is in the control of the opposition and not the incumbent, and decay arrives exogenously, stochastically, and inexorably over an unbounded horizon.

Transitions of power play a more central role in parliamentary democracies. A series of papers by Dewan and Myatt (2010, 2012) identify the characteristics and mechanisms by which governments live and die. We complement their work by studying political transitions in a model of legislative bargaining over an ideological policy space with decay, and identify at which policies a government — the agenda setter — is more likely to fall.

2 The Model

In each period $t = 1, 2, 3, ...$, two policymakers, L and R, bargain over policy. The policy space is two-dimensional. The first dimension is the standard left-right ideological continuum represented by the real line, $\mathbb{R}$. The second dimension captures the quality of policy. Each policy has a maximum quality that we set to be zero; quality is unbounded below. Thus, the policy space is $\mathbb{R} \times \mathbb{R}^-$, as depicted in Figure 1.

Policymakers have a common preference over quality but differ in their ideological preferences. In the ideological space, L's ideal point is 0 and R's is π, such that their ideal policy positions in the two-dimensional space are $(0, 0)$ and $(\pi, 0)$, respectively. We assume that per-period utility is separable across dimensions, linear in quality, and quasiconcave in ideology. A common functional form that satisfies these requirements is quadratic-loss utility over policy, as given in Equation 1 for policy (x_t, q_t).[11]

$$u_L(x_t, q_t) = -\alpha_L x_t^2 + q_t, \quad \text{and} \quad u_R(x_t, q_t) = -\alpha_R (x_t - \pi)^2 + q_t \ . \tag{1}$$

[11]Quadratic-loss utility is convenient to work with but not essential to the results in any way; quasiconcavity is sufficient for all of our results to go through.

Figure 1: The policy space, and ideal points of the policymakers.

Policymakers discount utility over time at common rate $\delta \in (0,1)$ and, thus, total utility is given by $\sum_t \delta^t u_L(x_t, q_t)$ and $\sum_t \delta^t u_R(x_t, q_t)$, respectively.

Decay is an exogenous force that arrives each period in amount λ_t, where λ_t is drawn independently from an exponential distribution F_λ with rate parameter r and support $[0, \infty)$.[12] If not removed, decay lowers the quality of policy by λ_t, such that policy (x_t, q_t) decays to $(x_t, q_t - \lambda_t)$.

At the beginning of each period, a status quo policy is in place, denoted by (x_t, q_t), and one of the policymakers is designated to be the Proposer, $P_t \in \{R, L\}$, and the other policymaker is the Opposition. The Proposer makes a proposal $(x_P, 0)$ that the Opposition accepts or rejects. If he accepts, $(x_P, 0)$ is implemented, becoming the new status quo, and the Proposer retains agenda setting power. If the Opposition rejects, decay is realized and the status quo is $(x_P, q_t - \lambda)$, and agenda setting power transitions with probability $\rho(q)$ where $q = q_t - \lambda$ and ρ satisfies $\lim_{q \to 0} \rho(q) > 0$.[13] We prove our results for general transition rules, but focus our presentation on the deterministic rule in which power transitions whenever decay persists; i.e., $\rho(q_{t+1}) = 1$ for non-zero decay and 0 otherwise. Simplifying to this limit case, the policy formation process in each period is as follows.

Timing of Policymaking at Each t:

1. Decay λ_t is realized and observed by both policymakers (but not yet experienced).

2. The Proposer may make a proposal $(x_P, 0)$.

3. The Opposition accepts $(x_P, 0)$, which becomes the new status quo, or rejects the proposal, in which case the previous status quo remains and decays to $(x_t, q_t - \lambda_t)$.

[12]The exponential assumption simplifies the analysis, but the key properties of the distribution function F_λ are finite expectation, strict monotonicity (i.e., a support that takes the form of a closed interval) and $F_\lambda\left(\frac{\delta}{1-\delta}\max[\alpha_R, \alpha_L]\pi^2\right) < 1$, which requires that the support of F is sufficiently broad in a sense that will become clear later. In Appendix A4 we show that the equilibrium characterization is very similar if we replace the exponential with a lognormal or uniform distribution with the same mean.

[13]We limit attention to transition rules that depend on decay but not ideology. A dependence on ideology complicates the analysis further but, under reasonable conditions, should not alter the results substantively.

4. Utility is realized.

5. Agenda setting power transitions if, and only if, the new status quo quality $q_{t+1} < 0$.

Without loss of generality we set R to be the Proposer for the first period. We further suppose that at the beginning of play the status quo is efficient with maximum quality and ideological location between the policymakers' ideal points; thus, $x_1 \in [0, \pi]$ and $q_1 = 0$. The assumption that decay can be removed before rather than after utility is realized is made solely for pedagogic transparency and analytic simplicity; the assumption carries no substantive importance.

A strategy for policymaker L is, for a given history, a policy offer when he is Proposer and the offers he will accept as Opposition for each status quo. The strategy for policymaker R is analogous. We restrict attention to proposal strategies that are continuous in policy[14] and characterize Markov Perfect Equilibria (MPE) in such strategies, which we refer to simply as an *equilibrium* hereafter.[15]

Observations on the Model

Decay and legislative activity: In the absence of decay, strategic behavior in our model is that of the classic logic of gridlock. The classic gridlock interval is the interval between the ideal points of the policymakers $[0, \pi]$ that lies on the efficient frontier. Our assumption that the status quo policy initially lies within this interval implies that, in the absence of decay, the equilibrium would be trivial and immediate: nothing happens. Thus, any legislative activity that emerges in our model can be attributed to decay.

Frictions in policymaking: To focus on decay, we assume that policymaking is otherwise frictionless. Policymakers can change policy costlessly and immediately, and we abstract from informational and technical constraints that, in practice, might hinder the ability of policymakers to remove decay. This friction-free policymaking implies that when decay is not removed, it is due to a political rather than a technical failure.

The source of decay: We assume that proposals must be at the frontier — that is, that they have the form $(x_P, 0)$ — for two reasons, one technical and the other substantive. Technically, this ensures existence of an optimal proposal for any status quo, which is not

[14] We impose the continuity requirement on proposal strategies for technical reasons, but continuous proposal strategies are reasonable in the following intuitive sense: very small changes in decay should not lead to dramatically different policy proposals from the Proposer.

[15] It is unclear what form non-Markovian equilibria take in this environment and, indeed, whether they exist at all. The application of standard notions of compromise equilibria supported by grim-trigger strategies is not straightforward. In particular, the requirement that all policymakers must agree to a policy change, and that without a change outcomes will grow inexorably worse due to decay, make supporting punishment strategies difficult.

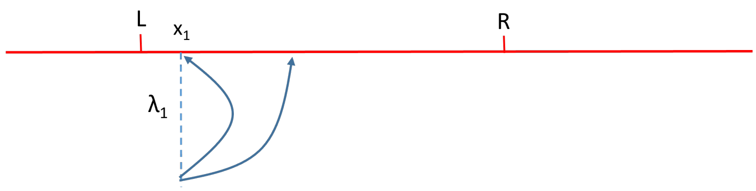


Figure 2: The leverage from decay.

guaranteed otherwise.[16] Substantively, the assumption implies that decay can emerge organically but not deliberately. A motivation for our work is to understand how decay caused by a changing world feeds into policymaking. The assumption sets aside the possibility that inefficiency is injected deliberately into the political system by strategic policymakers.[17]

3 Benchmark: No Transitions of Power

The strategic opportunities that policy decay creates are most easily seen visually. Consider the situation in Figure 2 in which the status quo, x_1, is to decay by amount λ_1. The Proposer R can simply remove decay and propose to return policy to the efficient frontier at x_1, an offer that L will gladly accept. However, the threat of leaving decay in place means that L is willing to concede on policy and accept a shift to the right if R's proposal returns policy to the frontier. L's willingness to concede on policy is the source of R's leverage and, thus, even when policy resides within the ideological gridlock interval, R is able to extract a benefit from agenda setting power.

Proposition 1 characterizes the equilibrium when agenda setter power is fixed with R and the transition of power is not possible.[18]

Proposition 1. *Fix R as the Proposer in every period. In the unique Markov-perfect equilibrium, R offers a proposal in each period, and L accepts, where the proposal is:*

$$x_t^* = \min\left(\sqrt{x_{t-1}^2 + \frac{\lambda_{t-1}}{\alpha_L}}, \pi\right) \text{ and } q_t^* = 0.$$

Policymaking in Proposition 1 exhibits a "no delay" property. In every period the policymakers strike a deal to return to the efficient frontier, regardless of the amount of decay or the location of the status quo. Thus, decay is never experienced on the equilibrium path.

[16] Without this restriction, a Proposer who anticipated decay persisting and losing power would want to propose a point infinitesimally below the frontier rather than on it.

[17] This is itself an interesting, but distinct, question that we leave for future researchers.

[18] This case is the one analyzed in Callander and Martin (2017).

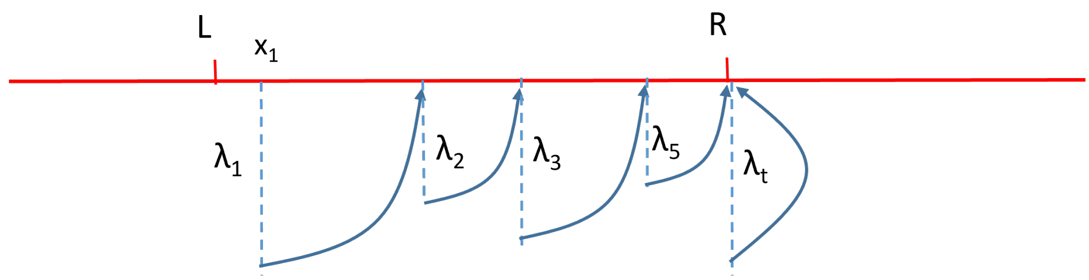


Figure 3: Equilibrium path of policy without transitions of power.

The legislative deal that is struck always favors the Proposer: she has positive leverage. Policy slides monotonically across the policy space toward R's ideal point, as depicted in Figure 3, and once it reaches her ideal point, policy stabilizes. Regardless of the decay that appears, R proposes, and L accepts, to return policy to R's ideal point in every period thereafter.

Although obstruction does not occur on the equilibrium path, it nevertheless plays an important role in the equilibrium. If R attempts to move policy too fast to the right, L can reject the proposal and keep the status quo, which he prefers even with the decay. Thus, the threat of obstruction constrains R's leverage, although only to a limited degree: L gains no electoral benefit from obstruction, and policy continues to converge inevitably to R's ideal point.

In a similar vein, that R removes decay immediately does not mean that the option to let it accumulate is not important to her proposals and the path of policy. If the pain of large decay is much higher then the threat of letting decay accumulate increases R's leverage today, allowing her to extract more policy concessions than a myopic evaluation of today's decay may suggest. This threat is not one-sided. If the pain of future decay is actually lower, L's threat to reject today's proposal and let decay accumulate will lower R's leverage today.

The speed at which policy moves across the policy space in equilibrium depends on all these factors. The faster decay arrives, the more leverage the proposer obtains and the faster policy moves. The rate at which decay translates into policy movement depends upon the global utility functions of policymakers and not simply their disutility from today's decay.

The remarkable feature of the equilibrium, given all of these considerations, is that a legislative deal can always be struck and that policy remains on the efficient frontier. This efficiency is, however, only in a static sense. For policymakers with concave utility (such as the canonical quadratic loss utility in Equation 1), the stuttered progressive path of policy is dynamically inefficient. Both policymakers would be better off if policy could be fixed at some intermediate point and remain there regardless of decay. The problem is that this deal is not dynamically consistent. As soon as L agreed to the compromise, R would resume leveraging policy toward her own ideal point. Without the ability to commit, the policymakers cannot make mutually beneficial agreements across time. Thus, a distinction emerges between the short and long term efficiency of policymaking. Within period, the policymaking process provides sufficient flexibility to ensure efficient bargains, but across time, the inability to commit ensures that dynamic inefficiency is unavoidable.[19]

Policymaking in the benchmark setting proceeds simply and intuitively. Four properties stand out:

Benchmark Equilibrium Properties:

#1: The proposer's leverage is always positive.

#2: Policy remains on the efficient frontier.

#3: Policy ultimately stabilizes at a single point.

#4: Policy is dynamically inefficient.

Although intuitive, we will see that the first three of these properties fail, and the fourth is attenuated, once power transitions are allowed. Thus, the four properties are not constants of legislative bargaining, but rather implications of fixed agenda control. We turn now to the analysis of the full model.

4 Obstruction and Transitions of Political Power

The strategic logic for the Opposition changes when he has the opportunity to obstruct and benefit electorally. The Opposition must live with decay today if he obstructs, but instead of facing more decay and an even more powerful Proposer, he becomes the Proposer and is the one able to benefit from that leverage. This benefit is only ephemeral, however, as the original Proposer, now the Opposition, can block his proposal, regain power, and begin the logic all over again.

In Proposition 2 we show how this seeming circularity is resolved.[20] The statement establishes equilibrium existence and the key properties; we explain below the difficulty in characterizing equilibrium behavior completely. Figure 4 depicts the key equilibrium properties graphically.

[19]A fundamental feature of legislative institutions in practice is that one sitting cannot tie the hands of future sittings. This notwithstanding, institutional design can embed some commitment power implicitly if not explicitly. See McCarty (2004) for an early exploration of the role of commitment or lack thereof in dynamic policymaking environments.

[20]The main proof in Appendix A2 considers the deterministic transition rule $\rho(q) = 1 \;\; \forall \;\; q < 0$. Appendix A3 extends the result to any probabilistic transition rule $\rho(q)$.

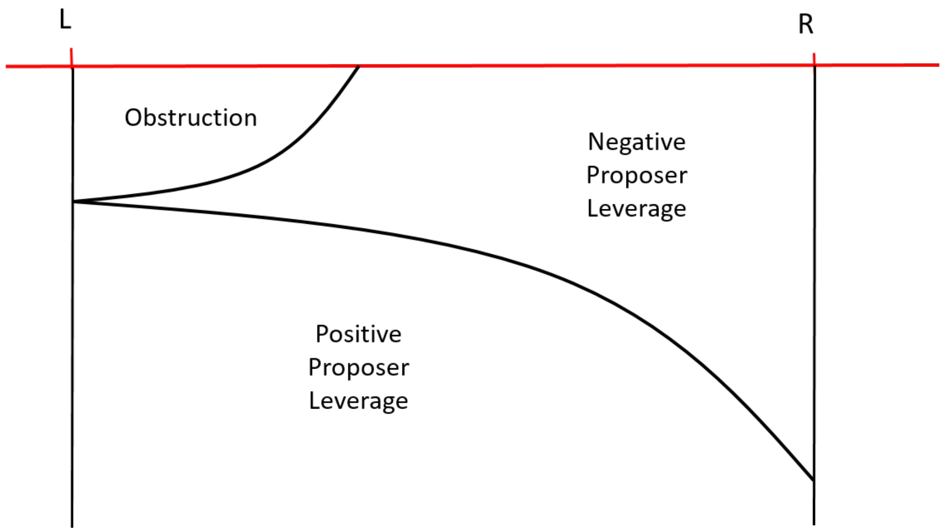


Figure 4: Equilibrium regions when R is the Proposer.

Note: The curves drawn in the figure are generated from a numerical solution of the model for specific parameter values (see Section 4.1 for details). The existence of the three equilibrium regions depicted is proven analytically in Proposition 2, but their specific sizes and shapes will vary depending on parameter choices.

Proposition 2. *A Markov Perfect Equilibrium in continuous proposal strategies exists. In any such equilibrium, there exist functions $\lambda_1, \lambda_2, \lambda_3$, with $\lambda_j : [0, \pi] \to [0, \infty)$, $j \in \{1, 2, 3\}$, and a policy threshold $x' \in (0, \pi)$ such that when δ is sufficiently close to 1, the following properties hold for any status quo $x \in [0, \pi]$:*

1. *For $\lambda_t < \lambda_1(x)$, with $\lambda_1(x) > 0$ if and only if $x \leq x'$, L rejects R's proposal such that delay is experienced and power transitions.*

2. *For $\lambda_t \leq \lambda_2(x)$ with $\lambda_2(x) \geq \lambda_1(x)$, R concedes on policy offering $x_P < x$ or L rejects the proposal.*

3. *For $\lambda_t \geq \lambda_3(x)$ with $\lambda_3(x) \geq \lambda_2(x)$, R proposes $x_P > x$ and this proposal is accepted.*

Behavior is symmetric when L is the Proposer.

In equilibrium, the policymakers are often but not always able to strike a legislative deal. When bargaining breaks down, policymakers live with decay and power transitions even though a policy that is better for both of them exists. Thus, policymaking is statically inefficient, violating property #2 of the benchmark model.

The breakdown of bargaining is also of interest for when it occurs. The Opposition rejects the Proposer's offer not when the Proposer is strong on policy such that it is close to her ideal point, but rather when she is weak. Thus, the Opposition obstructs when he has little to gain on policy rather than a lot. This is, however, exactly why he obstructs. Precisely because he has little to gain on policy, there is no offer the Proposer can make that benefits him a lot. The Opposition might as well reject the proposal and gain agenda setting power. That this benefit can only come from obstruction and experiencing decay is a limitation of the policymaking institution.[21]

In all other situations the policymakers are able to strike a legislative bargain. Notably, the bargains need not favor the Proposer. Because proposal power is valuable *on average*, a sufficiently patient Opposition is willing to live with decay to obtain that power. To appease the Opposition, therefore, the Proposer cannot leverage too much policy benefit from decay. Indeed, in many situations, the Proposer must concede on policy to acquire the Opposition's support. In these situations the Proposer has negative leverage. The opportunity to obstruct changes equilibrium behavior relative to the benchmark model even when a legislative deal is struck and it now violates property #1.

That negative leverage emerges is intuitive, but when it emerges is less straightforward. The larger is decay, the more costly it is to the Opposition to obstruct. However, because decay then persists, the leverage the Opposition would have when he became Proposer is greater. Conversely, small decay imposes a smaller cost of obstruction but also a smaller future benefit.

In the proof of Proposition 2 we show that this trade-off only resolves itself definitively for small and large levels of decay. For moderate levels of decay the trade-off is difficult to pin down. In all numerical solutions of the model (see Section 4.1, e.g. Figure 5a) there exists a single boundary that separates positive from negative leverage (as depicted in Figure 4); i.e., $\lambda_1(x) < \lambda_2(x) = \lambda_3(x)$ for all $x > 0$. However, this single-crossing property may not hold generally. It is for this reason that the statement in Proposition 2 describes behavior only for small and large decay. To be sure, the equilibrium exists, and outside the obstruction region, a legislative deal is struck. However, it may be that as decay increases there is more than one transition between the Proposer having positive and negative leverage, with these switches depending on how the Opposition trades-off the cost of decay versus the benefit of greater future leverage.

The equilibrium produces a rich policy dynamic. Policy flows around the policy space, moving away from the Proposer's ideal when decay is small and her leverage is negative, and pulls back toward her ideal point when decay is large and her leverage positive, touching

[21]This observation naturally leads to the question of how an institution may be designed to obviate this inefficiency. An obvious suggestion is that the Proposer could make an offer of a policy *and* proposal power to the Opposition, although in taking this choice away from voters other problems would obviously emerge that are beyond the scope of our model.

every policy in $[0, \pi]$ at some time.[22] The flow is broken up only by the occasional obstruction that causes power to transition and the pattern to reverse itself.

This flow implies that policy never stabilizes at a single point, thus violating property #3 of the benchmark model. As depicted in Figure 4, policy is returned to the efficient frontier at the same ideological position only when decay is exactly at the threshold separating positive from negative leverage, which is a zero probability event, or when the Proposer R has obtained his ideal point. But even then, no matter how many periods policy has spent at R's ideal point, it shifts away immediately when decay is anything but very large.

The flow of policy in equilibrium means that the dynamic inefficiency of the benchmark model continues to hold here. However, the inefficiency is attenuated. As policy flows back and forth across the policy space, it spends more time in the middle and less time at the fringes.[23] For policymakers with concave utility, such as quadratic quality, this moderation increases aggregate policymaker welfare. Counterintuitively, because obstruction makes policy less stable, it increases the *dynamic* efficiency of legislative bargaining.

We conclude this section by reiterating how obstruction and power transitions upends legislative policymaking. Three of the four properties of the benchmark model are reversed and the fourth property is attenuated. The restated properties for the model with obstruction are as follows:

Equilibrium Properties with Decay *and* Power Transitions:

- **#1:** The proposer's leverage can be positive and *negative*.
- **#2:** Policy *sometimes* departs from the efficient frontier.
- **#3:** Policy *never* stabilizes at a single point.
- **#4:** The dynamic inefficiency of policy is *attenuated*.

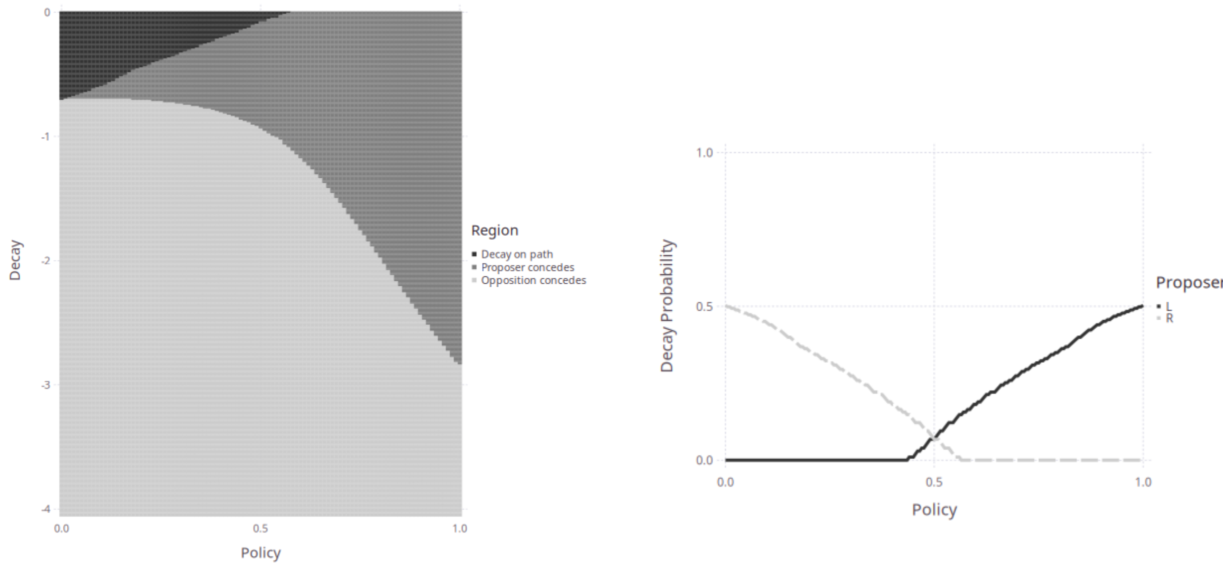
4.1 Exploring Equilibrium Behavior

To explore the properties of equilibrium behavior, in this section we solve numerically for the equilibrium value functions, using a finite-grid approximation and an iterative algorithm.[24] Although our characterization result does not prove uniqueness of the MPE, our solver converges to the same set of identical value functions regardless of the initialization chosen,

[22] This follows from Proposition 2 and the fact that decay is drawn from a continuous distribution.

[23] For sufficient patience (high δ) it is straightforward to show that total utility is higher with power transitions than in the benchmark case of fixed proposal power.

[24] Specifically, we initialize the value function on the grid, compute equilibrium proposals at each point given those values, and then update the value functions, repeating until convergence. Code that implements the value function iteration in the Julia language is available at `https://code.stanford.edu/gjmartin/policy-decay-and-political-competition`.



(a) Equilibrium regions.

(b) The likelihood of realized decay given x, P.

Figure 5: Numerical solution of the model under baseline parameters.

Notes: Figures are generated by solving the model numerically on a finite grid, under the assumptions that decay is drawn from an exponential distribution with rate parameter 1, i.e. $E[\lambda] = 1$, and that the other model parameters take values of $\alpha_L = \alpha_R = 1, \pi = 1$, and $\delta = 0.9$.

and hence we believe the equilibrium and the numerical results presented in this section to be unique.

Our baseline parameters are as follows. Utility of the policymakers is quadratic-loss as given in Equation 1, with ideal points 0 and $\pi = 1$, $\alpha_L = \alpha_R = 1$, and discount rate $\delta = 0.9$. Decay is drawn from the exponential distribution with mean 1. The equilibrium regions for this example when R is the Proposer are given in Figure 5a.

Obstruction

The obstruction region is significant. The probability of obstruction for each ideological location is depicted in Figure 5b. At the boundaries of the policy space the probability of obstruction reaches 50%. Ideologically, the obstruction region stretches past the middle of the policy space. In our numerical example, decay is possible for policies up to 0.57 when R is the Proposer and for policies beyond 0.43 when L is the Proposer. Thus, decay can be left in place and experienced at any point in the policy space.

The overlap in the obstruction regions when each policymaker acts as the Proposer also means that obstruction and transitions of power can occur in consecutive periods in equilibrium, with decay accumulating on itself. This is possible only for moderate policies where the obstruction regions overlap,[25] and only if decay is sufficiently small. Thus, while decay can accumulate, it does so only when the increments are small. It is only when the Opposition is strong on policy that a larger burst of decay is not removed, but this means that when the Opposition assumes power, he has a lot of ideological space to compensate the new Opposition should it be needed, and obstruction does not occur.

The Dynamic Flow of Policy

The policy flow in equilibrium in our numerical example is depicted in Figure 6, for the case when R is Proposer. The upper left region is where the Opposition obstructs and policy does not change (no arrows). The upper right region is where the Proposer has negative leverage and offers to shift policy to the left, as given by the direction of the arrows in the figure. The size of the arrow heads represents how much policy ground R must concede, and the right-most arrow head marks the ideological location that R offers when the status quo is at her ideal. As is evident, the amount R concedes is non-monotonic in the degree of decay. This represents the tension described above between the cost and benefit of obstruction for the Opposition that makes pinning down equilibrium behavior difficult.

The Proposer has positive leverage in the lower left region and is able to pull policy toward her ideal point. From this side, the left-most arrow indicates the policy R offers when policy begins on the left boundary. As is evident, the Proposer gains much more when leverage is positive than she concedes when leverage is negative.

The asymmetry in the relative strength of negative and positive leverage generates a policy flow that is asymmetric. The flow of policy consists mostly of small incremental concessions by the Proposer, combined with occasional but large policy jumps back toward the Proposer's ideal point.[26] In fact, at the right boundary in our numerical example, the Proposer's leverage is such that the Opposition benefits more than 94% of the time![27]

This dynamic turns the conventional wisdom of legislative bargaining on its head. Rather than the majority party dominating bargaining, this dynamic implies that it is the minority party that benefits from decay most of the time, and that the benefit of holding agenda setting power is evident only occasionally when decay is large. To an observer, therefore, the outcome of a single period of policymaking will give a misleading picture of which party it is that holds the power in legislative policymaking.

[25] In our numerical example, approximately the interval $[0.43, 0.57]$.

[26] Recall from Figure 5b that the probability of obstruction reaches 50% on the boundary of the policy space. As the boundary separating positive from negative leverage is strictly decreasing in ideology when R is the Proposer, R has negative leverage (or L obstructs) at least 50% of the time at every ideology.

[27] The Proposer concedes at values of λ as high as 2.83 at this point, and $F_\lambda(2.83) \approx 0.9409$ for the exponential distribution with mean 1.

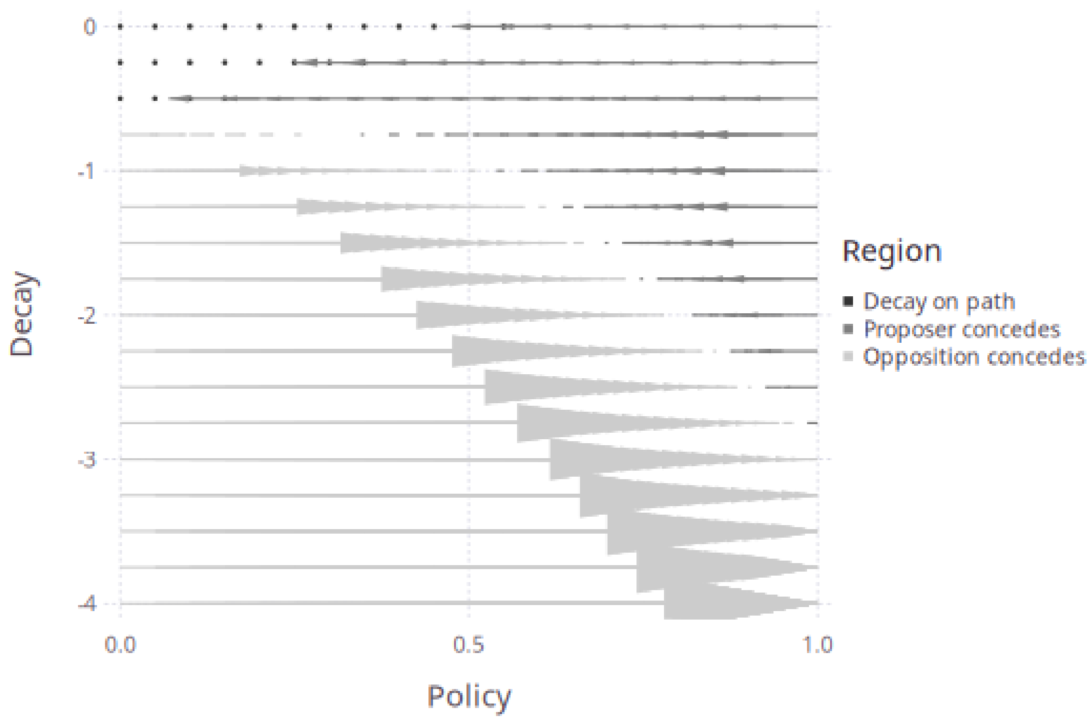
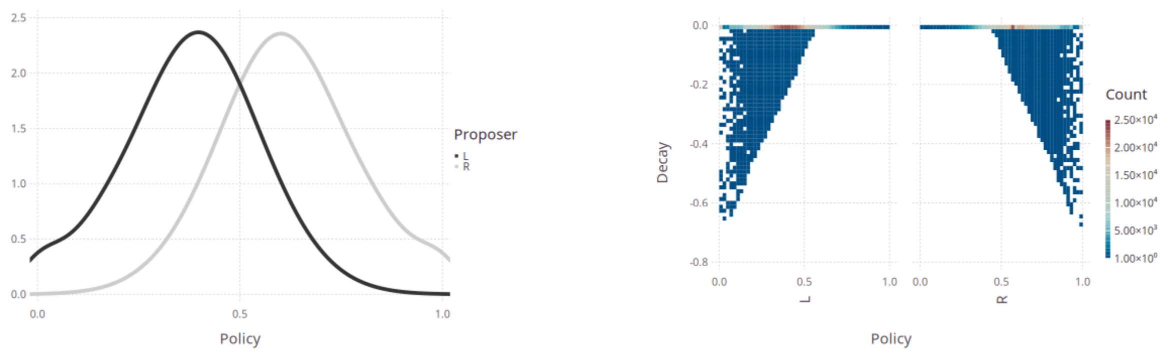


Figure 6: Policy flow when R is Proposer.

Notes: The size of the arrows indicate the magnitude of the policy movement proposed (and accepted) in equilibrium from each initial status quo. Points (in the decay on path region) indicate no policy movement from that status quo. Equilibrium proposals are generated from the same numerical solution with the same parameters described in Figure 5.



(a) Marginal distribution over x.

(b) Joint distribution over (x, q).

Figure 7: Density of policies visited in equilibrium.

Notes: The figures plot the density of realized policy / quality pairs over 1000 simulated paths of play consisting of 1000 rounds of proposal and acceptance each. Equilibrium proposals are generated from the same numerical solution with the same parameters described in Figure 5.

The Distribution of Policy Outcomes

To evaluate the distribution over policy locations in equilibrium, we simulated 1000 paths of 1000 periods each, randomly drawing realizations of decay and allowing both policymakers to play optimally given the solved value functions.

The distribution of ideological outcomes spans the entire space whichever policymaker holds proposal power, and there is considerable overlap in the distributions. The distributions are depicted in Figure 7a. As is evident, much of the time is spent at moderate policy locations. This reinforces the conclusion that dynamic efficiency is improved when power transitions are possible. It is also evident, however, that despite the Proposer holding negative leverage or being obstructed more than half of the time, proposal power remains valuable. The distribution of outcomes when R is the Proposer is clearly more favorable to her than when L is the Proposer.

To see where obstruction occurs and decay is realized, Figure 7b plots the joint distribution over (x, q) visited in equilibrium when R is the Proposer (left) and L is the Proposer (right). Points below the frontier represent obstruction and realized decay, mirroring the obstruction region of Figure 4. (The large mass of points on the frontier represent successful legislative agreements.)

Two features of the distribution are notable. First, that conditional on the policy location, obstruction is more likely to occur when the policy is extreme rather than moderate. Second, because policy is more likely to be relatively moderate than extreme, unconditionally, obstruction is actually more common at moderate rather than extreme policies. Thus, transitions of power are more likely to be observed at relatively moderate policies than at the policy extremes.

The Life and Death of Governing Majorities

The moderation of policy does mean that obstruction is less frequent than if policy spent more time at the extremes. As a consequence, transitions of power, while possible, are relatively infrequent. Indeed, a majority can hold onto power for a not insignificant number of periods.

Figure 8 plots the median duration of a Proposer holding power as a function of the location of policy when he or she initially takes power. The points are shaded in proportion to the frequency with which a new Proposer takes power at the indicated distance from her ideal point in our simulations. The expected life of a governing majority decreases the further is policy from the Proposer's ideal point—and, thus, closer to or in the zone of obstruction. Even at the maximum distance for which we observe transitions, however, the median life-span is seven periods, and it increases to over 20 periods when Proposer takes power at her own ideal point.

These numbers are striking as, in our model, power is maximally fragile. The Opposition can gain proposal power at any time it wishes. Yet it does so infrequently. This is because the threat of obstruction constrains the Proposer, and in many situations, the threat is sufficient for the Opposition to win a policy concession. Obstruction drives policy outcomes, yet it appears only occasionally along the equilibrium path.

Other Transition Rules

Figure 9 depicts the equilibrium regions when power transitions probabilistically. Specifically, we solve the case in which power transitions with probability $1 - e^{-\beta\lambda}$ for decay of magnitude λ and some $\beta > 0$. β parameterizes the effectiveness of obstruction in generating power transition; when β is small only large deviations from efficiency are likely to lead to transition, while when it is large, small deviations are sufficient. As $\beta \to \infty$, this rule approaches the sharp rule that we analyzed previously.

The same structure of equilibrium holds with probabilistic transition. For sufficiently large β, the equilibrium regions are indistinguishable from those in the sharp transition case. As β declines, the Proposer's position strengthens, because the threat of obstruction is less likely to lead to turnover at small values of decay. Accordingly, the region where decay is realized on the equilibrium path shrinks, and Opposition is more likely to concede for moderate values of decay.

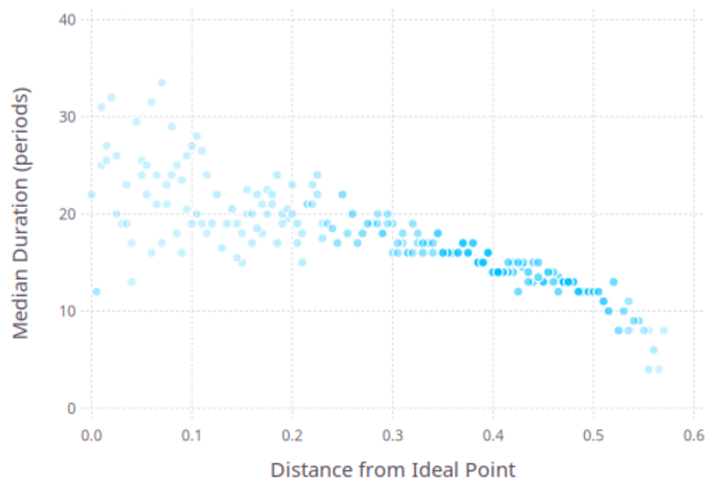
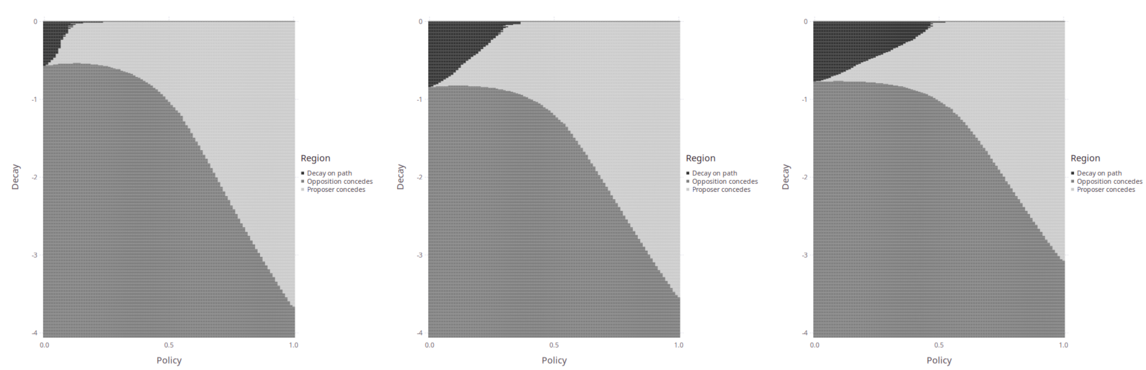


Figure 8: The Life and Death of Governments.

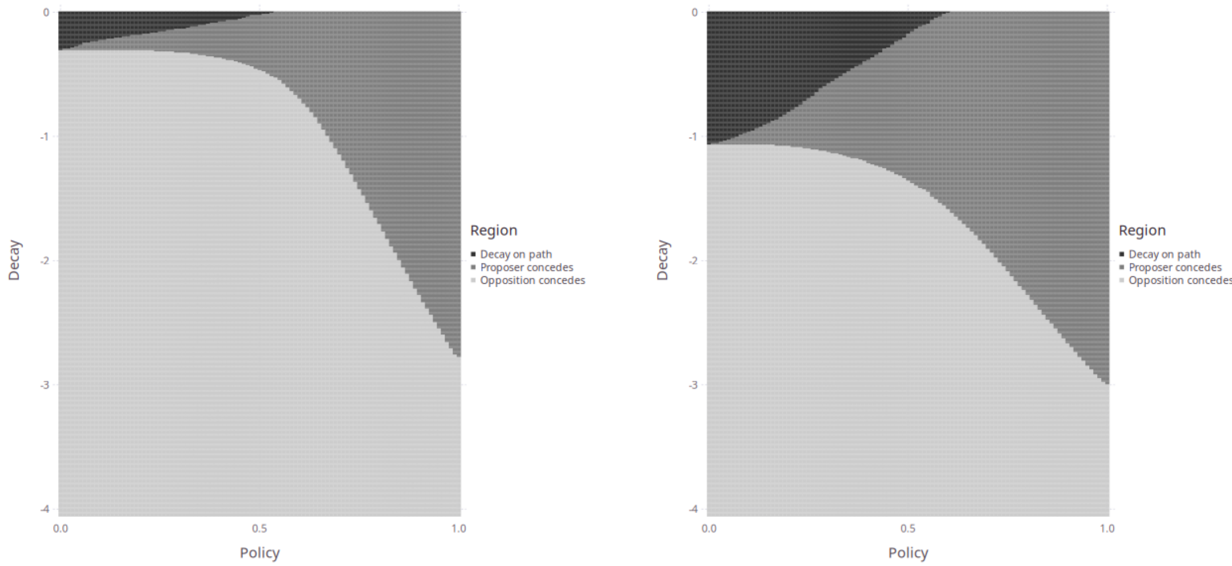
Notes: The horizontal axis indicates the point at which a Proposer initially takes power, in absolute distance from her ideal point. The vertical axis is the median number of periods that a Proposer who initially takes power at that distance survives before transition occurs. Points are shaded according to the frequency with which initial transitions at that distance from the Proposer's ideal occur in our simulations. Equilibrium proposals are generated from the same numerical solution with the same parameters described in Figure 5, evaluated at the same 1000 simulated paths of 1000 rounds each used in Figure 7.



(a) $\beta = 1$ (b) $\beta = 2$ (c) $\beta = 10$

Figure 9: Equilibrium regions with a probabilistic transition rule.

Notes: Figures are generated by solving the model numerically on a finite grid, as in Figures 5, 10 and 11, under the assumption that decay is drawn from an exponential distribution with $E[\lambda] = 1$. We replace the deterministic transition rule with a probabilistic one: if decay λ is realized, the current Proposer loses power with probability $1 - e^{-\beta\lambda}$. As $\beta \to \infty$, the equilibrium approaches the step-function transition analyzed in the baseline case. All other parameters are held at their baseline values: $\alpha_L = \alpha_R = 1, \pi = 1$, $\delta = 0.9$.



(a) $E[\lambda_t] = 0.5$ (b) $E[\lambda_t] = 1.5$

Figure 10: Equilibrium regions as the distribution of decay varies.

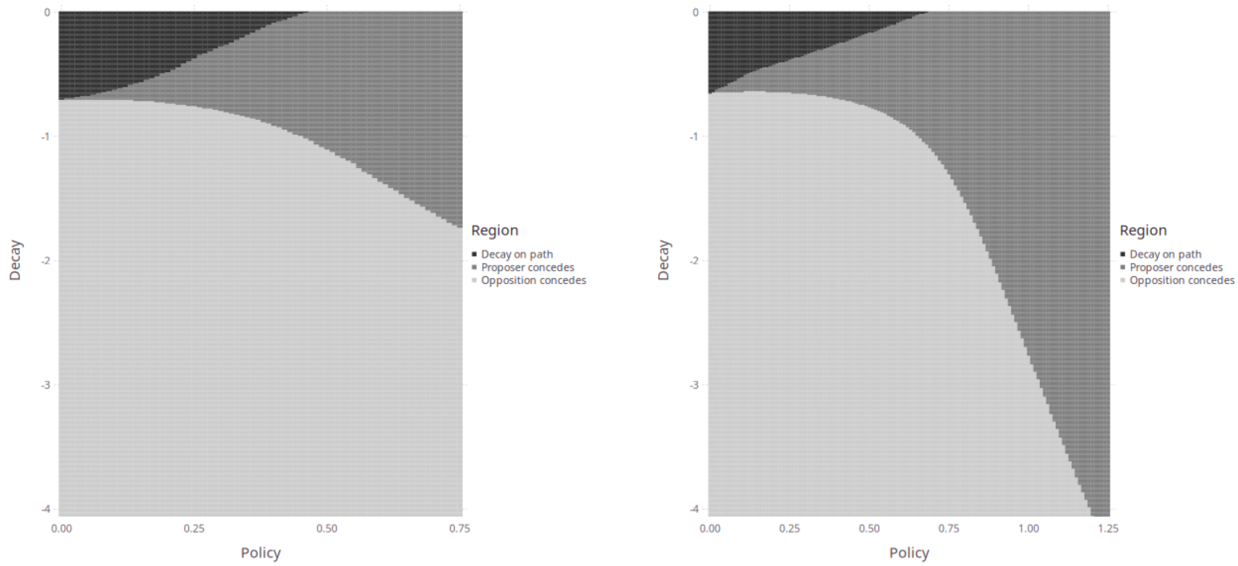
Notes: Figures are generated by solving the model numerically on a finite grid, as in Figure 5, under the assumption that decay is drawn from an exponential distribution with mean indicated in the captions. All other parameters are held at their baseline values: $\alpha_L = \alpha_R = 1, \pi = 1, \delta = 0.9$.

Comparative Statics

In this section, we explore how the equilibrium regions vary in two key parameters of the model, the exponential rate parameter for the decay distribution $E[\lambda]$, and the polarization between the two policymakers. We first describe the equilibrium effect of varying each parameter before turning to the welfare implications.

The Variance of Decay. Figure 10 shows what happens to the equilibrium regions when we decrease the exponential mean parameter to 0.5 (panel a) or increase it to 1.5 (panel b). The contrast between the figures is illustrative. An initial conjecture may be that less expected decay (from 1 to 0.5) is a boon to the Opposition as it is for larger decay that the Proposer gains leverage. This direct effect, however, is tempered by the equilibrium effect as both the obstruction region and the negative-leverage region get smaller. Both regions grow when the mean of decay rises (from 1 to 1.5) and for a larger range of decay the Opposition is the one with the leverage. The reason for this is that, in equilibrium, the value of proposal power decreases as the mean of the distribution of decay decreases. A lower value of proposal power, in turn, gives the Opposition less incentive to obstruct and, knowing this, the Proposer is less willing to concede on policy.

Polarization of Policy Preferences. Figure 11 shows what happens to the equilibrium



(a) $\pi = 0.75$

(b) $\pi = 1.25$

Figure 11: Equilibrium regions as the policy polarization between policymakers rises.

Notes: Figures are generated by solving the model numerically on a finite grid, as in Figures 5 and 10, under the assumption that decay is drawn from an exponential distribution with $E[\lambda] = 1$. All other parameters are held at their baseline values: $\alpha_L = \alpha_R = 1, \delta = 0.9$.

regions when the policy distance between the two policymakers' ideal points varies. Conventional wisdom from classical static models of gridlock would suggest worse bargaining performance (more failures of agreement) the more polarized parties are. Indeed, in our dynamic model it is true that greater policy divergence leads to a larger value of proposal power and hence greater incentives for obstruction.

Once again, however, this logic is tempered by the equilibrium effect within the model. To see why, recall that legislative agreement requires the policymakers to have sufficient policy space to find a mutually agreeable deal. Counterintuitively, the more the policymakers disagree over policy, the more ideological space they have available to negotiate with. This means obstruction needs to be deployed less often in equilibrium and that the inefficiency of decay is reduced. This is evident in Figure 11 as at the left boundary the obstruction boundary is lower (-0.7 vs. -0.65) when polarization is lower (panel a) than when polarization is greater (panel b). The obstruction region is, in an absolute sense, larger for $\pi = 1.25$, yet this is due to the larger relevant policy space when the policymakers are more polarized. Decay is experienced less frequently the greater the polarization and, as we will see momentarily, this leaves both policymakers relatively better off.

Welfare comparisons. To assess whether policymakers are overall better or worse off

Scenario	Efficient Benchmark	L Mean Utility	R Mean Utility
Baseline	-0.25	-0.297	-0.298
$E[\lambda] = 0.5$	-0.25	-0.263	-0.264
$E[\lambda] = 1.5$	-0.25	-0.330	-0.333
$\pi = 0.75$	-0.14	-0.197	-0.195
$\pi = 1.25$	-0.39	-0.423	-0.426

Table 1: Average utility in baseline and comparative statics scenarios.

as these parameters change and subsequent equilibrium behavior changes, we evaluate each player's average utility across all of our simulated rounds in each case. The results are shown in Table 1. The first column in this table shows the efficient benchmark: average utility that would result if policy remained on the frontier at the midpoint of both policymakers' ideal points for the entire history of the game. The second and third columns show the average realized utilities for L and R respectively in all one million rounds of the simulation we computed.[28]

The net effect of increasing the typical size of the decay shocks is to reduce utility for both policymakers. The additional leverage gained when in the Proposer role is outweighed by the loss of policy influence when in the Opposition role, along with the on-average greater decay experienced on path.

Increasing polarization between the policymakers also has the effect of reducing utility for both. However, this is entirely due to the fact that with more space between them, a moderate policy is worse for both. Relative to the efficient benchmark, policymakers actually do *better* in the higher-polarization cases (i.e., the difference with the efficient benchmark is smaller). Surprisingly, the more polarized are the policymakers, the more effectively they bargain, and the less welfare is wasted.

5 Concluding Discussion

We conclude with two observations on the assumptions and implications of the model.

Novel bargaining failure. Obstruction represents a bargaining failure. The nature of this failure is novel in the bargaining literature, not just within political science but also more broadly. Bargaining fails in our legislative setting for two reasons. First, the policymakers can

[28]As the simulation setting is perfectly symmetric, the difference in utility between L and R is due only to the particular sequence of random draws we used, and thus represents a measure of the uncertainty due to simulation error.

be satiated in policy terms. In having an ideal policy positions—rather than an unbounded appetite for money—the policy space with which policymakers negotiate is bounded. This limitation does not cause bargaining to fail in the benchmark model, but it does when obstruction is allowed. The second cause of bargaining failure is not obstruction per se, but that obstruction is tied inextricably to legislative inaction. Both policymakers would be better off if power transitioned *but* decay was removed. The legislative bargaining mechanism does not permit this agreement. In this sense, realized decay can be seen as the collateral damage of a limited policymaking institution.

Decay as a fundamental driver of politics. Decay is an unavoidable and recurring presence in all aspects of society. Politics is no exception. Even in a setting in which decay can be removed immediately and without cost, it can persist due to failures of strategic interactions. More importantly, not only might decay persist, but the possibility that it may be experienced drives the policymaking process.

Equilibrium behavior in our model demonstrates that decay is not a side issue or distraction in the practice of politics, rather it is a fundamental driver of politics. That policymakers in our model cannot avoid decay suggests that for their real-world counterparts, decay may play an even larger role.

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