Federalism and Ideology*

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Abstract

Scholars have long considered the implications of the centralization and decentralization of political power on policy learning and externalities. This paper takes a different approach by focusing on the relationship between federalist arrangements and ideology. We model an infinite horizon interaction between an elected central executive and two local units for which policies can be set at either level. The executive decides how to allocate policy-making power between central and local governments to achieve current policy goals, control externalities, and protect against future policy reversals. The model shows that higher levels of decentralization can insure against bad electoral outcomes, and thus centralization is increasing in an incumbent's electoral prospects. It also shows that allowing politicians to reallocate centralization over time can reduce welfare relative to a fixed regime with at least partial decentralization.

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1 Introduction

Writers of regulations, laws, and constitutions have long prioritized the issue of centralization versus decentralization. The concern is natural, as the assignment of authority is obviously consequential for policy outcomes across geographical units and over time. Many of the trade-offs are by now familiar. Decentralization can encourage the discovery of good policies and adaption to local conditions, while centralization can control externalities, implement best practices, and prevent a wasteful "race to the bottom."

The stakes of centralization choices are evident in the evolving institutional context of some of the most important policy arenas. As an example, the Clean Air Act of 1970 and its amendments provide the foundation for air quality regulations in the United States. Two provisions pertaining to automobile emissions are of particular interest. Section 209(a) of the law *preempted* state-level regulations; in other words, it centralized authority at the federal level by superseding state standards. Section 209(b) gave California the authority to adopt standards at least as stringent as prevailing federal standards. Other states could choose whether to use the California or federal standards. This decentralizing exemption allowed California and other states to address long-standing air quality issues in an aggressive manner, but in 2019 the Trump administration reinterpreted the section in a way that revoked the state's powers.[1] Other rollbacks of decentralized authority include state-level preemptions of paid sick leave and minimum wage laws in cities such as Austin, Birmingham, and Oklahoma City. Figure 1 shows that these preemptions have occurred predominantly in states governed by Republican 'trifectas,' or unified GOP control over the legislature and the governorship.

One often articulated rationale for centralization or decentralization is quality: centralization allows the imposition of better policies, while decentralization may aid in their discovery. A productive literature in theoretical political economy has characterized incentives for policy learning and diffusion in federal systems (e.g., Strumpf 2002, Cai and Treisman 2009, Callander and Hårstad 2015, Cheng and Li 2019). In these models, policy trials can produce useful information for future politicians, and thus centralization choices are driven by their equilibrium information-revelation properties.[2]

[1] In 2021 the state sought to restore this power under the Biden administration.

[2] Supreme Court Justice Louis Brandeis' famous 1932 quotation in *New State Ice Co. v. Liebmann* about each

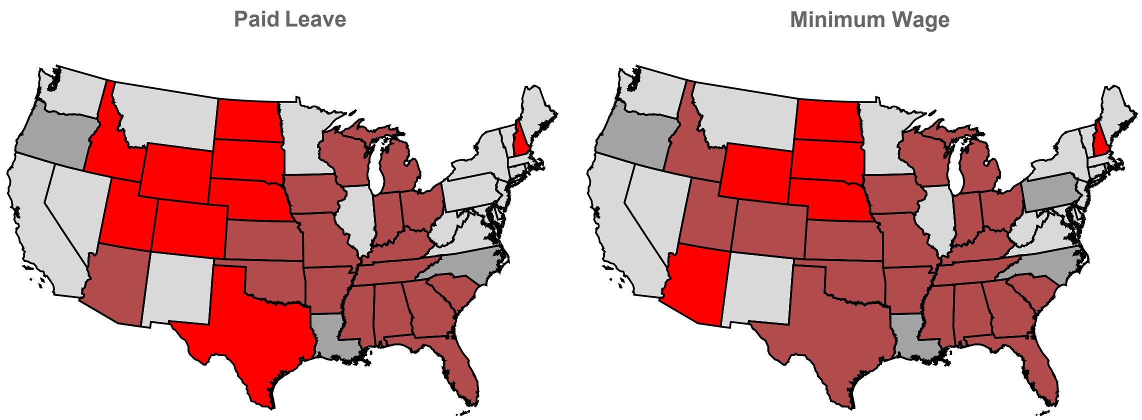


Figure 1: Preemption and GOP Trifectas. Darker shades denote the presence of preemption laws for municipal paid leave and minimum wage ordnances. Red shades denote Republican control of all legislative chambers and the governorship in 2017. Neither Alaska nor Hawaii had unified Republican control or preemption laws. Source: von Wilpert (2017).

Yet the above examples strongly suggest that the achievement of ideological outcomes rather than quality is often the central driver of centralization choices. The rationale for reducing California's 209(b) authority has seemingly little to do with revealed policy failures. If anything, the adoption of California's standards by 15 other states is evidence of the opposite. Likewise, the preemption of common and generally popular local sick leave and minimum wage laws was perfectly consistent with the well-established policy views of the governing party. Both examples also highlight the fact that changes in political preferences over time can affect the allocation of policy authority. Accordingly, forward-looking politicians must anticipate the durability of their chosen arrangements.

This paper develops a theory of the role of ideology in the centralization or decentralization of policy authority. It accounts for the observed variation in centralization structures by asking how a politician assigns authority across levels of government in the face of uncertainty over the preferences of future policy-makers. While a few other models have incorporated ideology in various ways (Volden, Ting, and Carpenter 2008, Crémer and Palfrey 1999, 2000), our focus on electoral uncertainty is to our knowledge both unique and empirically well-grounded.

Our model features policy-making in two localities over an infinite horizon. Policies are located on a unidimensional ideological policy space, and one locality is right-leaning while the other is left-

state acting as a potential "laboratory" for democracy (which need not be repeated here) is a staple in this literature.

leaning. Policies can have spillovers that induce some benefit from coordination. In each period a central or "federal" politician may centralize or decentralize each locality's policy-setting. We refer to this politician as an *executive*. Executives care about social welfare but also belong to either a right or left party and are therefore biased in favor of one locality. Their preferences may be more or less ideologically extreme than those of their local allies, and so the distance between left and right executives is a measure of national-level polarization. Under centralization, the executive chooses policy, while under decentralization, the locality chooses. Importantly, full centralization does not bind the executive to choose the same policies across both localities, and the executive can choose a mix of centralization and decentralization. The model suppresses uncertainty over the quality of policies, and thus in contrast with much of the existing literature, learning plays no role.

Before each period, an election determines the executive's party. Newly elected executives can be re-elected at most once and care about policies in their second period of life even if they lose. Thus, as is standard in models of federalism, executives have a two period time horizon. A key parameter in the model is institutional *rigidity*, which produces inertia in centralization decisions. With some probability, executives cannot change the polity's profile of centralization and decentralization and policy-making proceeds according to the previous period's arrangement. As the trifecta examples suggest, resolving fundamental (and perhaps constitutional) questions about the allocation of political authority requires strong political consensus. Rigidity thus captures the idea that opportunities for addressing centralization arrangements are rarer than those for conventional policy choices. High rigidity might correspond to a strong checks and balances systems, while Westminster parliamentary systems might have lower rigidity.

Electoral uncertainty and rigidity produce the central tension in the model. Centralization allows an executive to impose her ideal policy, which additionally helps to internalize policy externalities. However with high rigidity it also raises the risk of centrally-mandated policies set by the opposition. Centralization is therefore the clear choice for a re-elected executive. A less risky option is to centralize the ideologically distant locality while decentralizing the closer locality. This provides some insurance in the event of inertia and a bad electoral outcome. The reverse pattern of centralizing the closer locality and decentralizing the more distant one is never optimal. The least risky option is complete decentralization, which insulates policy completely from election outcomes.

The model shows that the conjunction of rigidity, polarization, and political competition produces greater decentralization. Generally, electorally secure incumbents adopt higher levels of centralization. Complete decentralization can be the result only under both high rigidity and high polarization. In equilibrium, the executive will often centralize the ideological opponent and decentralize the ideological ally. This prediction is consistent with the introductory examples, and more generally with the common U.S. practice of selectively granting state waivers for implementing alternatives to federal programs. Recent examples of such waivers include education and work requirements for recipients of the Medicaid health insurance program in several Republican-governed states during the Trump administration.[3] This contrasts with many existing models of federalism, which either assume that complete centralization or decentralization are the only policy options, or derive conditions under which these options are optimal.

As a final step, we perform a numerical welfare analysis to examine the performance of alternative centralization regimes. The main implication is that centralization choices by ideologically motivated politicians can be suboptimal from a social welfare perspective. Centralization is welfare enhancing when there are large policy spillovers across units and when central executives are not too polarized relative to the localities. Yet, when elite polarization is high, centralization allows executives to implement policies that are too extreme. Ideologically extreme executives will nonetheless centralize if they face positive electoral prospects or a term limit. Hence, in equilibrium, partial and complete centralization can arise even if full decentralization is socially optimal. Allowing central executives to centralize or decentralize policy-making authority over time can thus reduce welfare relative to institutional arrangements that fix the level of centralization over time.

The central logic that drives our model – that decentralization can insure against policy reversals when central executives expect to lose power – has received considerable attention in the empirical literature on decentralization. Table 1 shows that most of the evidence for this mechanism stems from Latin American countries with presidential systems, which plausibly fit our notion of rigidity. To our knowledge, O'Neill (2003, 2005) was the first to link political and fiscal decentralization to political turnover. She finds that incumbents in Bolivia, Colombia, Ecuador, Peru, and Venezuela

[3] The Obama administration did not allow such exemptions, and the Biden administration rescinded the waivers in 2021.

were more likely to implement major decentralization reforms when their party's national vote share decreased or the number of subnational electoral contests won by their party increased. To explain these patterns O'Neill posits that "[p]arties that find themselves in the executive of a strong, centralized government may rationally choose to decentralize power if they do not expect to retain the executive indefinitely..." (O'Neill, 2005, pp.16-17). Similarly, Moscovich (2015) argues that both President Néstor Kirchner in Argentina and President Ignacio Lula Da Silva in Brazil increased subnational spending when facing uncertainty over their electoral prospects at the national level.

Additional evidence for the role of election prospects in decentralization decisions comes from the behavior of legislators. Escobar-Lemmon (2003) finds that legislators from dominant national parties in Venezuela and Colombia were less likely to support decentralization initiatives than legislators from large parties whose chances of gaining central control were slim. Mardones (2007) shows that electoral success of their party on subnational levels makes legislators in Chile more likely to vote in favor of decentralization bills. Sorens (2009) provides evidence that similar logics may also apply outside Latin America. Focusing on the transfer of decision-making power to subnational units that pose a secessionist threat, he argues that decentralization in the UK, Spain, Italy, Belgium and France is driven by opposition parties who expect to be electorally strong in their respective regions. Dickovick (2007) makes similar arguments in the contexts of South Africa and Peru. In short, our model formalizes a popular intuition about the relationship between electoral uncertainty and decentralization that is well grounded in the available evidence.

Our paper joins a significant body of academic and policy analyses of the role of ideology in policy centralization (e.g., Bulman-Pozen 2014, von Wilpert 2017). On the theoretical side, Volden, Ting, and Carpenter (2008) include ideology in a model of policy learning, but focus primarily on the classic question of the adoption of high-quality policies. Closer in spirit to this paper, Crémer and Palfrey (1999) develop a model in which ideologically motivated citizens vote over centralization and representation schemes within a single period. Centralization in this environment is valuable for reducing policy risk. Crémer and Palfrey (2000) consider the incentive for policy-motivated citizens to impose welfare-reducing central mandates in a federal system. Grossback, Nicholson-Crotty, and Peterson (2004), Gilardi (2010), Volden (2015), and Butler *et al.* (2017) show empirically that ideology can affect policy diffusion across political subunits.

Table 1: Empirical evidence on the relationship between election prospects and decentralization

Study	Period	Context	Predictors	Outcome
O'Neill (2003, 2005)	1958-2000	Bolivia, Colombia, Ecuador, Peru, Venezuela	Vote share of president's party in last national elections and share of subnational elections won by president's party	Instances of political or fiscal decentralization reforms during president's term
Escobar-Lemmon (2003)	1979-1998	Colombia, Venezuela	Classification of legislator's party as nationally dominant, non-dominant or small	Legislator's authorship of bills that transfer power to subnational units
Mardones (2007)	1990-2006	Chile	Share of elected mayors that are from legislator's party	Legislator's support for decentralization bills
Moscovich (2015)	2000-2010	Argentina, Brazil	Difference between president's vote share and average co-partisan governor's vote share	Change in share of subnational spending during presidential term
Sorens (2009)	1970-2006	UK, Spain, Italy, Belgium, France	Parties' prospects of winning national or regional elections	Parties' support for decentralization of powers to regions that pose a secessionist threat
Dickovick (2007)	1980-2000	South Africa, Peru	Parties' prospects of winning national elections	Parties' support for regional decentralization

The literature on political centralization is by now vast enough to have spawned multiple review articles (Bednar 2011, Graham, Shipan, and Volden 2012, Mookherjee 2015, Gilardi 2016). In addition to models of policy experimentation in federal systems, our work is perhaps most closely related to a series of theoretical papers that address the effects of centralization on public goods provision (e.g., Oates 1999, Besley and Coate 2003, Hafer and Landa 2007, Tommasi and Weinschelbaum 2007, Kessler 2014). These papers examine a variety of institutional settings, but share a concern with the control of spillovers across units. Finally, Myerson (2006, 2021) endogenizes elections and politician performance in models of political centralization.

The paper proceeds as follows. Section 2 describes the basic model. Next, Section 3 presents our main results on centralization choices. Section 5 concludes.

2 Model

We consider an infinite horizon game of policy-making across two localities. In each period of the game the players are two localities, denoted by $i \in \{1, 2\}$, and a central "executive" player. In each period t, a policy $x_{i,t}$ is chosen for each locality i. Each locality i has an ideal point y_i, where $y_1 \leq y_2$ and, for tractability, $y_2 \equiv -y_1$. Executives have a time horizon of two periods, while localities can live for any finite number of periods. There is no discounting.

All players derive utility from policy choices. The per period utility that an actor with ideal point y derives from a policy $x_{i,t}$ implemented in locality i is given by

$$u\left(x_{i,t}, y\right) = -\left(x_{i,t} - y\right)^2 .$$

The one period preferences of any locality over a policy vector $\mathbf{x}_t = (x_{1,t}, x_{2,t})$ containing its own policy and the policy implemented in the other locality at any time are given by

$$U_i(\mathbf{x}_t, y_i) \equiv \alpha u\left(x_{i,t}, y_i\right) + (1-\alpha) u\left(x_{-i,t}, y_i\right), \tag{1}$$

where $\alpha \in (0, 1]$ is the weight that localities put on deviations of their own policies from their ideal point. Deviations of the policy implemented in the other locality from i's ideal point are weighted by $1-\alpha$. Thus α allows for localities to suffer from negative externalities of the policies implemented in other localities. We assume that localities choose policies myopically in each period. One way to interpret this assumption is that decision-makers on the locality level are replaced by identical versions of themselves in each period.

There are two types of executives, each of which is closer ideologically to one of the localities. Executives of type or party $j \in \{L, R\}$ have a time-invariant ideal point z_j. We assume that executive ideal points are symmetrically distributed around 0: $z_L \leq 0$ and $z_L = -z_R$. As a consequence, more extreme values of z_L imply more extreme values of z_R, and hence an increase in elite ideological polarization. In a given period party j executives earn the following utility from a policy vector $\mathbf{x}_t$:

$$U_j^e(\mathbf{x}, \mathbf{y}) \equiv \omega \sum_{i=1}^{2} u(x_i, z_j) + (1-\omega) \sum_{i=1}^{2} U_i(\mathbf{x}, y_i) \tag{2}$$

This utility function combines the executive's pure policy utility with her concern for locality-level welfare, where $\omega \in (0,1)$ is the common weight on the former. Note that the concern for welfare internalizes externalities across localities.

Every newly elected executive has a lifespan of two periods and automatically becomes her party's candidate in the subsequent election. Executives receive the utility given in Equation (2) regardless of whether they are in power. Whenever a party does not have an incumbent, a new party j candidate who may become the next executive is born. We denote the age of the executive in power in period t by $a_t \in \{1,2\}$.

Parties' electoral prospects vary across periods. Specifically, at the beginning of each period t, nature determines the probability p_t that a party L executive will be voted into office in the subsequent election, where $p_t \sim F(\cdot)$ is drawn randomly from non-degenerate distribution $F(\cdot)$ that has support $[0,1]$. The party R executive wins office in the following period with complementary probability $1-p_t$.

The incumbent executive observes p_t and may attempt to alter the status of centralization and decentralization across the polity. Each locality can be either *centralized* or *decentralized*. Centralization means that policy for this locality is chosen by the executive in power, while decentralization means that the locality itself chooses its policy. We denote the centralization status of each locality i in period t by $c_{i,t} \in \{0,1\}$, where 0 corresponds to decentralization and 1 corresponds to centralization. A *centralization profile* $\mathbf{c}_t = (c_{1,t}, c_{2,t})$ for period t is the set of centralization statuses for the localities. Let $\mathcal{C} = \{0,1\} \times \{0,1\}$ represent the set of possible centralization profiles.

Whether the executive in power in period t is able to change the centralization profile depends on institutional features and political conditions. With known probability $q > 0$, the executive in any given period is *weak* and unable to change the centralization profile, and thus $\mathbf{c}_t = \mathbf{c}_{t-1}$. With probability $1-q$, the executive is *strong* and free to choose $\mathbf{c}_t$. We refer to q as *rigidity.* For example, a highly rigid polity may be one with many institutional veto players or "checks and balances" that prevent rapid institutional changes. A consequence of such features is that centralization decisions made by one executive may persist over multiple periods. Once $\mathbf{c}_t$ has been determined, the actors that have policy-making authority simultaneously choose local policies. The period ends with an election.

The timing of the stage game can be summarized as follows:

1. Nature draws $p_t \sim F(\cdot)$.
2. With probability q the executive in power becomes *weak*, otherwise she becomes *strong*.
3. If the executive in power is *strong* she chooses $\mathbf{c}_t$, otherwise $\mathbf{c}_t = \mathbf{c}_{t-1}$.
4. Localities and the executive in power simultaneously choose $\mathbf{x}_t$ according to $\mathbf{c}_t$.
5. With probability p_t a party L executive is elected; otherwise a party R executive is elected.

We assume that in period 1 a party L executive is in office, and that the *status quo* centralization profile at the beginning of the game is $\mathbf{c}_0 = (0, 0)$ (full decentralization). Neither assumption affects the results.

We derive the unique subgame perfect Nash equilibrium in stage-optimal policy strategies. This requires that in each period, all players choose policies that are optimal for that period, and rules out contingent policy strategies.[4] Let H_t represent the history of play up to period t. In each period, a strong executive chooses a centralization profile $H_t \times \{1, 2\} \times (0, 1) \mapsto \mathcal{C}$ according to her age a_t and realized election probability p_t. Additionally, the executive in power chooses a policy for each centralized locality, represented by the mapping $H_t \times \{1, 2\} \times (0, 1) \times \{weak, strong\} \times \mathcal{C} \mapsto \mathbb{R}$. The mappings are analogous for policies that decentralized localities choose for themselves.

[4]For the localities, this is equivalent to living for only one period.

3 Equilibrium

3.1 Stage Preferences

We begin by characterizing the policy preferences of each actor in the stage game. For a locality, maximizing equation (1) simply produces its ideal point:

$$x_i^* = \arg\max_{x_i} U_i(\mathbf{x}, y_i) = y_i. \tag{3}$$

Next, maximizing Equation (2) produces an executive's optimal policy for a centralized locality:

$$x_i^* = \arg\max_{x_i} U_j^e(\mathbf{x}, \mathbf{y}) = \omega z_j + (1-\omega)\left[\alpha y_i + (1-\alpha) y_{-i}\right]. \tag{4}$$

Unlike the locality's optimal policy, the executive's takes externalities into account and thereby deviates from her ideal point. Additionally, the executive's optimal policy for each locality is independent of policies in the other locality, and thus does not depend on whether the other locality is centralized.

An important observation is that while centralization profiles may persist across periods, there is no policy persistence. Policy choices in a given period therefore have no implications for any player's future payoffs. Combined with stage-optimal strategies, this implies that conditional upon $\mathbf{c}_t$, the myopic optimal policies given in equations (3) and (4) fully describe all policy choices.

These policies shape the trade-off that a newly-elected party j executive faces when choosing a centralization profile. Substituting the optimal policies from equations (3) and (4) into equation (2) yields the utility of executive j under the optimal policy vector $\mathbf{x}_t^*$ chosen by the two localities and by an executive with ideal point z_k (where k may not be the same as j), given a centralization profile $\mathbf{c}_t$. We denote this utility by $U_{j,k}^e(\mathbf{x}_t^*(z_k, \mathbf{c}_t))$. Comparing the expressions for $U_{j,k}^e(\mathbf{x}_t^*(z_k, \mathbf{c}_t))$ across different centralization profiles and different executives provides two important facts that are summarized in Lemmas 1 and 2.

Lemma 1 shows how party control affects an executive's utility under each centralization profile.

Its proof, along with all other proofs, are in Appendix A.

Lemma 1 (Party Control)**.** *The differences between the stage utility of a party j executive when she is in power as opposed to when an executive from party $k \neq j$ is in power are as follows:*

$$U^e_{j,j}\left(\mathbf{x}^*_t(z_j, \mathbf{c}_t)\right) - U^e_{j,k}\left(\mathbf{x}^*_t(z_k, \mathbf{c}_t)\right) = \begin{cases} 0 & \text{if } \mathbf{c}_t = (0,0) \\ 4z_L^2\omega^2 & \text{if } \mathbf{c}_t = (0,1) \\ 4z_L^2\omega^2 & \text{if } \mathbf{c}_t = (1,0) \\ 8z_L^2\omega^2 & \text{if } \mathbf{c}_t = (1,1) \end{cases} \tag{5}$$

Party control of the executive makes no difference under complete decentralization (i.e., when $\mathbf{c}_t = (0,0)$). This is obviously the case because when both localities choose policies themselves, the executive becomes irrelevant. When at least one of the localities is centralized, the stakes of an election increase as executives become more polarized (lower z_L) and more ideologically- as opposed to welfare-motivated (higher ω). The benefits of winning elections are the same under the two partial centralization profiles and are maximized under full centralization, i.e. when $\mathbf{c}_t = (1,1)$. Thus *centralization raises the cost of losing the elections*, and decentralization can potentially play an insurance role for the age 1 executive.

The next lemma characterizes the executive's preferences over centralization profiles in a single period. We state the result from the perspective of a party L executive; a symmetric result holds for a party R executive. The result depends on the following threshold values of z_L:

$$\underline{z}_L = \left(2\alpha + \frac{2(1-\alpha)}{\omega} - 1\right) y_1, \tag{6}$$

$$\overline{z}_L = \frac{1}{3}\left(2\alpha + \frac{2(1-\alpha)}{\omega} - 1\right) y_1. \tag{7}$$

Note that the term in parentheses is grater than 1 and decreases in ω and α. It is straightforward to verify that $\underline{z}_L < \overline{z}_L < 0$.

Lemma 2 (Executive Stage Preferences)**.** *For a party L executive:*

(i) When a party L executive is in power, $(1,1) \succ (0,1) \succ (1,0) \succ (0,0)$.

(ii) When a party R executive is in power,

$$(1,1) \succ (0,1) \succ (1,0) \succ (0,0) \text{ if } \overline{z}_L \le z_L \le 0,$$

$$(0,1) \succ (1,1) \succ (1,0), (0,1) \succ (0,0) \succ (1,0) \text{ if } \underline{z}_L \le z_L \le \overline{z}_L,$$

$$(0,0) \succ (0,1) \succ (1,0) \succ (1,1) \text{ if } z_L \le \underline{z}_L.$$

Lemma 2 shows that an executive in power has a unique preference ordering over centralization profiles, with more centralization preferred to less. An executive can always increase her stage utility by centralizing a locality. Thus, an age 2 executive will attempt complete centralization. At the same time any executive prefers centralizing the more ideologically distant locality to centralizing the more ideologically close one. In what follows, we use the following terms for these localities:

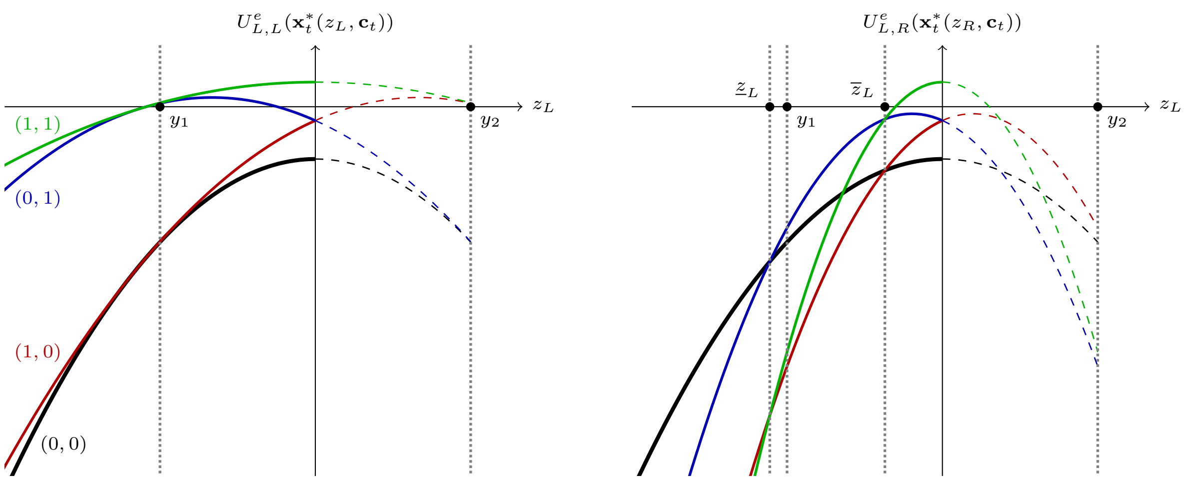
Definition 1 (Ideological ally and opponent)**.** *The* ideological ally *of an executive j is the locality with the smallest ideological distance from z_j. Analogously, the* ideological opponent *of an executive j is the locality with the largest ideological distance from z_j.*

The preference ordering is ambiguous when the other party's executive is in power. As before, the executive prefers centralizing the ideological opponent to centralizing her ally. All other comparisons depend on the degree of elite polarization, as given by the location of z_L relative to $\underline{z}_L$ and $\overline{z}_L$. When polarization is low ($\overline{z}_L \le z_L \le 0$), the executive out of power prefers full centralization, and when it is high ($z_L \le \underline{z}_L$), she prefers full decentralization. This suggests that as executives become more extreme relative to localities, they become increasingly inclined to let localities choose policies to guard against the prospect of being out of power.

Several observations about the cutoffs $\underline{z}_L$ and $\overline{z}_L$ follow directly from equations (6) and (7). First, $\underline{z}_L = 3\overline{z}_L$: Higher $\underline{z}_L$ shrinks the range of elite polarization in which at least partial centralization is supported by executives out of power. Second, full decentralization is supported by executives out of power only if the elites are more polarized than localities, i.e. $\underline{z}_L < y_1$. Finally, full centralization can always be preferred by moderate executives ($z_L > y_1 > \overline{z}_L$) if they are sufficiently welfare-motivated: $\omega < \frac{1-\alpha}{2-\alpha}$.

In sum, higher welfare motivations of executives (lower ω) and localities (lower α) align party preferences. This expands the range of elite polarization under which executives would support at least partial centralization even when the opposition holds executive power. By contrast, if executives and localities are more ideologically motivated (high ω and α), then there is high disagreement between executives from different parties. As a consequence, age 1 executives have incentives to "lock in" full decentralization or centralization of the ideological opponent, especially if the probabilities of both winning the upcoming election and strong executives are low.

Figure 2 illustrates both observations for a party L executive. (Stage preferences for party R executives are symmetric with $(0, 1)$ replaced by $(1, 0)$ and *vice versa*.) Panel (a) shows that when she is in power, a party L executive in power has a strict preference ordering over centralization profiles. Panel (b) shows that when R is in power, executive L's preference ordering changes as she becomes more extreme, i.e. as z_L decreases. Recall that since $z_R = -z_L$, a decrease in z_L implies more party polarization. We can also see that executive L prefers full decentralization only if her opponent is in power and parties are more extreme than the localities they represent.



(a) $(1, 1) \succ (0, 1) \succ (1, 0) \succ (0, 0)$ **(b)** $(0, 1) \succ (1, 0)$

Figure 2: Stage preferences of a party L executive for different executives in power and centralization profiles. Here, $\alpha = 5/6$, $\omega = 3/4$, and $y_1 = -3$. In both panels for the relevant domain of z_L: Solid black line depicts executive L's stage utility from centralization profile $\mathbf{c}_t = (0, 0)$, red – from $\mathbf{c}_t = (1, 0)$, blue – from $\mathbf{c}_t = (0, 1)$, and green – from $\mathbf{c}_t = (1, 1)$. $U^e_{L,R}(\mathbf{x}^*_t(z_R, \mathbf{c}_t))$ stands for utility of executive L if the executive R is in power and implements policy under centralization profile $\mathbf{c}_t$.

3.2 Infinite Horizon

In the full game, a party j executive who comes into power in period t faces the possibility that she may be replaced in the following period by an executive from the opposing party. If she is re-elected, then given the single period preferences of executives derived previously, any strong executive of age 2 will choose full centralization ($\mathbf{c}_{t+1} = (1,1)$) and implement her optimal policy (4) for both localities. If she is not re-elected, then the opposing party's executive will choose a new centralization profile if she is strong. This produces a distribution of possible centralization profiles in $t+1$, where $\mathbf{c}_{t+1}$ depends on the realization of p_{t+1}. We denote the period t executive's expected utility from this lottery by $\mathbb{E}_{p_{t+1}}\left[U^e_{j,k}(\mathbf{x}^*_{t+1}(z_k, \mathbf{c}_{t+1}))\right]$.

These elements allow us to fully describe the dynamic objective, $V_j(\mathbf{c}_t, p_t)$. By the symmetry of the game, we focus on a party L executive's problem. The expected lifetime utility of a strong party L executive who is newly elected in period t and observes her probability of re-election p_t is as follows:

$$V_L(\mathbf{c}_t, p_t) = U^e_{L,L}(\mathbf{x}^*_t(z_L, \mathbf{c}_t)) + p_t\Big[qU^e_{L,L}(\mathbf{x}^*_t(z_L, \mathbf{c}_t)) + (1-q)U^e_{L,L}(\mathbf{x}^*_t(z_L, (1,1)))\Big] + \\ (1-p_t)\Big[qU^e_{L,R}(\mathbf{x}^*_t(z_R, \mathbf{c}_t)) + (1-q)\,\mathbb{E}_{p_{t+1}}\left[U^e_{L,R}(\mathbf{x}^*_{t+1}(z_R, \mathbf{c}_{t+1}))\right]\Big]. \quad (8)$$

The expected lifetime utility of a party R executive can be expressed analogously by switching L and R subscripts and switching p_t and $1-p_t$ in the expression above.

An important observation is that the utility that an age 1 executive in period t will receive under a strong executive in period $t+1$ is independent of the period t centralization profile $\mathbf{c}_t$. A strong executive is never constrained by her predecessor's centralization profile. What matters for the age 1 executive's choice of centralization profile in period t is the case in which the $t+1$ executive is weak and thus constrained to choose policy under the previously implemented centralization profile $\mathbf{c}_t$.

Recall from Lemma 2 that $(1,0)$ is dominated for party L in the stage game. Hence, it can never be optimal for a first-period executive. In a similar fashion, $(0,1)$ is dominated for party R. Consequently, a party L executive of age 1 effectively chooses between three "increasing" levels of centralization ((0, 0), (0, 1), and (1, 1)). The first-period executive can maximize her utility in period t by implemeting full centralization (1, 1). In period $t+1$, however, the first-period executive may no longer be in office, and, as we know from Lemma 1, greater centralization increases the stakes of losing the election. Hence in deciding how much to centralize today, the first-period executive trades off the benefit of being able to choose policy today and potentially tomorrow with the risk of her opponent being able to set policies in centralized localities tomorrow.

How the age 1 executive resolves this trade-off will depend on her probability of re-election p_t. An executive that has high chances of being in office tomorrow may find it optimal to choose more centralized institutional arrangements, while decentralization will be appealing to a first-period executive that faces an adverse electoral environment. In line with this reasoning, the expected lifetime utility of a strong age 1 executive increases linearly with p_t and more so, the higher the level of centralization that the executive chooses in period t. In other words, *the benefits of greater centralization are increasing in the executive's electoral prospects*, and thus in equilibrium centralization must be monotonically increasing in p_t.

To derive conditions under which a party j executive switches between centralization profiles, we find the values of p_t at which she is indifferent between centralization profiles. Equating different values of $V_j(\mathbf{c}_t, p_t)$ produces two important cut-offs on the probability of re-election. We denote these cut-offs $\underline{p}$ and $\overline{p}$.

The executive from party L is indifferent between (0, 0) and (0, 1), and the executive from party R is indifferent between (0, 0) and (1, 0) when their probability of re-election is:

$$\underline{p} = 1 - \frac{1+q}{q} \left(\frac{z_L + (2\alpha + 2(1-\alpha)/\omega - 1)\, y_1}{2z_L} \right)^2 . \tag{9}$$

Analogously, the executive from party L is indifferent between (1, 1) and (0, 1), and the executive from party R is indifferent between (1, 1) and (1, 0), when their probability of re-election is:

$$\overline{p} = 1 - \frac{1+q}{q} \left(\frac{z_L - (2\alpha + 2(1-\alpha)/\omega - 1)\, y_1}{2z_L} \right)^2 . \tag{10}$$

The following result summarizes the optimal choice of centralization profile by *strong* party j

executives given their electoral prospects.

Proposition 1 (Optimal Centralization)**.** *The optimal centralization profile for a strong age* 1 *executive from party* L *is:*

$$\mathbf{c}_L^* = \begin{cases} (0,0) & \text{if } p_t < \underline{p} \\ (0,1) & \text{if } \underline{p} \leq p_t < \overline{p} \\ (1,1) & \text{if } p_t \geq \overline{p}. \end{cases} \tag{11}$$

For a strong age 1 party R executive, the optimal centralization profile $\mathbf{c}_R^*$ is symmetric, replacing $(0,1)$ by $(1,0)$ and p_t by $1-p_t$.

Proposition 1 confirms our earlier intuition about the insurance value of decentralization: When strong executives face a low probability of re-election, they respond by decentralizing the ideologically closer locality ($\mathbf{c}_t = (0,1)$ for executive L) or even both localities ($\mathbf{c}_t = (0,0)$). With some rigidity, this deprives their opponent of future policy-making power. By contrast, a high probability of re-election makes executives more "greedy": They might attempt full centralization, anticipating that they are likely to remain in office but might not be able to change the centralization level because of rigidity.

It is clear from equations (9) and (10) that $\underline{p} < \overline{p} \leq 1$. Thus there always exists an election probability for which strong executives will at least weakly prefer full centralization. Intuitively, full centralization has few downsides for an executive who is certain of re-election. It is furthermore straightforward to find conditions under which $\overline{p} \leq 0$, so that a party *only* chooses full centralization in equilibrium. This implies that full decentralization is never optimal for all realized re-election probabilities. For an incumbent executive to prefer full decentralization for some re-election probabilities we need $\underline{p} \geq 0$, which is not guaranteed to hold.

What conditions determine equilibrium centralization? The answer depends on the behavior of the thresholds $\overline{p}$ and $\underline{p}$. To characterize this behavior, it will be helpful to distinguish between two kinds of polities:

Definition 2 (Rigidity)**.** *A polity has high rigidity if* $q > \frac{1}{3}$ *and low rigidity if* $q < \frac{1}{3}$.

Figure 3 plots two cases of $\overline{p}$ and $\underline{p}$ as a function of z_L, the ideal point of a left executive. The upper and lower panels consider high and low rigidity environments, respectively. Both panels show that $\overline{p}$ first increases and then decreases with z_L. Put differently, as executives become less polarized, partial centralization (**blue** regions) gains in attractiveness relative to full centralization (**red** regions) at first, but ultimately loses its value. This non-monotonicity stems from changes in the trade-off that age 1 executives face in deciding whether to centralize ideological allies. On the one hand, decentralizing this locality prevents the executive from setting its policy today and potentially in the future if she remains in power. On the other hand, decentralizing an ideological ally can potentially prevent the opposition from setting extreme policies in the future. As very extreme executives moderate and move towards their ideological allies, partial centralization becomes more attractive relative to full centralization. This dynamic reverses as executives become ideologically close to and ultimately more moderate than their ideological allies. As moderation takes the executive further away from her ideological ally and closer to the opposition executive, decentralizing the ally becomes relatively more costly. When the executives are sufficiently close to each other ($z_L \geq z_c$), $\overline{p}$ drops below 0 and full centralization is always preferred.

For $z_L < z_c$, the character of the equilibrium depends on whether rigidity is high or low. When rigidity is low, future executives will likely be able to change the centralization profile, and so there is no point for an incumbent to give up policy-making authority in order to "lock in" decentralization. Complete decentralization is never optimal and accordingly, $\underline{p} < 0$ across the entire range of z_L. By contrast, partial centralization may be optimal since $\overline{p} > 0$ for some interval of z_L below z_c. The reason is that decentralizing an ideological ally will be almost costless for an ideologically proximate incumbent executive. As executives become more extreme than their ideological allies, however, the value of partial centralization dissipates rapidly if rigidity is low. Given that partial centralization is unlikely to survive into the future, extreme executives are hesitant to give up present policy-making authority even to moderate localities on their side of the ideological spectrum.

Only high rigidity allows for complete decentralization. Under high rigidity, $\underline{p}$ is positive for extreme values of z_L. This captures the ability of decentralization to insure against adverse electoral outcomes. An extreme age 1 executive who is pessimistic of re-election can exploit rigidity to preserve her ideological ally's policy autonomy. As executives become more moderate, $\underline{p}$ decreases because they become less concerned about the possibility of centralization by her opponent. This increases the attractiveness of partial centralization. The value of $\underline{p}$ is also increasing in rigidity q, because the insurance value of decentralization depends on the persistence of institutional mechanisms.

Proposition 2 collects these cases to state the relationship between rigidity, elite polarization and optimal centralization decisions. It rests on two critical values of polarization, expressed in terms of z_L. There is a z_c such that $\overline{p} < 0$ for all $z_L > z_c$, regardless of rigidity. And there is a z_p such that for all $z_L < z_p$, $\underline{p} > 0$ when rigidity is high, and $\overline{p} < 0$ when rigidity is low. The main result is that full decentralization requires both high rigidity and elite polarization ($z_L < z_p$). Age 1 executives in the interval $[z_p, z_c]$ partially centralize if they are pessimistic of re-election, and fully centralize if they are optimistic. Full centralization across the range of p_t is possible under low polarization ($z_L > z_c$) or low rigidity and high polarization. Otherwise, the relationship between full versus partial centralization and polarization is non-monotonic. As before, symmetric statements hold for a newly elected party R executive, replacing $(0, 1)$ by $(1, 0)$ and p_t by $1 - p_t$.

Proposition 2 (Elite Polarization and Centralization)**.** *There exists z_c and z_p, where $z_p < z_c$, such that:*

(i) if $z_L \geq z_c$, then $\overline{p} \leq 0$ and thus $c^* = (1, 1)$.

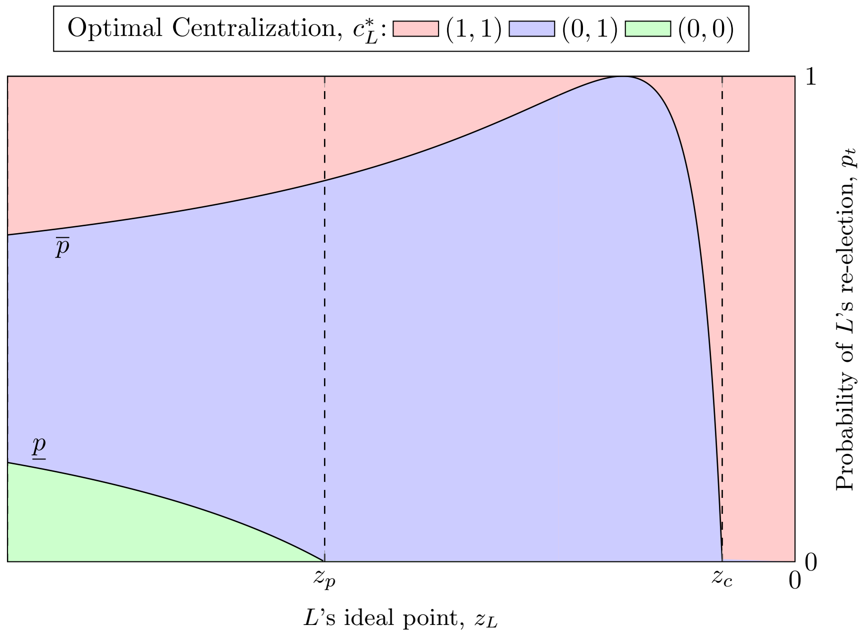
(ii) if $z_L \in [z_p, z_c)$, then $\overline{p} > 0 > \underline{p}$ and thus $c^* \neq (0, 0)$.

(iii) if $z_L < z_p$ and rigidity is low, then $\overline{p} < 0$ and thus $c^* = (1, 1)$.

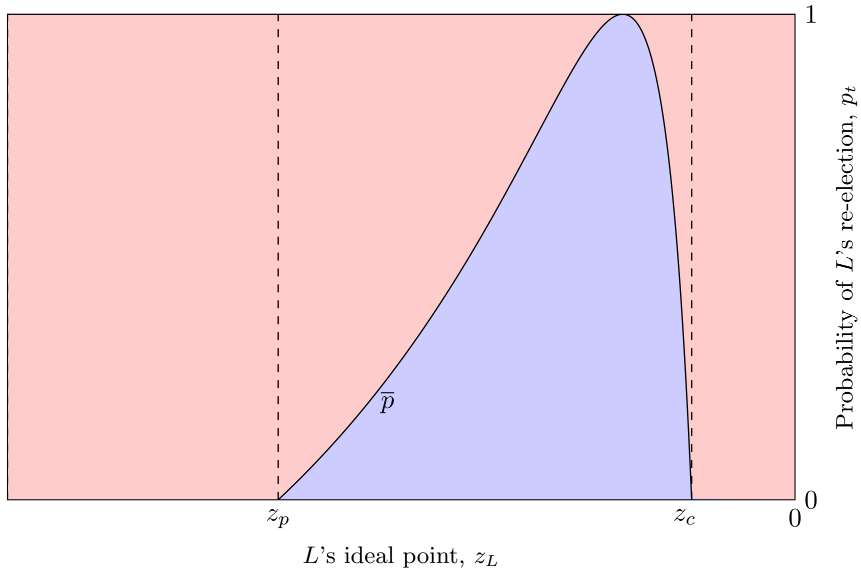
(iv) if $z_L < z_p$ and rigidity is high, then $\underline{p} > 0$ and thus all centralization profiles are possible.

The calculated values of z_c and z_p in the proof of Proposition 2 allow us to be more specific about the polarization levels required for different centralization profiles of interest. In particular, it is easily shown that full decentralization requires $z_L < y_1$: Executives must be *more* extreme than the localities.

As Figure 3 illustrates, Propositions 1 and 2 broadly imply that higher rigidity increases decentralization by insecure incumbents. Yet the main qualitative change of introducing full decentralization depends on high levels of elite polarization as well. Our results are therefore consistent with the evidence on how electoral prospects affect centralization decisions in countries with rigid presidential systems (O'Neill 2003, 2005), but suggest that a fuller exploration would additionally require data on the ideological dimension of party competition.



(a) High rigidity ($q = 7/8 > 1/3$): Implementing $(0,0)$ as an insurance against policy reversals can be beneficial if the polity is rigid and executives are ideologically polarized.



(b) Low rigidity ($q = 1/8 < 1/3$): Implementing $(0,0)$ as an insurance against policy reversals is not beneficial if institutional arrangement is not stable, so $(0,1)$ becomes a "middle ground."

Figure 3: Rigidity, polarization and centralization preferences. Here, $\alpha = 5/8$, $\omega = 1/2$, and $y_1 = -5/4$. Colors represent optimal centralization profile that maximizes lifetime expected utility of age 1 L executive. Solid black lines represent $\underline{p}$ and $\overline{p}$.

4 Welfare

Our preceding results do not answer the question of when policy outcomes are socially optimal. This section presents two results that evaluate the welfare consequences of endogenous centralization choices. The first looks at the optimal policy choices within a given period. The second presents equilibrium performance over time, at least for parts of the parameter space and under uniformly distributed election probabilities.

An initial issue is the selection of a welfare standard. Consistent with the executive's valuation of locality utility in the basic model, we use the sum of utilities of the two localities, defined as follows:

$$\begin{aligned} W(\mathbf{x}) &= \sum_i U_i(\mathbf{x}, y_i) \\ &= \alpha \sum_i u\left(x_{i,t}, y_i\right) + (1-\alpha) \sum_i u\left(x_{i,t}, y_{-i}\right). \end{aligned}$$

The expression for $W(\mathbf{x})$ makes clear that welfare is independent of election probabilities. Since equilibrium strategies in our game depend on election prospects, deviations from welfare-maximizing centralization profiles will be inevitable. Welfare can depend on the executive's preferences, as x_t might depend on z_L when there is some centralization.

4.1 One Period

As in the preceding analysis, we focus without loss of generality on the case of a party L executive. For each centralization profile, we can substitute the equilibrium policy choices into the localities' utility functions to arrive at the following welfare values.

$$W_c(\mathbf{x}^*) = \begin{cases} 8(\alpha-1)y_1^2 & \mathbf{c}_t = (0,0) \\ -\left(4\alpha^2(\omega^2-1) - 4\alpha\omega^2 + \omega^2 + 4\right) y_1^2 + 2(1-2\alpha)\omega^2 y_1 z_L - \omega^2 z_L^2 & \mathbf{c}_t = (0,1) \\ -\left(4\alpha^2(\omega^2-1) - 4\alpha\omega^2 + \omega^2 + 4\right) y_1^2 - 2(1-2\alpha)\omega^2 y_1 z_L - \omega^2 z_L^2 & \mathbf{c}_t = (1,0) \\ -2\left(4\alpha^2(\omega^2-1) - 4\alpha(\omega^2-1) + \omega^2\right) y_1^2 - 2\omega^2 z_L^2 & \mathbf{c}_t = (1,1) \end{cases} \tag{12}$$

Independently of the centralization profile, the "first best" policies that maximize $W(\mathbf{x})$ are $-y_1(1-2\alpha)$ and $y_1(1-2\alpha)$ for localities 1 and 2, respectively, which result in $W(\mathbf{x}) = -8y_1^2(1-\alpha)\alpha$. The values of $W_c(\mathbf{x}^*)$ can only attain the first best if $\alpha = 1$.

The optimal centralization profile from a welfare perspective depends on two thresholds for α. First, when spillovers are very low ($\alpha > (2+\omega)/(2+2\omega)$), full decentralization dominates full centralization. Low spillovers reduce the value of coordination and thus the benefit of centralization. This threshold depends on the extent to which the executive values local policy utility (ω), since an executive who cares more about her own utility reduces the scope for welfare improvements from centralization.

Second, when $\alpha > 1/2$, welfare is higher under centralization profile $(1,0)$ than under $(0,1)$. This ordering is reversed when $\alpha < 1/2$. Centralizing an opposed locality (i.e., locality 2) under low spillovers reduces welfare because it allows the executive to manipulate its policy excessively. By contrast, high spillovers attenuate the welfare loss from setting locality 2's policy closer to locality 1's policy.

The expressions in equation (12) allow us to derive the following result on welfare-maximizing centralization profiles.

Proposition 3 (Static Welfare)**.** *If $\alpha > \frac{2+\omega}{2+2\omega}$, then the welfare maximizing centralization profile in a single period is:*

$$\mathbf{c}_W^* = \begin{cases} (0,0) & \text{if } z_L < \frac{y_1(2\alpha(\omega-1)-\omega+2)}{\omega} \\ (1,0) & \text{otherwise.} \end{cases}$$

If $\alpha \in \left(\frac{1}{2}, \frac{2+\omega}{2+2\omega}\right]$, the welfare maximizing centralization profile in a single period is:

$$\mathbf{c}_W^* = \begin{cases} (0,0) & \text{if } z_L < \frac{y_1(2\alpha(\omega-1)-\omega+2)}{\omega} \\ (1,0) & \text{if } z_L \in \left[\frac{y_1(2\alpha(\omega-1)-\omega+2)}{\omega}, \frac{y_1(-2\alpha(\omega+1)+\omega+2)}{\omega}\right) \\ (1,1) & \text{otherwise.} \end{cases}$$

If $\alpha \leq \frac{1}{2}$, then welfare maximizing centralization profile in a single period is:

$$\mathbf{c}^*_W = \begin{cases} (0,0) & \text{if } z_L < \frac{y_1(2\alpha(1-\omega)+\omega+2)}{\omega} \\ (0,1) & \text{if } z_L \in \left[\frac{y_1(-2\alpha(\omega+1)+\omega+2)}{\omega}, \frac{y_1(2\alpha(1-\omega)+\omega-2)}{\omega}\right) \\ (1,1) & \text{otherwise.} \end{cases}$$

Complete decentralization always maximizes welfare when z_L is sufficiently extreme. This coincides with the necessary condition for equilibrium complete decentralization in Proposition 2. And for all but very high values of α, welfare-maximizing complete centralization is also possible when elite polarization is low, as Proposition 2 also suggests. However, by Proposition 1, these profiles are only chosen under specific electoral conditions, and it is always possible for an executive not to choose the welfare maximizing profile.

The biggest distortions to welfare occur when $\alpha > 1/2$. In these cases, welfare maximization calls for centralizing the "friendlier" locality over a range of z_L, but the party L executive never does this in equilibrium. Thus, roughly speaking, welfare-maximizing profiles are more likely when $\alpha < 1/2$, as high spillovers ensure the existence of some realized re-election probabilities that will result in the choice of $\mathbf{c}^*_W$. Unfortunately, $\alpha < 1/2$ seems unlikely in a two-locality world, as it implies that each locality cares about the other locality's policy more than its own.

4.2 Dynamic Welfare

Finally, we provide an exploratory analysis of welfare performance over time. To do so, we assume that re-election probabilities are drawn from a standard uniform distribution, i.e., $p_t \sim \text{U}[0,1]$. Under this assumption, we derive an expression for the average equilibrium welfare over an infinite horizon. We compare equilibrium welfare to three benchmark scenarios that fix the centralization profile for all t: (i) centralization, where the executive in power sets policy in both states, i.e., $\mathbf{c}_t = (1,1)$ for all t; (ii) partial centralization, where executives always set policy in one state but not the other, i.e., $\mathbf{c}_t = (0,1)$ or $\mathbf{c}_t = (1,0)$; and (iii) decentralization, where both localities always set their own policies, i.e., $\mathbf{c}_t = (0,0)$.

If both states are always centralized or never centralized, then the same level of welfare results in every period. Long-run average welfare under cases (i) and (iii) is thus given by, respectively, $\Omega_{11} = W_{11}(\mathbf{x}^*)$ and $\Omega_{00} = W_{00}(\mathbf{x}^*)$. For case (ii), where only one state is centralized, welfare in each period depends on the executive in power. The reason is that the policy that an executive implements in an ideologically allied centralized state differs from that which she chooses for her ideological opponent. Under the assumed symmetric election probabilities, each executive is in power half of the time in expectation. Long-run average welfare under partial centralization is given by

$$\Omega_{10/01} = \frac{1}{2}\left(W_{10}(\mathbf{x}^*) + W_{01}(\mathbf{x}^*)\right).$$

To derive long run average welfare, we model equilibrium play as a Markov chain that moves through states that are defined by the age $a \in \{1, 2\}$ of the executive in power, the type $j \in \{L, R\}$ of the executive, by whether the executive is strong or weak, and, if the executive is weak, by the centralization profile $\mathbf{c} \in \mathcal{C}$ under which policy is being chosen. Conditional on the executive's age and type, all periods in which the executive is strong can be grouped together as one state. To see why, recall that the centralization profile that strong executives implement depends only on their age, type, and realized re-election probability but not on the previous period's centralization profile. Since there are four possible centralization profiles, the Markov chain has twenty states; $2 \times 2 \times 4 = 16$ possible states in which the executive is weak and $2 \times 2 = 4$ possible states in which the executive is strong. States with a strong executive of age a from party j are denoted by ajs. States with a weak executive of age a from party j and a centralization profile c are denoted by $ajwc$.

Our equilibrium characterization allows us to derive the probability $\rho_{\sigma,\sigma'}$ that play moves from any state σ to any other state σ'. The transition probabilities are summarized in Appendix B. Several facts facilitate this exercise. First, since weak executives cannot change the centralization profile, there can be no transition from a state with a given centralization profile to a state with a weak executive and a different centralization profile. Second, since executives have a two term limit, any state with an age 2 executive must transition to a state with an age 1 executive. Conversely, a state with an age 1 executive transitions to a state with an age 1 or 2 executive depending on election result. Finally, the probability of transitioning from any state into a state with a weak executive is simply q. These facts imply, for example, that a transition between states in which an executive is re-elected and becomes weak occurs with probability $\frac{1}{2}q$.

The transition probabilities are slightly more complicated for states with a strong age 1 executive, because the choice of centralization profile by a strong age 1 executive depends on the realization of her re-election probability p_t. For example, the probability of moving from a state with a strong age 1 executive from party L to a state with a weak age 1 executive from party R that has to choose policy under $\mathbf{c}_t = (0, 1)$ is given by

$$\rho_{1Ls,1Rw01} = q\left(\overline{p} - \underline{p}\right)\left(1 - \frac{\underline{p} + \overline{p}}{2}\right).$$

Here, q is the probability that the period $t+1$ executive is weak, $\overline{p} - \underline{p}$ is the probability that p_t falls in the range in which a strong age 1 party L executive finds it optimal to implement $\mathbf{c}_t = (0, 1)$, and $1 - \frac{\underline{p}+\overline{p}}{2}$ is the conditional probability that this executive loses the election. This expression presumes that $0 \leq \underline{p} \leq 1$ and $0 \leq \overline{p} \leq 1$. Recall, however, that one or both of these cutoffs can be negative, so that a strong age 1 executive would either never choose full decentralization or always choose full centralization in equilibrium. Transition probabilities for these cases can be found by setting $\underline{p} = 0$ or $\overline{p} = 0$, respectively.

With the transition probabilities in hand, we calculate the long run probability of the system being in each of the twenty states by solving the following system of equations

$$\boldsymbol{\pi}\boldsymbol{R} = \boldsymbol{\pi}.$$

Here, $\boldsymbol{\pi}$ is the vector of long-run probabilities and $\boldsymbol{R}$ the matrix of transition probabilities.[5] Since welfare in any particular period depends only on the centralization profile implemented in that period, equilibrium welfare can be expressed as a function of four long-run probabilities: the long-run probability of being in a state with full centralization, ϕ_{11}, a state with full decentralization, ϕ_{00}, a state with partial centralization where the ideological ally of the executive in power is centralized,

[5]It is straightforward to show that $\boldsymbol{R}$ is positive recurrent and thus a unique stationary distribution $\boldsymbol{\pi}$ exists.

ϕ_{10}, and a state with partial centralization where the ideological opponent of the executive in power is centralized, ϕ_{01}.[6] To calculate each of these four probabilities, we sum the long-run probabilities of all states with the relevant centralization profile, taking into account that the centralization profile implemented by a strong age 1 executive depends on the executive's realized election probability. For example, ϕ_{00}, the long-run probability of being in a state with full decentralization, is given by

$$\phi_{00} = \pi_{1Lw00} + \pi_{1Rw00} + \pi_{2Lw00} + \pi_{2Rw00} + (\pi_{1Ls} + \pi_{1Rs})\underline{p}.$$

Here, the first four terms refer to the long-run probabilities of being a weak executive from, respectively, the right or left party and of, respectively, age 1 or 2 that inherits full decentralization. π_{1Ls} and π_{1Rs} are the long-run probabilities of being a strong age 1 executive from the left and right, respectively. $\underline{p}$ is the probability that such executives decide to implement full decentralization.

Using this procedure, we arrive at the following long-run probabilities:[7]

$$\begin{aligned}
\phi_{11} &= 1 - \frac{2}{3}\overline{p} \\
\phi_{00} &= \frac{2}{3}\underline{p} \\
\phi_{10} &= \frac{1}{3}(\overline{p} - \underline{p})\left((2 - \overline{p} - \underline{p})q + (\overline{p} + \underline{p} - 1)q^2\right) \\
\phi_{01} &= \frac{1}{3}(\overline{p} - \underline{p})\left(2 - (2 - \overline{p} - \underline{p})q - (\overline{p} + \underline{p} - 1)q^2\right).
\end{aligned}$$

Finally, long-run equilibrium welfare can be calculated as

$$\Omega_e = \phi_{11}W_{11}(\mathbf{x}^*) + \phi_{00}W_{00}(\mathbf{x}^*) + \phi_{10}W_{10}(\mathbf{x}^*) + \phi_{01}W_{01}(\mathbf{x}^*). \tag{13}$$

We seek to compare long-run equilibrium welfare to welfare under the three benchmarks that fix

[6] Note that a state with partial centralization where the ideological ally of the executive in power is centralized can be a state in which a left-wing executive is in power and state 1 is centralized or a state in which a right-wing executive is in power but state 2 is centralized. In keeping with the rest of the paper, our notation takes the perspective of a left-wing executive. Hence, we denote the long-run probability of being in a state where the ideological ally is centralized by ϕ_{10} and the long-run probability of being in a state in which the ideological opponent is centralized by ϕ_{01}.

[7] The long-run probabilities for the case in which only full and partial centralization are possible can be found, again, by setting $\underline{p} = 0$ in the above expressions. Note that if we set $\underline{p} = \overline{p} = 0$, then these long-run probabilities simplify to $\phi_{11} = 1$ and $\phi_{00} = \phi_{10} = \phi_{01} = 0$, i.e., the case in which only full centralization is possible.

the centralization profile over time. This comparison turns out to be complex and does not yield tractable results that pertain to the entire parameter space. Nonetheless, Proposition 4 provides analytical results for the simpler case where $z_L < z_p$. As Proposition 2 (iv) shows, this condition implies that all centralization profiles are possible in equilibrium. Below, we also provide some suggestive numerical results which show that similar patterns can arise outside this specific case.

Proposition 4 (Dynamic Welfare)**.** *Under high rigidity and $z_L < z_p$, $\Omega_{00} > \Omega_{10/01} > \Omega_e > \Omega_{11}$.*

Proposition 4 states that under high rigidity and executive polarization, fixing full decentralization brings the highest social welfare, while fixing full centralization brings the lowest. The long-run equilibrium welfare is always bounded by partial centralization and full centralization.

These results seem intuitive in light of the assumed extremity of executives. Under high elite polarization, full centralization leads to extreme policies. The equilibrium performs better than full centralization, since other centralization profiles will be implemented in equilibrium with non-zero probability. At the same time, on the equilibrium path full centralization will be observed more frequently than other centralization profiles, since all age 2 executives implement $\mathbf{c}_t = (1, 1)$. Hence, equilibrium welfare is lower than those under the other benchmarks.

What happens if elite polarization is moderate or low? Figure 4 shows that the ordering of benchmark and equilibrium welfare levels from Proposition 4 can remain the same across the whole range of executive ideal points z_L. The figure plots a case with high rigidity in which policy spillovers are very low ($\alpha = 9/10$), which makes centralization less attractive from a welfare perspective, and executives are highly motivated by self-interest ($\omega = 9/10$), which makes them implement policies closer to their ideal points in centralized localities. Fixing full decentralization then maximizes welfare and full centralization minimizes it, even as executives become very moderate. If z_L is such that executives choose only partial or full centralization in equilibrium ($z_p \leq z_L < z_c$), the equilibrium welfare level remains bounded by the partial and full centralization benchmarks. When executives are very moderate ($z_c \leq z_L$), the equilibrium coincides with the full centralization benchmark and thus performs worst.

That said, the pattern illustrated by Proposition 4 and this figure does not generalize to the entire parameter space. Many orderings are possible. For example, as is apparent from Proposition 3, full

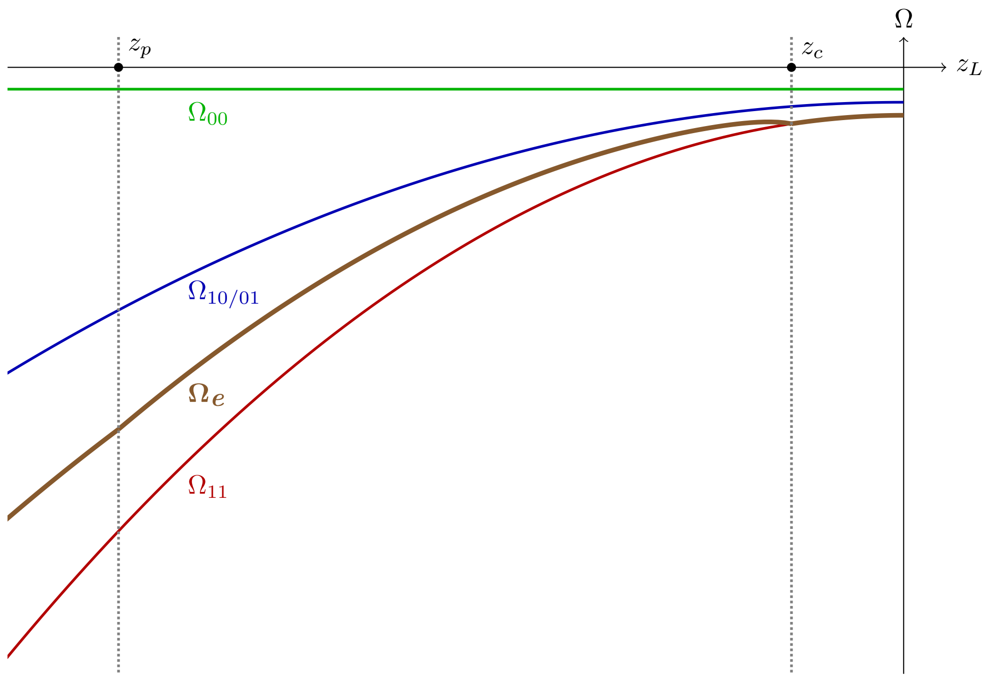


Figure 4: Long-run average welfare as a function of party L's ideal point. Here, $\alpha = 9/10$, $\omega = 9/10$, $y_1 = -3$, and $q = 4/5$. The solid green line depicts long-run average welfare from centralization profile $\mathbf{c}_t = (0,0)$ for all t, blue – from either $\mathbf{c}_t = (0,1)$ or $\mathbf{c}_t = (1,0)$ for all t, red – from $\mathbf{c}_t = (1,1)$ for all t. The solid brown line depicts long-run average welfare in equilibrium.

centralization can be the preferred institutional arrangement for sufficiently moderate executives, especially if policy spillovers are high. In such cases, equilibrium behavior can result in high levels of welfare, because it will sometimes coincide with the full centralization benchmark. Moreover, there are cases in which the equilibrium performs better than all benchmarks, even at intermediate levels of executive polarization where the equilibrium does not coincide with full centralization. Yet, there also exist cases in which the equilibrium performs worst.

5 Discussion

The allocation of policy-making authority is a key factor in determining policy outcomes, and therefore the question of centralization versus decentralization has long been a concern to institution designers. An extensive literature has addressed the role of decentralization in producing externalities, generating information, and diffusing policies. However, as recent examples make clear, ideology is often a primary driver of such decisions. This paper isolates the roles of ideology and electoral turnover to generate a purely political account of centralization choices.

Using a simple infinite horizon policy-making model, we show that ideological polarization and re-election prospects play important roles in pushing politicians away from fully centralized policy. The central intuition is that decentralization can allow current politicians to insure against future politicians' efforts at imposing unfavorable policies. For this mechanism to work, institutional rigidities such as those found in presidential systems are crucial. In a system without rigidities or under unified government, majorities can easily undo decentralization and insurance is impossible. But in an environment with rigidities, centralization is increasing in an incumbents' likelihood of re-election. We show that partial decentralization is the norm, with complete decentralization predicted only when polarization is very high. These comparative statics contrast sharply with those of models based on experimentation, in which central policies ultimately reflect good experimental results. That centralization decisions in our model reflect politicians' re-election prospects also means that they are not always optimal from a social welfare perspective. The adjustments made by ideologically motivated politicians can reduce social welfare when compared to institutions that fix the level of centralization over time.

Our framework is simple enough to allow the exploration of many institutional features that we have so far suppressed. Two directions immediately stand out. First, many political systems feature systematic asymmetries in either ideologies or partisan balance. The "trifecta" states mentioned in the introduction illustrate the dilemma of liberal cities in persistently conservative states in the U.S. Second, election probabilities could be endogenized by allowing a median voter to arise from one of the two localities in each period. The need to design policies to cater to this voter might help to discipline central politicians. Both features could further illuminate the implications of interactions between institutions, ideology, and centralization for citizen welfare.

Appendix

A Proofs of Theoretical Results

Proof of Lemma 1. Using the expressions for $U^e_{j,k}(\mathbf{x}^*_t(z_k, \mathbf{c}_t), \mathbf{y})$ and substituting for $y_2 = -y_1$ and $z_R = -z_L$ yields

For executive L:

$$U^e_{L,L}(\mathbf{x}^*_t(z_L, \mathbf{c}_t)) = \begin{cases} y_1^2(-8\alpha(\omega-1)+6\omega-8) - 2\omega z_L^2, & \text{if } \mathbf{c}_t = (0,0) \\ y_1^2\left((\omega-2\alpha(\omega-1))^2 + 2(\omega-2)\right) + & \\ \qquad 2\omega y_1 z_L(2\alpha(\omega-1)-\omega+2) + (\omega-2)\omega z_L^2, & \text{if } \mathbf{c}_t = (0,1) \\ y_1^2\left((\omega-2\alpha(\omega-1))^2 + 2(\omega-2)\right) + & \\ \qquad 2\omega y_1 z_L(-2\alpha(\omega-1)+\omega-2) + (\omega-2)\omega z_L^2, & \text{if } \mathbf{c}_t = (1,0) \\ 2(\omega-1)\left(y_1^2(4(\alpha-1)\alpha(\omega-1)+\omega) + \omega z_L^2\right), & \text{if } \mathbf{c}_t = (1,1) \end{cases}$$

$$U^e_{L,R}(\mathbf{x}^*_t(-z_L, \mathbf{c}_t)) = \begin{cases} y_1^2(-8\alpha(\omega-1)+6\omega-8) - 2\omega z_L^2, & \text{if } \mathbf{c}_t = (0,0) \\ y_1^2\left((\omega-2\alpha(\omega-1))^2 + 2(\omega-2)\right) + & \\ \qquad 2\omega y_1 z_L(2\alpha(\omega-1)-\omega+2) - \omega(3\omega+2) z_L^2, & \text{if } \mathbf{c}_t = (0,1) \\ y_1^2\left((\omega-2\alpha(\omega-1))^2 + 2(\omega-2)\right) + & \\ \qquad 2\omega y_1 z_L(-2\alpha(\omega-1)+\omega-2) - \omega(3\omega+2) z_L^2, & \text{if } \mathbf{c}_t = (1,0) \\ 2(\omega-1)y_1^2(4(\alpha-1)\alpha(\omega-1)+\omega) - 2\omega(3\omega+1) z_L^2, & \text{if } \mathbf{c}_t = (1,1) \end{cases}$$

For executive R:

$$U^e_{R,R}(\mathbf{x}^*_t(-z_L,\mathbf{c}_t)) = \begin{cases} y_1^2(-8\alpha(\omega-1)+6\omega-8)-2\omega z_L^2, & \text{if } \mathbf{c}_t=(0,0) \\ y_1^2\left((\omega-2\alpha(\omega-1))^2+2(\omega-2)\right)+ & \\ \qquad 2\omega y_1 z_L(-2\alpha(\omega-1)+\omega-2)+(\omega-2)\omega z_L^2, & \text{if } \mathbf{c}_t=(0,1) \\ y_1^2\left((\omega-2\alpha(\omega-1))^2+2(\omega-2)\right)+ & \\ \qquad 2\omega y_1 z_L(2\alpha(\omega-1)-\omega+2)+(\omega-2)\omega z_L^2, & \text{if } \mathbf{c}_t=(1,0) \\ 2(\omega-1)\left(y_1^2(4(\alpha-1)\alpha(\omega-1)+\omega)+\omega z_L^2\right), & \text{if } \mathbf{c}_t=(1,1) \end{cases}$$

$$U^e_{R,L}(\mathbf{x}^*_t(z_L,\mathbf{c}_t)) = \begin{cases} y_1^2(-8\alpha(\omega-1)+6\omega-8)-2\omega z_L^2, & \text{if } \mathbf{c}_t=(0,0) \\ y_1^2\left((\omega-2\alpha(\omega-1))^2+2(\omega-2)\right)+ & \\ \qquad 2\omega y_1 z_L(-2\alpha(\omega-1)+\omega-2)-\omega(3\omega+2)z_L^2, & \text{if } \mathbf{c}_t=(0,1) \\ y_1^2\left((\omega-2\alpha(\omega-1))^2+2(\omega-2)\right)+ & \\ \qquad 2\omega y_1 z_L(2\alpha(\omega-1)-\omega+2)-\omega(3\omega+2)z_L^2, & \text{if } \mathbf{c}_t=(1,0) \\ 2(\omega-1)y_1^2(4(\alpha-1)\alpha(\omega-1)+\omega)-2\omega(3\omega+1)z_L^2, & \text{if } \mathbf{c}_t=(1,1) \end{cases}$$

Subtracting expressions for particular executive and centralization profile when executives from different parties are in power implies equation (5).

Proof of Lemma 2. The preference orderings for each type of executive and for cut-offs directly follow from comparison of relevant expressions in the proof of Lemma 1.

Proof of Proposition 1. It will be useful to denote the difference between the terms that correspond to the age 1 period t executive's utility from a strong executive in period $t+1$ as:

$$\forall j \in \{L,R\}: \ \Delta \equiv U^e_{j,j}(\mathbf{x}^*_t(z_j,(1,1))) - \mathbb{E}_{p_{t+1}}\left[U^e_{j,-j}(\mathbf{x}^*_{t+1}(z_{-j},\mathbf{c}_{t+1}))\right].$$

It is straightforward to see that due to symmetrical ideal points of executives and localities, Δ does not depend on the executive's party. In addition $\Delta > 0$, since $U^e_{j,j}(\mathbf{x}^*_t(z_j,(1,1)))$ is the maximum possible stage utility a party j executive can receive and no lottery over other possible policy choices can bring higher utility.

To see how the electoral environment changes the incentives to adopt different centralization profiles, we take the derivative of $V_L(\mathbf{c}_t, p_t)$ with respect to p_t at each possible profile:

$$\frac{\partial V_L(\mathbf{c}_t, p_t)}{\partial p_t} = \begin{cases} (1-q)\,\Delta & \text{if } \mathbf{c}_t = (0,0) \\ q\,4\omega^2 z_L^2 + (1-q)\,\Delta & \text{if } \mathbf{c}_t = (0,1) \\ q\,4\omega^2 z_L^2 + (1-q)\,\Delta & \text{if } \mathbf{c}_t = (1,0) \\ q\,8\omega^2 z_L^2 + (1-q)\,\Delta & \text{if } \mathbf{c}_t = (1,1). \end{cases} \tag{14}$$

It is clear that $V_L(\mathbf{c}_t, p_t)$ is linear and increasing in p_t, and furthermore

$$\frac{\partial V_L((1,1), p_t)}{\partial p_t} > \frac{\partial V_L((1,0), p_t)}{\partial p_t} = \frac{\partial V_L((0,1), p_t)}{\partial p_t} > \frac{\partial V_L((0,0), p_t)}{\partial p_t} > 0.$$

The corresponding derivatives for a party R executive's objective are identical. Since higher levels of centralization have higher slopes with respect to p_t, centralization must be monotonically increasing in p_t.

The existence of the cut-off values of p_t, $\underline{p}$ and $\overline{p}$, for which there are unique most preferred centralization profile for executive from party j can be proven directly by comparison of expressions for $V_j(\mathbf{c}_t, p_t)$ for each executive across different centralization profiles. The expressions are as follows

$$V_L(\mathbf{c}_t, p_t) =$$

$$\begin{cases}
(1-q)(U^e_{L,L}(\mathbf{x}^*_t(z_L,(1,1))) - (1-p_t)\Delta) - \\
\quad q\left(y_1^2(8\alpha(\omega-1)-6\omega+8)+2\omega z_L^2\right) + y_1^2(-8\alpha(\omega-1)+6\omega-8) - 2\omega z_L^2, & \text{if } \mathbf{c}_t = (0,0) \\
(1-q)(U^e_{L,L}(\mathbf{x}^*_t(z_L,(1,1))) - (1-p_t)\Delta) + \\
\quad q\left(\omega z_L^2((4p_t-3)\omega-2) + y_1^2\left((\omega-2\alpha(\omega-1))^2+2(\omega-2)\right) + 2\omega y_1 z_L(2\alpha(\omega-1)-\omega+2)\right) + \\
\quad y_1^2\left((\omega-2\alpha(\omega-1))^2+2(\omega-2)\right) + 2\omega y_1 z_L(2\alpha(\omega-1)-\omega+2) + (\omega-2)\omega z_L^2, & \text{if } \mathbf{c}_t = (0,1) \\
(1-q)(U^e_{L,L}(\mathbf{x}^*_t(z_L,(1,1))) - (1-p_t)\Delta) + \\
\quad q\left(\omega z_L^2((4p_t-3)\omega-2) + y_1^2\left((\omega-2\alpha(\omega-1))^2+2(\omega-2)\right) + 2\omega y_1 z_L(-2\alpha(\omega-1)+\omega-2)\right) + \\
\quad y_1^2\left((\omega-2\alpha(\omega-1))^2+2(\omega-2)\right) + 2\omega y_1 z_L(-2\alpha(\omega-1)+\omega-2) + (\omega-2)\omega z_L^2, & \text{if } \mathbf{c}_t = (1,0) \\
(1-q)(U^e_{L,L}(\mathbf{x}^*_t(z_L,(1,1))) - (1-p_t)\Delta) + \\
\quad q\left(2\omega z_L^2((4p_t-3)\omega-1) + 2(\omega-1)y_1^2(4(\alpha-1)\alpha(\omega-1)+\omega)\right) + \\
\quad 2(\omega-1)\left(y_1^2(4(\alpha-1)\alpha(\omega-1)+\omega)+\omega z_L^2\right), & \text{if } \mathbf{c}_t = (1,1)
\end{cases}$$

$$V_R(\mathbf{c}_t, p_t) =$$

$$\begin{cases}
(1-q)(U^e_{R,R}(\mathbf{x}^*_t(z_R,(1,1))) - (1-p_t)\Delta) - \\
\quad q\left(y_1^2(8\alpha(\omega-1)-6\omega+8)+2\omega z_L^2\right) + y_1^2(-8\alpha(\omega-1)+6\omega-8) - 2\omega z_L^2, & \text{if } \mathbf{c}_t = (0,0) \\
(1-q)(U^e_{R,R}(\mathbf{x}^*_t(z_R,(1,1))) - (1-p_t)\Delta) + \\
\quad q\left(\omega z_L^2((4p_t-3)\omega-2) + y_1^2\left((\omega-2\alpha(\omega-1))^2+2(\omega-2)\right) + 2\omega y_1 z_L(-2\alpha(\omega-1)+\omega-2)\right) + \\
\quad y_1^2\left((\omega-2\alpha(\omega-1))^2+2(\omega-2)\right) + 2\omega y_1 z_L(-2\alpha(\omega-1)+\omega-2) + (\omega-2)\omega z_L^2, & \text{if } \mathbf{c}_t = (0,1) \\
(1-q)(U^e_{R,R}(\mathbf{x}^*_t(z_R,(1,1))) - (1-p_t)\Delta) + \\
\quad q\left(\omega z_L^2((4p_t-3)\omega-2) + y_1^2\left((\omega-2\alpha(\omega-1))^2+2(\omega-2)\right) + 2\omega y_1 z_L(2\alpha(\omega-1)-\omega+2)\right) + \\
\quad y_1^2\left((\omega-2\alpha(\omega-1))^2+2(\omega-2)\right) + 2\omega y_1 z_L(2\alpha(\omega-1)-\omega+2) + (\omega-2)\omega z_L^2, & \text{if } \mathbf{c}_t = (1,0) \\
(1-q)(U^e_{R,R}(\mathbf{x}^*_t(z_R,(1,1))) - (1-p_t)\Delta) + \\
\quad q\left(2\omega z_L^2((4p_t-3)\omega-1) + 2(\omega-1)y_1^2(4(\alpha-1)\alpha(\omega-1)+\omega)\right) + \\
\quad 2(\omega-1)\left(y_1^2(4(\alpha-1)\alpha(\omega-1)+\omega)+\omega z_L^2\right), & \text{if } \mathbf{c}_t = (1,1)
\end{cases}$$

The resulting cut-offs that define the most preferred centralization profile in infinite horizon game are given in equations (9) and (10) and are the same for both executives for their respective probabilities of re-election. It is straightforward to see that the difference between these cut-offs is

$$\overline{p} - \underline{p} = \frac{1+q}{q} \frac{(2\alpha + 2(1-\alpha)/\omega - 1)\, y_1}{z_L}.$$

Since $z_L < 0$ and $y_1 < 0$, and $2\left[\alpha + (1-\alpha)\frac{1}{\omega})\right] - 1 > 0$, this expression is always positive, and thus $\overline{p} > \underline{p}$.

Proof of Proposition 2. The proof directly follows from solving for $\overline{p} = 0$ and $\underline{p} = 0$ using the expressions in equations (9) and (10).

Solving $\underline{p} = 0$ for z_L produces one negative root that simplifies to:

$$z_p' = -\frac{1+q+2\sqrt{q(1+q)}}{1-3q}\left(2\alpha + \frac{2(1-\alpha)}{\omega} - 1\right) y_1. \tag{15}$$

For $z_L < z_p'$, $\underline{p} > 0$; Proposition 1 implies that $(0,0)$ is the preferred profile for $p_t < \underline{p}$. This cut-point exists (i.e., is negative) if and only if $q > \frac{1}{3}$. In addition, it is straightforward to show that $z_p' < y_1$ when $q > \frac{1}{3}$: Executives have to be more polarized than localities for $(0,0)$ to be implementable.

Solving $\overline{p} = 0$ for z_L yields two roots. The first is:

$$z_c = \frac{1+q-2\sqrt{q(1+q)}}{1-3q}\left(2\alpha + \frac{2(1-\alpha)}{\omega} - 1\right) y_1. \tag{16}$$

For $z_L > z_c$, $\overline{p} < 0$. Again invoking Proposition 1, for $z_L \geq z_c$, $(1,1)$ is the preferred profile for all p_t. It can be shown that when $q > \frac{1}{3}$, $\overline{p} = 0$ can hold only if $z_L > y_1$.

The second root is:

$$z_p'' = \frac{1+q+2\sqrt{q(1+q)}}{1-3q}\left(2\alpha + \frac{2(1-\alpha)}{\omega} - 1\right) y_1. \tag{17}$$

For $z_L < z_p''$, $\overline{p} < 0$; by Proposition Proposition 1, for $z_L < z_p''$, $(1,1)$ is the preferred profile for all p_t.. This cut-point exists (i.e., is negative) if and only if $q < \frac{1}{3}$.

Now define

$$z_p = \begin{cases} z_p' & \text{if } q > \frac{1}{3} \\ z_p'' & \text{if } q < \frac{1}{3} \end{cases}$$

Part (i) of the result follows from the derivation of z_c. Part (ii) follows from the derivations of z_c and z_p. Finally, parts (iii) and (iv) follow from the derivation of z_p.

Proof of Proposition 3. We first provide the condition under which profile $(0,0)$ dominates profile $(1,1)$. From (12), it is obvious that $W_{00}(\mathbf{x}^*)$ is constant in z_L and $W_{11}(\mathbf{x}^*)$ is maximized at $z_L = 0$. Evaluating both at $z_L = 0$ yields that $W_{00}(\mathbf{x}^*)$ is always higher than $W_{11}(\mathbf{x}^*)$ if:

$$\alpha > \frac{2+\omega}{2+2\omega}.$$

Next, we provide the condition under which profile $(1,0)$ dominates profile $(0,1)$. From (12), it is straightforward to verify that $W_{01}(\mathbf{x}^*)$ and $W_{10}(\mathbf{x}^*)$ are parabolas that are symmetric around $z_L = 0$ and maximized at $y_1(1-2\alpha)$ and $-y_1(1-2\alpha)$ respectively, but are otherwise identical. Thus $(1,0)$ dominates profile $(0,1)$ if and only if $-y_1(1-2\alpha) < y_1(1-2\alpha)$. Since $y_1 < 0$, this is equivalent to $\alpha > 1/2$.

Now consider three cases. (i) If $\alpha > (2+\omega)/(2+2\omega)$, then $(1,1)$ is never welfare maximizing and $(1,0)$ dominates $(0,1)$. Solving for z_L, the welfare under $(1,0)$ is higher than under $(0,0)$ if:

$$\begin{aligned} W_{10}(\mathbf{x}^*) &> W_{00}(\mathbf{x}^*) \\ z_L &\in \left(\frac{y_1(2\alpha(\omega-1)-\omega+2)}{\omega}, \frac{y_1(2\alpha(\omega+1)-\omega-2)}{\omega}\right) \end{aligned} \tag{18}$$

Since $y_1(2\alpha(\omega+1)-\omega-2)/\omega > 0$ and $y_1(2\alpha(\omega-1)-\omega+2)/\omega < 0$, $(1,0)$ is welfare maximizing for $z_L > y_1(2\alpha(\omega-1)-\omega+2)/\omega$ and $(0,0)$ is welfare maximizing otherwise.

(ii) If $\alpha \in (1/2, (2+\omega)/(2+2\omega)]$, then $(0,0)$, $(1,0)$, and $(1,1)$ may all be welfare maximizing. The condition for $W_{10}(\mathbf{x}^*) > W_{00}(\mathbf{x}^*)$ is given by (18). The condition for $W_{11}(\mathbf{x}^*) > W_{10}(\mathbf{x}^*)$ evaluates to:

$$z_L \in \left(\frac{y_1(-2\alpha(\omega+1)+\omega+2)}{\omega}, \frac{y_1(-2\alpha(\omega-1)+\omega-2)}{\omega}\right).$$

Since $y_1(-2\alpha(\omega-1)+\omega-2)/\omega > 0$ and $y_1(-2\alpha(\omega+1)+\omega+2)/\omega < 0$ for these values of α, $W_{11}(\mathbf{x}^*) > W_{10}(\mathbf{x}^*)$ for $z_L > y_1(-2\alpha(\omega+1)+\omega+2)/\omega$. Observe finally that:

$$\frac{y_1(-2\alpha(\omega+1)+\omega+2)}{\omega} - \frac{y_1(2\alpha(\omega-1)-\omega+2)}{\omega} = \frac{y_1(2-4\alpha)}{\omega} > 0,$$

so the interval of z_L for which $(1,0)$ is welfare maximizing is non-empty.

(iii) If $\alpha \leq 1/2$, the analysis is identical to case (ii), but (since $(0,1)$ dominates $(1,0)$) substituting in profile $(0,1)$ for $(1,0)$.

Proof of Proposition 4. Appendix B shows the transition matrix for equilibrium play for the case in which $0 \leq \underline{p} \leq 1$ and $0 \leq \overline{p} \leq 1$.

To calculate the long run probability of the system being in each of the twenty states, we solve the following system of equations:

$$
\begin{aligned}
\pi_{1Ls} &= \frac{1}{2}(1-q)\left(\pi_{1Rs}+\pi_{2Ls}+\pi_{2Rs}+\pi_{1Rw00}+\pi_{1Rw10}+\pi_{1Rw01}+\pi_{1Rw11}\right.\\
&\quad\left.+\pi_{2Lw00}+\pi_{2Rw00}+\pi_{2Lw10}+\pi_{2Rw10}+\pi_{2Lw01}+\pi_{2Rw01}+\pi_{2Lw11}+\pi_{2Rw11}\right)\\
\pi_{1Rs} &= \frac{1}{2}(1-q)\left(\pi_{1Ls}+\pi_{2Ls}+\pi_{2Rs}+\pi_{1Lw00}+\pi_{1Lw10}+\pi_{1Lw01}+\pi_{1Lw11}\right.\\
&\quad\left.+\pi_{2Lw00}+\pi_{2Rw00}+\pi_{2Lw10}+\pi_{2Rw10}+\pi_{2Lw01}+\pi_{2Rw01}+\pi_{2Lw11}+\pi_{2Rw11}\right)\\
\pi_{2Ls} &= \frac{1}{2}(1-q)\left(\pi_{1Ls}+\pi_{1Lw00}+\pi_{1Lw10}+\pi_{1Lw01}+\pi_{1Lw11}\right)\\
\pi_{2Rs} &= \frac{1}{2}(1-q)\left(\pi_{1Rs}+\pi_{1Rw00}+\pi_{1Rw10}+\pi_{1Rw01}+\pi_{1Rw11}\right)\\
\pi_{1Lw00} &= \pi_{1Rs}q\underline{p}(1-\frac{\underline{p}}{2})+\frac{1}{2}q\left(\pi_{1Rw00}+\pi_{2Lw00}+\pi_{2Rw00}\right)\\
\pi_{1Rw00} &= \pi_{1Ls}q\underline{p}(1-\frac{\underline{p}}{2})+\frac{1}{2}q\left(\pi_{1Lw00}+\pi_{2Lw00}+\pi_{2Rw00}\right)\\
\pi_{1Lw10} &= \pi_{1Rs}q\left(\overline{p}-\underline{p}\right)(1-\frac{\underline{p}+\overline{p}}{2})+\frac{1}{2}q\left(\pi_{1Rw10}+\pi_{2Lw10}+\pi_{2Rw10}\right)\\
\pi_{1Rw10} &= \frac{1}{2}q\left(\pi_{1Lw10}+\pi_{2Lw10}+\pi_{2Rw10}\right)\\
\pi_{1Lw01} &= \frac{1}{2}q\left(\pi_{1Rw01}+\pi_{2Lw01}+\pi_{2Rw01}\right)\\
\pi_{1Rw01} &= \pi_{1Ls}q\left(\overline{p}-\underline{p}\right)(1-\frac{\underline{p}+\overline{p}}{2})+\frac{1}{2}q\left(\pi_{1Lw01}+\pi_{2Lw01}+\pi_{2Rw01}\right)\\
\pi_{1Lw11} &= \pi_{1Rs}q(1-\overline{p})(1-\frac{1+\overline{p}}{2})+\frac{1}{2}q\left(\pi_{1Rw11}+\pi_{2Ls}+\pi_{2Rs}+\pi_{2Lw11}+\pi_{2Rw11}\right)\\
\pi_{1Rw11} &= \pi_{1Ls}q(1-\overline{p})(1-\frac{1+\overline{p}}{2})+\frac{1}{2}q\left(\pi_{1Lw11}+\pi_{2Ls}+\pi_{2Rs}+\pi_{2Lw11}+\pi_{2Rw11}\right)\\
\pi_{2Lw00} &= \pi_{1Ls}q\frac{\underline{p}^2}{2}+\frac{1}{2}q\pi_{1Lw00}\\
\pi_{2Rw00} &= \pi_{1Rs}q\frac{\underline{p}^2}{2}+\frac{1}{2}q\pi_{1Rw00}\\
\pi_{2Lw10} &= \frac{1}{2}q\pi_{1Lw10}\\
\pi_{2Rw10} &= \pi_{1Rs}q\left(\overline{p}-\underline{p}\right)\frac{\underline{p}+\overline{p}}{2}+\frac{1}{2}q\pi_{1Rw10}\\
\pi_{2Lw01} &= \pi_{1Ls}q\left(\overline{p}-\underline{p}\right)\frac{\underline{p}+\overline{p}}{2}+\frac{1}{2}q\pi_{1Lw01}\\
\pi_{2Rw01} &= \frac{1}{2}q\pi_{1Rw01}\\
\pi_{2Lw11} &= \pi_{1Ls}q\left(1-\overline{p}\right)\frac{1+\overline{p}}{2}+\frac{1}{2}q\pi_{1Lw11}\\
\pi_{2Rw11} &= \pi_{1Rs}q\left(1-\overline{p}\right)\frac{1+\overline{p}}{2}+\frac{1}{2}q\pi_{1Rw11},
\end{aligned}
$$

where π_{ajwc} refers to the long-run probability of being in a state characterized by a weak (w) executive of age a $(a \in \{0,1\})$ from party j $(j \in \{L,R\})$ and by centralization profile c $(c \in \{00,01,10,11\})$, while π_{ajs} denotes the long-run probability of being in a state characterized with a strong (s) executive of age a $(a \in \{0,1\})$ from party j $(j \in \{L,R\})$.

This system provides a unique solution for the twenty long-run probabilities. These long-run probabilities can be used to calculate the four long-run probabilities of being in state with full decentralization (ϕ_{00}), partial decentralization (ϕ_{10} and ϕ_{01}) and full centralization (ϕ_{11}) used in equation (13) as follows:

$$
\begin{aligned}
\phi_{11} &= \pi_{1Lw11} + \pi_{1Rw11} + \pi_{2Lw11} + \pi_{2Rw11} + \pi_{2Ls} + \pi_{2Rs} + (\pi_{1Ls} + \pi_{1Rs})(1 - \overline{p}) \\
\phi_{00} &= \pi_{1Lw00} + \pi_{1Rw00} + \pi_{2Lw00} + \pi_{2Rw00} + (\pi_{1Ls} + \pi_{1Rs})\underline{p} \\
\phi_{10} &= \pi_{1Lw10} + \pi_{1Rw01} + \pi_{2Lw10} + \pi_{2Rw01} \\
\phi_{01} &= \pi_{1Lw01} + \pi_{1Rw10} + \pi_{2Lw01} + \pi_{2Rw10} + (\pi_{1Ls} + \pi_{1Rs})(\overline{p} - \underline{p}).
\end{aligned}
$$

Comparing Ω_e to welfare from full centralization, $\Omega_{11} = W_{11}(\mathbf{x}^*)$, full decentralization, $\Omega_{00} = W_{00}(\mathbf{x}^*)$ and partial decentralization, $\Omega_{10/01} = \frac{1}{2}\left(W_{10}(\mathbf{x}^*) + W_{01}(\mathbf{x}^*)\right)$ we can show that

$$\Omega_{00} > \Omega_{10/01} > \Omega_e > \Omega_{11}.$$

B Transition Matrix for Welfare Calculations

Below we present the transition matrix for equilibrium play for $0 \leq \underline{p} \leq 1$ and $0 \leq \overline{p} \leq 1$. For legibility, the first 10 and last 10 columns are presented separately. States with a strong executive of age a from party j are denoted by ajs. States with a weak executive of age a from party j and a centralization profile c are denoted by $ajwc$.

	1Ls	**1Rs**	**2Ls**	**2Rs**	**1Lw00**	**1Rw00**	**1Lw10**	**1Rw10**	**1Lw01**	**1Rw01**
1Ls	0	$\frac{1}{2}(1-q)$	$\frac{1}{2}(1-q)$	0	0	$q\underline{p}\left(1-\frac{\underline{p}}{2}\right)$	0	0	0	$q(\overline{p}-\underline{p})\left(1-\frac{\underline{p}+\overline{p}}{2}\right)$
1Rs	$\frac{1}{2}(1-q)$	0	0	$\frac{1}{2}(1-q)$	$q\underline{p}\left(1-\frac{\underline{p}}{2}\right)$	0	$q(\overline{p}-\underline{p})\left(1-\frac{\underline{p}+\overline{p}}{2}\right)$	0	0	0
2Ls	$\frac{1}{2}(1-q)$	$\frac{1}{2}(1-q)$	0	0	0	0	0	0	0	0
2Rs	$\frac{1}{2}(1-q)$	$\frac{1}{2}(1-q)$	0	0	0	0	0	0	0	0
1Lw00	0	$\frac{1}{2}(1-q)$	$\frac{1}{2}(1-q)$	0	0	$\frac{1}{2}q$	0	0	0	0
1Rw00	$\frac{1}{2}(1-q)$	0	0	$\frac{1}{2}(1-q)$	$\frac{1}{2}q$	0	0	0	0	0
1Lw10	0	$\frac{1}{2}(1-q)$	$\frac{1}{2}(1-q)$	0	0	0	0	$\frac{1}{2}q$	0	0
1Rw10	$\frac{1}{2}(1-q)$	0	0	$\frac{1}{2}(1-q)$	0	0	$\frac{1}{2}q$	0	0	0
1Lw01	0	$\frac{1}{2}(1-q)$	$\frac{1}{2}(1-q)$	0	0	0	0	0	0	$\frac{1}{2}q$
1Rw01	$\frac{1}{2}(1-q)$	0	0	$\frac{1}{2}(1-q)$	0	0	0	0	$\frac{1}{2}q$	0
1Lw11	0	$\frac{1}{2}(1-q)$	$\frac{1}{2}(1-q)$	0	0	0	0	0	0	0
1Rw11	$\frac{1}{2}(1-q)$	0	0	$\frac{1}{2}(1-q)$	0	0	0	0	0	0
2Lw00	$\frac{1}{2}(1-q)$	$\frac{1}{2}(1-q)$	0	0	$\frac{1}{2}q$	$\frac{1}{2}q$	0	0	0	0
2Rw00	$\frac{1}{2}(1-q)$	$\frac{1}{2}(1-q)$	0	0	$\frac{1}{2}q$	$\frac{1}{2}q$	0	0	0	0
2Lw10	$\frac{1}{2}(1-q)$	$\frac{1}{2}(1-q)$	0	0	0	0	$\frac{1}{2}q$	$\frac{1}{2}q$	0	0
2Rw10	$\frac{1}{2}(1-q)$	$\frac{1}{2}(1-q)$	0	0	0	0	$\frac{1}{2}q$	$\frac{1}{2}q$	0	0
2Lw01	$\frac{1}{2}(1-q)$	$\frac{1}{2}(1-q)$	0	0	0	0	0	0	$\frac{1}{2}q$	$\frac{1}{2}q$
2Rw01	$\frac{1}{2}(1-q)$	$\frac{1}{2}(1-q)$	0	0	0	0	0	0	$\frac{1}{2}q$	$\frac{1}{2}q$
2Lw11	$\frac{1}{2}(1-q)$	$\frac{1}{2}(1-q)$	0	0	0	0	0	0	0	0
2Rw11	$\frac{1}{2}(1-q)$	$\frac{1}{2}(1-q)$	0	0	0	0	0	0	0	0

	1Lw11	**1Rw11**	**2Lw00**	**2Rw00**	**2Lw10**	**2Rw10**	**2Lw01**	**2Rw01**	**2Lw11**	**2Rw11**
1Ls	0	$q(1-\overline{p})\left(1-\frac{1+\overline{p}}{2}\right)$	$q\frac{\underline{p}^2}{2}$	0	0	0	$q(\overline{p}-\underline{p})\frac{\underline{p}+\overline{p}}{2}$	0	$q(1-\overline{p})\frac{1+\overline{p}}{2}$	0
1Rs	$q(1-\overline{p})\left(1-\frac{1+\overline{p}}{2}\right)$	0	0	$q\frac{\underline{p}^2}{2}$	0	$q(\overline{p}-\underline{p})\frac{\underline{p}+\overline{p}}{2}$	0	0	0	$q(1-\overline{p})\frac{1+\overline{p}}{2}$
2Ls	$\frac{1}{2}q$	$\frac{1}{2}q$	0	0	0	0	0	0	0	0
2Rs	$\frac{1}{2}q$	$\frac{1}{2}q$	0	0	0	0	0	0	0	0
1Lw00	0	0	$\frac{1}{2}q$	0	0	0	0	0	0	0
1Rw00	0	0	0	$\frac{1}{2}q$	0	0	0	0	0	0
1Lw10	0	0	0	0	$\frac{1}{2}q$	0	0	0	0	0
1Rw10	0	0	0	0	0	$\frac{1}{2}q$	0	0	0	0
1Lw01	0	0	0	0	0	0	$\frac{1}{2}q$	0	0	0
1Rw01	0	0	0	0	0	0	0	$\frac{1}{2}q$	0	0
1Lw11	0	$\frac{1}{2}q$	0	0	0	0	0	0	$\frac{1}{2}q$	0
1Rw11	$\frac{1}{2}q$	0	0	0	0	0	0	0	0	$\frac{1}{2}q$
2Lw00	0	0	0	0	0	0	0	0	0	0
2Rw00	0	0	0	0	0	0	0	0	0	0
2Lw10	0	0	0	0	0	0	0	0	0	0
2Rw10	0	0	0	0	0	0	0	0	0	0
2Lw01	0	0	0	0	0	0	0	0	0	0
2Rw01	0	0	0	0	0	0	0	0	0	0
2Lw11	$\frac{1}{2}q$	$\frac{1}{2}q$	0	0	0	0	0	0	0	0
2Rw11	$\frac{1}{2}q$	$\frac{1}{2}q$	0	0	0	0	0	0	0	0

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