The Repression-Revolution Dilemma

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September 4, 2018

Abstract

Empirically, authoritarian regimes vary in their durability, democratization likelihood, and violence. This paper presents a game theoretic model that explains a dictator's dilemma to exercising heavy preventive repression, and consequences for regime dynamics. Although higher repression enables the government to consume higher rents by decreasing mobilization frequency, it also leaves society "no other way out" except revolution—the repression-revolution tradeoff. Although power-sharing may prevent revolution by enabling the ruler to commit to higher transfers, this arrangement may not be self-enforcing by enabling outsider coups. Furthermore, the government cannot extricate itself from a violent path by democratizing because repression empowers societal extremists. Instead, the dictator only democratizes when too weak to sustain durable authoritarianism but also strong enough to protect elite interests under democratic rule. The model implications help to explain empirical differences across authoritarian regimes distinguished by institutional basis: personalist (high repression and other violence), military (high democratization likelihood), and party-based (greater power-sharing and durable authoritarian regimes).

Keywords: Authoritarian regimes, Coups, Democratization, Power-Sharing, Repression, Revolutions

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Why do authoritarian regimes exhibit diverse regime trajectories? For example, although non-democratically elected rulers have governed the Democratic Republic of Congo and Malaysia and since independence, the DRC has experienced *repressive* and exclusionary kleptocratic rulers, compared to more inclusive *power-sharing* in Malaysia. And countries such as South Korea have *democratized* following authoritarian episodes. Many scholars explain these trends by examining differences in dictators' institutional bases. Specifically, authoritarian regimes in which the dictator personally concentrates power rely upon a distinct support base from regimes that exhibit more dispersed decision-making among collegially organized military officers or within institutionalized party organizations (Huntington, 1993; Bratton and van de Walle, 1994; Geddes, 1999; Geddes, Wright and Frantz, 2014).

Existing evidence shows that personalist, military, and party regimes exhibit distinct regime trajectories. Party-based authoritarian regimes share power more broadly with society and, on average, survive in power for the longest periods (Geddes, Wright and Frantz, 2014, 320). Personalist authoritarian regimes associate with repression and violence: higher levels of personal liberty violations (Davenport, 2007) and a greater likelihood of experiencing violence upon losing power—observations illustrated in many case studies on "sultanistic" regimes (Chehabi and Linz, 1998, 41-45) and on social revolution (Goodwin and Skocpol, 1989). Finally, military regimes exhibit the shortest average regime spells and are most likely to democratize (Huntington 1993; Geddes et al. 2014, 325).[1]

This paper seeks to explain differences in authoritarian regime trajectories by examining heterogeneous incentives for—and consequences of—preventive repression.[2] This focus builds off the contention that repression is a foundational survival tool for authoritarian rulers (Svolik 2012, 9; Escribá-Folch and Wright 2015, 50), although departs from the primary focus of recent research on varying patronage strategies across authoritarian regimes. The overarching contribution of the analysis is to combine insights from the formal political economy literature and authoritarian institutions research (as well as related literatures on social revolutions, and power-sharing and civil wars). Recent general theories of regime transitions focus mainly on effects of economic inequality (Acemoglu and Robinson, 2006; Boix, 2003) and do not analyze differ-

[1] Appendix A provides more detailed statistical evidence for these patterns.

[2] Preventive forms of repression such as denying civil liberties and surveillance intend to prevent mass mobilization, as opposed to higher-intensity coercion such as mass imprisonment and executions or firing on protesters.

ences in authoritarian regime institutions (e.g., Acemoglu and Robinson, 2006, 18). Furthermore, many critique these models for lack of empirical applicability (Ansell and Samuels, 2014; Haggard and Kaufman, 2016), at least without modifications (Dower et al., 2018). Conversely, authoritarian politics research studies various facets of how authoritarian regime institutions affect outcomes such as durability, democratization, and violence (Geddes, 1999; Svolik, 2012; Wright and Escribà-Folch, 2012; Debs, 2016; Meng, 2017), but without analyzing the various mechanisms proposed here in a unified framework.

I analyze an infinite-horizon game between a government that chooses between high repression and authoritarian power-sharing, and a representative societal actor that in every period chooses whether or not to mobilize. An extension introduces a democratization option. Mobilization enables staging a revolution, and can also induce temporary concessions from the government. The baseline model draws primarily from Acemoglu and Robinson (2006), with the important novel twist that repression affects the frequency of periods in which society mobilizes, rather than treating this phenomenon as exogenous. Extensions consider agency problems and disaggregate society into moderates and extremists.

Dictators face repression-revolution dilemma. High repression leaves society no other way out than revolution by raising society's expected mobilization costs. This effect decreases the percentage of periods in which society mobilizes, causing them to demand greater transfers in each mobilization period and potentially making the government unable to buy off revolution. By contrast, sharing power prevents revolution by enabling higher permanent concessions across periods—at the cost of lower rents for the government. Paradoxically, only governments *effective* at repression face revolutionary attempts because they face incentives to reject a power-sharing path. Similarly, higher opportunities for rent-seeking push authoritarian governments to deliberately pursue a strategy that causes revolution in equilibrium, hence creating a tradeoff between rents and political survival—contrary to common assertions that dictators prioritize political survival above all other goals.

The baseline model is intentionally spare to highlight this core tradeoff. But under what conditions do repression and power-sharing indeed facilitate distinct regime paths? Largely separate literatures on military agency problems in dictatorship (Svolik, 2012; Tyson, 2017) and the perils of power-sharing (Roessler, 2016) highlight opposing considerations about political survival prospects. On the one hand, exercising high repression may not be incentive compatible for the military. Therefore, extending the model to incorporate a distinct military actor creates a distinct repression dilemma focused on regime insiders rather than outsiders.

Higher repressive capacity provides incentives not to negotiate deals with society because revolutions are unlikely, but also can breed coups, highlighting a novel agency tradeoff. On the other hand, sharing power with society via incorporation into the central government shifts power in favor of society, facilitating outsider coups. A large enough shift in power implies that the government faces a political survival threat even when sharing power, unlike in the baseline model.

But even if repression creates revolutionary incentives, what prevents the government from extricating itself from a violent path by democratizing in a mobilization period? The possibility of democratizing does not provide a panacea for repressive dictators because repression shapes the *composition* of societal organization. The democratization extension assumes there are two societal factions, moderates and extremists. High repression causes only the extremist faction to ever organize because they face lower mobilization costs in the face of high repression, and extremists prefer revolution to democracy. Democratizing further poses a dilemma for dictators because although only weak rulers—in the sense of inability to peacefully share power or repress effectively—will consider democratizing, they also need to be sufficiently organizationally strong to protect elite interests under democratic rule.

Finally, the paper links these three broad authoritarian ruling strategies to three empirically prevalent types of authoritarian regimes: personalist regimes with repression, military regimes with democratization, and party regimes with power-sharing and durable authoritarian rule. High rent-seeking possibilities and minimal agency problems each encourage high repression in personalist regimes, compared to perils of authoritarian power-sharing and low-valued outside options to democratizing. Although agency problems and the power-sharing dilemma make it difficult for military regimes to survive long periods of time under stable authoritarian rule, most military juntas survive as intact organizations after democratizing—causing them to choose low repression and eventual democratization. Third, party regimes do not face a strong power-sharing dilemma and tend to experience lower rent-seeking opportunities. Therefore, party-based dictators tolerate societal mobilization, yielding durable regimes unlikely to transition to democracy, although party regimes with revolutionary origins often combine power-sharing with relatively high repression.

1 Contributions to Existing Research

Broadly, this paper aims to combine insights from formal political economy models and the vast authoritarian institutions literature. Furthermore, the various aspects of the government's tradeoff in the model draw from and deepen insights from these diverse literatures.

1.1 Repression-Revolution Tradeoff

The repression-revolution effect relates to arguments from the social revolutions literature regarding consequences of repression (Goodwin, 2001), the repression-dissent paradox (Lichbach, 1987; Moore, 2000), and also builds off a central mechanism in Acemoglu and Robinson (2006). However, although Goodwin (2001) "place[s] the state at the center of analysis of revolutions" (24), he treats governments' actions as fixed and does not evaluate strategic repression incentives. Similarly, by modeling the frequency of mobilization periods as exogenous, Acemoglu and Robinson (2006) do not address the central question here regarding why a government would ever intentionally pursue a strategy that *causes* revolution in equilibrium. Focusing on strategic preventive repression also departs from recent formal theoretic research on repression that either analyzes one-shot interactions in which the government responds to movements that have already formed (Pierskalla, 2010; Ritter, 2014; Shadmehr, 2015), i.e., *reactionary* repression, or only analyzes agency problems (see below). Gibilisco (2017) also analyzes repression strategies in a dynamic setting. However, like Acemoglu and Robinson (2006) and Boix (2003), he assumes that repression—if applied—succeeds with certainty, and therefore does not generate a "no other way out" effect.

The rent-seeking effect that pushes dictators toward repression most closely relates to existing political economy research that examines immobile assets such as land or oil (Boix, 2003; Paine, Forthcoming) or economic inequality more broadly (Acemoglu and Robinson, 2006). Integrating this mechanism into the broader framework shows its relevance even when accounting for additional aspects of authoritarian governance and democratization, contrary to recent empirical critiques of these theories.

Furthermore, the present model poses a starker tradeoff for dictators regarding rent-seeking by presenting a model in which authoritarian regimes differ in regime durability. In Boix (2003) and Acemoglu and Robinson (2006), authoritarian regimes that repress survive in power for the same expected duration as regimes that negotiate temporary concessions with society (similar to power-sharing in the present model). By contrast, here, the government trades off between higher rents and longer regime duration, which better situates the present theory to explain empirical patterns, including differences across authoritarian regime types in both overall duration and in how the regime ends (violence versus negotiated transition). Trading off between rents and regime durability also distinguishes the mechanism from opportunistic theories of ethnopolitical exclusion (Roessler, 2016, 60-81), which argue that regimes only pursue rent-seeking strategies when facing a weak opposition that will not rebel in response to exclusion and repression. Related, this result reinforces that the authoritarian government cares about total lifetime expected consumption rather than about political survival per se. Trading off between durability and rents contrasts with the standard assumption that "[t]he basic expected benefit of repression is to increase the likelihood of staying in power" (Escribà-Folch, 2013, 546).

1.2 Agency Problems

Extending the model to incorporate coup risks builds off contentions that controlling insiders poses another major dilemma of heavy repression (Escribà-Folch and Wright, 2015, 50), whereas existing leading transition models abstract away from this consideration (Boix, 2003; Acemoglu and Robinson, 2006). Recent formal work examines how building up the military for repression or foreign policy goals can cause coups (Besley and Robinson, 2010; Acemoglu, Vindigni and Ticchi, 2010; Svolik, 2012) or why militaries may choose not to comply with repression orders (Tyson, 2017; Dragu and Przeworski, 2017). The present analysis shows that both aspects of the agency problem interact with each other in counterintuitive ways: more effective repression makes repression compliance self-enforcing only when dictators can effectively coup-proof their regimes. The current paper also embeds these mechanisms in the broader coup-proofing literature (Quinlivan, 1999), integrates these agency problems into a broader theory of regime transitions, and examines how agency problems differ across authoritarian regime types.

But, as other strands of the literature highlight, military insiders do not pose the only coup threat. Although sharing power helps to prevent revolution by facilitating higher spoils for society, expanding dictator's circle carries its own political survival risks. Roessler (2016) examines the prevalence of coups by ethnic groups with access to power at the center in post-colonial Africa. Aksoy, Carter and Wright (2015) provide evidence that broad-based societal disturbances create opportunities for outsiders in the military to stage coups.

By contrast, the authoritarian institutions literature focuses mainly on how parties solve commitment and other problems to facilitate durable authoritarian rule (Magaloni and Kricheli, 2010), and models of regime transitions do not distinguish authoritarian regimes in this manner.

Juxtaposing military agency problems with the power-sharing dilemma also highlights that there is no free lunch for preventing coup attempts. Excluding other groups to prevent coups requires relying on repressive agents that may themselves overthrow the regime. However, lesser reliance on the security apparatus to repress outsiders creates its own risks, as the power-sharing dilemma highlights.

1.3 Democratic Transitions

Finally, the model analysis provides a new formal theoretic perspective on democratic transitions. Many existing models of democratic transitions assume that mass movements necessarily seek democratic concessions (Boix, 2003; Acemoglu and Robinson, 2006). This also implies that a highly repressive government could always choose to democratize in a mobilization period to extricate itself from a destructive path. However, drawing insights from the social movements literature and from formal theoretic work such as Shadmehr (2015) highlights why this assumption is not tenable in many empirical cases: repression can empower societal extremists, who face lower mobilization costs when facing high repression.

The model also incorporates and extends insights from a growing literature that examines how ex-dictators can protect themselves under democratic rule via constitutions (Albertus and Menaldo, 2018), modern party organizations (Ziblatt, 2017), or mobilization ability more broadly (Acemoglu and Robinson, 2008). This perspective contrasts with earlier regime transition models that assume democratic rule necessarily provides an institutional means for the poor masses to redistribute heavily from rich elites. These contributions show that elites need sufficient strength to willingly acquiesce to democracy. However, conceiving these elite protections in the context of dynamic regime transitions raises countervailing considerations about conditions under which democracy will likely arise. Paradoxically, authoritarian regimes must also be sufficiently *weak* that they choose democratization over sustaining authoritarian rule via repression or power-sharing. In this sense, the power-sharing dilemma considered in a model extension also relates to existing research on elite splits and democratization (Lizzeri and Persico, 2004; Llavador and Oxoby, 2005; Ansell and Samuels, 2014) by highlighting how factors internal to the regime may prompt democratization. The model helps to explain how dictators resolve these tensions.[3]

Finally, combining these various mechanisms into a unified framework also helps to explain how they interact with each other to affect optimal authoritarian strategies, as well as provide a broadly applicable framework for understanding differential outcomes across authoritarian regime types.

2 Baseline Model

This section characterizes the core repression-revolution tradeoff that dictators face.

2.1 Setup

An authoritarian government (G) and societal group (S) interact in a complete information game over an infinite time horizon. Actors discount future payoffs by a common factor $\delta \in (0, 1)$ and $t = 1, 2, \ldots$ denotes time. The following presents the sequence of moves at the outset of the game and then within each period, and Section 2.5 summarizes extensions that add continuous mobilization costs, continuous repression costs, and history-dependent strategies.

Economic production endowments. Total economic output in each period equals 1, of which S commands $e \in (0, 1)$ and G the remainder. The parameter e captures that a more valuable economic exit option for S enables retaining a higher percentage of total output.[4] By contrast, low values of e could correspond either with a weak economic exit option or with a circumstance in which the government's revenues derive largely from rents not produced by society.

Repression and power-sharing. At the outset of the game, G chooses either *repression* or *power-sharing*.

[3]There are, of course, international and other sources of pressure beyond those highlighted in the present model that can explain why countries democratize. However, the present model focuses solely on dictator's domestic incentives to isolate a non-strategically trivial setting in which an authoritarian government contemplates democratization.

[4]Models such as Boix (2003), Acemoglu and Robinson (2006), and Paine (Forthcoming) explicitly model taxation in each period, but that additional strategic move is unnecessary to derive the main results here.

Formally, it chooses $(r, \theta) \in \{(r_h, \theta_l), (r_l, \theta_h)\}$, for $0 < r_l < r_h$ and $0 < \theta_l < \theta_h < 1$. An extension introduces the democratization option. Repression r affects S's per-period mobilization costs in the baseline game (see next step).[5] The degree of power-sharing θ determines minimum transfers from G to S in each period, and therefore G's effective per-period revenues equal $(1-\theta) \cdot (1-e)$ and S's effective per-period endowment equals $e + \theta \cdot (1-e)$. The parameter θ captures the degree of institutionalized benefits that the regime provides to society. For example, institutions such as mass parties and legislatures enable limited participation for broad segments of society (Wright and Escribà-Folch, 2012), whereas the absence of such institutions provides rulers with higher discretion to retain rents for themselves. Similarly, the ethnic conflict literature analyzes variance in the degree to which non-ruling ethnic groups have access to power in the central government (Roessler, 2016).

Assuming G can commit to the same level of repression spending and institutionalized transfers in every period clarifies the exposition of the main results, but they do not hinge on this assumption. Appendix C shows similar findings if G instead chooses (r_t, θ_t) in every period upheld by punishments in history-dependent strategy profiles.[6] Finally, this initial choice creates a tradeoff for G: either high repression r_h with low power-sharing θ_l, or low repression r_l with high power-sharing θ_h. Although it is intuitive that dictators would need to trade off between these two, the analysis also highlights consequences for dictators that are skilled at both or neither.

Mobilization. After G has set the repression level at the outset of the game, Nature moves first within each period by drawing S's period t cost to mobilizing:

$$c_t = \begin{cases} 0 & \text{with probability } \mu(r) \\ \infty & \text{with probability } 1-\mu(r) \end{cases}$$

Higher repression spending strictly increases S's expected mobilization costs, $0 < \mu(r_h) < \mu(r_l) < 1$,[7] and relates to *preventive* repression.[8] The literature generally categorizes repression into (1) preventive restrictions on civil liberties (i.e., U.S. First Amendment-type rights) aimed at the broad population and

[5]An extension considers an additional effect: repression impacts S's probability of successful revolution.

[6]Additionally, the results would also be qualitatively similar if G paid a higher per-period cost to higher repression levels, although the expressions become somewhat more cumbersome.

[7]More technically, assume $\mu(\cdot)$ is smooth and strictly decreasing in r, and $\lim_{r\to\infty} \mu(r) = 0$.

[8]Appendix C shows a similar core tradeoff when modeling continuous mobilization costs across periods.

(2) physical repression targeted at individuals, ranging from political arrests to mass killings (Davenport, 2007; Escribà-Folch, 2013; Frantz and Kendall-Taylor, 2014). Similarly, Levitsky and Way (2010, 58) distinguish between low-intensity and high-intensity coercion: "Whereas high-intensity coercion is often a response to an imminent—and highly threatening—opposition challenge, low-intensity coercion is often aimed at *preventing* such challenges from emerging in the first place" [emphasis added]. Repression in the baseline model relates to the preventive low-intensity type because the only role of repression is to raise S's expected mobilization costs. In addition to broadly denying civil liberties, preventive repression also involves surveillance, low-profile physical harassment, and denial of employment or legal opportunities for political reasons. Many of these activities are conducted by internal security organizations such as the army and police, secret police, intelligence bodies, and paramilitary organizations. Compared to other models, this way of conceptualizing repression resembles Shadmehr's (2015) concept of a minimum punishment that individuals must pay to join a movement.[9]

Furthermore, although the repression level is constant across periods, S's cost of mobilizing will differ across periods. Substantively, this captures that events outside the government's control impact how effective repression spending is at deterring S from mobilizing. For example, the fall of the Berlin Wall in 1989 suggested to opposition movements in neighboring Eastern bloc countries that the costs of mobilizing were temporarily low. Protests in Tunisia in late 2010 similarly enabled a temporary decrease in the costs of mobilization across the Middle East and North Africa.

After perfectly observing the cost of mobilization, the first strategic move in each period involves S deciding whether or not to mobilize to demand concessions from G. If S does not mobilize, then the period ends and G consumes $(1-\theta)\cdot(1-e)$ and S consumes $e+\theta\cdot(1-e)$. An identical interaction occurs in period $t+1$, with respective future continuation values denoted as V^G and V^S.

[9] Related, it might seem overly simple to model a single societal actor that observes the government's repression and then makes a mobilization decision. However, more complicated ways of modeling social mobilization would not alter the main insights, for example, having multiple or a continuum of societal actors needing to coordinate in order to mobilize. Even with a unitary actor, as shown below, society will choose not to mobilize in some periods because of government repression. Adding coordination problems would lower the benefit of mobilization (because of the possibility that it could fail) but would not qualitatively alter the main tradeoff here regarding how repression affects the likelihood of bargaining breakdown.

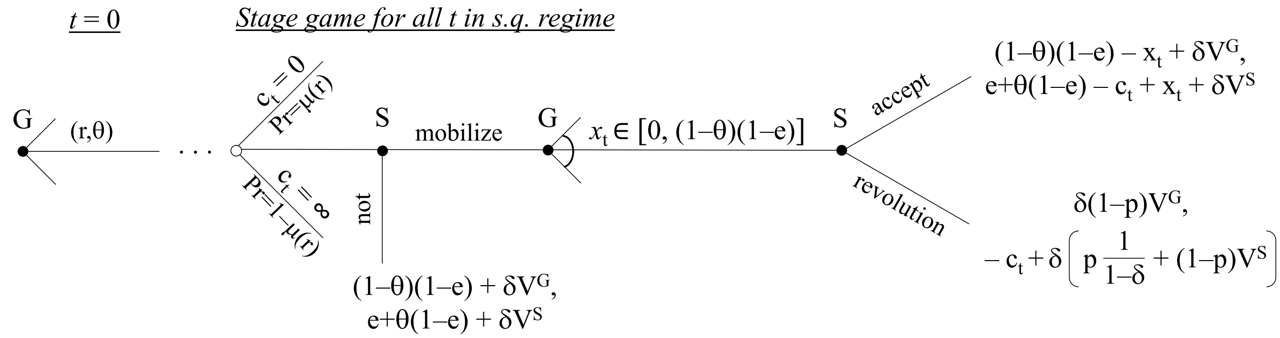
Bargaining. If S mobilizes, then the government makes a transfer offer $x_t \in \big[0, (1-\theta)\cdot(1-e)\big]$. Substantively, these transfers could range from building desired infrastructure projects to offering a cabinet position to members of a group. However, the concession is temporary because G cannot credibly promise to keep making the concession in future periods in which S does not mobilize. S observes G's offer and decides whether to accept or to launch a revolution. Accepting a transfer offer yields consumption of $(1-\theta)\cdot(1-e)-x_t$ for G and $e+\theta\cdot(1-e)+x_t-c_t$ for S in period t. If G and S achieve a peaceful bargain, then the respective continuation values are still V^G and V^S.

Revolution. Alternatively, S can launch a revolution in a period it mobilizes. A revolutionary attempt destroys all consumption in the period t it occurs (although S still pays the mobilization cost c_t) but does not create future costs. With probability $p \in (0,1)$, the revolution succeeds and the game moves to an absorbing state in period $t+1$ in which S consumes 1 and G consumes 0 in every period. With complementary probability, the revolution fails and G's and S's future continuation values equal the original amounts V^G and V^S.

The present conceptualization of revolutions captures a wide range of events. Skocpol (1979) and Goodwin (2001) analyze classic social revolutions. Goodwin (2001, 10) defines radical revolutionary movements as "not only seek[ing] to control the state, but also aim[ing] (among other things) to transform more or less fundamentally the national national or some segment therefore, ruled by that state," which naturally corresponds to the incumbent autocrat receiving 0 consumption following a successful revolution. However, interpreting the payoffs in relative terms—i.e., treating 0 as the baseline consumption amount for ex-governments—enables classifying a broader range of events into what the model labels as revolutions. For example, protests that cause a dictator to step down on unfavorable terms—perhaps afterwards leading to exile, imprisonment, or even death—create relatively bad fates for leaders as well, as occurred in several African countries after the fall of the Soviet Union. Defeat in civil wars that fall short of radical revolutionary movements also fit this conceptualization of revolution, as in Zaire in 1997.

Figure 1 presents G's initial repression choice and the tree of the stage game in each period of the status quo regime.

Figure 1: Game Tree



2.2 Revolution Constraint and Optimal Transfers

Solving backwards on the stage game enables characterizing the Markov perfect equilibria of the game, which the next section derives.[10] The following two recursive equations characterize S's optimal choices if revolution does not occur along the equilibrium path. Equation 1 presents S's continuation value, which consists of three parts. First, its per-period endowment $e + \theta \cdot (1 - e)$. Second, S chooses to mobilize in $\mu(r)$ percent of periods—in every period that costs are 0, and never when costs are infinite. If S mobilizes, then G responds by offering transfers. Third, the status quo regime persists in the next period.

$$V^S = e + \theta \cdot (1 - e) + \mu(r) \cdot x^* + \delta \cdot V^S \tag{1}$$

Equation 2 characterizes S's no-fighting constraint. The right-hand side shows S's expected utility to revolution. Fighting destroys all current-period consumption. With probability p, S wins and consumes all revenues in future periods, but with complementary probability the revolution fails and the status quo authoritarian regime persists. Therefore, in a period that S mobilizes, G's transfer offer must generate lifetime expected consumption at least as large as that from fighting.

$$e + \theta \cdot (1 - e) + x^* + \delta \cdot V^S \geq \delta \cdot \left[p \cdot \frac{1}{1 - \delta} + (1 - p) \cdot V^S\right] \tag{2}$$

[10] Appendix B proves every formal result.

G's optimal proposal to buy off S entails satisfying this expression with equality if this yields a positive transfer, and otherwise equals 0.

$$x^*(r,\theta) = \max\left\{\frac{\delta\cdot p - \big[1-\delta\cdot(1-p)\big]\cdot\big[e+\theta\cdot(1-e)\big]}{1-\delta\cdot\big[1-\mu(r)\cdot p\big]}, 0\right\} \tag{3}$$

G can only afford to make an offer that satisfies S in a mobilization period if the optimal offer does not exceeds G's per-period revenues. This budget constraint condition is:

$$B^* \equiv (1-\theta)\cdot(1-e) - x^*(r,\theta) \geq 0 \tag{4}$$

The following comparison establishes that G always prefers to buy off S in a mobilization period, if possible. Proposing $x_t = (1-\theta)\cdot(1-e)$ yields G's minimum lifetime expected utility along a peaceful path of play, $\delta\cdot V^G$. However, if G makes a proposal that S rejects, then G's lifetime expected utility is $\delta\cdot(1-p)\cdot V^G$, which is strictly lower because of the possibility that the revolution succeeds. Lemma 1 summarizes equilibrium behavior conditional on G's initial repression/power-sharing choice.

Lemma 1 (Equilibrium bargaining outcomes)**.** *Fix G's initial choice* (r,θ).

- *In every period, S mobilizes if* $c_t = 0$ *and does not mobilize otherwise. In every period that S mobilizes, G proposes* $x_t = x^*(r,\theta)$,[11] *and S accepts any* $x_t \geq x^*(r,\theta)$ *and launches a revolution otherwise.*
- *If* $B^* > 0$, *then along the equilibrium path G proposes* $x_t = x^*(r,\theta)$ *in every mobilization period and S accepts with probability 1. If instead* $B^* < 0$, *then along the equilibrium path G proposes any* $x_t \in \big[0,(1-\theta_l)\cdot(1-e)\big]$ *in a mobilization period, and accepts with probability 0.*

2.3 Repression-Revolution Dilemma

Although repressing enables higher rents for the government, it causes revolution along the equilibrium path. By contrast, sharing power prevents revolution by enabling higher permanent concessions across periods. This section derives this tradeoff by characterizing the equilibria of the baseline game.

Lemma 2 characterizes two key determinants of when revolution will occur in a period that S mobilizes.

[11] If there does not exist an x_t that satisfies Equation 4, then G is indifferent among all $x_t \in \big[0,(1-\theta_l)\cdot(1-e)\big]$ but all equilibria are payoff-equivalent.

First, higher repression exerts countervailing short-term and long-term effects that, overall, increase revolution likelihood. On the one hand, in the short term, higher repression decreases the probability of mobilization in any particular period by raising expected mobilization costs. On the other hand, the long-term effect is that—by diminishing S's ability to organize to gain transfers—high repression leaves S with "no other way out" besides revolution to improve its consumption. Although linking the frequency of mobilization periods to fighting provides the same mechanism as Acemoglu and Robinson (2006), the analysis demonstrates the consequential difference in the present setup: by enabling G to make strategic choices that affect mobilization frequency, we gain insight into how the dictator could possibly choose a strategy that *increases* revolution likelihood.[12] Second, a higher degree of power-sharing decreases revolution likelihood. Although granting S larger institutional concessions diminishes G's remaining budget, the overall effect of higher θ increases B^*. By virtue of receiving these concessions in every period, higher θ decreases the optimal offer x^* by a greater magnitude than it decreases G's per-period revenues.

Lemma 2 (Effects of repression and power-sharing)**.**

> ***Part a.*** *For every value of the power-sharing parameter θ, there exists a unique threshold level of repression $\underline{r}(\theta)$ such that:*
>
> - *Low enough repression facilitates peace. Formally, if $r < \underline{r}(\theta)$, then $B^* > 0$.*
> - *High repression causes revolution in every mobilization period. Formally, if $r > \underline{r}(\theta)$, then $B^* < 0$.*
>
> ***Part b.*** *Higher values of the power-sharing parameter θ facilitate peaceful bargaining for a wider range of parameter values. Formally, for any θ' and $\theta'' > \theta'$, $\underline{r}(\theta') < \underline{r}(\theta'')$.*

G's tradeoff between repression and power-sharing has bite if two conditions are met. First, revolution occurs along the equilibrium path under repression, which corresponds with G choosing $(r, \theta) = (r_h, \theta_l)$ at the outset of the game. Second, revolution does not occur under power-sharing, $(r, \theta) = (r_l, \theta_h)$. Therefore, much of the analysis imposes Assumptions 1 and 2:

Assumption 1 (Repression and revolution)**.**

$$r_h > \underline{r}(\theta_l)$$

[12] By contrast, in Acemoglu and Robinson (2006), elites repress specifically to *prevent* revolution when temporary concessions are not sufficient.

Assumption 2 (Power-sharing and stable authoritarianism)**.**

$$r_l \leq \underline{r}(\theta_h)$$

Under these assumptions, how does G trade off between repression—which engenders revolution along the equilibrium path—and power-sharing? Equation 5 recursively characterizes G's consumption under power-sharing if Assumption 2 holds, where the subscript θ in the future continuation value denotes that G has chosen high θ_h. It follows the structure of Equation 1. G begins each period with per-period revenues $(1-\theta)\cdot(1-e)$. In the $\mu(r_l)$ percent of periods in which S mobilizes, G gives away the optimal transfer amount $x^*(r_l,\theta_h)$, and the status quo regime persists into the next period.

$$V_\theta^G = (1-\theta_h)\cdot(1-e) - \mu(r_l)\cdot x^*(r_l,\theta_h) + \delta\cdot V_\theta^G \tag{5}$$

Equation 6 recursively characterizes G's consumption under repression if Assumption 1 holds, where the subscript r in the future continuation value denotes that G has chosen high r_h. In any period t, S does not mobilize with probability $1-\mu(r_h)$. Therefore, G consumes its revenues and persists into the next period under the status quo regime. With complementary probability, S mobilizes and a revolution occurs.[13] With probability p, the revolution succeeds and G consumes nothing for the remainder of the game. But, with probability $1-p$, the revolution fails and the status quo regime survives into the next period, although G does not consume in a revolution period.

$$V_r^G = \left[1-\mu(r_h)\right]\cdot\left[(1-\theta_l)\cdot(1-e)+\delta\cdot V_r^G\right] + \mu(r_h)\cdot(1-p)\cdot\delta\cdot V_r^G \tag{6}$$

Some results are easier to explicate when, for fixed r_l, θ_h yields G's highest possible lifetime expected consumption amount conditional on inducing peace in mobilization periods. Lemma 3 shows that this equals the lowest possible value that enables avoiding revolution (see Lemma 2), depicted below in Figure 2 at $\theta_h = (\underline{r})^{-1}(r_l)$. Assumption 2' imposes this θ_h value.[14] Setting θ_h to maximize G's utility under revolution also sharpens the tradeoff regarding why G would ever choose an alternative strategy that causes

[13] The proof for Lemma 1 explains the absence of mixed equlibria.

[14] This implies that S is indifferent between accepting x^* and fighting at $(r,\theta) = (r_l,\theta_h)$. Therefore $B^*(r_l,\theta_h) = 0$ and G consumes 0 in every mobilization period, but—conditional on not triggering revolution—G consumes the maximum possible amount in non-mobilization periods.

revolution. Related, to make G's tradeoff non-trivial, Assumption 2' also assumes that θ_h is sufficiently small that G prefers power-sharing to repression at $\theta_h = (\underline{r})^{-1}(r_l)$, because otherwise it would never choose power-sharing. Throughout, the analysis states when any or all of Assumptions 1, 2, and 2' hold.

Lemma 3 (Maximizing G's utility under power-sharing)**.** *G's utility under power-sharing is maximized at $\theta_h = (\underline{r})^{-1}(r_l)$.*

Assumption 2' (Optimal power-sharing)**.**

$$r_l = \underline{r}(\theta_h)$$

$$\theta_h < \frac{\delta \cdot p - (1-\delta) \cdot (1-\theta_l) \cdot (1-e) - \big[1 - \delta \cdot (1-p)\big] \cdot e}{\big[1 - \delta \cdot (1-p)\big] \cdot (1-e)}$$

Imposing Assumption 2' and recursively solving Equations 5 and 6 enables comparing G's lifetime expected utility when choosing power-sharing versus repression.[15]

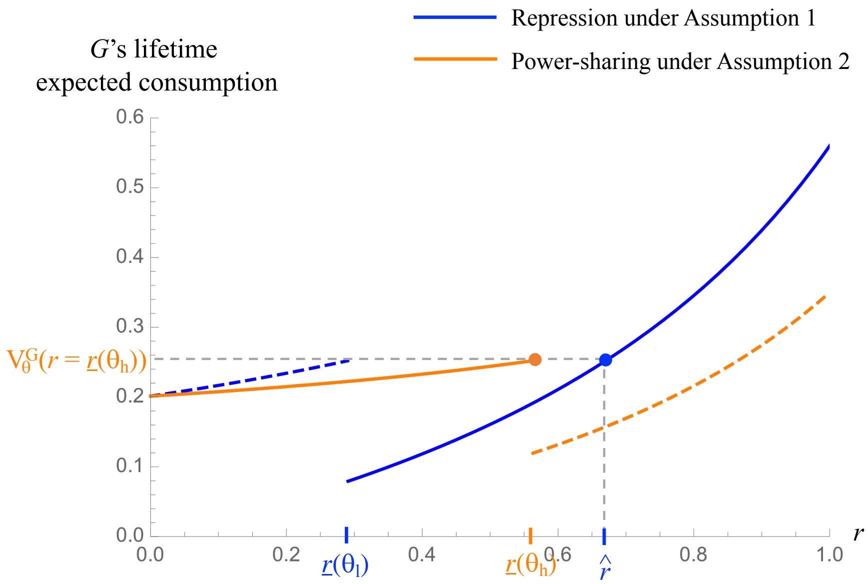
$$\Omega_{\theta,r} \equiv \underbrace{\frac{\big[1-\mu(r_l)\big] \cdot (1-\theta_h) \cdot (1-e)}{1-\delta}}_{V_\theta^G} - \underbrace{\frac{\big[1-\mu(r_h)\big] \cdot (1-\theta_l) \cdot (1-e)}{1-\delta \cdot \big[1-\mu(r_h) \cdot p\big]}}_{V_r^G} \tag{8}$$

Figure 2 highlights key aspects of G's tradeoff between repression and power-sharing by fixing two values of θ. The horizontal axis shows the repression level, and the vertical axis shows G's lifetime expected consumption as a function of repression for $\theta_l = 0.2$ (blue curves) and $\theta_h = 0.5$ (orange curves). Before imposing the aforementioned assumptions, it is useful to examine how each of the blue and orange functions vary in r. First, at the point where repression becomes large enough to cause revolution, G experiences a discrete drop in lifetime expected utility due to the destructiveness of revolutions $\big($see the drop from the dashed blue curve to the solid blue curve at $r = \underline{r}(\theta_l)$, or the drop from the solid orange curve to the dashed orange curve at $r = \underline{r}(\theta_h)\big)$. However, at all other r values, G's consumption strictly increases in r. Conditional on not crossing the revolution threshold, G either wants to make offers to S as seldom as possible—$r < \underline{r}(\theta_l)$ for the blue line and $r = \underline{r}(\theta_h)$ for the orange line—or to rarely face revolutionary attempts (see the opposite r ranges).

[15] If Assumption 2 but not 2' holds, then:

$$V_\theta^G = \frac{(1-\theta) \cdot (1-e) - \mu(r) \cdot x^*(r,\theta)}{1-\delta} \tag{7}$$

Figure 2: Tradeoff Between Repression and Power-Sharing



Notes: Figure 2 plots G's lifetime expected utility as a function of repression. The figure uses the functional form assumption $\mu(r) = 1 - \frac{2r}{1+r}$ and the following parameter values: $\delta = 0.85$, $e = 0.3$, and $p = 0.7$. For the blue curve, $\theta_l = 0.2$. For the orange curve, $\theta_h = 0.5$. The solid segment of the blue curve satisfies Assumption 1, and the dashed segment violates it. The solid segment of the orange curve satisfies Assumption 2, and the dashed segment violates it. The orange dot satisfies Assumption 2'.

These two effects of r highlight why G may choose either repression or power-sharing. The obvious appeal of power-sharing is that it prevents revolution. Imposing Assumption 1 implies that we only consider values of the blue curve satisfying $r > \underline{r}(\theta_l)$ (i.e., the solid segment), and imposing Assumption 2' implies we compare these values to the orange curve at $r = \underline{r}(\theta_h)$, which yields a corresponding utility amount $V_\theta^G\big(r = \underline{r}(\theta_h)\big)$.[16] If we fix $r_h = r_l = \underline{r}(\theta_h)$, then G clearly prefers power-sharing (shown because the orange line sits above the blue line at this point). In this case, S mobilizes in an identical number of periods, but power-sharing avoids the cost of revolution.[17]

However, for $r_h > \hat{r}$, G prefers repression. Although G eventually expects to suffer revolution costs, the more effective the high repression strategy is—i.e., higher r_h—the less frequent that S mobilizes. The difference in S's mobilization frequency between $r = \underline{r}(\theta_h)$ and $r = \hat{r}$ makes up for the differences in costs

[16]The solid segment of the orange line corresponds with all parameter values that satisfy Assumption 2.

[17]If we reverse the assumption $r_h > r_l$ but continued to impose Assumption 1, then G has even stronger preferences for power-sharing. For any $r_h \in \big(\underline{r}(\theta_h), \underline{r}(\theta_l)\big)$, the expected utility of repression is lower than at $r_h = \underline{\theta}_l$ because revolutions occur more frequently, i.e., the solid orange line lies above the solid blue line in this parameter range.

of fighting. Therefore, for a fixed value r_h, we need to know whether $r_h < \hat{r}$ or $r_h > \hat{r}$, and understand factors that increase or decrease $\hat{r}$.[18]

Proposition 1 states the equilibrium of the baseline game. It is unique if peace occurs along the equilibrium path, and there exist a continuum of payoff-equivalent equilibria strategy profiles if revolution occurs in every mobilization period.

Proposition 1 (Equilibrium). *If Assumptions 1 and 2' hold, then:*

- *There exists a unique $\hat{r} > r_l$ (defined in the proof) such that if $r_h < \hat{r}$, then G chooses power-sharing: $(r, \theta) = (r_l, \theta_h)$. Otherwise, G chooses repression: $(r, \theta) = (r_h, \theta_l)$.*
- *Lemma 1 characterizes optimal bargaining given the initial repression/power-sharing choice.*
- *In equilibrium, if $r_h < \hat{r}$, then G proposes $x_t = x^*(r_l, \theta_h)$ in every mobilization period and S accepts. If instead $r_h > \hat{r}$, then in equilibrium G proposes any $x_t \in \big[0, (1-\theta_l) \cdot (1-e)\big]$ in a mobilization period, and S launches a revolution.*

A final note about the equilibrium requires comparing G's optimal choices at two distinct parts of the game. Lemma 1 establishes that in any mobilization period, if possible, G prefers to propose a transfer offer that S will accept, rather than face a revolution. This is because G would immediately pay the cost of revolution. By contrast, when setting (r, θ) at the outset of the game, G might make a choice that makes it impossible to buy off S in a mobilization period because, if r_h is high enough, then G expects to pay costs of revolutions far enough into the future that it willingly chooses actions that yield a conflictual equilibrium path.[19]

2.4 Rent-Seeking Opportunities

Faced with a tradeoff between revolution-inducing repression and greater transfers via power-sharing, the structure of the economy provides one deciding factor. G faces higher incentives to choose high repression

[18] Figure 2 also shows that, conditional on pursuing high repression, G would prefer to repress as much as possible, which the binary repression choice restricts. If instead we modeled a continuum, real-world factors that constrain feasible repression amounts would affect the convexity of the costs of arming, which would produce similar constraints on repression but at the cost of additional notation and technical considerations (see Appendix C).

[19] Appendix Proposition C.1 shows similar behavior if G chooses (r_t, θ_t) in every period in a subgame perfect Nash equilibrium enforced by history-dependent punishment strategies.

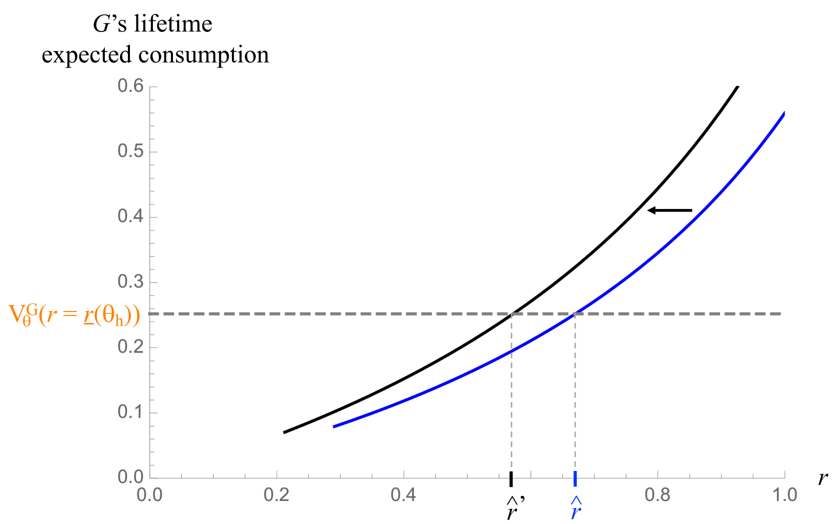
when S has a lower-valued economic exit option, denoted by lower e, because concessions entail higher opportunity costs. Assets such as land and oil possess properties that make it easier for the governments to accrue revenues because societal producers have limited ability to exit to informal or international economic markets (Boix, 2003; Paine, Forthcoming). Related, if G represents social groups that are considerably wealthier than S, then redistribution is relatively more costly for G (Acemoglu and Robinson, 2006).

Formally, Equation 9 highlights two components of the rent-seeking effect. First, choosing θ_l over θ_h implies that G forgoes relatively fewer rents in periods that G does not mobilize. Second, choosing r_h over r_l implies that G must concede high rents to S (or face revolution) less frequently. These effects combine to strictly decrease $\hat{r}$.

$$sgn\left(-\frac{d\hat{r}}{de}\right) = sgn\left(-\frac{\overbrace{\left[1-\mu(r_h)\right]}^{2}\cdot\overbrace{(1-\theta_l)}^{1}}{1-\delta\cdot\left[1-\mu(r_h)\right]\cdot p}\right) < 0 \tag{9}$$

Figure 3 depicts this effect by plotting the same solid blue line from Figure 2 under parameter values that satisfy Assumption 1, i.e., $r > \underline{r}(\theta_l)$. It also depicts the same dashed gray line that depicts $V_\theta^G\big(r = \underline{r}(\theta_h)\big)$. It adds a new solid black line that reflects G's lifetime expected utility to repression when θ_l decreases from 0.3 to 0.1. Lower e increases G's gains from repressing at high levels, yielding a decrease in the critical $\hat{r}$ threshold to $\hat{r}'$.

Figure 3: Rent-Seeking Effect



Notes: Figure 3 plots G's lifetime expected utility as a function of S's share of economic profits. The figure uses the functional form assumption $\mu(r) = 1 - \frac{2r}{1+r}$ and the following parameter values: $\delta = 0.85$, $p = 0.7$, $e = 0.3$ for the blue line, and $e = 0.1$ for the black line. For the blue and black lines, $r = 0.7$ and $\theta = 0.2$. For the dashed gray line, $r = 0.4$ and $\theta = 0.5$.

Proposition 2 formally states the rent-seeking effect.

Proposition 2 (Rent-seeking effect)**.** *If Assumptions 1 and 2' hold, then there exists a unique threshold* $\hat{e}$ *such that:*

- *If* $e < \hat{e}$*, then* G *chooses power-sharing.*
- *If* $e > \hat{e}$*, then* G *chooses repression.*

2.5 Enriching the Baseline Model

The baseline model contains three notable simplifying features. First, the cost structure for S's mobilization problem is somewhat trivial. Second, G chooses between two levels of repression/power-sharing and does not pay repression costs. Third, G makes its repression/power-sharing choice at the outset of the game and can perfectly commit to this strategy throughout the game. Appendix C shows that these assumptions simplify the analysis without qualitatively changing the insights. It assumes that mobilization costs vary according to a continuous distribution across periods, and that G sets a repression level in every period while choosing among a continuum of repression amounts. The extension shows that there exists a unique mobilization cost that determines whether or not S mobilizes in each period, and that higher repression strictly raises this threshold—creating the same repression-revolution tradeoff as the baseline model. For the government, there exists a unique optimal low repression amount (i.e., no revolution in equilibrium) and a unique high repression amount. The strategy profile posits that G chooses low repression, and the players move into a punishment phase if G ever deviates to high repression. As in the baseline model, low repression is not incentive compatible if G is sufficiently effective at repression (which in the extension relates to the convexity of G's military cost function rather than a fixed value of r_h).

The similar results produced by this model extension also underscore that simply allowing repression levels to affect mobilization frequency—even if the assumed mobilization cost structure is trivial—provides an important innovation. Although repression facilitates higher authoritarian rents, it also triggers revolution by leaving society with "no other way out."

3 Political Survival Dilemma

The baseline model is intentionally spare to highlight the core repression-revolution tradeoff. But under what conditions do repression and power-sharing indeed facilitate distinct regime paths? This section considers extensions that endogenize military actions and that vary S's probability of winning based on repression and power-sharing choices.

3.1 Repression Agency Problem

Repression not only affects the government's relationship with society, it also creates two types of agency problems between the dictator and its military. On the one hand, the dictator may be unable to induce the military to consistently comply with high repression, as studied in several formal models (Tyson, 2017; Dragu and Przeworski, 2017). On the other hand, a larger military capable of repression can also overthrow the ruler via a coup (Acemoglu, Vindigni and Ticchi, 2010; Besley and Robinson, 2010; Svolik, 2012). This section models the military as a strategic actor and shows that these agency problems interact with each other in counterintuitive ways. The main finding is that more effective repression makes repression compliance self-enforcing only when dictators can effectively coup-proof their regimes.

3.1.1 Setup

In this extension, G still faces a repression/power-sharing/democratization choice at the outset of the game. If G chooses power-sharing or democratization, then the game is identical to above. However, if G chooses repression, then a strategic military actor M moves first in each period. M chooses to comply with repression orders, to attempt a coup, or to negotiate a transition with society. If M represses, then repression succeeds with probability $1 - \mu(r_h)$ and S faces high repression costs: $c_t = \infty$. However, with complementary probability, repression fails and $c_t = 0$. M consumes a fixed rent ω_{sq}, which also includes costs of executing repression, in every period it represses and if no revolution occurs.

A coup attempt succeeds with probability $q(r_h) \in (0, 1)$, and this probability strictly increases in r_h. If successful, M consumes 1 in period t and in all future periods, but 0 following a failed coup attempt. If M negotiates a transition, then it consumes ω_{rc} in period t and all subsequent periods. M's ordering of the different regimes is $0 < \omega_{rc} < \omega_{sq} < 1$, implying that it most-prefers military dictatorship, then the status quo authoritarian regime, then negotiated regime change, and then revolution.[20]

3.1.2 Analysis

The key question is whether the large military will comply with repression orders in any period in the status quo regime, or deviate to either of its non-repression options:

$$\underbrace{V^M}_{\text{repress}} \geq \frac{1}{1-\delta} \cdot \max\Big\{\underbrace{q(r_h)}_{\text{coup}}, \quad \underbrace{\omega_{rc}}_{\text{negotiated transition}} \quad \Big\} \tag{10}$$

for:

$$V^M = \big[1-\mu(r_h)\big] \cdot \big(\omega_{sq} + \delta \cdot V^M\big) + \mu(r_h) \cdot \delta \cdot \big[1-p(r_h)\big] \cdot V^M \tag{11}$$

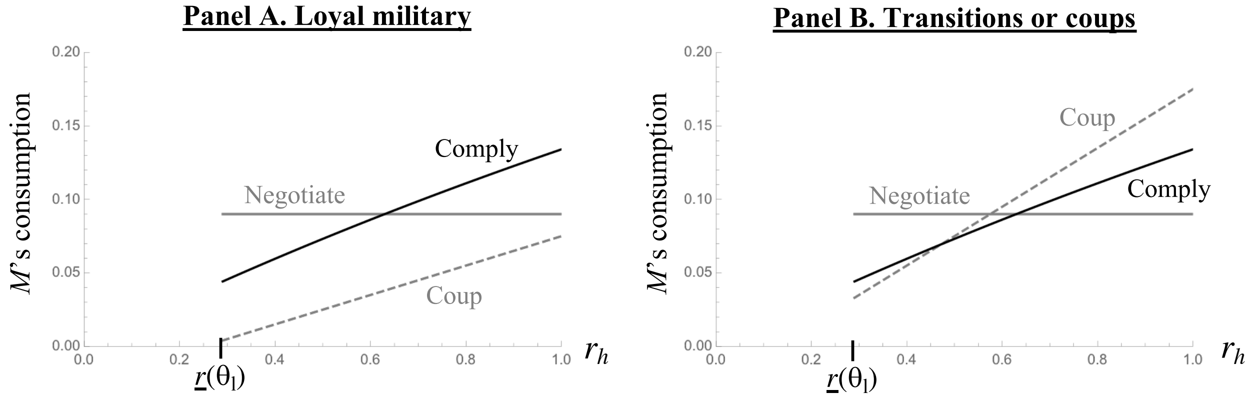
Equation 10 and the accompanying Figure 4 shows that G must clear two hurdles for high repression to be incentive compatible. The figure presents r_h on the horizontal axis and M's per-period consumption for different choices on the vertical axis. The black line corresponds with repression, the solid gray line with negotiating a transition with society, and the dashed gray line with a coup attempt. The only difference between the two panels are the parameters in the assumed functional form for the probability of coup success.

Two aspects of the high repression level affect the possibility of incentivizing compliance.[21] On the one hand, higher r_h endogenously raises M's utility in the status quo regime by decreasing the frequency of mobilization periods and, correspondingly, of revolution attempts. Therefore, effective repression can make repression compliance self-enforcing. Both figures show that high enough r_h cause M to prefer repression

[20] Although not necessary to derive the compliance constraint analyzed here, to complete the formal description of this extension, assume that G's utility following a coup attempt is 0, either because the coup succeeds or because the coup fails but M's non-repression enables a revolution to succeed with probability 1. Also assume that G consumes 0 following a negotiated transition. Assume that S consumes 1 in all periods following either a successful coup or a negotiated transition.

[21] It is trivial to show that if Equation 10 holds, then the strategic interaction between G and S is isomorphic to the baseline game. If instead Equation 10 does not hold, then it is optimal for G to choose $(r, \theta) = (r_l, \theta_h)$ if Assumption 2 holds.

Figure 4: Military Compliance



Notes: Figure 4 uses the same parameter values as Figure 2, plus $\omega_{sq} = 0.8$ and $\omega_{rc} = 0.6$. Both panels use the functional form $\mu(r) = 1 - \frac{r}{1+r}$ and $q(r) = \min\left\{0, \frac{1}{10} \cdot \left(\frac{1}{4} + \alpha \cdot r\right)\right\}$, and $\alpha = 1$ in Panel A and $\alpha = 2$ in Panel B.

compliance over a negotiated transition. This resembles Tyson's (2017) emphasis that incentives to exercise repression depend on the endogenous probability of regime survival. Conversely, for a fixed r_h, sufficiently large ω_{rc} undermines repression compliance. Although M is assumed to prefer the status quo regime to rule by society, it may prefer the tranquility of societal rule over periodic revolutions against the status quo regime.

On the other hand, Panel B shows that high repressive capacity is not sufficient to ensure compliance. A common assumption in formal models of military control and the broader literature (Acemoglu, Vindigni and Ticchi, 2010; Besley and Robinson, 2010; Svolik, 2012) is that larger militaries succeed at coup attempts more frequently, motivating the assumption $q'(r_h) > 0$. If this probability increases sharply enough in r_h, relative to the depressing effect of r_h on the per-period probability of a revolution, then G cannot enforce compliance even if r_h is large.

Combining these two effects shows the importance of simultaneously evaluating coup possibilities and alternative forms of military non-compliance. High repressive capacity can solve the problem of the military cutting deals with other societal actors, but can also breed coups. Conversely, although high repressive capacity increases coup prospects, high repressive capacity may be necessary to eliminate the military from pursuing other options (i.e., negotiated transitions) that also negatively affect the dictator. Lemma 4 formalizes this intuition.

Lemma 4 (Repression compliance)**.** *There exist unique thresholds $\hat{q} \in (0,1)$, $\tilde{q} \in (0,1)$, and $\hat{\omega}_{rc} \in (0,1)$ defined in the proof with the following properties:*

- *If $q < \hat{q}$ and $\omega_{rc} < \hat{\omega}_{rc}$, then M represses in every period in the status quo regime.*
- *If $q > \max\left\{\hat{q}, \tilde{q}\right\}$, then M attempts a coup in every period in the status quo regime.*
- *If $\omega_{rc} > \hat{\omega}_{rc}$ and $q < \tilde{q}$, then M negotiates a transition in every period in the status quo regime.*

The thresholds $\hat{\omega}_{rc}$ and $\hat{q}$ naturally correspond with two aspects of military composition that the coup-proofing literature studies. First, many posit that militaries stacked with loyalists such as family members and co-ethnics are less likely to stage coups because they have a lower-valued outside option to negotiating a transition (i.e., low ω_{rc}), given their likely exclusion in future regimes (at least relative to their privileged position in the status quo regime). Second, dictators that can create effective counterbalancing organizations such as presidential guards and overlapping intelligence agencies can directly decrease the probability of coup attempts succeeding (Quinlivan, 1999; Pilster and Böhmelt, 2011), i.e., $q(\cdot)$ increases less sharply in r_h. However, absent coup-proofing features such as these, the military charged with saving the regime may instead end the regime.

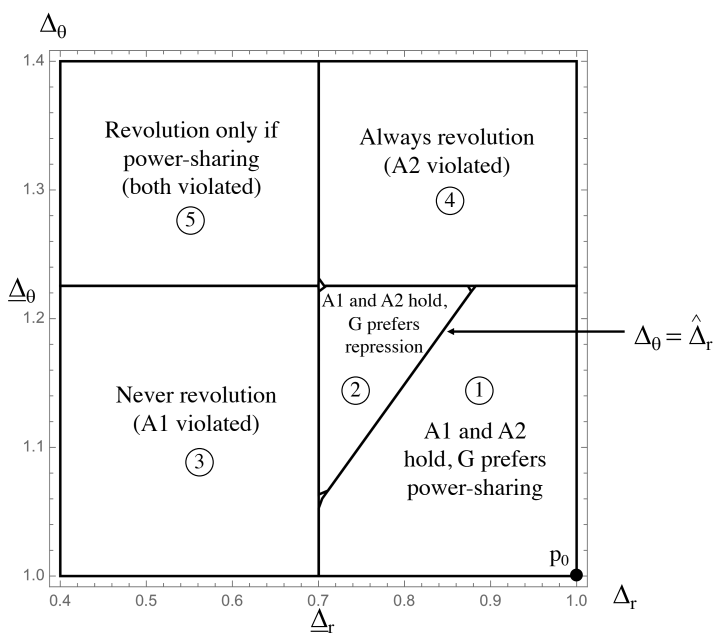
3.2 Power-Sharing Dilemma

The core tradeoff presumes that sharing power prevents revolutionary overthrow. However, expanding the dictator's circle carries its own political survival risks. Roessler (2011, 2016) examines the prevalence of coups by ethnic groups with access to power at the center in post-colonial Africa. Aksoy, Carter and Wright (2015) provide evidence that broad-based societal disturbances create opportunities for outsiders in the military to stage coups. Although conceptually distinct from the revolutions discussed thus far, from the ruler's perspective, any form of overthrow by societal members carries a grave risk. Therefore, expanding the concept of p to include success in any type of removal by non-core regime members, power-sharing may fail to prevent revolution. Conversely, in reality, high repression also lowers society's probability of winning—a countervailing effect that diminishes revolution prospects.

The model can incorporate these possibilities by assuming that S's revolution success probability depends on G's repression/power-sharing choice: $p(r_h)$ if G chooses high repression and $p(\theta_h) \geq p(r_h)$ if power-sharing. Stating these terms relative to a baseline probability $p = p_0$, we can write $p(\theta_h) = \Delta_\theta \cdot p_0$ and

$p(r_h) = \Delta_r \cdot p_0$, for $\Delta_\theta \geq 1$ because power-sharing increases S's probability of winning, and $\Delta_r \in (0, 1]$ because repression decreases S's probability of winning (in the baseline model, $\Delta_\theta = \Delta_r = 1$). Figure 5 presents a region plot that highlights different cases as a function Δ_r and Δ_θ, and the corresponding Table 1 states the expected per-period probability of successful revolution under different choices. The various regions in the plot correspond with different possible combinations of: whether or not Assumption 1 holds (revolution in mobilization periods under high repression), whether or not Assumption 2 holds (no revolution in mobilization periods under power-sharing), and G's preference for repression or power-sharing.

Figure 5: Shifting Power Effects



Notes: Figure 5 uses the same parameter values and functional form assumptions as Figure 2, except $p_0 = 0.6$ and it fixes $r_l = 0.4$ and $r_h = 0.6$ and allows $p(r_h)$ and $p(\theta_h)$ to vary independently. It presents a region plot divided by whether Assumptions 1 and 2 hold, and by G's preference for repression or power-sharing.

Regions 1 and 2 satisfy both assumptions by corresponding with parameter values in which revolution occurs under high repression but not under power-sharing. Comparing these two regions highlights the effects of small changes in p. Assume that p_0 lies in region 1, where G prefers power-sharing. However, large enough Δ_θ and small enough Δ_r can push the parameter values into region 2, where G prefers repression. Although Assumptions 1 and 2 still hold in region 2, differential probabilities of winning alter $x^*(r, \theta)$ and push G toward the high repression path. The logic here resembles the predation mechanism because high repression enables G to avoid transferring the larger rents required under power-sharing required because S wins with higher probability (see Equation 2).

Table 1: Expected Regime Duration

Region	Failure rate w/ high rep.	Failure rate w/ power-sharing	Takeaway
1 and 2	$q(r_h) \cdot p(r_h)$	$\mathbf{0}$	Power-sharing promotes political survival
3	0	0	No effect on political survival
4	$\boldsymbol{q(r_h) \cdot p(r_h)}$	$q(r_l) \cdot p(\theta_h)$	Repression promotes political survival
5	$\mathbf{0}$	$q(r_l) \cdot p(\theta_h)$	Repression promotes political survival

Notes: Table 1 states the per-period expected probability of successful revolution disaggregated by G's repression/power-sharing choice and by the numbered regions in Figure 5. Bold font indicates the choice with lower failure rate.

Larger changes in the probabilities of winning can cause either Assumption 1 or 2 not to hold. Sufficiently low Δ_r violates Assumption 1 because revolution no longer occurs along the equilibrium path even with high repression. In region 3, despite the relative infrequency which with S is able to mobilize and gain concessions because of high repression, G's effectiveness at using repression to lower S's probability of winning implies that it is now possible for G to buy off S in a societal mobilization period (i.e., Equation 4 is satisfied). In this case, G no longer faces a tradeoff between rents and revolution, because revolution does not occur regardless of its choice between repression and power-sharing. This is equivalent to the $r < \underline{r}(\theta_l)$ region in Figure 2 (dashed blue line), in which G prefers high repression to power-sharing for a fixed r to accrue higher rents.

Sufficiently high Δ_θ violates Assumption 2, and revolution occurs regardless of G's choice of repression and power-sharing. In region 4, despite the larger transfers θ_h that G makes to S in every period, S's probability of winning is high enough that G still cannot buy off S if it mobilizes. Faced with inevitable revolution, G prefers high repression over power-sharing.[22] Not only does this choice deliver higher rents, but high repression also *promotes* political survival. S mobilizes less frequently with high repression and wins with lower probability, creating a per-period regime failure probability of $q(r_h) \cdot p(r_h) < q(r_l) \cdot p(\theta_h)$.

Finally, combining the previous two effects, a large enough increase in $p(\theta_h)$ accompanied by a large enough decrease in $p(r_h)$ violates Assumptions 1 and 2: revolution (or coups) occur under power-sharing, but not under high repression. Once again, choosing high repression enhances political survival. Proposition 3 formalizes this intuition.

[22]However, the next section discusses why G may democratize in this circumstance.

Proposition 3 (Political survival effect)**.** *Assume there is a baseline probability of winning* p_0 *such that* G *prefers power-sharing over repression at* $p = p_0$*. Define* $p(\theta_h) = \Delta_\theta \cdot p_0$ *and* $p(r_h) = \Delta_r \cdot p_0$*. There exist unique thresholds* $0 < \underline{\Delta}_r < \hat{\Delta}_r < 1$ *and* $\underline{\Delta}_\theta > 1$ *defined in the proof with the following properties.*

- *If* $\Delta_r < \hat{\Delta}_r$*, then* G *prefers repression over power-sharing although Assumptions 1 and 2 hold; and* $\hat{\Delta}_r$ *strictly increases in* Δ_θ*.*
- *If* $\Delta_r < \underline{\Delta}_r$*, then Assumption 1 fails.*
- *If* $\Delta_\theta > \underline{\Delta}_\theta$*, then Assumption 2 fails.*

4 Repression, Societal Extremists, and Democratization

Even if repression creates revolutionary incentives, what prevents the government from extricating itself from a violent path by democratizing in a mobilization period? The possibility of democratizing does not provide a panacea for repressive dictators because repression shapes the *composition* of societal organization. The democratization extension assumes there are two societal factions, moderates and extremists. High repression causes only the extremist faction to ever organize because they face lower mobilization costs in the face of high repression, and extremists prefer revolution to democracy. This setup contrasts with many existing models of democratic transitions that assume mass movements necessarily seek democratic concessions (Boix, 2003; Acemoglu and Robinson, 2006). Democratizing further poses a dilemma for dictators because although only weak rulers—in the sense of inability to peacefully share power or repress effectively—will consider democratizing, they also need to be sufficiently organizationally strong to protect elite interests under democratic rule.

4.1 Setup

To develop this mechanism, this section extends the model by enabling G to propose democratization. At the outset of the game, G chooses (r, θ, D), where $D = 1$ implies that G proposes to democratize in the first mobilization period, and $D = 0$ yields the baseline interaction.[23] If society accepts a democratization

[23]Formally, G's choice set is $\big\{(r_h, \theta_l), (r_l, \theta_h)\big\} \times \{0, 1\}$. For technical reasons, as with the repression/power-sharing choice, it greatly simplifies the analysis to assume that G chooses its democratization strategy at the outset of the game and furthermore, that $D = 1$ entails proposing democratization in

proposal, then the game reaches an absorbing state. G consumes $(1-\theta_d)\cdot(1-e)$ in the first and all subsequent democratization periods, and assuming $\theta_d > \theta_h$ implies that the ex-dictator concedes higher rents under democracy than under dictatorship. The parameter θ_d captures a wide range of possible arrangements from undemocratic upper legislative chambers to elite domination of major political parties. Lower θ_d corresponds with higher de facto power for G under democracy.

On the society side, assume there are two actors, a moderate faction S_m and an extremist faction S_e, indexed by $i \in \{m, e\}$. In each period, after observing mobilization costs, they simultaneously decide whether or not to mobilize. Assume for simplicity that the effective endowment $e+\theta\cdot(1-e)$ is a club good, i.e., S_m and S_e both consume it, and equally value it. If neither mobilize in period t, then everything is identical to the baseline game: this is each factions' only consumption source, and the game continues with the status quo regime in place in the next period. If exactly one faction mobilizes, then a similar bargaining interaction as in the in baseline game occurs, and the transfer offer is also a club good. If both factions mobilize, then S_m makes the acceptance or revolution choice, under the premise that societal moderates are more numerous than extremists and, conditional on mobilizing, moderates dominate the agenda.

The moderate and extremist factions differ in two ways. First, their mobilization costs if G represses at high levels. As in the baseline game, in $1-\mu(r_h)$ percent of periods, $c_{i,t}=\infty$ for $i \in \{m, e\}$. However, in the $\mu(r_h)$ percent of periods that repression fails, the societal factions face different mobilization costs: $c_{e,t}=c_e \geq 0$ and $c_{m,t}=c_m > c_e$. This assumption captures the intuitive idea that extremists are more willing to tolerate costs of overcoming repression. If instead G chooses power-sharing, then the mobilization cost structure is identical to the baseline game. Second, the factions enjoy different fates under democratic rule. In each period, S_m consumes the remainder not consumed by G, $e+\theta_d\cdot(1-e)$. However, this is not a club good because S_e consumes 0 under democracy, with the idea that extremists have a comparative

the first mobilization period and in all subsequent periods. If instead G chooses D_t in every period, and we posit that $D_t=1$ with probability $\pi \in [0,1]$ and $D_t=0$ with complementary probability, then G's future continuation value is non-monotonic in π. This creates the possibility of mixed democratization strategies in equilibrium. However, regarding substantive insights, any $\pi > 0$ (democratization with positive probability) is qualitatively different than $\pi = 0$ (never democratize), which is why I prefer a simpler setup that generates a pure strategy equilibrium.

advantage in violence over democratic negotiation.[24] By contrast, winning a revolution is identical to the baseline game, yielding per-period consumption of 1 for both factions.

4.2 Analysis

This section analyzes conditions under which the extremist faction will dominate the societal organization under high repression.[25] The discussion surrounding Lemma 1 established that, conditional on a mobilization period, if possible G prefers to offer a transfer that S will accept. For high enough p, it is also true that G prefers democratization to a revolutionary attempt. However, S_e will clearly reject this offer since it consumes 0 under democratic rule. Under the following assumption imposed throughout the analysis, the two societal factions differ in the their behavior conditional on mobilizing because S_m prefers democratization to revolution.

Assumption 3 (Boundary conditions for democratization)**.**

$$\theta_d > \underline{\theta}_d \equiv \frac{\delta \cdot p \cdot (1-e) - (1-\delta) \cdot e}{\big[1 - \delta \cdot (1-p)\big] \cdot (1-e)} > 0$$

Given Assumption 3, the possibility of negotiating a democratic transition with society in a mobilization period hinges on whether S_e or mobilizes S_m. The following present the two incentive compatibility constraints for only the extremist faction to mobilize under high repression:

$$\underbrace{e + \theta_l \cdot (1-e) + \delta \cdot V^S}_{E[U_{S_e}(\text{not mobilize})]} \leq \underbrace{-c_e + \delta \cdot \left[p \cdot \frac{1}{1-\delta} + (1-p) \cdot V^S\right]}_{E[U_{S_e}(\text{mobilize})]} \tag{12}$$

$$\underbrace{\delta \cdot \left[p \cdot \frac{1}{1-\delta} + (1-p) \cdot V^S\right]}_{E[U_{S_m}(\text{not mobilize})]} \geq \underbrace{-c_m + \frac{e + \theta_d \cdot (1-e)}{1-\delta}}_{E[U_{S_m}(\text{mobilize})]}, \tag{13}$$

where V^S is identical to the baseline game.[26] Equation 12 states that S_e must prefer to mobilize in a

[24] The results are similar if S_e enjoys positive consumption under democracy as long as this amount is sufficiently small.

[25] A future draft will present the proof that this is the unique equilibrium under these conditions.

[26] The continuation value V^S does not differ depending on whether revolution occurs along the equilibrium path because S achieves its lower bound payment (revolution constraint) in all equilibria.

failed repression period given that S_m does not mobilize, and Equation 13 states that S_m must prefer to not mobilize in a failed repression period given that S_e does mobilize. Given the strategy profile and each factions' preferences over revolution and democratization, S_e not mobilizing is sufficient for peace in period t, S_e mobilizing and S_m not mobilizing are individually necessary and jointly sufficient for revolution, and S_m mobilizing is sufficient for democratization. Lemma 5 shows that if S_e's mobilization costs are sufficiently lower than S_m's, then there exists an equilibrium in which high repression causes extremists to dominate the societal organization, leading to equilibrium revolution even if G chooses $D = 1$. By contrast, S_m's strict preference for democracy over revolution (Assumption 3) is sufficient for moderates to dominate under low repression (because the mobilization cost structure is assumed to be identical to the baseline game).

Lemma 5 (Democratization possibilities)**.** *Assume $c_e < \hat{c}_e$ and $c_m > \hat{c}_m$, defined in the proof, and assume $D = 1$. Then if G chooses power-sharing, only S_m will mobilize in a failed repression period, and will accept democratization. If instead G chooses repression, then only S_e will mobilize in a failed repression period, and will fight a revolution.*

The remainder of the analysis assumes $c_e < \hat{c}_e$ and $c_m > \hat{c}_m$. Therefore, given Lemma 5, it is only strategically relevant to evaluate G's lifetime expected utility to choosing $D = 1$ if it represses at low levels:

$$V^G_{\text{demo}} = \big[1 - \mu(r_l)\big] \cdot \Big[(1 - \theta_h) \cdot (1 - e) + \delta \cdot V^G_{\text{demo}}\Big] + \mu(r_l) \cdot \frac{(1 - \theta_d) \cdot (1 - e)}{1 - \delta}, \tag{14}$$

which solves to:

$$V^G_{\text{demo}} = \underbrace{\frac{\big[1 - \mu(r_l)\big] \cdot (1 - \theta_h) \cdot (1 - e)}{1 - \delta \cdot \big[1 - \mu(r_l)\big]}}_{\text{Before first mobilization period}} + \underbrace{\frac{\mu(r_l) \cdot (1 - \theta_d) \cdot (1 - e)}{(1 - \delta) \cdot \Big[1 - \delta \cdot \big[1 - \mu(r_l)\big]\Big]}}_{\text{After democratization}}, \tag{15}$$

4.3 Discussion

Showing that the democratization option is only possible if repression occurs at low enough levels relates to the real-world observation that repression tends to embolden extreme members of society and deter moderates (Della Porta, 2013, 67).[27] Throughout the 20th century, communist revolutionaries, warlords, and

[27] Shadmehr (2015) provides a different way to formalize this idea by showing that an increase in the minimum punishment that individuals pay to join a movement endogenously creates more extreme demands

anarcho-syndicalist union leaders have all sought to overthrow authoritarian regimes without replacing them with democracies. Collier (1999) provides examples of anarchist labor unions in Europe and South America in the early 20th century. In Argentina, “the labor movement was generally indifferent or even hostile to democracy, often viewing it as a means of elite co-optation” (45). Skocpol (1979, 206-214) describes the absence of a pronounced liberal movement underpinning the Russian Provisional Government of 1917 that followed the end of the monarchy. Particularly problematic, the government was dependent on the Petrograd Soviet to implement any policy that required worker cooperation (208). Shortly after the October Revolution later in 1917 in which the Bolsheviks seized state power, they dissolved the elected Constituent Assembly and quickly turned to coercive means to establish power (214-218), setting the stage for the long, bloody, and decidedly non-democratically oriented Russian Revolution.

5 Optimal Regime Strategies

How does G decide among repression, power-sharing, and democratization? This subsection analyzes G's full choice set by also comparing the democratization option to repression and power-sharing. The analysis imposes Assumption 1 throughout,[28] although considers parameter values in which Assumption 2 either does or does not hold to account for empirical circumstances in which sharing power with society generates high coup risk. After showing that G will always choose power-sharing over democratization if possible, it then shows the paradoxical circumstances in which G optimally democratizes.

If Assumption 2’ holds, then democratization cannot be optimal. If G can prevent revolution by sharing at least θ_h percent of revenues in every period, and this power-sharing arrangement maximizes G's utility conditional on preventing revolution in every societal mobilization period, then it cannot be optimal to share more rents with society—as assumed for democratization. Therefore, if Assumption 2’ holds, then G faces the same tradeoff as in the baseline analysis between repression and power-sharing. Combining Proposition 2 and Lemma 4 shows that repression is optimal if rents are high and G can induce a large military to comply with repression orders, but otherwise G prefers power-sharing. Proposition 4 summarizes this logic.

by the group.

[28] If Assumption 1 does not hold, then the analysis is trivial because repression is always optimal.

Proposition 4 (Repression or power-sharing?)**.** *Assume Assumptions 1 and 2' hold.*

- *If $e > \hat{e}$ (high rent-seeking threshold from Proposition 2) and $q < \hat{q}$ and $\omega_{rc} < \hat{\omega}_{rc}$ (repression compliance thresholds from Lemma 4), then G chooses repression and the per-period rate of status quo regime failure is $\mu(r_h) \cdot p(r_h)$.*
- *Otherwise, G chooses power-sharing and the per-period rate of status quo regime failure is 0.*

If instead Assumption 2 does not hold, then Proposition 3 shows that power-sharing does not prevent revolution and cannot be the optimal choice. This implies that G's only possible choices are repression, or democratization to prevent revolution. If there are lucrative rent-seeking possibilities and the military will comply with high repression, then G prefers high repression for the same reason as in Proposition 4. However, if either of these two conditions fail, then democratization may be optimal. G's willingness to democratize depends on how well it can protect its interests after democratization. If G expects very low de facto power after democratizing (high θ_d), then it chooses repression as the best of two bad options: although rent-seeking possibilities are low or repression is relatively ineffective, G will still hold onto power to prevent a bad fate under democratization. Proposition 5 summarizes this logic.

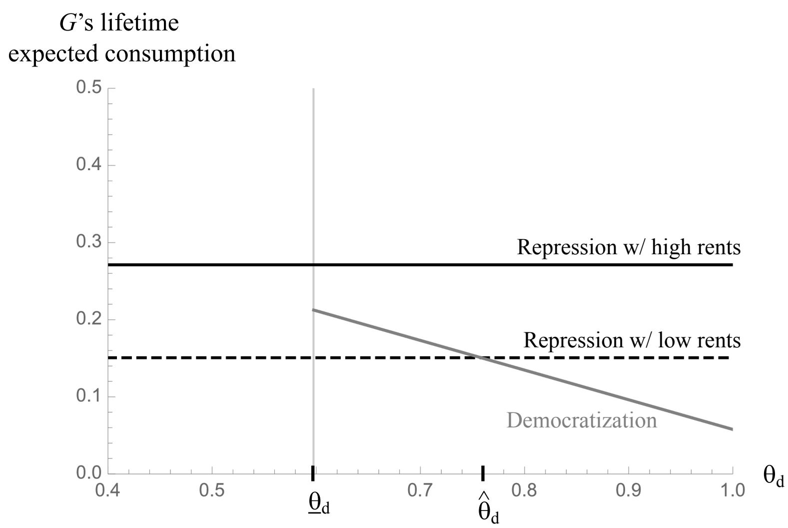
Proposition 5 (Repression or democratization?)**.** *Assume Assumption 1 but not Assumption 2 holds.*

- *If $e > \hat{e}$ (high rent-seeking threshold from Proposition 2) and $q < \hat{q}$ and $\omega_{rc} < \hat{\omega}_{rc}$ (repression compliance thresholds from Lemma 4), then G chooses repression and the per-period rate of status quo regime failure is $\mu(r_h) \cdot p(r_h)$.*
- *If $e < \hat{e}$, $q < \hat{q}$, and $\omega_{rc} < \hat{\omega}_{rc}$, then there exists a unique threshold $\hat{\theta}_d$ defined in the proof such that G democratizes if $\theta_d < \hat{\theta}_d$ and represses otherwise. The per-period rate of status quo regime failure is $\mu(r_l)$ if G democratizes.*
- *If $q > \hat{q}$ or $\omega_{rc} > \hat{\omega}_{rc}$, then there exists a unique threshold $\tilde{\theta}_d$ defined in the proof such that G democratizes if $\theta_d < \tilde{\theta}_d$ and represses otherwise. The per-period rate of status quo regime failure is $\mu(r_l)$ if G democratizes.*

This result highlights a paradox of democratization, which Figure 6 shows by plotting G's utility as a function of θ_d. The solid black line expresses repression with high rents, the dashed black line is repression with low rents, and the gray line is democratization. As the first part of Proposition 5 states, repression is optimal if rents are large enough and G can ensure compliance, which the black line shows. Furthermore, as Proposition 4 shows, only governments that are *weak* in the sense of managing power-sharing arrangements will ever choose to democratize.

However, for vulnerable authoritarian rulers in societies with lower scope for rent-seeking, there is a non-monotonic relationship between democratic rents and democratization prospects. Democracy must concede high enough rents to S to prevent revolution (Assumption 3), and therefore the gray line begins at $\underline{\theta}_d$. However, if θ_d increases too far past this point $\left(\theta_d > \hat{\theta}_d\right)$, then democratization is so costly for G that it represses despite the low value of sustaining authoritarian rule via repression. Therefore, G has be organizationally *strong* enough to protect its interests under democratic rule to choose this option. This relates to Albertus and Menaldo's (2018) discussion of why democracy often produces disappointing outcomes and their finding that many democratic transitions in the 20th century emerged from existing authoritarian constitutions, and Ziblatt's (2017) argument that organizationally strong conservative parties facilitate regime transitions. Democratization is most likely in circumstances where outgoing dictators can manage the transition and expect to retain substantial influence after the transition.

Figure 6: Democratization



Notes: Figure 6 assumes $\delta = 0.85$, $p = 0.7$, $\theta = 0.2$, $r_h = 0.6$, and $r_l = 0.5$, and uses the functional form $\mu(r) = 1 - \frac{2r}{1+r}$. For repression with high rents, $e = 0.1$. For the other two lines, $e = 0.5$.

6 Implications for Authoritarian Regime Dynamics

The three trajectories implied by the model correspond with three empirically prevalent types of authoritarian institutions: repression in personalist regimes, power-sharing and long duration in party-based regimes, and democratization and short duration by military regimes. Appendix A provides statistical evidence for these associations, and this section provides qualitative evidence that these three types of regimes tend to exhibit the conditions implied by the model to generate the different regime trajectories.[29] Personalist regimes repress at high levels because they have considerable scope for extracting rents and can more effectively enforce deals with close associates than with regime outsiders. This explains their relative durability juxtaposed with high violence, high rates of post-tenure leadership punishment, and infrequent democratization. By contrast, military regimes usually face favorable exit options to democracy in contrast to high coup risk under continued authoritarian rule, yielding shorter regimes more likely to transition to democracy. Finally, party-based regimes are best equipped to contain societal pressures even amid power-sharing and to tolerate societal mobilization, yielding durable and relatively non-violent regimes.

Importantly, none of these quantitative or qualitative patterns should be interpreted as *causal*. It is implausible to treat authoritarian regime type as fixed and to assess effects on outcomes such as violence, durability, and democratization. Instead, the logic of the model suggests that authoritarian regime types emerge in part in reaction to parameters that determine prospects for other outcomes. The main takeaway from the substantive discussion is that the tradeoffs posed by the model indeed correspond to real-world patterns and can help to explain puzzling patterns among different authoritarian regime types.

6.1 Personalist Regimes and the Repression/Revolution Puzzle

Existing studies suggest a paradox about personalist regimes. Research on social revolution examines how exclusionary and repressive authoritarian regimes often leave "no other way out" than violence for societal actors (Skocpol, 1979; Goodwin and Skocpol, 1989; Goodwin, 2001), but cannot explain why an authoritarian government may deliberately pursue a policy that raises prospects for revolution. Existing models of regime transitions that feature a repression option (Boix, 2003; Acemoglu and Robinson, 2006) also cannot answer this question by modeling societal mobilization as exogenous. The present model explains the paradoxical logic that personalist dictators may deliberately take actions that *increase* the probability of revolution given unpalatable alternatives: risking coups via power-sharing, or democratizing.

[29] Although this institutions-focused scheme for disaggregating authoritarian regimes most closely resembles the distinction in Geddes (1999) and Geddes, Wright and Frantz (2014), many others discuss a similar typology (e.g., Huntington, 1993; Bratton and van de Walle, 1994; Weeks, 2012).

Personalist dictatorships often arise in societies that enable high scope for rent seeking (low e), reinforced by the regime's low constraints on the executive (low θ). Famous cases of kleptocratic rule include Mobutu's reign in Zaire from 1965 until 1997 in which he amassed an enormous personal fortune by pocketing a percentage of the country's diamond and copper exports (Bratton and van de Walle, 1997, 67). During this time, Zaire's bureaucracy followed the dictum to "make the quest for wealth and money an obsession" (Evans, 1995, 47). More broadly, Bratton and van de Walle (1994, 458) argue that in personalist, or neopatrimonial regimes: "Leaders occupy bureaucratic offices less to perform public service than to acquire personal wealth and status." Kleptocratic economic controls include selective access to essential services, government-owned monopolies, and property confiscation (Chehabi and Linz, 1998, 22).

Conversely, personalist dictators expect few privileges under democratic rule (high θ_d). The narrow coalition underpinning many personalist regimes undermines their ability to command political clout following transitions to democracy (Bratton and van de Walle 1994, 465, 475; Snyder 1998). Bratton and van de Walle (1994) argue that this explains differences in the dominant mode of transition between Africa in the 1990s and Latin America in the 1980s and 1990s. Pacted transitions to democracy occurred more frequently in Latin America's military regimes, whereas personalist regimes in Africa tended to concede power only in the face of widespread protests. Some personalist regimes during the Third Wave experienced lengthy and intense periods of violence before the regime fell, as in Uganda, Ethiopia, Zaire, and Liberia. Although democracies occasionally emerge following violence, this tends to be a more difficult path to creating and consolidating democracy than through negotiated transfer (Huntington, 1993, 192-207).

Personalist rule also typically arises alongside coup-proofing maneuvers to keep the military loyal, especially given the perils of broader power-sharing in weakly institutionalized regimes examined theoretically in Proposition 3 and empirically in Roessler (2016). High-ranking generals depend on the personal patronage of the ruler and are intertwined in the broader structure of coercion (Snyder, 1998). Syria following the Arab Spring protests that began in 2011 illustrates this point. Despite facing multiple fronts of initially peaceful protests and of insurgent groups, Bashir al-Asad's regime—supported mainly by co-ethnics from his minority Alawite group—has remained intact into 2018. But this induced loyalty is endogenous to the patterns of repression by a regime tightly organized around the person of Bashir al-Asad and, before him, his father Hafiz. By the time Hafiz had become head of state through a series of military coups in the 1960s and early 1970s, almost all of the top officers were co-ethnic Alawites, and their small size ($\sim$10%

of the population) has encouraged repressive means for remaining in power (Quinlivan, 1999, 140-1). The poor expected fate of top military officers under a different regime has created incentives for military loyalty even during unrest. Bellin (2012) illustrates a similar point by comparing Middle Eastern countries. Discussing different outcomes during the Arab Spring in 2011, she argues that the military remained loyal in Syria and Bahrain because it was ethnically distinct from the protesters. By contrast, in largely ethnically homogeneous Tunisia and Egypt, the military did not perceive its fate as intrinsically related to the incumbent.

6.2 Military Regimes and the Puzzle of Elite Protections Under Democracy

Although considerable research associates democracy with rule by a non-elite median voter, democratization in military regimes highlights the opposing consideration that transition is most likely when elites can safeguard themselves under democracy. The most important difference between collegially ruled military regimes and personalist regimes is that military dictators usually face a relatively favorable exit option to democratization (Bratton and van de Walle, 1994; Geddes, 1999). Unlike narrowly constructed personalist ruling coalitions, collegial military regimes share power more broadly and expect to survive as an intact institution following democratization, i.e., relatively low θ_d.[30] For example, Brazil transitioned to democracy in 1985. After a surprise victory by the opposition in national elections, the ruling military junta decided "the costs of accepting a Tancredo Neves presidency were not too great" (Stepan, 1988, 67). Although the military had a weaker bargaining position than when it took over power in 1964, it retained enough institutional coherence to attain key goals: preventing retaliation for past human rights violations, and continued development of the arms industry (67). Democratization may also often provide an attractive option for dictators given the high prevalence of coups and killing ex-rulers in military dictatorships (Debs, 2016).

More broadly, this logic highlights similarities between military regimes and seemingly disparate alternative contributors to democracy creation. For example, Ziblatt (2017) discusses elite safeguards under democracy. His analysis of 19th and 20th century Europe produces the paradoxical conclusion that protecting the fates of conservative parties greatly shaped prospects for democratization and democratic consolidation. Counter-

[30]To de-politicize what is supposed to be a meritocratic and hierarchical organization, generals sometimes prefer to return in the barracks rather than to continue ruling (Geddes, 1999; Finer, 2002), although the model assumes that all dictators have identical goals and, in a given period, are better off being in power than not.

majoritarian elements to constitutions, such as reserved rights for the military or unelected upper chambers, can promote democracy by improving elites' fate under majority rule (364). For more recent post-colonial cases, these conditions are more difficult to replicate given stronger norms against countermajoritarian institutions. However, characteristics of the incumbent authoritarian regime can provide a substitute.[31] Regimes that simultaneously fear insider overthrow under prolonged authoritarianism but that can secure favorable fates under democracy—such as collegially organized military regimes—are more likely to negotiate transitions to democracy.

6.3 Party Regimes and the Mobilization Puzzle

Party regimes pose a final puzzle. Whereas research on personalist regimes treats mass mobilization as a grave threat to regime stability (Bratton and van de Walle, 1994; Snyder, 1998; Goodwin, 2001), studies of party-based regimes highlight mass mobilization as a source of authoritarian *durability* (Magaloni and Kricheli, 2010). The model offers two explanations for this paradox. First, whether or not a period with societal mobilization will correspond with revolution depends on the long-run frequency of societal mobilization periods—which preventive repression spending determines. Societal mobilization as modeled here is not inherently threatening to the incumbent in the sense of causing a revolution. Instead, sufficiently frequent opportunities for societal organization are necessary in the model to facilitate peaceful bargaining in a mobilization period and to prevent revolution along the equilibrium path. Therefore, low repressive regimes will be invulnerable to revolutions precisely because social mobilization occurs frequently (alongside high enough power-sharing θ). Second, party-based regimes can tolerate high mobilization levels and power-sharing because they often create mass organizations such as youth party wings that can deter outsider coups and revolution (see Proposition 3), and the party machine can rally citizens to *support* the regime.

The same sources of mass support for party regimes also correspond with a relatively weak rent-seeking effect, i.e., high θ. Perhaps the most commonly discussed mechanism linking authoritarian parties to regime stability is that they solve commitment problems regarding delivering spoils to society (Magaloni and Kricheli, 2010), which the exogenous transfer parameter captures in a reduced form way. Hierarchically organized parties provide lower-level officials with coordination mechanisms that can be used to

[31] Additionally, Albertus and Menaldo (2018) discuss the prevalence of democratic constitutions that originated in authoritarian regimes.

check authoritarian transgressions, perhaps by disseminating information among party cadres (Gehlbach and Keefer, 2011). This off-the-equilibrium threat of anti-regime mobilization enables the ruler to promise high concessions.

Finally, although party-based regimes tend to feature comparatively higher levels of power-sharing and lower coercion levels than personalist regimes, many party regimes feature relatively high repression levels amid authoritarian stability, such as China. Party regimes with revolutionary origins often enjoy an additional source of loyalty from their military. By constructing the army from scratch or by radically transforming the existing military, and by commanding the military with cadres from the revolutionary struggle, revolutionary party regimes are largely invulnerable to coups (Levitsky and Way, 2013). In such cases, the effect of higher r_h may exert a stronger effect on decreasing the probability of revolution success $p(\cdot)$ than on increasing the likelihood that a military coup succeeds, $q(\cdot)$, which suggests that revolutionary regimes can exert high repression levels without triggering revolution (see Proposition 3).

7 Conclusion

Empirically, authoritarian regimes vary in their durability, democratization likelihood, and violence. This paper presents a game theoretic model that explains a dictator's dilemma to exercising heavy preventive repression, and consequences for regime dynamics. The authoritarian government can choose among high repression, authoritarian power-sharing, and democratization, and society reacts by endogenously mobilizing to negotiate transfers or launch a revolution. Repressing at high levels creates a tradeoff relative to power-sharing: although higher repression enables the government to consume higher rents by decreasing mobilization frequency, it also leaves society "no other way out" except revolution. Introducing additional political survival concerns shows that the government may fail at either repression or power-sharing because each potentially generates conditions for coups. Furthermore, the government cannot extricate itself from a violent path by democratizing because repression empowers societal extremists. Instead, the dictator only democratizes when too weak to sustain durable authoritarianism but also strong enough to protect elite interests under democratic rule. The model implications help to explain empirical differences across authoritarian regime types: personalist (high repression and other violence), military (high democratization likelihood), and party-based (greater power-sharing and durable authoritarian regimes).

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Online Appendix

Contents

A Patterns Across Authoritarian Regimes

This section presents brief regression evidence to substantiate the main patterns to explain. The sample is all country-years from the Geddes, Wright and Frantz (2014) dataset (1946–2010) in which at least one of personalist, military, or party institutions were central to the regime. This restricts attention to the most prevalent forms of post-1945 authoritarian regimes and to the regime types for which the model generates theoretical implications, and excludes democracies, oligarchies, monarchies, and state collapse years. For hybrid regimes in which Geddes, Wright and Frantz (2014) code multiple institutions as important—for example, military-personal regimes—Panel A codes the regime as the least institutionalized category and Panel B as the most institutionalized. Therefore, conceiving party-based as most institutionalized, followed by military and then personal, military-personal regimes are coded as personal in Panel A and as military in Panel B. Notably, regimes with rulers who were in the military when they came to power can be coded as either military or personalist, depending on the extent to which power is shared within the junta. Geddes, Wright and Frantz (2014) reserve the term "military regimes" for regimes in which a military leader came to power *and* subsequently shared power within a junta, creating collegial military rule. This also relates to Svolik's (2012) distinction between personal and corporate military regimes.

Table A.1 presents logit estimates for the binary dependent variables and OLS for the categorical dependent variable. Every specification clusters standard errors by country. The dependent variables differ across columns. Column 1 analyzes regime failure, which equals 1 in a country-year that an authoritarian regime ends and 0 otherwise using Geddes, Wright and Frantz's (2014) data. Given the expectation that party regimes should be the least likely to fail, the column presents coefficient estimates for military regimes and for personalist regimes, leaving party regimes as the omitted basis category to which military and personalist regimes are compared. The next two columns analyze violence, and personalist regime is the omitted category. Column 2 analyzes Freedom House's civil liberties index (Freedom House, 2018), which Davenport (2007) uses as a measure low-intensity, or preventive repression. I rescaled the variable to take values between 0 and 1, with higher values indicating greater civil liberty protection.[32] Column 3 analyzes a different aspect of violence, and the dependent variable equals 1 if violence occurred during regime change (at least 25 deaths) and 0 otherwise. It restricts the sample to years with regime failure. Geddes, Wright and Frantz (2014) draw from the Armed Conflict Database (Gleditsch et al., 2002) for this variable. Columns 4 and 5 analyze democratization, and military regime is the omitted category. The dependent variable in both equals 1 if the regime in the next year is democratic, and 0 otherwise, using Geddes, Wright and Frantz's (2014) democracy data. The Column 4 sample includes all country-years, and Column 5 truncates the sample to years with regime failure.

The regression results substantiate the main differences across authoritarian regimes summarized at the beginning of the paper. All the following comparisons use the Panel A estimates. Regarding regime durability, party regimes fail in 2.4% of years (Column 1). This is 82% lower than military regimes (13.0% of years) and 58% lower than personalist regimes (5.7% of years), and each of these differences are statistically significant in both panels. Regarding violence, compared to personalist regimes, civil liberty scores are 35% higher in

[32] The present focus on low-intensity repression explains an importance difference from Escribà-Folch and Wright (2015), who present graphical evidence that military regimes repress at higher levels than personalist regimes (59). They use Fariss's (2014) repression measure that incorporates information on high-intensity repression events such as torture and killing, in contrast to the present focus on preventive repression—which relates more closely to civil liberty violations—to prevent mass mobilization.

Table A.1: Patterns Across Authoritarian Institutions

	Panel A. Hybrid regimes coded as least institutionalized type				
DV:	Regime failure	Civil liberties	Violence	Democratization	
	(1)	(2)	(3)	(4)	(5)
Personal	0.897***			-1.088***	-0.416
	(0.183)			(0.259)	(0.307)
Military	1.809***	0.133***	-1.277***		
	(0.235)	(0.0455)	(0.474)		
Party		0.0718	-0.639	-2.077***	-0.606
		(0.0456)	(0.470)	(0.297)	(0.405)
Country-years	3,899	1,110	207	3,899	207
Sample	Full	Full	Failure years	Full	Failure years
Model	Logit	OLS	Logit	Logit	Logit
	Panel B. Hybrid regimes coded as most institutionalized type				
DV:	Regime failure	Civil liberties	Violence	Democratization	
	(1)	(2)	(3)	(4)	(5)
Personal	1.031***			-1.311***	-1.156***
	(0.178)			(0.239)	(0.312)
Military	1.777***	0.137***	-0.786*		
	(0.180)	(0.0450)	(0.406)		
Party		0.0658	-0.356	-2.296***	-1.127***
		(0.0396)	(0.386)	(0.226)	(0.345)
Country-years	3,899	1,110	207	3,899	207
Sample	Full	Full	Failure years	Full	Failure years
Model	Logit	OLS	Logit	Logit	Logit

Notes: Table A.1 summarizes a series of regressions with country-clustered standard errors. The low number of observations in Column 2 arises from data restrictions for the dependent variable. $^{***}p < 0.01,^{**}p < 0.05,^{*}p < 0.1$.

military regimes and 19% higher in party regimes (Column 2). Conditional on regime failure, personalist regimes experience violence in 32.1% of years (Column 3). This is 2.8 times the frequency in military regimes (11.7%) and 1.6 times the frequency in party regimes (20.0%). For both violence columns, these differences are statistically significant for military regimes. Regarding democratization, military regimes democratize in 7.1% of years (Column 4) and, conditional on failing, transition to democracy 55% of the time (Column 5). The unconditional figure (Column 4) is 7.5 times the frequency for party regimes (1.0% of years) and 2.8 times the frequency for personalist regimes (2.5% of years), and each of these differences are statistically significant. The conditional figure (Column 5) for military regimes is 38% higher than party regimes (40% of transitions lead to democracy) and 23% higher than personalist regimes (45% of transitions). These differences rise above the 10% significance level in Panel A but remain significant in Panel B.

B Supplemental Material for Formal Model

B.1 Proofs for Baseline Model

Proof of Lemma 1. Given the equations from the text, two remaining points need to be established. First, any equilibrium must feature S accepting with probability 1 if indifferent. Accepting with any probability strictly less than 1 yields an open set problem for G's optimization problem because it would optimally choose the minimum $\epsilon > 0$ such that $x_t + \epsilon > x^*(r, \theta)$.

Second, need to show that S accepts with probability 0 if $x_t < x^*(r, \theta)$. S's most-profitable deviation from the posited strategy entails accepting an offer of 1 in a mobilization period rather than fighting. Denoting S's future continuation value in the status quo regime if revolution occurs in every mobilization period as V^S_{war}, this deviation is not profitable if and only if:

$$1 + \delta \cdot V^S_{\text{war}} \leq \delta \cdot \left[p \cdot \frac{1}{1-\delta} + (1-p) \cdot V^S_{\text{war}} \right], \text{ for:}$$

$$V^S_{\text{war}} = \big[1 - \mu(r)\big] \cdot \left[e + \theta \cdot (1-e) + \delta \cdot V^S_{\text{war}} \right] + \mu(r) \cdot \delta \cdot \left[p \cdot \frac{1}{1-\delta} + (1-p) \cdot V^S_{\text{war}} \right]$$

Solving the second equation yields:

$$V^S_{\text{war}} = \frac{(1-\delta) \cdot \big[1-\mu(r)\big] \cdot \big[e + \theta \cdot (1-e)\big] + \mu(r) \cdot \delta \cdot p}{(1-\delta) \cdot \Big[1 - \delta \cdot \big[1 - \mu(r) \cdot p\big]\Big]}$$

Substituting this term into the first equation and rearranging yields the complement of Equation 4:

$$(1-\theta) \cdot (1-e) \leq \frac{\delta \cdot p - \big[1 - \delta \cdot (1-p)\big] \cdot \big[e + \theta \cdot (1-e)\big]}{1 - \delta \cdot \big[1 - \mu(r) \cdot p\big]}$$

■

Proof of Lemma 2. Follows directly from the interior optimal transfer strictly increasing in r and strictly decreasing in θ.

■

Proof of Lemma 3. First establish two unique threshold values of θ. For $\theta < \underline{\theta}$, Equation 4 is violated. For $\theta \in \big(\underline{\theta}, \overline{\theta}\big)$, $x^* = \frac{\delta \cdot p - [1-\delta \cdot (1-p)] \cdot [e + \theta \cdot (1-e)]}{1 - \delta \cdot [1-\mu(r) \cdot p]}$. For $\theta > \overline{\theta}$, $x^* = 0$. These thresholds are defined as:

$$\frac{\delta \cdot p - [1 - \delta \cdot (1-p)] \cdot [e + \underline{\theta} \cdot (1-e)]}{1 - \delta \cdot [1 - \mu(r) \cdot p]} = (1 - \underline{\theta}) \cdot (1-e)$$

$$\frac{\delta \cdot p - [1 - \delta \cdot (1-p)] \cdot [e + \overline{\theta} \cdot (1-e)]}{1 - \delta \cdot [1 - \mu(r) \cdot p]} = 0$$

It suffices to show that $(1-\theta) \cdot (1-e) - x^*(r, \theta)$ strictly decreases in θ for all $\theta \in (\underline{\theta}, \overline{\theta})$, strictly decreases in θ for all $\theta > \overline{\theta}$, and is continuous at $\theta = \underline{\theta}$.

- The derivative equals $\frac{-(1-e) + \frac{\mu(r) \cdot [1-\delta \cdot (1-p)] \cdot (1-e)}{1-\delta \cdot [1-\mu(r) \cdot p]}}{1-\delta}$. Setting this term strictly less than 0 and simplifying yields $\mu(r) < 1$, a true expression.

- The derivative equals $-\frac{1-e}{1-\delta} < 0$.
- $\lim_{\theta \to \bar{\theta}^-} \frac{\delta \cdot p - [1-\delta \cdot (1-p)] \cdot [e+\theta \cdot (1-e)]}{1-\delta \cdot [1-\mu(r) \cdot p]} = 0$. ■

Proof of Proposition 1. Given the preceding results, it suffices to establish the existence of a unique $\hat{r}$ with the stated properties. Showing the conditions for the intermediate value theorem hold demonstrates the existence of at least one $\hat{r} > r_l$ such that $\Omega_{\theta,r}(r_h = \hat{r}) = 0$.

- If $r_h = r_l$, then Assumption 2' implies that $\Omega_{\theta,r} > 0$.
- If $r_h \to \infty$, then assuming $\lim_{r_h \to \infty} \mu(r) = 0$ implies that $V_r^G = \frac{(1-\theta_l) \cdot (1-e)}{1-\delta}$. Then, $\Omega_{\theta,r} < 0$ follows from $\theta_l < \theta_h$ and $\mu(r_l) \in (0,1)$.
- The assumed continuity of $\mu(\cdot)$ in r implies that $\Omega_{\theta,r}$ is continuous in r_h.

Assuming $\mu(\cdot)$ strictly decreases in r implies that $\Omega_{\theta,r}$ strictly decreases in r_h, which yields the unique threshold claim. ■

Proof of Lemma 5. The continuation value V^S from Equations 12 and 13 is identical to the baseline game in the substantively interesting parameter ranges with an interior equilibrium offer. (V^S does not depend on whether or not fighting occurs in equilibrium because G holds S to its fighting reservation value). This enables solving for the boundary conditions:

$$\hat{c}_e \equiv \frac{\delta \cdot p - \big[1 - \delta \cdot (1-p)\big] \cdot \big[e + \theta \cdot (1-e)\big]}{1-\delta}$$

$$\hat{c}_m \equiv \frac{(\theta_d - \theta_l) \cdot (1-e)}{1-\delta}$$

If $D = 1$, then $V^S = \frac{e + d(r) \cdot \theta_d \cdot (1-e)}{1-\delta}$. (Note that this expression uses the assumption that G proposes democratization in every future period.) Substituting this into Equation 2 and imposing Assumption 3 establishes the claim under power-sharing, and the statement for repression is trivial to establish given that only extremists mobilize. ■

Proof of Proposition 3. The unique thresholds and their ordering follow directly from the fact that the interior solution for $x^*(r,\theta)$ (see Equation C.5) strictly increases in p. ■

Proof of Proposition 2. The threshold is:

$$\frac{\big[1 - \mu(r_l)\big] \cdot (1-\theta_h) \cdot (1-\hat{e})}{1-\delta} = \frac{\big[1 - \mu(r_h)\big] \cdot (1-\theta_l) \cdot (1-\hat{e})}{1 - \delta \cdot \big[1 - \mu(r_h) \cdot p\big]}$$

The unique threshold claim follows from the strict monotonicity shown in Equation 9. Note that the derivative of the left-hand side of this equation with respect to e equals 0 because Assumption 2' constrains $(1-\theta_h)\cdot(1-e)$ to equal 0 (implying the budget constraint in Equation 4 binds with equality), and therefore does not vary in e. ■

Proof of Proposition 3. The unique thresholds and their ordering follow directly from the fact that the interior solution for $x^*(r,\theta)$ (see Equation C.5) strictly increases in p. ■

Proof of Lemma 4. Solving and combining Equations 10 and 11 yields:

$$\frac{\big[1-\mu(r_h)\big]\cdot\omega_{sq}}{1-\delta\cdot\big[1-\mu(r_h)\cdot p(r_h)\big]}\geq\frac{1}{1-\delta}\cdot\max\big\{q(r_h),\omega_{rc}\big\}\tag{B.1}$$

The following expressions implicitly characterize the threshold values:

$$\frac{\big[1-\mu(r_h)\big]\cdot\omega_{sq}}{1-\delta\cdot\big[1-\mu(r_h)\cdot p(r_h)\big]}=\frac{1}{1-\delta}\cdot\hat{q}\tag{B.2}$$

$$\frac{\big[1-\mu(r_h)\big]\cdot\omega_{sq}}{1-\delta\cdot\big[1-\mu(r_h)\cdot p(r_h)\big]}=\frac{1}{1-\delta}\cdot\hat{\omega}_{rc}\tag{B.3}$$

$$\tilde{q}=\omega_{rc}\tag{B.4}$$

It is straightforward to verify the boundary conditions and strict monotonicity properties that establish these thresholds are unique and are each strictly bounded between 0 and 1. The inequalities stated in the lemma follow directly from the thresholds.

Regarding G's optimal choices, the statement when military compliance holds follows from Proposition 2. If military compliance does not hold, then the necessary inequality is:

$$\frac{\big[1-\mu(r_l)\big]\cdot(1-\theta_h)\cdot(1-e)}{1-\delta}>\frac{\big[1-\mu(r_l)\big]\cdot(1-\theta_l)\cdot(1-e)}{1-\delta\cdot\big[1-\mu(r_l)\cdot p\big]}\tag{B.5}$$

The first part of Assumption 2' implies that θ_h satisfies:

$$(1-\theta_h)\cdot(1-e)=\frac{\delta\cdot p-\big[1-\delta\cdot(1-p)\big]\cdot\big[e+\theta\cdot(1-e)\big]}{1-\delta\cdot\big[1-\mu(r)\cdot p\big]}\tag{B.6}$$

Substituting Equation B.6 into the inequality from Equation B.5 yields a statement that is true because of the second part of Assumption 2'. ■

Proof of Proposition 4. First, show Assumption 2' implies that power-sharing strictly dominates democratization. If $D=1$ and $r=r_l$, then $V^S=\frac{e+\theta_d\cdot(1-e)}{1-\delta}$. (Note that this assumes that G proposes democratization in every future period.) Substituting $\theta=\theta_d$ and $x^*=0$ into Equation 2 yields the incentive compatibility constraint:

$$\frac{e+\theta_d\cdot(1-e)}{1-\delta}\geq\delta\cdot\left[p\cdot\frac{1}{1-\delta}+(1-p)\cdot\frac{e+\theta_d\cdot(1-e)}{1-\delta}\right],$$

which Assumption 3 implies is true. Combining Lemma 3 and Assumption 2' implies that G's utility is higher under power-sharing.

The first statement in the proposition, and optimal power-sharing if $e < \hat{e}$, follow from Proposition 2. The remainder of the second statement follows from Lemma 4. ■

Proof of Proposition 5. The first statement follows from Propositions 2 and 4. The threshold in the second statement is:

$$\frac{\big[1-\mu(r_h)\big]\cdot(1-\theta_l)\cdot(1-e)}{1-\delta\cdot\big[1-\mu(r_h)\cdot p\big]} = \frac{\big[1-\mu(r_l)\big]\cdot(1-\theta_h)\cdot(1-e)}{1-\delta\cdot\big[1-\mu(r_l)\big]} + \frac{\mu(r_l)\cdot(1-\hat{\theta}_d)\cdot(1-e)}{(1-\delta)\cdot\Big[1-\delta\cdot\big[1-\mu(r_l)\big]\Big]}$$

The threshold in the third statement is:

$$\frac{\big[1-\mu(r_h)\big]\cdot(1-\theta_l)\cdot(1-e)}{1-\delta\cdot\big[1-\mu(r_h)\cdot p\big]} = \frac{\big[1-\mu(r_l)\big]\cdot(1-\theta_h)\cdot(1-e)}{1-\delta\cdot\big[1-\mu(r_l)\big]} + \frac{\mu(r_l)\cdot(1-\tilde{\theta}_d)\cdot(1-e)}{(1-\delta)\cdot\Big[1-\delta\cdot\big[1-\mu(r_l)\big]\Big]}$$

The unique threshold claims follow from the strict monotonicity of these equations in θ_d. ■

C Enriching the Baseline Model

C.1 Setup

This extension modifies the baseline game in three ways. First, as the first move in each period, G chooses a repression spending amount $r_t \in [0,1]$. To minimize notation and to focus solely on the repression-revolution tradeoff, I set $e = \theta = 0$ throughout. Second, G pays a cost r_t for this repression spending. Third, there are three components to S's mobilization costs. (1) A fixed cost $F > 0$ expresses generic difficulties to and costs of mobilizing support even in non-repressive regimes.[33] (2) G's repression spending yields an additional cost $c(r)$ that strictly increases in r.[34] (3) Nature draws a stochastic element for the mobilization cost, ϵ_t, that is distributed independently across periods according to a smooth distribution function $H(\epsilon_t)$ with continuous support over $[-F, F]$ and an expected value of 0. The associated probability density function is $h(\epsilon_t)$. Therefore, as in the baseline model, even if the repression level is constant across periods, S's cost of mobilizing will differ across periods. In sum, S's cost to mobilizing in period t is $C_t \equiv F + c(r) + \epsilon_t$. S perfectly observes this cost and the rest of the stage game proceeds as in the baseline model.

I analyze a strategy profile in which G represses at the same ...

[33] The proof of Lemma C.3 defines the upper bound for the fixed cost, $\hat{F} > 0$.

[34] There are several additional technical restrictions: $c(\cdot)$ is smooth; $c(0)=0$; $\lim_{r\to 0} c'(r) = \infty$; $c''(r) < 0$; and $\big|c''(r)\big| > \underline{c}''$, for $\underline{c}''$ defined in the proof of Lemma C.5.

C.2 Transfer Offer and Mobilization

If S has mobilized in period t and sunk the cost C_t, then it accepts any transfer offer x_t for which consuming in the current period and remaining in the status quo authoritarian regime in the future yields an expected consumption stream at least as large as from revolting, which enables S to gain control of the government starting in the next period.

$$\underbrace{-C_t + x_t + \delta \cdot V^S(r)}_{E[U_S(\text{accept})]} \geq \underbrace{-C_t + \delta \cdot \left[p \cdot \frac{1}{1-\delta} + (1-p) \cdot V^S(r)\right]}_{E[U_S(\text{revolt})]} \tag{C.1}$$

In equilibrium, G never strictly satisfies Equation C.1 because it would have incentives to deviate to a lower offer. Furthermore, because a revolution eliminates G's consumption, G will always propose a transfer that satisfies Equation C.1 if possible. Holding fixed the future continuation value V^S, the interior optimal offer is:

$$x^*(r) = \delta \cdot p \cdot \left[\frac{1}{1-\delta} - V^S(r,\theta)\right], \tag{C.2}$$

although the bounds $[0,1]$ constrain this transfer. S's optimal mobilization choice weighs the mobilization costs against the benefit from being able to stage a revolution. Its mobilization cost fluctuates across periods because of the stochastic component, ϵ_t. In equilibrium, there exists a unique threshold value of ϵ_t such that S mobilizes if ϵ_t is sufficiently small and does not otherwise. This threshold, denoted as $\underline{\epsilon}^*(r)$, is determined by S's future continuation value from remaining in the status quo authoritarian regime, V^S. In $1 - H(\underline{\epsilon}^*)$ percent of periods, for $H(\underline{\epsilon}^*) = \int_{-F}^{\underline{\epsilon}^*(r)} dH(\epsilon_t)$, S does not mobilize. It consumes 0 in those periods and remains in the status quo authoritarian regime in the next period, yielding future consumption $\delta \cdot V^S$. If instead S mobilizes in period t, then it pays $C_t = F + c(r) + \epsilon_t$. Given the equilibrium mobilization threshold, the average cost that S pays when mobilizing equals:

$$\overline{C}(r) \equiv \frac{\int_{-F}^{\underline{\epsilon}^*(r)} [F + c(r) + \epsilon_t] \cdot dH(\epsilon_t)}{H(\underline{\epsilon}^*(r))} \tag{C.3}$$

S's lower-bound expected lifetime consumption in a mobilization periods equals $-C_t + \delta \cdot \Big[p \cdot \frac{\phi_R}{1-\delta} + (1 - p) \cdot V^S(r,\theta)\Big]$ and therefore is dictated by its value to revolution because S can always initiate a revolution after mobilizing. Equation C.2 shows that this also equals S's upper bound lifetime consumption from mobilizing. These considerations yield a recursive equation for V^S that solves to:

$$V^S(r,\theta) = \frac{H\big(\underline{\epsilon}^*(r)\big) \cdot \big[-(1-\delta) \cdot \overline{C}(r) + \delta \cdot p\big]}{(1-\delta) \cdot \Big[1 - \delta \cdot \big[1 - H\big(\underline{\epsilon}^*(r)\big)\big] \cdot p\Big]} \tag{C.4}$$

Combining Equations C.2 through 1 enables stating the interior optimal transfer offer as a function of parameters. Below, the analysis characterizes the conditions under which it satisfies the per-period budget constraint.

$$x^*(r,\theta) = \frac{\delta \cdot p \cdot H\big(\underline{\epsilon}^*(r)\big) \cdot \overline{C}(r)}{1 - \delta \cdot \big[1 - H\big(\underline{\epsilon}^*(r)\big) \cdot p\big]} \tag{C.5}$$

Solving for the future continuation value also enables defining the mobilization threshold, which Lemma C.1 states by showing the state of the world in which S is indifferent between mobilizing or not. Remark

C.1 provides an equivalent statement of the mobilization threshold that equates the contemporaneous cost of mobilization with the equilibrium transfer offer.

Lemma C.1 (Mobilization threshold)**.** *There exists a unique mobilization threshold $\underline{\epsilon}^*(r) \in (-F, F)$ such that S mobilizes if $\epsilon_t < \underline{\epsilon}^*(r)$ and does not mobilize otherwise. This threshold is implicitly defined as:*

$$\Theta\big(\underline{\epsilon}^*(r)\big) \equiv \underbrace{-\big[F + c(r) + \underline{\epsilon}^*(r)\big] + \delta \cdot \Big[p \cdot \frac{1}{1-\delta} + (1-p) \cdot V^S\big(r, \underline{\epsilon}^*(r)\big)\Big]}_{E[U_S(\textit{mobilize})]} - \underbrace{\delta \cdot V^S\big(r, \underline{\epsilon}^*(r)\big)}_{E[U_S(\textit{not})]} = 0,$$

for V^S defined in Equation 1.

Remark C.1 (Alternative statement of mobilization threshold)**.** *$\Theta\big(\underline{\epsilon}^*(r)\big)$ can be equivalently stated as:*

$$\Theta\big(\underline{\epsilon}^*(r)\big) = x^*(r) - \big[F + c(r) + \underline{\epsilon}^*(r)\big],$$

for $x^*(r)$ defined in Equation C.5.

Before proving Lemma C.1, it is necessary to specify upper and lower bounds on the cost of mobilizing to rule out strategically uninteresting cases in which S either mobilizes in every period or in no periods—i.e., independently of the stochastic component of the cost function.

Assumption C.1 (Bounds on mobilization costs)**.** *For all $r \in [0, 1]$:*

$$0 < \frac{\delta \cdot p}{1-\delta} - c(r) < (2-\delta) \cdot F$$

Note that every proof uses the statement of $\Theta\big(\underline{\epsilon}^*(r)\big)$ from Remark C.1 rather than Lemma C.1.

Proof of Lemma C.1. Applying the intermediate value theorem demonstrates the existence of at least one $\underline{\epsilon}^*(r)$ that satisfies $\Theta\big(\underline{\epsilon}^*(r)\big) = 0$. The first inequality in Assumption C.1 implies that $\Theta(-F) > 0$ for all $r \in [0, 1]$. The second inequality in Assumption C.1 implies that $\Theta(F) < 0$ for all $r \in [0, 1]$. Finally, the assumed smoothness of the distribution function $H(\cdot)$ implies that $\Theta(\cdot)$ is continuous.

Demonstrating that $\Theta(\cdot)$ strictly decreases in $\underline{\epsilon}^*(r)$ proves the threshold claim.

$$\frac{d\Theta}{d\underline{\epsilon}^*(r)} = -\left(1 - \frac{dx^*(r)}{d\underline{\epsilon}^*(r)}\right),$$

for:

$$\frac{dx^*(r)}{d\underline{\epsilon}^*(r)} = \frac{\delta \cdot h\big(\underline{\epsilon}^*(r)\big)}{1 - \delta \cdot \big[1 - H\big(\underline{\epsilon}^*(r)\big)\big]} \cdot \Big[F + c(r) + \underline{\epsilon}^*(r) - x^*(r)\Big] = 0$$

This term equals 0 because, by definition of $\underline{\epsilon}^*(r)$, $x^*(r) = F + c(r) + \underline{\epsilon}^*(r)$. Therefore, $\frac{d\Theta}{d\underline{\epsilon}^*(r)} = -1$. ■

C.3 Repression-Revolution Tradeoff

Characterizing optimal choices in the per-period stage game enables analyzing how repression spending affects the equilibrium frequency of mobilization and the equilibrium frequency of revolution. Before analyzing how G chooses the optimal level of r, it is necessary to first analyze the consequences of varying levels of r. A short-term effect makes societal mobilization less likely in a particular period by raising S's costs to organizing. However, this short-term effect also exerts a paradoxical long-term effect by making revolution more likely to occur along the equilibrium path. By increasing the costs that society must pay to gain concessions, the government must offer higher transfers in a period that society does mobilize—decreasing the likelihood of peaceful bargaining.

Formally, analyzing the mobilization threshold from Lemma C.1 yields the first key effect of repression spending. Lemma C.2 shows that higher r strictly decreases S's equilibrium frequency of mobilization, $H\big(\underline{\epsilon}^*\big)$. The expression in Lemma C.1 shows that repression exerts this short-term effect because repression spending raises the cost of mobilizing.

Lemma C.2 (Short-term repression effects)**.** *Higher repression spending strictly decreases S's equilibrium mobilization frequency, $H\big(\underline{\epsilon}^*\big)$, through its effect on increasing the cost of mobilization, $c(r)$.*

Proof of Lemma C.2. First need to show:

$$\frac{dH\big(\underline{\epsilon}^*(r)\big)}{dr} = -h(\underline{\epsilon}^*)\cdot\frac{\frac{\partial\Theta}{\partial r}}{\frac{\partial\Theta}{\partial\underline{\epsilon}^*}} = h(\underline{\epsilon}^*)\cdot\frac{-\big(1-\frac{\partial x^*}{\partial c}\big)\cdot c'(r)}{1-\frac{\partial x^*}{\partial\underline{\epsilon}^*}} < 0$$

$\frac{\partial x^*}{\partial c} = \int_{-F}^{\underline{\epsilon}^*} dH(\epsilon_t)$, which the fundamental theorem of calculus implies equals $H(\underline{\epsilon}^*)$. Because $H(\cdot)$ is a cumulative density function and because $c'(r) > 0$ by assumption, the numerator is strictly negative. The proof of Lemma C.1 showed that the denominator equals 1, and therefore the overall term is $-h(\underline{\epsilon}^*)\cdot\big[1-H(\underline{\epsilon}^*)\big]\cdot c'(r) < 0$. ■

However, preventive repression spending also exerts a countervailing long-term effect that facilitates revolution. G can buy off a social revolt in a period that S mobilizes if and only if $x^*(r) \leq 1-r$. Higher repression makes this more difficult satisfy precisely because of the short-term effect: less frequent mobilization causes S to demand more in periods it does mobilize. G must compensate S for the more frequent periods in which S will not receive transfers to prevent fighting, raising x^*. Lemma C.3 shows that there exist a unique $\hat{r} > 0$ such that revolution will occur in equilibrium if $r > \hat{r}$ but not otherwise.

Lemma C.3 (Long-term repression effect via mobilization costs)**.** *There exists a unique threshold $\hat{r} > 0$ such that:*

- *If G chooses $r_t < \hat{r}$ for all t, then in any period t in which S mobilizes, G offers $x_t = x^*$. S accepts any $x_t \geq x^*$ with probability 1 and any $x_t < x^*$ with probability 0.*
- *If G chooses $r > \hat{r}$ for all t, then in any period t in which S mobilizes, then G offers any $x_t \in \big[0, 1-r\big]$ and S responds to any offer with revolution.*

Proof of Lemma C.3. Define $B^*(r) \equiv 1 - r - x^*(r)$. Applying the intermediate value theorem demonstrates the existence of at least one $\hat{r} \in (0,1)$ such that $B^*(\hat{r}) \equiv 1 - \hat{r} - x^*(\hat{r}) = 0$.

- To establish $B^*(0) > 0$, it suffices to show that there exists $\hat{F} > 0$ such that $B^*(0)\big|_{F<\hat{F}} > 0$ because the setup assumes $F < \hat{F}$. This can be established by showing (1) $\lim\limits_{F \to 0} B^*(0) > 0$ and (2) $\frac{dB^*(0)}{dF} < 0$.
  1. If $r = 0$ and $F \to 0$, then $\overline{C} = 0$ because $c(0) = 0$. This implies $x^* = \frac{\delta \cdot p}{1 - \delta \cdot (1-p)}$, which in turn implies that $\lim\limits_{F \to 0} B^*(0) > 0$ if and only if $1 > \frac{1-\delta}{1-\delta \cdot (1-p)}$, which follows from $\delta > 0$ and $p > 0$.
  2. $\frac{dB^*(0)}{dF} = -\frac{dx^*(0)}{dF}$.
- To establish the upper bound, $B^*(r) < 0$ for any $r > 1$.
- The assumed continuity of each function in r and applying the theorem of the maximum to prove that $\underline{\epsilon}^*(r)$ is continuous in r demonstrates that $B^*(r)$ is continuous in r.

The threshold $\hat{r}$ is unique because $B^*(r)$ strictly decreases in r, which follows directly from the proof of Lemma C.2. ■

C.4 Self-Enforcing Low Repression

If the government sought solely to prevent revolution, then characterizing its optimal strategy would be straightforward. Lemma C.3 shows that revolution will not occur if the dictator spends nothing on repression. However, despite the costliness of revolutions, preventing revolts is the not the only objective of authoritarian rulers. Decreasing the frequency of societal mobilization—which can be achieved via repression (Lemma C.2)—provides two benefits to rulers. First, preventing societal mobilization eliminates the possibility of a government insider overthrowing the dictator (political survival effect). Second, the dictator accrues more rents in periods it does not have to buy off society (predation effect). Either effect may push the dictator to choose a high repression strategy—despite eventually causing revolution—therefore highlighting a tradeoff among coups, rents, and revolution.

Equation C.6 recursively characterizes G's lifetime expected consumption, V^G, if it chooses the optimal low repression spending amount r_l^*—which, given Lemma C.3, implies repression spending no greater than the threshold that triggers revolution in a mobilization period, $\hat{r}$.[35] Choosing low repression enables G to buy off S in a period with societal mobilization. In every period, G pays the repression cost r_l^*. In periods without societal mobilization, G consumes 1 and remains as government in the next period with probability 1. In periods with societal mobilization, G additionally pays the transfer x^* defined in Equation C.5.

$$V^G(r_l) = 1 - e - \underbrace{H\big(\underline{\epsilon}_l^*\big) \cdot x^*}_{\text{Mobilization period}} + \delta \cdot V^G(r_l) \tag{C.6}$$

Equation C.7 recursively characterizes G's lifetime expected consumption if it chooses the optimal high

[35] Lemma C.5 formally characterizes $r_l^* \in [0, \hat{r}]$, which also yields a corresponding mobilization threshold $\underline{\epsilon}_l^* \equiv \underline{\epsilon}^*(r_l^*)$, for $\underline{\epsilon}^*(r)$ defined in Lemma C.1.

repression spending amount r_h^*—which, given Lemma C.3, implies repression spending higher than $\hat{r}$.[36] Therefore, a revolution attempt will occur in the first period with societal mobilization. Periods without societal mobilization are identical to those in Equation C.6 except for differences in repression spending. In social mobilization periods, a revolution occurs. Therefore, G pays the repression cost in that period and consumes 0 in the current and in all future periods.

$$V^G(r_h) = 1 - e + \underbrace{\Big[1 - H\big(\underline{\epsilon}_h^*\big)\Big] \cdot \delta \cdot V^G(r_h^*)}_{\text{Non-mobilization period}} + \underbrace{H\big(\underline{\epsilon}_h^*\big) \cdot (1-p) \cdot \delta \cdot V^G(r_h^*)}_{\text{Mobilization period}} \tag{C.7}$$

Combining Equations C.6 and C.7 shows that G prefers low repression if:

$$\Omega_{l,h} \equiv \underbrace{\frac{1 - e - r_l^* - H(\underline{\epsilon}_l^*) \cdot x^*}{1-\delta}}_{\text{Low repression}} - \underbrace{\frac{1 - e - r_h^*}{1 - \delta \cdot \big[1 - H(\underline{\epsilon}_h^*)\big] \cdot p}}_{\text{High repression}} > 0 \tag{C.8}$$

Excepting the formal characterization of r_l^* and r_h^* presented in the final, technical appendix section, this provides the ingredients needed to state a history-dependent strategy profile in which G chooses low repression in every period, given that it faces a repression-revolution tradeoff.

Proposition C.1 (Non-stationary equilibrium with per-period repression choice)**.** *To denote the phase of the game, $\mathbb{P}_t$ is the set of periods between (1) the greater of the first period of the game and the period in which the most recent revolution occurred, and (2) period $t-1$. Assume $\Omega_{l,h} > 0$.*

1. *G's repression choice:*
   (a) *If $r_j \leq \hat{r}$ for all $j \in \mathbb{P}_t$, then $r_t = r_l^*$.*
   (b) *If $r_j > \hat{r}$ for any $j \in \mathbb{P}_t$, then $r_t = r_h^*$.*
2. *S's mobilization choice:*
   (a) *If $r_j \leq \hat{r}$ for all $j \in \mathbb{P}_t$ and $r_t \leq \hat{r}$, then S mobilizes if $\epsilon_t < \underline{\epsilon}^*(r_t, r_l^*)$ and does not mobilize otherwise, for r_l^* defined in Lemma C.5 and $\underline{\epsilon}^*(r_t, r^*)$ implicitly defined as:*

$$\underbrace{-\big[F + c(r) + \underline{\epsilon}^*(r)\big] + \delta \cdot \Big[p \cdot \frac{1}{1-\delta} + (1-p) \cdot V^S\big(r, \underline{\epsilon}^*(r)\big)\Big]}_{E[U_S(\textit{mobilize})]} - \underbrace{\delta \cdot V^S\big(r, \underline{\epsilon}^*(r)\big)}_{E[U_S(\textit{not})]} = 0,$$

   Lemma C.1 defines $\underline{\epsilon}^*(r^*)$ and Equation 1 defines V^S.

   (b) *If $r_j > \hat{r}$ for any $j \in \mathbb{P}_t$ or if $r_t > \hat{r}$, then S mobilizes if $\epsilon_t < \underline{\epsilon}^*(r_t, r_h^*)$ and does not mobilize otherwise, for r_h^* defined in Lemma C.5.*
3. *Bargaining (only occurs if S has mobilized):*

[36] Lemma C.5 formally characterizes $r_h^* \in (\hat{r}, 1 - \phi_A]$ and demonstrates existence despite the absence of a closed constraint set. This also yields a corresponding mobilization threshold $\underline{\epsilon}_h^* \equiv \underline{\epsilon}^*(r_h^*)$, for $\underline{\epsilon}^*(r)$ defined in Lemma C.1.

(a) *If $r_j \leq \hat{r}$ for all $j \in \mathbb{P}_t$ and $r_t \leq \hat{r}$, then G proposes $x_t = x^*$, for x^* defined in Equation C.5. S accepts any $x_t \geq x^*$ and otherwise initiates a revolution.*

(b) *If $r_j > \hat{r}$ for any $j \in \mathbb{P}_t$ or if $r_t > \hat{r}$, then G proposes $x_t = 0$ and S initiates a revolution in response to any proposal.*

Proof of Proposition C.1.

1a. Follows by construction of r_l^* and $\tilde{q}$.

1b. The strategy profile states that S will initiate a revolution in the first strong period in this subgame. By construction, r_h^* maximizes G's lifetime expected consumption in such a subgame.

2a. Follows by construction of S's mobilization indifference condition and because the $r_t = r_l^*$ in all future periods in this subgame.

2b. Follows by construction of S's mobilization indifference condition and because the $r_t = r_h^*$ in all future periods in this subgame.

3a. In this subgame, the strategy profile states that $r_t = r_l^*$ in all future periods. By construction of x^*, S cannot profitably deviate from accepting any offer such that $x_t \geq x^*$. Because $r_l^* < \hat{r}$, by definition of $\hat{r}$, x^* satisfies $B^* \geq 0$. G cannot profitably deviate to $x_t < x^*$ if it is sufficiently patient because revolution induces strictly lower expected consumption for G in all periods $s > t$. G cannot profitably deviate to a feasible $x_t > x^*$ because this yields strictly lower consumption for G in period t and the same expected consumption for G in all periods $t > s$.

3b. The strategy profile states that $r_t = r_h^*$ in all future periods until the next revolution. Because $r_h^* > \hat{r}$, by definition of $\hat{r}$, S strictly prefers revolution to any offer that satisfies $B^* \geq 0$. Additionally, the existence of $r_t > \hat{r}$ in period t or in $\mathbb{P}_t$ implies that $V_d^S = 0$. G cannot profitably deviate from $x_t = 0$ because all feasible offers will be rejected. ■

C.5 Technical Section: Optimal Low and High Repression Spending Amounts

The final, technical, section proves the existence of unique optimal repression spending amounts below and above the threshold $\hat{r}$ defined in Lemma C.3. The following preliminary results will be used to prove Lemma C.5. Without additional restrictions, a solution to the optimal high repression spending amount, i.e., strictly exceeding $\hat{r}$, may not exist because the constraint set is not closed. Define:

$$V_h^G \equiv \frac{1-r}{1-\delta \cdot \left[1 - H\left(\underline{\epsilon}^*(r)\right) \cdot p\right]}$$

Within the set $(\hat{r}, 1]$, a sufficient condition for the maximum value of $V_h^G\big|_{r>\hat{r}}$ not to occur at $\lim_{r \to \hat{r}^+} r$ is for V_h^G to strictly increase at $r = \hat{r}$, which Assumption C.2 imposes.

Assumption C.2.

$$\left.\frac{dV_h^G}{dr}\right|_{r=\hat{r}} > 0$$

This is not a restrictive assumption because it only rules out a strategically uninteresting case. Lemma C.4 shows that if instead $\frac{dV_h^G}{dr}\Big|_{r=\hat{r}} < 0$, then under no parameter values will G have a profitable deviation to high repression. This follows because G experiences a discrete decrease in utility at $r = \hat{r}$, and because V_h^G is strictly concave.

Lemma C.4. *If Assumption C.2 is strictly violated, then $V^G(r_h) < V^G(\hat{r})$ for all $r_h > \hat{r}$.*

Proof. Two results establish the lemma. First, G experiences a discrete drop in lifetime expected consumption at $\hat{r}$: $V^G(\hat{r}) > \lim_{\alpha \to 0^+} V^G(\hat{r} + \alpha)$. Rearranging Equation C.8 and recalling that $1 - \hat{r} - x^*(\hat{r}) = 0$ shows that $q < 1$ yields the result. Second, if V^G is strictly concave, then a strict violation of Assumption C.2 implies that V^G strictly decreases in r_h for all $r_h > \hat{r}$. The proof for Lemma C.5 establishes sufficient conditions for the strict concavity of V^G. ∎

Lemma C.5 (Unique low and high repression spending maximizers)**.**

Part a. *There exists a unique strictly positive low-repression spending amount r_l^* that maximizes G's lifetime expected utility subject to $r_l^* \in [0, \hat{r}]$.*

Part b. *There exists a unique high-repression spending amount r_h^* that maximizes G's lifetime expected utility subject to $r_h^* \in (\hat{r}, 1]$.*

Proof of part a. Solving Equation C.6 yields:

$$V^G(r_l) = \frac{1 - r_l - H\big(\underline{\epsilon}^*(r_l)\big) \cdot x^*(r_l)}{1 - \delta \cdot \big[1 - p \cdot H\big(\underline{\epsilon}^*(r_l)\big)\big]}$$

Therefore, G's optimization problem with inequality constraints is:

$$\max_{r_l} \quad \frac{1 - r_l - H\big(\underline{\epsilon}^*(r_l)\big) \cdot x^*(r_l)}{1 - \delta \cdot \big[1 - H\big(\underline{\epsilon}^*(r_l)\big) \cdot p\big]} + \lambda_1 \cdot r_l + \lambda_2 \cdot (\hat{r} - r_l)$$

The KKT conditions characterize the solution:

$$\frac{\partial \mathcal{L}}{\partial r_l} = \underbrace{\frac{h\big(\underline{\epsilon}^*(r_l^*)\big) \cdot x^*}{1 - \delta \cdot \big[1 - H\big(\underline{\epsilon}^*(r_l^*)\big) \cdot p\big]} \cdot \big[1 - H\big(\underline{\epsilon}^*(r_l^*)\big)\big] \cdot c'(r_l^*)}_{\text{MB: decreases frequency of paying } x^*}$$

$$+ \underbrace{\frac{\big[1 - r_l^* - H\big(\underline{\epsilon}^*(r_l^*)\big) \cdot x^*\big] \cdot \delta \cdot h\big(\underline{\epsilon}^*(r_l^*)\big) \cdot p}{\Big[1 - \delta \cdot \big[1 - H\big(\underline{\epsilon}^*(r_l^*)\big) \cdot p\big]\Big]^2} \cdot \big[1 - H\big(\underline{\epsilon}^*(r_l^*)\big)\big] \cdot c'(r_l^*)}_{\text{MB: decreases \% of periods w/ internal overthrow possibility}}$$

$$\underbrace{- \frac{\delta \cdot \big[H\big(\underline{\epsilon}^*(r_l^*)\big)\big]^2}{\Big[1 - \delta \cdot \big[1 - H\big(\underline{\epsilon}^*(r_l^*)\big) \cdot p\big]\Big] \cdot \Big[1 - \delta \cdot \big[1 - H\big(\underline{\epsilon}^*(r_l^*)\big)\big]\Big]} \cdot c'(r_l^*)}_{\text{MC: increases } x^*}$$

$$-\underbrace{\frac{1}{1-\delta\cdot\left[1-H\big(\underline{\epsilon}^*(r_l^*)\big)\cdot p\right]}}_{\text{MC: direct cost of repression spending}}+\lambda_1-\lambda_2=0$$

$$r\geq 0,\ \ \hat{r}\geq r_l,\ \ \lambda_1\geq 0,\ \ \lambda_2\geq 0,\ \ \lambda_1\cdot r_l=0,\ \ \lambda_2\cdot(\hat{r}-r_l)=0 \tag{C.9}$$

Assuming $\lim_{r\to 0}c'(r)=\infty$ implies positive repression spending. The continuity of the objective function over a compact set with a convex constraint set implies a maximum exists, and demonstrating that the objective function is strictly concave implies that Equation C.10 characterizes the unique maximum. Taking the second derivative of the objective function and making the negative term $c''(r)$ large enough in magnitude generates this result, specifically, greater than the threshold $\underline{c}''$ stated in footnote 34.

Part b. Solving Equation C.7 yields:

$$V^G(r_h)=\frac{1-r_h}{1-\delta\cdot\left[1-H\big(\underline{\epsilon}^*(r_h)\big)\right]}$$

Assumption C.2 implies that within the set $(\hat{r},1]$, the objective function does not achieve its upper bound at $r_h=\hat{r}$. Therefore, we can pick an arbitrarily small $\alpha>0$ such that the the compact set $[\hat{r}+\alpha,1]$ contains the maximizer. G's optimization problem with inequality constraints is:

$$\max_{r_h}\ \ \frac{1-r_h}{1-\delta\cdot\left[1-H\big(\underline{\epsilon}^*(r_h)\big)\cdot p\right]}+\lambda_1\cdot\left[r_h-(\hat{r}+\alpha)\right]+\lambda_2\cdot\big(1-r_h\big)$$

The KKT conditions characterize the solution:

$$\frac{\partial\mathcal{L}}{\partial r_h}=\underbrace{\delta\cdot\left[1-H\big(\underline{\epsilon}^*(r_h^*)\big)\cdot p\right]\cdot h\big(\underline{\epsilon}^*(r_h^*)\big)\cdot\frac{1-r_h^*}{\Big[1-\delta\cdot\left[1-H\big(\underline{\epsilon}^*(r_h^*)\big)\cdot p\right]\Big]^2}\cdot c'(r_h^*)}_{\text{MB: Increase expected time until revolution}}$$

$$-\underbrace{\frac{1}{1-\delta\cdot\left[1-H\big(\underline{\epsilon}^*(r_h^*)\big)\cdot p\right]}}_{\text{MC: Direct cost of repression spending}}+\lambda_1-\lambda_2=0$$

$$r_h\geq\hat{r},\ \ 1\geq r_h,\ \ \lambda_1\geq 0,\ \ \lambda_2\geq 0,\ \ \lambda_1\cdot(r_h-\hat{r})=0,\ \ \lambda_2\cdot(1-r_h)=0 \tag{C.10}$$

The same conditions as discussed in part a imply that this term yields a unique maximizer. ■